13TH ANNUAL FOCUS ON CREATIVE INQUIRY PROGRAM

2018 FOCI poster forum

CLEMSON CREATIVE INQUIRY

Watt Center

APRIL 02 & 03

13TH ANNUAL FOCUS ON CREATIVE INQUIRY

The Focus on Creative Inquiry (FoCI) Poster Forum is an annual event in which CI teams can present their research and project accomplishments through poster and interactive displays. FoCI is a celebration of student and mentor collaboration and accomplishments! FoCI is a great venue for students to develop and hone their communication skills.

In addition to student presentations, the Plenary Session and Awards Ceremony highlights winners of the poster competition as well as recognizes recipients of the two mentoring awards for Creative Inquiry. During the Plenary address, the recipient of the Phil and Mary Bradley Award for Mentoring in Creative Inquiry presents research and mentorship experiences. After the Plenary, the winner of the annual Creative Inquiry Graduate Student Mentor Award and the winners of the poster contests are announced.

What is Creative Inquiry?

Creative Inquiry (CI) is small group learning for all students, in all disciplines. It is the imaginative combination of engaged learning and undergraduate research – and it is unique to Clemson University.

In CI, small teams of undergraduate students work with mentors to take on problems that spring from their own curiosity, a professor's challenge, or the pressing needs of the world around them. Students take ownership of their projects. They ask questions, they take risks and they get answers.

Since its start in 2005, Creative Inquiry has supported more than 1200 projects enrolling more than 40,000 undergraduate students. Students may join CI teams as early as freshman year and continue through graduation and afterwards as graduate student mentors. They hone critical thinking and problem-solving skills as they learn to work in a team - sometimes as leaders, sometimes as followers. They develop communication skills as they present their work at professional conferences and to the external community, where they can address questions from experts and decision makers.

Creative Inquiry alumni praise their experiences for exposing them to real-world, work experiences not available in the classroom, providing hands-on research experiences, preparing them for their future careers and providing opportunities to work closely with faculty.

Indeed, Creative Inquiry is a campus-wide, cross-disciplinary culture that makes the Clemson experience relevant, engaging and extraordinary.

CLEMSON®
CREATIVE INQUIRY

ACKNOWLEDGMENTS

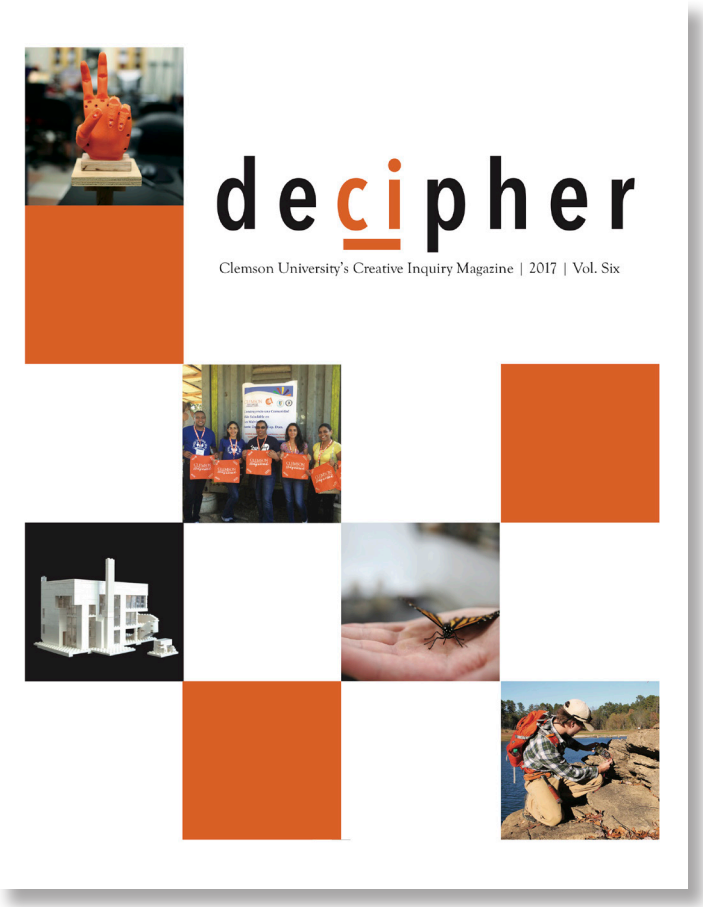
CREATIVE INQUIRY COMMITTEE

We extend out thanks to the CI Committee for support and guidance throughout the year.

Margaret Condrasky, Food, Nutrition and Packaging Sciences
Min Cao, Biological Sciences
Michael Henson, Biological Sciences
David Detrich, Art
James Gaubert, Marketing
Bobby Hollandsworth, Library
Chad Navis, Management
Suzanne Price, Student Affairs
Kathy Woodard, Public Service and Agriculture
JoAnna Floyd, Research
Denny Lester, Watt Family Innovation Center
David Knox, Clemson Thinks^2
KC Wang, School of Computing
June Pilcher, Psychology
Charles Chancellor, Parks, Rec and Tourism Management
Steven Brandon, General Engineering
Matthew Boyer, Education and Human Development
Thomas Simpson, Institutional Research
Alan Grubb, History

ABOUT *DECIPHER*

Decipher is produced by Clemson's undergraduate students to describe the accomplishments of their peers in Creative Inquiry - Clemson's unique brand of undergraduate research. Each year, more than 3,500 Creative Inquiry students investigate topics ranging from children's literacy to medical microbiology to developing the next generation of solar cells. Creative Inquiry provides students with an outlet for their curiosity and allows them to take a closer look at the problems facing our University, our community and beyond.



Read more Decipher articles on the Decipher Blog:
ci.clemson.edu/blogs/

THE WATT CENTER

Welcome to the Watt Family Innovation Center, Clemson University's newest and most versatile academic building which opened in January 2016. The Watt offers a setting and resources that promote cross-disciplinary interactions and collaborations among faculty, students and industry. The 70,000 square foot building harbors 191 high definition touch computer screens, 3D video walls, table and window whiteboards,and more than 73 collaboration spaces. Software allows users to share screens and to communicate anywhere in the world via virtual connectivity. The Watt is Clemson's epicenter for innovation and cross-disciplinary engagement, thus it is a natural home for Creative Inquiry.

The Watt is the vision of Clemson alumnus and founding director, Dr. Charles Watt '59. His experience in education, government and industry molded his conviction that students should experience cross-disciplinary, collaborative environments, as well as depth of knowledge in their majors, to better prepare themselves for careers after graduation. He recognized that students need breadth of understanding, entrepreneurial outlook, communication skills, critical thinking and the ability to work in diverse teams.

Thus the Watt is a building and a mission – to help students develop the skills they need by facilitating cross-disciplinary engagement opportunities and collaborations among industry partners, faculty and students. The Watt brings disciplines together in a collaborative environment, to spark research and innovation.

The Creative Inquiry offices are housed in the Watt, emphasizing our commitment to interactive cross-disciplinary student research. All Creative Inquiry projects – and all Clemson's students - are encouraged to consider how they can use the Watt's unique technology to advance their projects. Students said it best, the Watt is an "Overall Awesome Facility [that] encourages higher learning, innovation and collaboration." on skills, critical thinking and the ability to work in diverse teams.

SCHEDULE OF EVENTS

2 APRIL - Watt Atrium

8AM - 9:30AM Students Setup/Install Posters
(Posters 1-42, see map pgs. 70-71)

10AM - 12PM Morning Poster Session

1PM - 3PM Afternoon Poster Session

3 APRIL - Watt Atrium

8AM - 9:30AM Students Setup/Install Posters
(Posters 43-84, see map pgs. 72-73)

10AM - 12PM Morning Poster Session

1PM - 3PM Afternoon Poster Session

3:10PM - 4:15PM

Plenary Session, Watt Center Auditorium

Welcome - **Dr. Barbara Speziale,** *Associate Director, Watt Family Innovation Center | Director, Creative Inquiry*

Featured Plenary Speaker - **Dr. Vladimir Reukov,** *Bioengineering*

Award Announcements -
Graduate Student Award for Mentoring in Creative Inquiry
Poster Competition Award Announcements

4:15PM - 5PM Students Remove Posters

*Note: Posters 'A' are in the AM session and 'B' are the PM session

WELCOME and AWARD CEREMONY

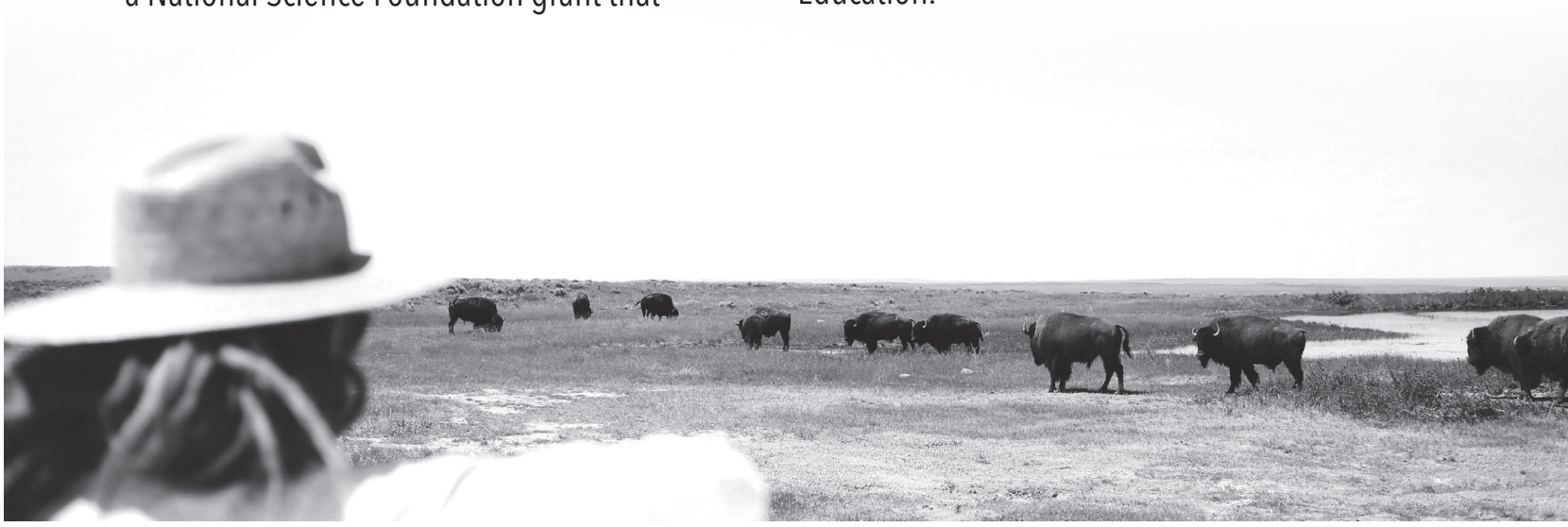
Dr. Barbara Speziale

Associate Director, Watt Family Innovation Center
Director, Creative Inquiry
Professor, Biological Sciences

Dr. Barbara Speziale is the director for the Creative Inquiry program, associate director for academic affairs in the Watt Family Innovation Center, and a professor of Biological Sciences. She received her bachelor's degree in Biology and English Literature from the State University of New York at Binghamton, her Master's in Botany from the University of Minnesota, and her Ph.D. in Zoology from Clemson University. She has served Clemson in teaching, public service, and administrative roles.

Dr. Speziale's research, funded by $14,700,000 in external grants, includes projects in aquatic ecology research and STEM education. Recent projects include: SC Life, funded by $6,400,000 from the Howard Hughes Medical Institute, which supported undergraduate research and science outreach to thousands of K-12 students and teachers; a National Science Foundation grant that established Clemson's FIRST program for first-generation college students; and grants for STEM education and award-winning water quality education programs and materials.

She has received numerous awards including the South Carolina Governor's Award for Scientific Awareness, the Society for Environmental Toxicology / Menzie-Cura Environmental Education Award, and Clemson's Martin Luther King Jr. Award for Excellence in Service and Elliott Award for Outstanding Service to Off-Campus, Distance and Continuing Education.

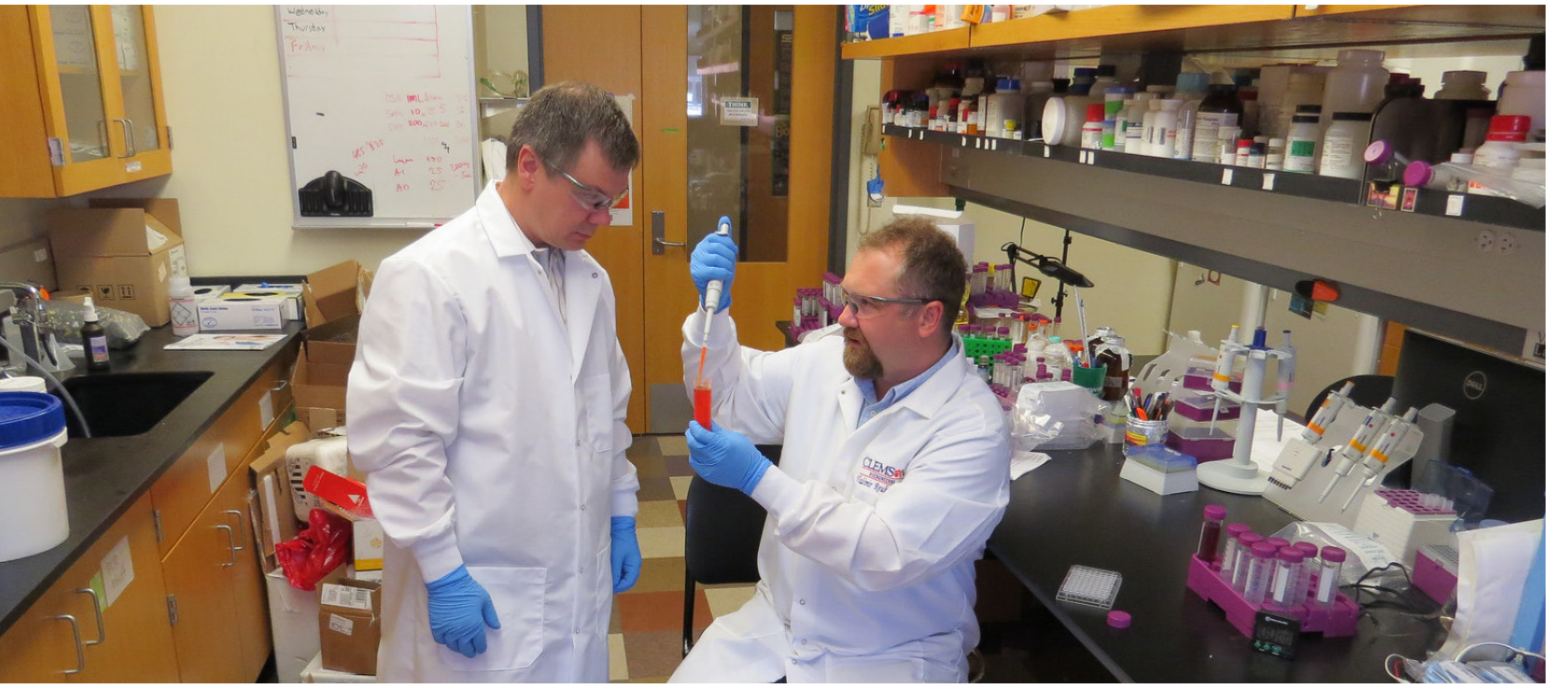


PLENARY SPEAKER

Dr. Vladimir Reukov

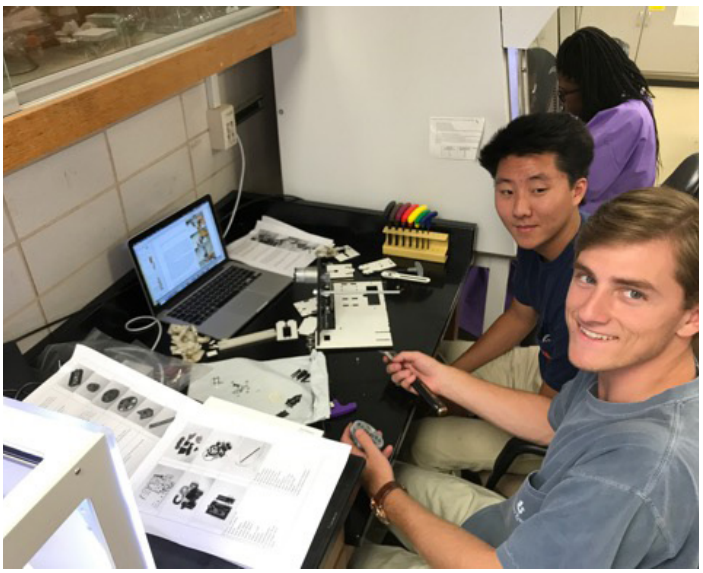
Research Assistant Professor of Bioengineering

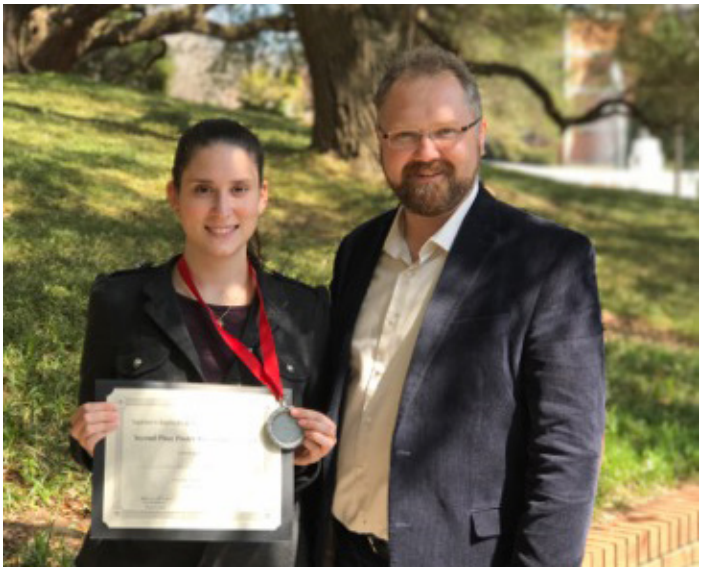
Dr. Vladimir Reukov is a Research Assistant Professor in the Bioengineering Department at Clemson University. His lab develops new biomaterials for various medical applications. Dr. Reukov received a BS/MS in Material Science and a PhD in Chemistry from Moscow State University in Russia and did his postdoctoral fellowship at Clemson. Among his awards are the Phil and Mary Bradley Award for Mentoring in Creative Inquiry, the Dr. Fred D. Bisplinghoff Research Innovation Award and the Innovation Award. Awards his students have received include Best Interactive Display and Best Poster at the 2017 Focus on Creative Inquiry Conference and Best Poster at the 33rd Southern Biomedical Engineering Conference. Dr. Reukov is the faculty advisor for the Clemson Russian Speaking Society and is an active member of professional organizations such as the Society for Biomaterials, Biomedical Engineering Society, Materials Research Society, and the Institute of Biological Engineering. Dr. Reukov has supervised the research of two graduate students, 53 undergraduates, and over 300 Creative Inquiry students. The state, private foundations and the university fund his research.



PLENARY ABSTRACT

Dr. Vladimir Reukov's research interests are broad and include nanoparticles and their conjugates with enzymes for anti-inflammatory and antimicrobial applications; oxidative stress and its prevention; live cell mechanics and imaging; and imaging and analysis of various materials, from polymer films and hydrogels to mammalian and bacterial cells using atomic force microscopy. From a recent study published in PLoS ONE, we used an AFM to measure the stickiness of bedbug molting fluid, which apparently helps them to cover large distances upon molting. We have also used a modified AFM technique – band-excitation piezoresponse force microscopy – to differentiate between bacterial cells. In research on nanoparticulate inorganic materials, as we demonstrated in our resent publication in MDPI Antioxidants, synergistic activities of metal oxides such as cerium oxide (IV) and therapeutic enzymes like superoxide dismutase and catalase promise new materials for scavenging free radicals during chronic inflammation. Dr. Reukov is always recruiting enthusiastic undergraduate students to conduct mentored and Creative Inquiry research in his laboratory. Students learn indispensable laboratory skills, cell culturing and materials characterization techniques as well as working in a team, conducting literature research and problem-solving.





PHIL AND MARY BRADLEY

William P. 'Phil' and Mary Bradley are staunch supporters of Clemson and Creative Inquiry, with the first major gifts to Creative Inquiry for project support and to establish the Phil and Mary Bradley Award for Mentoring in Creative Inquiry and the new award for graduate student mentors. They support CI because they see that it makes a difference for students and achieves results. "The projects we've seen so far are about real problems" says Phil, "and they are designed to find real solutions." In 2015, Phil and Mary recorded a video to encourage other donors to support Creative Inquiry.

The Bradleys have a long history with Clemson. Phil's father attended Clemson in the 1930s. Phil was a Distinguished Military Graduate of Clemson, with a 1965 degree in industrial management. Mary wed Phil in 1963 while he was a student at Clemson. They have two children. Phil has served Clemson as a member of the Clemson Foundation and the University Board of Visitors, including on its executive committee and as chairman in 2014-15. In 2015, Mary was named an Honorary Alumna for her lifelong devotion and demonstrated loyalty to her adopted school. In accepting the award, Mary stated, "As far as Phil and I are concerned, our whole life revolves around Clemson University."

Phil and Mary continue to actively promote Creative Inquiry. As Phil says, "I tell the parents, 'Get your kids involved in Creative Inquiry! It makes a big difference in their student-life.'"

ABOUT THE AWARDS

The Phil and Mary Bradley Awards for Mentoring in Creative Inquiry are presented each spring in recognition of outstanding work with undergraduate students. Nominations are accepted from student participants in Creative Inquiry team projects. The awards are made possible by generous gifts from Phil and Mary Bradley.

AWARDS FOR MENTORING

<u>Previous Faculty Award Recipients</u>

2017 – Vladimir Reukov, Bioengineering
2016 – Michael Sehorn, Genetics and Biochemistry
2015 – Michael J. Childress, Biological Sciences
2014 – Heather Walker Dunn, Animal and Veterinary Sciences
2013 – Molly Kennedy, Materials Science and Engineering
2012 – John DesJardins, Bioengineering
2011 – Delphine Dean, Bioengineering
2010 – June J. Pilcher, Psychology
2009 – Karen Kemper, Public Health Sciences
2008 – Susanna Ashton, English
2007 – Mark Charney, Performing Arts

GRADUATE STUDENT AWARD

Creative Inquiry began formally recognizing the significant contributions of graduate students as CI mentors in 2016. We are now honored to have the support of Phil and Mary Bradley for this award.

<u>Previous Graduate Student Award Recipients</u>

2017 – Dotan Shvorin, Industrial Engineering
2016 – Alice Brawley, Psychology

POSTER #1A

Identifying Cis-Enhancing Regions that Influence Craniofacial Development in Cichlid Fishes

Mentor: Kara Powder, Biological Sciences

Students: Emily Furno, Emma Hawkins

Many birth defects are associated with anomalies in craniofacial development, and faces show a great deal of natural variation. The goal of the Powder lab is to find the genomic basis for these changes variations using cichlid fishes from East Africa, which have a range of facial shapes correlating to their feeding mechanism. Changes in regulatory DNA called enhancers can alter gene expression which manifests as varying morphologies. The goal of this project is to find regions within the cichlid genome that can bring new understanding to how craniofacial development is regulated. We identified 3 enhancers of interest that lie in immediate proximity to genes involved in craniofacial development and the deposition of craniofacial cartilage and bones. Specifically, hs844 and hs1007 are thought to regulate the gene ***Sp8***, which controls bone production, and hs1602 is thought to regulate either ***Six1*** or ***Six4***, both of which are important in facial development. DNA for these regions was PCR amplified and sequenced in multiple long faced cichlids, ***Metriaclima zebra***, and short faced cichlids, ***Labeotropheus fuelleborni***. Using alignment software, we then compared these regions to identify single nucleotide variants (SNVs) that were distinct between the two species. To further test if and how these enhancers alter facial phenotypes, we will clone these regions and look at where they can turn on Green Fluorescent Protein (GFP), demonstrating where and when in an embryo that enhancer is active. Furthermore, the CRISPR/cas9 genetic editing system can be employed to directly observe the influence of these enhancers on craniofacial development. Data drawn from this study will help us understand how craniofacial development is regulated and how it can evolve.

POSTER #1B

Tiger Gardens: Healthy Urban Vegetable Production

Mentor: Dil Thavarajah, Agricutural and Environmental Sciences

Co-Authors: Niroshan Siva, Indikaprasannamapa Mapapathirannehelage

Students: Shannon Gallagher, Rachel Edwards, Savanah Dale, Bailey Nicolas, Elizabeth Reid, Frances Schueren, Angela Sterling, Grayson Younts, Meredith Mcswain

Tiger Gardens is a community garden project designed to fight malnutrition and obesity in upstate SC through promotion of nutritional awareness and basic agricultural practices. The goal of these experiments has been to examine how providing access to raised vegetable garden beds may help to promote health and wellness in an academic setting. The continuation of this project has emphasized nutritional literacy and examined further the nutritional benefits of incorporating homegrown produce into ones diet. As a continuation, Tiger Gardens has been seeking to expand our presence on campus by utilizing existing beds for vegetable gardening, exploring options for low maintenance summer crops including sweet potatoes and examining their macro and micro nutritional content both before and after a curing process. We've used the data collected to compile more comprehensive culture and nutritional information for Clemson Extension public outreach initiatives.

POSTER #2A

The Impact of Trauma, Emotion Regulation, and Media Contagion Effects on Non-Suicidal Self-Injury and Suicidal Behavior

Mentors: Heidi Zinzow, Psychology, Kristi Bussell, Student Health Center, Martha Thompson, Public Health Sciences

Students: Dylan Erikson, Martha Fields, Kristin Free, Brienne Krug, Rebecca Roth, Daniel Solomon, Chastyn Webster

Two studies were conducted to examine psychosocial factors associated with non-suicidal self-injury (NSSI) and suicidal behavior. Study 1 examined self-report questionnaire data from 819 college students. Multiple regression analyses demonstrated significant mediating effects of emotion dysregulation in the relation between trauma exposure and NSSI. Study 2 used Radian6 software and the Social Media Listening Center to analyze social media data related to the TV series "13 Reasons Why." Analyses coded 5% of tweets to determine the prevalence of themes that either increase or decrease risk of social contagion effects for NSSI and suicide (*e.g.*, glamorization of suicide, blaming the victim, encouraging help-seeking). Findings from Study 1 highlight the value of interventions to improve emotion regulation skills among trauma-exposed youth. Findings from Study 2 can inform efforts to minimize media contagion of NSSI and suicidal behavior.

POSTER #2B

Bamboo Reinforced Concrete

Mentor: Weichiang Pang, Civil Engineering

Students: Grace Brokaw, Lee Davis, Adam Derwitsch, Nathan Forrester, Robert Hawsey, Silas Holmes, Sean Mcdermott, Collin Psenka, Kyle Rickey, Rachel Rosstedt, Rob Smith, Connor Staudmyer, Ashleigh Walsh, Mayank Patel

The goal of the Bamboo Reinforced Concrete Project is to design and build a wall that uses bamboo as a structural alternative to steel rebar in order to replicate the shear strength and load bearing capabilities that traditional rebar provides for concrete walls, while minimizing cost. The inspiration for this project comes the infrastructure flaws (lack of steel rebar reinforcement) that resulted in the deaths of thousands during the 2010 Haitian earthquake. Some, if not most, of those deaths could have been avoided if the infrastructure of the buildings in Haiti had some sort of reinforcement. Steel rebar is the primary source of structural reinforcement in the United States, but it is much too expensive to be used in Haiti. However, recent studies by graduate students at Clemson University show strong promise in the use of bamboo as a reinforcement in walls and buildings. Furthermore, unlike steel rebar, bamboo is an abundant natural resource and is the fastest growing plant in the world, which makes it cheap and easy to access. Because of this, bamboo is the perfect material to be used as structural reinforcement in Haiti. During this semester, the designs for a bamboo reinforced concrete wall prototype have been finalized and construction on the first prototype is near completion. The Bamboo Reinforced Concrete Team has put in countless hours at the Wind and Structural Engineering Research (WiSER) facility working on the prototype, which required a homemade steamer. The team had to design and create a steamer in which they could steam their split bamboo pieces in order to have the ability to bend them into the necessary shapes for the bamboo "cage," which acts as the structural reinforcement base of the prototype. This semester, two in plane forms were poured and will be tested to determine the actual feasibility of bamboo as a steel rebar alternative.

POSTER #3A

Transformative Role of Photovoltaics in Surface Transportation

Mentor: Rajendra Singh, Electrical and Computer Engineering

Co-Authors: Guneet Bedi, Prahaladh Paniyil, Vishwas Powar

Students: Logan Ditullio, Meisha Draper, Katlyn Simmons, Anthony Carambia, Precious Galvez, John Kimsey, Kaylee Osteen

With the plummeting cost of PV based localized solar energy generation and the sudden burgeoning demand for cleaner electric vehicles, the transport sector is on the verge of total transformation. The continuing research in improved battery technology and cheaper manufacturing and operating costs of PV over the past decade, has been the driving force for this change. Also, the transportation sector being the largest greenhouse gas creator in the US has led researchers, investors and policy makers to formulate and implement newer technology to curb pollution. Electric vehicles (EVs) being one such technology has the potential to offset a huge portion of the nation's carbon footprint. The use of photovoltaics (PV) and batteries results in a local direct current (DC) powered network that is resilient, reliable, sustainable and economical as the cost of solar power has decreased to levels lzower than any other electricity-generating source, and the cost of batteries continues to decline at a rapid pace. The local DC power network is the ideal solution to create electricity infrastructure to meet the need of electric vehicle (EV) based transport sector. Autonomous vehicles based on electrical power will provide "personal mobility' which will be driver of disruptive digital economy in the 21st century. In this poster, transformative role of PV in transport sector including proof of concept data of PV based DC power network in transport sector will be presented.

POSTER #3B

Field Based Experiences that Build Confidence and Leadership Skills in the Geosciences

Mentor: Scott E Brame, Environmental Engineer and Earth Science

Student: Austin Bruner

With the increased emphasis on being proficient in digital technology, the focus of many geoscience education programs has shifted away from field based experiences that once represented the cornerstone of a geoscience foundation. Still, employers expect their geoscientists to be equally competent in both fields. Recognizing and filling this gap is the goal of this project. Most field experiences are modeled around developing specific skill sets that field geologists are expected to be proficient in like recognizing the same rock type in different geologic settings, interpreting complex geologic structures and making standard field measurements such as strike and dip. The unspoken skill sets that are implied though this process that the students will develop are leadership abilities and self-confidence in their geologic pronouncements.

POSTER #4A

Evaluating Length Bias in Three-Pass Depletion Electofishing

Mentor: Brandon Peoples, Forestry and Environment Conservation

Students: David Bell, Elijah Lamb

Three-pass depletion electrofishing is a common method used to collect fishes from wadeable streams. While the number of individuals collected tends to decrease per pass, pass-specific length bias is less understood. The focus of this investigation was to understand size biases for species collected in sequential backpack electrofishing passes with the prediction that total length would decrease with each successive pass. We sampled four wadeable streams seasonally from September 2016 to November 2017. We used a Poisson generalized linear-mixed model (GLMM) with species and site as random intercepts to examine length bias among all species. Next, we estimated effect sizes using GLMMs for each species and modeled them as a function of maximum total length and total abundance in the dataset. Overall, total length decreased significantly with additional passes, and was significant for some, but not all species; these trends were not related to either maximum total length or abundance. These results suggest that pass-related bias is species-specific. Further analyses are underway on larger datasets.

POSTER #4B

Pressure Adaptive System for Sneakers

Mentor: Delphine Dean, Bioengineering

Students: Sarah Mckain, Peyton Tharp

Current sneakers do not adapt during use to the user's needs: with changing activity shoes neither tighten nor loosen. A shoe that is too loose could lead to injury. On the other hand, a shoe that is too tight can cut off blood supply to the foot. Our solution is a pressure-adaptive sneaker outfitted with a system that will detect the changing pressure values the foot exerts on the shoe, then transmitting the information to a processing system that has a mechanical output to tighten or loosen the shoe correspondingly. The designed system input will collect data through a pressure sensor within an insert; as pressure changes inside silicone tubing located in the sole of the shoe. The signal will then be sent through an op-amp and to an Arduino Nano, the incoming data outputs a reaction to a motor driver which will control a stepper motor, either tightening or loosening the lacing system. To decrease the force needed to pull the laces, a pulley system will be implemented into the lacing system. The entire housing unit will sit on top of the laces, with hooks that attach to the shoelace holes within a shoe. The next phase of the design will move away from technique in the hopes of creating an accessory device that can attach to any shoe rather than a system that is specific to the shoe that it is built into. Eventually, the introduction of a mobile application as the third component of the design could be helpful and beneficial to the user. An app could allow the user to manually alter shoe tightness in a way that is complementary to the automated tightening of the laces.

POSTER #5A

Pretty Pushers and Empowered Birth

Mentor: Lisa Miller, School of Nursing

Students: Brittany Walsh, Sarah Wills

The CDC reports that 1 in 9 women will experience postpartum depression, and according to the American Academy of Pediatrics, maternal depression is the most under-diagnosed complication of pregnancy. Focusing on the aspect of maternal choice, this research explores the relationship between a woman's choice of birthing gown and the woman's development of PPD. Using a qualitative approach, questionnaires were collected to analyze the usability and potential effectiveness of Pretty Pushers, a birthing gown. Overall, there was a very positive response to these gowns, with 100% of participants desiring to wear these gowns in their next birth and through the postpartum. Because of the correlation between empowering women and lowering PPD, the use of birthing gowns should be further explored and implemented.

POSTER #5B

The Use of Wearable Capacitive Force Sensors with Meaningful User Feedback for Modeling Grip Intensity in Upper Limb Prosthetics

Mentors: Delphine Dean, Bioengineering, Melissa McCullough, Bioengineering, Tyler Harvey, Bioengineering, Jorge Rodriguez, Bioengineering

Students: Kacie O'Neill, David Mcleod, Abigail Keating, Amelia Godolphin, Alexander Garver, Matthew Brown, Kevin Barker

The purpose of this project is to explore the use of capacitive force sensors and meaningful user feedback for the future goal of integration into a glove wearable over an upper limb prosthesis. This technology will allow upper limb amputees to gather a sense of the intensity of their grip on an object. A method of fabrication of capacitive force sensors is developed relying on a Polydimethylsiloxane (PDMS) elastomer as the dielectric and two thin copper plates as electrodes.The information gathered by the capacitive force sensors is recorded,

digitally converted and processed into meaningful feedback. Several parameters of the sensor design are explored such as cross-sectional area, spatial resolution, dielectric permittivity constant and dielectric thickness. Furthermore, while previous efforts have focused on visual feedback, audio-visual and tactile feedback are also explored. Sensor testing focused on dielectric thickness and yielded the result that a decreasing dielectric thickness increases not only sensitivity, but also precision.

POSTER #6A

The Effects of Low-Dose Radiation on Various Cell Types

Mentors: Endre Takacs, Physics and Astronomy, Delphine Dean, Bioengineering

Students: Konnor Mcdowell, Rebecca Keller, Justin Napolitano, Chris Petty, Anderson Patrick, Stephanie Pusker

Radiation is an important medical tool that is involved in a number of ways ranging from diagnostic imaging to cancer treatment. Many assume that a negligible level of radiation has little to no effect on humans. Our research is designed to determine the impact on humans of the low dose radiation that is assumed to be harmless. Thanks to a custom x-ray machine designed by the Clemson's Physics Department, which was created within an incubator, we are able to irradiate cells and test our theories. This is novel because it allows cells to be irradiated while not removing them from the environment they need to be in, and would be in while inside the human body. Our particular cell of choice is currently the endothelial cell, which is found in the inner layer of blood vessels and prevents clots from forming. In order to execute our experiments, we cultured these cells in plastic cups with mylar surfaces to promote cell adhesion and reduce x-ray attenuation. The results of the data were then quantified via proliferation assays. These results show that there is not a statistically significant difference between endothelial cells irradiated with 1 mGy x-ray radiation compared to control samples. What these results show is that though we cannot prove any damage caused by low dose radiation at the moment, we have enough evidence to continue the research at a more in depth level. We are currently preparing for more tests including live-dead, phalloidin/DAPI/cadherin staining, and many others to further understand what goes on within the human body when low dose radiation is applied.

POSTER #6B

Emotion, Motivation and Expression in Marketing

Mentor: Oriana Aragon, Marketing

Students: Andrew Bellucco, Aaron Camacho, Allison Houston, Craig Lucas, Abigail Rigatti, Mary Romano, Shelby Thompson

Normatively, one expression of emotion broadly represents one category of emotion, *e.g.*, smiles represent positive emotion and tears represent negative emotion. Sometimes however, expressions are dimorphous, that is, two alternating or scrambled expressions represent and communicate one category of emotion, *e.g.*, during "tears of joy," both smiles and tears represent and communicate happiness. Our lab investigates, the prevalence of these expressions, what they communicate and how they affect product communications. We focus on experimental paradigms, with survey collection, behavioral observation of individuals expressing emotion in lab settings and electroencephalogram (EEG) methodologies. We have multiple projects concurrently running. Our results thus far indicate the dimorphous expressions not only communicate emotion states, but also motivational orientations, both of which affect consumers' inferences about products, and product users' preferences. We conclude that dimorphous expressions may come about in service of this unique communicative function.

POSTER #7A

Evaluation of a Rake-collection Method to Estimate Biomass of Submersed Aquatic Vegetation as Waterfowl Forage in Managed Coastal South Carolina Wetlands

Mentors: Greg K Yarrow, Forestry and Environment Conservation, Richard Kaminski, Belle W Baruch Forest Science Institute, Nicholas Masto, Forestry and Environment Conservation

Students: Richard Coen, Sean Byrd, Jess Eidson, Harold Farah, Ryan Frazier, Matthew King, Robert Leland, Cameron Massey, Caroline Sharpe, Ian Talty, Justin Theo, Tristan Turner

Brackish, impounded wetlands in coastal South Carolina are managed to promote growth of widgeongrass (*Ruppia maritima*) and other submersed aquatic vegetation (SAV) as forage for waterfowl and other waterbirds. Managers of these wetlands manipulate water depth, duration of flooding and salinity to stimulate growth of SAV. Researchers need efficient methods to estimate SAV biomass (*i.e.*, food abundance) at multiple scales to estimate foraging carrying capacity of these wetlands for migrating and wintering waterfowl and habitat conservation initiatives of the North American Waterfowl Management Plan. With support of the James C. Kennedy Waterfowl and Wetlands Conservation Center we are evaluating accuracy and precision of using garden rakes to estimate total and species-specific, above- and below-ground biomass of SAV within five impoundments at Bear Island Wildlife Management Area in the ACE Basin of South Carolina. In August 2016, 10 random samples of SAV were collected within each of the five impoundments ($n = 50$) using a garden rake rotated in circular motion within a 0.2-m2 quadrat and hand harvested residual above- and below-ground vegetation ($n = 50$) within the quadrat (*i.e.*, rake + hand collection = total biomass). We have been processing, drying and weighing preserved SAV samples since fall semester 2016 and are slated to finish spring semester 2018. Using linear modeling techniques, we will evaluate effectiveness of the rake collection method in predicting total and species-specific SAV biomass. We will evaluate predictive power of our models by calculating a coefficient of determination (adjusted $R2$) and address uncertainty by computing upper and lower 95% confidence intervals. We will present results at the 2019 North American Duck Symposium in Winnipeg, Manitoba, Canada and prepare a manuscript for publication.

POSTER #7B

Morne Michel Water System

Mentor: David Vaughn, Engineering, Computing, Applied Science

Students: Ryan Donahue, Reid Hoffman, Lisa Uy, Jesse Dooley

Morne Michel is a remote village in Haiti that CEDC supports. This village does not have an easily accessible source of clean water. The five identified sources of water in this area pose problems in regards to reliability and location when accessing sites. In addition, the water exceeds the limit of 200 colonies of fecal coliform per 100 milliliters of water. Because of this, CEDC formed the Morne Michel Water System team. Our mission statement is to provide the village of Morne Michel with a reliable and potable water source. This semester we evaluated previous research to ensure the feasibility of the project. After we identified a water source, the design of the water system provided clean water. However, due to location of the water, phase two will include installing a pump system, to transfer the water from the initial cistern up 500 feet to a second cistern, which will be located at a school in Morne Michel. This will provide the village with clean, accessible water. Our group has concluded that the project is feasible for CEDC and will be moving on to concrete planning. Trinity Cathedral, located in Columbia, South Carolina, is a stakeholder who is funding this project. We will be working closely with them to approve designs and budgets.

POSTER #8A

Improving the Power Output of a Savonius Wind Turbine Experiment

Mentors: John R Wagner, Mechanical Engineering, Todd Schweisinger, Mechanical Engineering

Students: Ethan Severance, Sam Schmidt, Dhruval Patel, David Matthews, Ryan King, Ryan Lagroon, Zachary Bowers

In recent years, the demand for alternative energy has increased due to the environmental impact of traditional energy sources. A few of the renewable resources being researched are wind, solar, hydroelectric and geothermal. Vertical wind turbines are an alternative used for small scale electricity generation. A Savonius wind turbine is a vertical axis wind machine with a drag-type configuration. The purpose of this project was to increase the power output of an existing prototype of a Savonius turbine system to be used in a laboratory setting. The success of this project will help students learn the physical concepts of transforming wind into mechanical and electrical power. To achieve the overall objective of increasing power output, the students formed three separate sub teams, the gear box team, the field measurements team and the systems assembly team. Each team developed specific goals, which included installing a gearbox and reducing bearing friction, increasing the wind power input to the system and collecting and comparing anemometer data from the field. At the end of the semester the team was able to increase the power output of the turbine from approximately 1.5 watts to 13 watts using a controlled wind speed of 9 m/s. Wind data was collected at a local farm in the northwest corner of South Carolina. It was determined that the average wind speed at the site was 1.78 m/s and the average gust speed was 3.35 m/s. These wind speeds were far less than the wind speeds used to test the turbine in a laboratory setting. In addition, a professional and safe data acquisition and control enclosure was built to measure wind speed, turbine speed, voltage, current and power output from the generator. The power output increased over 10 times the original prototype. Wind speeds

from the field were about 80% less than peak wind speeds in the labs, so it is still a challenge to deploy this Savonius turbine at the field site. However, the turbine experiment meets the requirements to study fundamental principles of wind energy in a laboratory setting. The goal for the next phase of the project is to reduce startup torque and increase turbine speed even more to increase power output.

POSTER #8B

A Tail of Two Territories: Sex Differences in the Territories of Stoplight Parrotfish, *Sparisoma viride*.

Mentors: Michael Childress, Biological Sciences, Kylie Smith, Biological Sciences

Students: Robert Hulsey, Elizabeth Way, Mason Collins

Parrotfish are abundant, herbivores on coral reefs that regulate algal abundance, which is vital for coral survival. These hermaphroditic fish have a social structure in which one supermale controls and protects a territory. Studies have shown territory size may be determined by harem size (female defense polygyny) or reef characteristics (resource defense polygyny). Our study tests which hypothesis best explains territory size in supermale and female stoplight parrotfish in the Florida Keys. We estimated territory size of two supermale and two female parrotfish on four sites. We also measured substrate cover, reef complexity and conspecific density for each territory. Our results show supermale parrotfish have significantly larger territories than females and that supermale territory size was negatively correlated with conspecific density. These findings suggest territoriality in supermale parrotfish may be driven by female defense polygyny.

POSTER #9A

The Importance of Maternal Inclusion When Treating Neonatal Abstinence Syndrome (NAS): A Literature Review

Mentors: Heide Temples, School of Nursing, Mary Wright, School of Nursing

Student: Lauren Drum

Objective: The project purpose is to examine if health care provider's bias regarding prenatal maternal substance use influences inclusion of mothers with infant care while in the hospital. Methods: A literature review using EBSCO host from 2013 - 2018 addressing health care provider bias and experiences of mothers with perinatal substance use was performed. After exclusion criteria was applied, 8 studies were included. Results: These studies found that some mothers reported feeling judged and excluded from their infants' care. Two studies found the time hospitalized was reduced when mothers are integrated into their infants' care. One study described that many nurses try to take on the mothering role. Conclusion: All studies concluded the infants benefit from experiences that promotes inclusion of the mother in the infant's care. Reducing this negative stigma of the health care provider's may help improve mother-infant bonding. Healthcare providers need to be educated on this topic in order for them to provide care without showing bias towards the mothers.

POSTER #9B

Investigation of Ligament and Tendon Tear Detection for Baseball

Mentor: Delphine Dean, Bioengineering

Students: Monica Coode, Michael Maggio, Olivia Newkirk, Emily Wood, Melissa Judge

The goal of our project is to understand the forces and stresses incurred at the elbow during baseball pitching and eventually develop new tools to assess ligament and tendon issues for baseball players. We completed a small pilot study to investigate the forces and stresses incurred to the elbow during a baseball pitch. However, we were left with questions about maximum stress capacity before failure of the ligament, and if there were identifiable indicators of impending failure. This semester, our new CI aims to investigate the microstructure of ligaments and tendons, as well as their ability to withstand mechanical stresses. We will then apply our findings to a sports medicine setting to look for early warning signs of ligament failure, to prevent injury. This research is still in the initial phase of research. We are looking at the biomechanical properties of porcine tissues obtained from a local abatoire. Following this, we will be submitting an IRB protocol to use Ultrasound technology to take images of the joints of Clemson athletes, as well as Clemson students. We plan to compare the density the density data we found in ligaments with and without microtearing.

POSTER #10A

Sorry, Not Sorry: A Study on the Perceptions of Apologies

Mentor: Robin Kowalski, Psychology

Students: Mackenzie Foster, Madeleine Franchi, Sarah Nash, Hailey Bednar, Kelsey Crawford

Apologies are common in our everyday lives, but not in the empirical literature. Little research to date has examined the factors that determine whether apologies are necessary or expected following particular behaviors. Such factors include intentionality of the behavior, harm to another, and personal gain to the actor. To address the extent to which these variables influence perceptions of apologies, 96 students (38 male; 58 female) were randomly assigned to one of 16 scenarios. Each scenario described a player from Team A tripping a player from Team B. The trip was either intentional or accidental. The player from Team B was either hurt or not. The player from Team A either scored in the process of tripping the Team B player or did not score, and the player from Team A either apologized or did not apologize. Among the findings to date, participants perceived that the Team A player would feel more responsible when the behavior was intentional and no apology was given ($M = 3.50$; $SD = 1.05$) and when the behavior was accidental and an apology was given ($M = 4.20$; $SD = 1.30$), $F(1, 77) = 8.36$, $p < .005$.

POSTER #10B

Exploring Innovation and Inventive Concepts in Product Development

Mentor: Felix H Barron, Food, Nutrition and Package Science

Students: Kelsi Berkebile, Sydney Carroll, Francis Caughman, Peter Girolamo, Megan Johnson, Ian Mills, Matthew Suffern, Chad Cope, Kyle Mccarter, Brianna Roberge

innovation and inventive principles are being applied in the development of a food product.

A familiar green salsa was selected in order to innovate its processing and packaging to obtain a finished product that would impact the market due to its acceptance in terms of quality, package functionality and cost.

POSTER #11A

Geographic Variation in Acclimatory Capacity of Embryos in Response to Changing Nest Temperatures

Mentor: Michael Carlo, Biological Sciences

Students: Benjamin Camper, Loquatia Cuttino

Organisms in sessile life stages rely heavily on physiological plasticity to buffer the effects of thermal stressors. However, local adaptation may constrain the capacity for acclimation to changing thermal conditions, which could severely limit the potential responses to effects of climate warming. The widespread Eastern fence lizard (*Sceloporus undulatus*) lays eggs in shallow nests where embryos are exposed to daily temperature fluctuations. Recently, we found that nesting behavior varies across latitudes such that embryos from warmer southern latitudes experience cooler thermal regimes than embryos in northern populations. Embryos from northern populations grow and develop more quickly than southern embryos, even when reared under the same temperatures, a pattern which may have been driven by geographic variation in nesting behavior. Adaptation of embryo physiology to variation in nesting conditions along latitudinal clines could constrain the capacity for acclimation to changing thermal conditions. Here, we performed reciprocal transplants of eggs from three populations across a latitudinal gradient to examine variation in the plasticity of embryonic cardiac performance in response to nest thermal regimes. For the first six weeks of incubation, we measured embryonic heart rates across temperatures at two-hour intervals between the daily minimum and maximum temperatures in each treatment. We then calculated the energy of activation of heart rate during each week to compare the capacity for acclimation to changing nest temperatures across geography. Our results will demonstrate how local adaptation of maternal behavior and embryonic physiology may interact to affect thermal acclimatory capacity. Geographic variation in the physiological plasticity of widespread ectotherms during sessile stages of development has significant implications for the ability to buffer negative effects of climate warming.

POSTER #11B

3D Printing of Carbides Using Renewable Resources

Mentor: Rodrigo Martinez-Duarte, Mechanical Engineering

Co-Author: Monsur Islam

Students: Gabriel Carrillo, Morgan Sullivan

Porous carbides feature unique properties such as high melting point, high chemical stability, low thermal expansion coefficient, low density, high surface area and high specific strength. Current fabrication includes incomplete sintering and templating methods as well as non-renewable carbon precursors. The carbide geometry relies on molds, and making complex shapes is currently challenging. Here we propose the sustainable fabrication of complex geometries of porous tungsten carbide (WC) by 3D printing a renewable biopolymer composite and using carbothermal reduction. The composite was made from iota-carrageenan, chitin, tungsten trioxide nanoparticles and water. Its Bingham plastic nature allowed for layer-by-layer fabrication. The composite was extruded into 3D shapes before drying and receiving heat treatment to produce WC. Potential applications include lightweight structural materials, catalyst supports, high temperature filters and insulations. Ongoing work includes characterizing shrinkage from drying and heat treatment, using different dimensions of cellular architectures and characterizing mechanical properties.

POSTER #12A

Student Engagement: Lowering the Barrier of Entry to The Clemson Makerspace

Mentor: Todd Schweisinger, Mechanical Engineering

Students: Nolan Hoolachan, Jasmine Cohen, Wesley Grant, Nicholas Turner, Pranav Patel, Matthew Samstag

The Clemson University Makerspace is advised by a team of faculty and staff while governed and operated by a student organization. The space contains 3D printers, laser cutters, as well as sewing and embroidery machines, vinyl cutters and button makers, etc. A Creative Inquiry (CI) team was formed to develop strategies to expand the broader impact of the Makerspace. The main goal of the Makerspace CI is to develop standard operating and training procedures for Makerspace equipment in order to lower the barrier to entry for new users. During the CI's first semester, the team focused on improving the current training used by the Makerspace. The team reviewed existing training materials, and they researched strategies to reduce training time and reduce anxiety for new users. The team create videos, screen capture commentaries to guide new users through the programs needed to use the 3D printers, laser cutters and other tools. The team also created walk through tutorials of beginner projects to inspire and encourage students. Additionally, an engaging website was created to provide a more interactive and informative interface for student users. The videos will be pilot tested in the Spring 2018, and additional training and digital content will be created to lower the barrier of entry and the initial intimidation of users in the Makerspace. Another aspect of the project in the Spring 2018 semester is to develop introductory workshops targeted toward underrepresented disciplines and students in the space to create an inclusive environment and increase diversity

POSTER #12B

Advertising Campaign Development and Execution

Mentor: James G Gaubert, Marketing

Students: Haley Carter, Jacob Borders, Alyssa Collado, Joseph Devine, Kenton Holden, Shelby Nichole King, Madeleine Kruener, Valencia Mcneal, Joshua Murray, Eneida Rivera, Alexandra Sebestyen, Laura Taylor, Alexander Todd

This Creative Inquiry project demonstrates the research-based processes and strategic development in an advertising campaign development. Buoyed by a real-world case challenge from a major corporation, the two-semester project is a challenge offered by the American Advertising Federation's annual National Student Adverting Competition. Comprised of 16 districts and over 2,000 students, teams begin with a case released in September by the sponsoring organization (this year, Ocean Spray) and ultimately pitch their work to advertising professional in district, semi-final, and final levels. Based on the directive and information of the case, the CI team at Clemson conducts a thorough secondary research program and begins strategically planning for primary research execution. Teams within the CI group are formed to address a synergistic approach that mimics the operation of an agency; account planning and management, research, creative, media, and design. Planning the ultimate submission of a 20-page Plans Book and live presentation against other "agencies" [participating schools] requires months of survey design and collection, focus group administration, data analysis, and the development of a strategic vison based on the case. This culminates with a structured plans book and presentation detailing the group's strategic creative vision, rationale, design concepts, campaign components, budgetary allocation for objectives, and metrics. Students are consequently enhanced in their brainstorming, collaboration, and communication skills in a collective process reflected in the completed project offered to Ocean Spray.

POSTER #13A

Aerodynamic Design and Wind Tunnel Testing of Formula SAE Prototype Cars

Mentor: Yiqiang Han, Mechanical Engineering

Students: Andrew Bruce, Gregory Hughes, Richard Hughey, Michael Masdea, Connor Murrell, Alec Udell, Tony Wang, James Wright

Formula SAE Collegiate Design Series competition is organized by Society of Automotive Engineers (SAE International) and promotes engineering through design, development and testing of small-scale Formula style race cars. Each team designs a prototype racing car within the same set of constrains, and is to be evaluated for its potential as a production item. The aerodynamics of the racing car plays a critical role during the performance testing on track. The objective of this research is to identify the potential improvement of aerodynamic performance on the components through computer-aided design and hands-on experimental testing. Prototype designs will be evaluated inside a low-speed, low-turbulence, closed-loop wind tunnel at Department of Mechanical Engineering at Clemson. In this project, through hands-on learning, students utilize their knowledge of vehicle wind tunnel testing and applied aerodynamics to validate CFD models. The student team's their unique aerodynamic designs combined with wind tunnel testing are then used to determine the best aerodynamic configuration for prototype racing cars. In this work, students will highlight a comprehensive comparison between experimental measurements and numerical aerodynamic predictions for Formula SAE racing car team.

POSTER #13B

AIChE Chem-E-Car

Mentor: Christopher Kitchens, Chemical and Biomolecular Engineering

Students: Bernadine Daichendt, Theresa Earls, Joseph Gaul, Cooper Klaasmeyer, Hansen Mou, Sean Nance

Our team worked to design and build a car that ran off of a chemical reaction to compete in the AIChE Chem-E-Car competition at the 2018 Southern Regional AIChE Student Conference at Louisiana State University. The competition challenges teams to build a car roughly the size of a shoebox that could carry up to 500 mL of water to a distance announced at the competition, powered by chemical energy. Inspired by designs from teams in previous competitions, we sought to construct our own car out of an aluminum chassis powered by a magnesium-copper redox reaction. We chose aluminum for its lightness, and the magnesium-copper reaction offered a simple and reliable source of energy in our experiments. For our stopping mechanism, we implemented an iodine clock reaction in coordination with an Arduino and a photo-resistor. The iodine clock reaction has a predictable rate, and our experiments show that it will work as a precise chemical clock. We look forward to competing on April 6!

POSTER #14A

Economic, Ethical and Practical Aspects of Trapping

Mentor: Webb M Smathers Jr, Plant and Environmental Sciences

Students: Micah Chinnis, Jacob Murray, Melody Reynolds

In this project, we focus on the reasons and methods of trapping as well as the ethics of trapping. Mainly, we trap in order to keep the population of nuisance animals at a manageable number and to prevent environmental degradation. In South Carolina, feral hogs and beavers are major sources of environmental damage. Mice, carpenter bees, grey squirrels, raccoons and groundhogs also cause nuisance problems. Feral hogs can cause millions of dollars worth of damage to agricultural fields (S. Rodriguez 2016 estimated $115 million). Beavers cause millions of dollars of damage to roadways and timber. Along with the poster, examples of common traps used for control will be displayed.

POSTER #14B

Environmental Factors in the Delaware Bay Affecting Microbial Composition and Function

Mentor: Barbara Campbell, Biological Sciences

Co-Author: Margi Patel

Students: Cooper HALL, Alexis Harris, Suraj Katragadda, Elijah Weber

Microbes are major contributors to biogeochemical cycling in most ecosystems. The Bacteroidetes are the most abundant bacterial phylum in many estuaries. Samples from the Delaware Bay were taken under different environmental conditions such as season, time, salinity and size fraction. DNA was sequenced and assembled into metagenome assembled genomes (MAGs) and annotated. RAxML was used to generate a phylogenetic tree comparing 14 genes shared between Bacteroidetes related MAGs and their closest relatives. NCBI and RAST databases were used for comparative genome analysis. Low amino acid similarities to known bacteria indicate the MAGs are novel species. High amino acids similarity scores between MAGs suggest that some samples taken in similar environmental conditions may be the same species. Within the Bacteroidetes, *Flavobacteriales* MAGs were dominant during the summer, likely because proteorhodopsin containing organisms benefit from additional light stimulated energy production.

POSTER #15A

Southern Life Expectancy: Assessing the Sex and Race Gap Between States and Over Time

Mentor: Victoria Prieto Rosas, Sociology and Anthropology

Students: Lisa Johnson, Katherine Gnegy, Joseph Murphy, Brianna Tennie

This paper assesses the inter-group inequalities in life expectancy within the Southern states as well as the gap between these states and other regions with higher life expectancy. We aim to disentangle which causes of death and which age groups have positively or negatively contributed to: (i) the progress of life expectancy over time within each of the Southern states, (ii) the in-state sex and race inequalities in life expectancy, (iii), as well as the gap in respect to one of the US' leading states in life expectancy, such as Connecticut. Based on death and population data from the Center for Disease Control and Prevention available by state, sex, age and race for the period 1999-2015, we decompose the gaps by age and leading causes of death using the decomposition method developed by Vladimir Shkolnikov *et al.* (2001). Results contribute to the understanding of the drivers behind the recent trends in life expectancy and may enable the discussion of hypothesis regarding the impact of the health system at the state level on the expansion of survival.

POSTER #15B

NASA Micro-G NExT Sharp Edge Detection and Removal - Edge B' Gone

Mentors: Hallie Stidham, Mechanical Engineering, Joshua Summers, Mechanical Engineering

Students: Samuel Borel, Kimberly Henning, Meredith Sutton, Michael Furgeson, William Pierce, Nicholas Spivey

The design group for Clemson University's Team C, "Tune Squad," was selected to develop a device to solve the sharp edge detection and removal challenge. Our proposed solution to the challenge put forth by the NASA Micro-g NExT challenge team has been titled "Edge B' Gone." The Edge B' Gone will work as one device that both detects and eliminates the threat of a sharp edge created on the surface of an ISS handrail by micrometeoroids and orbital debris (MMOD) impacts that may occur. The device will be operated by the user to slide along the handrail and detect the sharp edge, and an internally contained pneumatic system will be used to power the device with input from the user to remove the sharp edge by using a pressurized roller to flatten the edge. The device has been designed to be operated by an astronaut wearing EVA gloves. There are only three actuating mechanisms that the operator must control, which can all be accessed by the user. Clemson's Team C was one of two teams selected from Clemson University and one of three teams selected nationally to compete in this Micro-g NExT Challenge.

POSTER #16A

Robotics in Horticulture and Agriculture: Automated Nursery

Mentor: Cameron Turner, Mechanical Engineering

Students: Aaron Anderson, Jon Charron, Joshua Harvey

This Creative Inquiry project represents the initial phase of developing robotic automation methods of horticulture. By utilizing a 3-axis system with multiple tools, the platform will be able to sow, water, light and monitor plants with limited intervention. The open-source system, Farmbot, allows for cultivation of a single planting area and was an influential system design. This newer system has been mounted to a portable work-space allowing for the handling of any number of self-contained growing trays which can be conveyed under the gantry system and managed according to the needs and settings of each unique tray and plant. The system recollects any excess water from the process. Future phases of inquiry will explore methods of data collection and mining allowing for future research into optimizations for plant growth cycles, additional feedback controls and developing means of controlled fertilizer delivery to prevent excess nitrogen usage and runoff.

POSTER #17A

The Role of Texting and Illumination in Trip Hazard Assessment

Mentor: Benjamin R Stephens, Psychology

Students: Mary Lawrence, Hannah Cooper, Ansley Seay, Kylie Anne Stiltner

There are sudden elevation changes that cause trip-and-falls in public areas such as walkways which are significant sources of injury. This research was used to see how individuals would evaluate the validity of a survey technique to measure hazard perception of trips, to explore the connection between participants judgment of trip hazards and estimates of their own minimum foot clearance, in addition to seeing if distractions, such as texting on a cell phone and day vs. night, create a more hazardous situation for the individual encountering expansion joints. By adding the 4 variables, the CI team was interested in seeing if participants consider texting a major distraction, more so than how much light is provided when walking. The CI team asked participants to take a survey which included a series of questions regarding the eight profiles of expansion joints ranging from 0.12 to 1.5 inches along with a scenario. Overall, profile height did have an effect on hazard perception as our CI team expected. However, texting had no significant impact on any measure.

POSTER #17B

The Importance of Learning and Social Experience on the Development of Female Mate Preferences in Sailfin Mollies, *Poecilia latipinna*

Mentors: Margaret Ptacek, Biological Sciences, Mary Ramos-Negrete, Biological Sciences

Students: Connor Burke, Christopher Heijjer, Mackenzie Lally, Heather Scovill

Understanding the genetic basis of female mating decisions is an important component to describing how sexual selection shapes species differences in mating signals. While a growing number of studies are showing that early social experiences influence the behavior of adults, few studies have investigated how the social environment might influence the mating preferences of females. Prior research has identified two genes shaping differences between species of fishes in mate choice decisions, the synaptic plasticity genes, neuroserpin and neuroligin-3. To investigate the role of developmental plasticity in female mating preferences, this experiment was designed to determine whether or not the social environment experienced during sexual development by virgin female sailfin molly (*Poecilia latipinna*) plays a role in candidate gene expression, and thus mate preference for either large or small males.

POSTER #18A

Does a Psychology Research Methods Course Enhance Critical Thinking?

Mentor: Benjamin Stephens, Psychology

Students: Kaileigh Grier, Megan Mckinney, Collin Mcwhite, Holly Nelson

Critical thinking is the ability to identify central issues or assumptions in an argument, eliminate useless information, evaluate evidence and alternative explanations, provide support for a conclusion, and read with a high level of comprehension (Terenzini *et al.*, 1995). A Quality Enhancement Plan was created and implemented to improve the critical thinking of Clemson University students, where course syllabi were modified with activities to enhance these skills. Our sample consists of students in several classes of Dr. Stephens' Advanced Experimental Psychology class (n = 79). Students' critical thinking skills were assessed before and after completion of the course using the California Critical Thinking Skills Test (CCTST). The subscales included an analysis, evaluation, inference, deduction and induction. Scores improved significantly for all scales, and inference and deduction showed the most improvement. This result suggests that the program was effective, especially for critical thinking skills central to scientific reasoning.

Poster #18b

Creation of Rubric to Score Healthy Salad Competition for Children

Mentor: Margaret Condrasky, Food, Nutrition and Package Scienceences

Students: Carly Duffy, Natalie Farr, Catherine Harvey, Caroline Kelly, Genna Pesce

Clemson University students challenged grade school students to create a healthy salad with the guidance of a food service employee that followed the program guidelines. The winner of this competition had their salad on this years school lunch menu. Clemson University nutrition students used a rubric to score samples put together by children involved in the competition. The rubric included categories for originality, easy preparation, kid-friendliness, plate presentation and healthy attributions. The total amount of points a student could earn from their salad was 20 points, and the average score was 15. The winning score was 19. The results of this competition found that children were successful in creating healthy meals using nutritious ingredients that satisfied the program rubric.

POSTER #19A

Waste Management in Cange, Haiti

Mentor: David Vaughn, Engineering, Computing, Applied Science

Students: Douglas Stewart, Christian Jones, Tristan Witham

The mission of the waste management group is to develop an economic and environmentally feasible solid waste management (SWM) program for Cange that is capable of being replicated across Haiti. Improper waste management is a detriment to any community; impacting public health, environmental well being and economic development. In Cange, waste is either dumped into a public location or burned. The former encourages the spread of disease while the latter releases noxious fumes that are harmful to the community and environment. The problem is exacerbated by a complacent culture towards waste management. Trash that is not located on one's private property is not seen as a problem. This leads to build up of trash in public spaces, with little to no municipal clean-up operations. Our team has begun research into the problem of solid waste management in Cange. Thedata gathered helped us narrow our scope into long and short-term goals. We plan to research, design and implement a system that will have short term impacts on SWM in Cange. After a short-term system is in place and can maintain itself, a longer-term plan will be developed. The short term projects will focus on altering the culture that surrounds waste management, whereas the longer term projects will deal more with the technical problems that impact waste management. With either goal, we must contend with a variety of design constraints, including limited access to resources, social norms and widespread poverty.

POSTER #19B

New Impact for a New Future

Mentor: Margaret Condrasky, Food, Nutrition and Package Science

Students: Larkin Kelly, Christian Krantz, Amber Martinez, Kayley McCasland, Haley Newton, Ashley Oneill, Jillian Richardson, Frances Schueren

The Greenville Health System identified South Carolina as having the second highest percentage of obese children in the nation. Students developed healthy, low-cost recipes for the New Impact Nutrition program, which includes families with children at risk for obesity and obesity related diseases in the Greenville County Area. Using sensory science, recipes were compiled to follow MyPlate guidelines and contain cost efficient ingredients. The recipes were selected based on criteria of nutritional profile, audience analysis, and accessibility of ingredients. Dishes were prepared for the families in the New Impact Program at the Greenville Health System's Life Center. Long term implementation of this program could reduce obesity and related diseases in the upstate region.

POSTER #20A

The Sif3 Promoter Drives Gene Expression in Diverse Plant Species

Mentor: Hong Luo, Genetics and Biochemistry

Co-Authors: Zhigang Li, Qian Hu, Peipei Wu

Students: Rachel Magnin, Matthew Cullen

Promoters are regulatory DNA sequences that control gene expression. They are important components in crop genetic engineering. We have identified a new promoter, Sif3abc, which could be used to drive foreign gene expression in transgenic plants. Promoter activity and its regulatory pattern analyses using GUS reporter constructs in transgenic plants show that Sif3abc is a strong, leaf-specific promoter functional in *Arabidopsis* and tobacco. Analysis of different deletion versions of Sif3 promoter suggests that the *cis* regulatory element resides in the middle part of Sif3abc promoter, The 383-bp Sif3c, the 5′ end deletion version of Sif3abc promoter, has strong activity in almost the whole *Arabidopsis* plant except in seeds and most floral organs, and was shown to effectively drive an herbicide resistant gene *bar* in transgenic *Arabidopsis*. Sif3c can also function in tobacco and creeping bentgrass. Our study not only revealed the *cis* regulatory region in the strong leaf specific promoter Sif3abc but also identified a small-size and strong promoter without function in seeds, both of which could serve as useful tools for agriculture industry.

POSTER #20B

Anti-Inflammation, Anti-Cancer and the Antioxidant Effects of the Poha Plant

Mentor: Yanzhang Wei, Biological Sciences

Co-Author: X. Yang

Students: Hiba Kouser, Megan Magrane, Mary Catherine Smith

The goal of this project was to identify natural samples of the Hawaiian poha plant for potential anti-cancer properties by testing the samples' anti-proliferation, anti-inflammatory and antioxidant properties. This was done using an MTS anti-proliferation assay on cultured A549 and Hela tumor cells lines, an anti-inflammation assay on Raw264.7 mouse macrophage cells and an antioxidant assay on the samples. The strength of each of these properties was varied both within and between the samples. The sample that showed the most promising potential for use in anti-cancer treatment–with relatively high effects of each property–was Sample 3. This sample was then tested comparatively between cancer and non-cancer cell lines of certain cell types to investigate the specificity of the compound to target cancer cells. Samples with strong anti-cancer effects that preferentially target cancer cells would be ideal candidates for further investigation for use in cancer treatments.

POSTER #21A

3D Cell-Based Structures for Myocardial Regeneration

Mentor: Agneta Simionescu, Bioengineering

Students: Alexandra Boulez, Taylor Bryson, Grace Casalino, Delayne Di Gangi, Elizabeth Donley, Anderson Patrick, Emily Shook, Palmer Smith, Jensen Williams

Cardiovascular diseases are some of the leading causes of death in today's society. This includes problems with the heart and/or blood vessels, leading to myocardial infarction and ultimately heart failure. Mesenchymal stem cells derived from adipose tissue have the potential to differentiate into cardiomyocytes (cardiac cells), especially in 3D spheroid cultures that closely resembles in vivo tissues. Our studies aim to regenerate cardiac-like microtissues to serve as in vitro studies of cardiac tissue pathologies and could possibly be used for further tissue engineering to create larger and life sized tissues. Human adipose tissue-derived stem cells were cultured in 3D Petri dishes to form spheroids. They were treated with 5-azacytidine to differentiate them into cardiomyocytes. Using immunofluorescent techniques, the cells stained for connexin 43, a gap junction protein considered a marker for cardiomyocytes. Cardiomyocyte differentiation is shown to be possible from adipose tissue-derived stem cells, so these cells could be implemented into the heart and replace the dead cells after myocardial infarction.

POSTER #21B

Bio-Digester Development in the Central Plateau of Haiti

Mentor: David Vaughn, College of Engineering and Science, Natalie Osten, Bioengineering

Students: Robert Falconer, Hannah Sarver, Ian Stewart, Amanda Dara

Residents of developing countries, such as Haiti, often lack methods to safely dispose of human waste, leading to the spread of disease such as cholera. Bio-digesters provide a method to prevent water contamination and, thus, diseases. These systems retain and break down waste through anaerobic digestion before releasing the decontaminated byproducts back into the environment. CEDC installed a system in Cange, Haiti in 2013. The setup consists of a latrine building, a series of 3 anaerobic bio-digester bags and a subsurface flow wetland. Black water from the toilets in this building enter a line that runs to the first bio-digester bag, while grey water from sinks runs directly to the wetlands. The waste of the bags flow into each subsequent bag in order to maximize retention time. All flow within the system is controlled solely by gravity as the system is positioned on a hill with each component placed lower. The effluent from the digester enters the wetland which can utilize nutrients and further break down certain components. The material is then considered safe to re-enter the environment. In addition to managing waste, the systems produce methane gas as a byproduct which can be utilized as a sustainable energy source. Since the system requires no energy and yet produces it, it is considered net-positive. The system in Cange has demonstrated that the system design works as expected. Currently, the bio-digesters team is working to implement this system to forty other villages in the Central Plateau. In order to do this, research is being done on system optimization, social challenges, and maintenance requirements. Additionally, the success of this project will depend on the community taking ownership of the project and its ability to employ and maintain the systems.

POSTER #22A

Low Concentrations of Ethanol Improves the Healthspan of *C. elegans* Through Heat Shock Factor 1 and Boosts the Gut Integrity of Worms

Mentors: Yuqing Dong, Biological Sciences, Min Cao, Biological Sciences

Students: Pierce Sutton, Andrew Mckamy, Samantha Maich

The detrimental effects of large amounts of ethanol consumption have been well studied. Given that small quantities of ethanol from daily diets or produced by gut biota extensively interplays with our body, it is critical to unravel how ethanol at the low concentration in the body affects health. Previously we have shown that low concentrations of ethanol (0.5% and 1%) supplementation can prolong the lifespan of *C. elegans*. Following studies further found that worms that grew in to old age with exposure to low concentrations of ethanol show improved protein homeostasis, a hallmark of aging status. Here, we report that supplementation of low concentrations of ethanol improves the gut integrity in middle aged worms. We also report that heat shock factor 1 (*hsf-1*) which regulates expression of many chaperone proteins plays a role in ethanol mediated lifespan and healthspan promotion. We are also studying the involvement of the insulin signaling pathway which regulates *hsf-1* and the other target of insulin signaling pathway *daf-16* for their probable role in ethanol mediated healthspan promotion. Our study would provide insight into the potential benefits of lower concentrations of ethanol on health.

POSTER #22B

Clemson Engineers Without Borders Nicaragua Water Project

Mentor: Mark A. Schlautman, Environmental Engineer and Earth Science

Co-Author: Jerry Wylie

Students: Nathan Baugh, Jarrod Bohr, Elizabeth Brigham, Jared Capuano, Christopher Coskrey, Matthew Lee, Jessica Spitz, Phillip Storie, Zach Williamson

El Serrano, Nicaragua is a mountainous community of approximately 3,000 people. The community has a functional water system in place. Water from two rainwater-fed sources in the mountains is piped down into a large (30,000 gal.) storage tank. From there, the water is distributed out to all of the houses in the community. Although this system is robust, the water supply is insufficient to meet the community's needs during the dry season. Furthermore, the water is contaminated with *E. coli* and coliform. Thus, we asked: what is the optimal solution for increasing El Serrano's water quantity and improving its water quality? During two assessment trips, the team collected data by conducting water quality tests, performing flow rate tests, logging the gps coordinates along the piping system, surveying the land, measuring the storage tank, taking photographs, interviewing community members and discussing the project scope with the El Serrano Water Committee. In December 2017, the Clemson team traveled to El Serrano, Nicaragua to oversee the drilling and installation of a well. The well installation was successfully completed using a pneumatic air hammer (air rotary) to drill through bedrock to reach water-bearing fractures within the bedrock. The estimated flow rate is between 50 and 60 gallons per minute of water, which greatly exceeded the team's expectations of 15 gpm. Today, the Clemson EWB Nicaragua Team is working to figure out the best solution for integrating the well water with the current water system. Tackling the water quality aspect of the problem will also come into play during this phase of the project.

POSTER #23A

3D Cell-Based Structures for Pancreatic Islet Regeneration

Mentor: Agneta Simionescu, Bioengineering

Students: James Black, Laura Beth Herndon, Christian Kalacanic, Thomas Knight, Sanjana Mandilwar, Riley Rapert, Arianna St. Clair, Stephen Zoeller, Spencer Marsh

Approximately 29.1 million Americans are affected by diabetes with almost 1.4 million new diagnoses every year. Despite its prevalence, a cure has not been found. Our studies are focused on a new method for combating diabetes using a tissue engineering approach. Adipose tissue-derived stem cells were cultured in 3D spheroids and treated with a differentiation cocktail containing 10 uM Nicotinamide, 4 uM Activin A, 10 nM GLP-1, and 1 g/L Glucose. Cells in spheroids were constantly monitored for viability (Live/Dead fluorescent staining) and for their beta cell characteristics (using human beta-cells as control). An enzyme-linked immunosorbent assay (ELISA) was performed to determine the insulin production. Although the differentiated spheroid was clearly different from the control and showed beta cell-like structures, the ELISA did not show statistically significant data for insulin production. In the future, we would like to repeat this experiment based on successful cell culture and spheroid formation. Once these beta cells are effectively differentiated and produce insulin, we will be one step closer to replenish the deficient beta cells.

POSTER #23B

Identification of a Genetic Suppressor of Hypernodulating Phenotypes

Mentor: Julia Frugoli, Genetics and Biochemistry

Co-Author: Elise Schnabel

Student: Cameron Corbett

Legumes can grow using atmospheric nitrogen (N), due to a symbiosis the plants establish with N-fixing bacteria in the soil. Multiple environmental inputs result in a "decision" by the plant to form root nodules to house the bacteria. A long-distance signaling pathway in plants regulates the number of nodules formed, and the LRR kinase ***SUNN*** in the shoot is critical to this pathway; mutation of ***SUNN*** results in hypernodulation. A forward genetic screen for suppressors of the sunn-1 phenotype identified five potential interacting partners of the kinase. Among the verified suppressor of ***sunn-1*** (SOS) lines, ***sos3*** suppresses multiple hypernodulation mutants, suggesting a general suppression mechanism. The mapping populations for the ***sos3*** suppressor line have been screened and the location of the ***sos3*** lesion is being determined. We present the effort to identify underlying mutations in these suppressor lines and ongoing characterization of the phenotype of ***sos3*** mutant plants. Knowing the gene affected will aid understanding of how plants signal information from shoots to roots. Supported by NSF and CI.

POSTER #24A

Finding Your Voice

Mentors: Denise Anderson, Parks Recreation and Tourism Management, Alexsandra Dubin, PRTM Leisure Skills

Students: Emily Beane, Robin Bridgers, Emma Covington, Taylor Delucca, Johanna Giles, Sabrina Guest, Darby Halliburton, Katie Harbin, Mabry Hunt, Chelsea Huston, Aleigh King, Samantha Kramer, Juanita Pacheco, Ryan Piller, Emma Plymel, Rachel Richardson

Physical activity is critical for young people, as individuals who are highly physically active are more likely to have greater self-esteem, better body image and increased physical activity self-efficacy. Currently, the average PE program provides less than 12% of the recommended daily amount of physical activity, with adolescent girls being the least active. Therefore, there is a need for programs that provide opportunities for adolescent girls to be physically active and develop their self-esteem, body image and self-efficacy. Women who participate in recreation report feeling empowered to engage in a wider range of activities (McNeil, Harris and Foundren, 2012). However, little is known about the effects of outdoor recreation experiences in adolescent girls. The purpose of this research is to understand how participating in Finding Your Voice influences self-esteem, body image and physical activity self-efficacy for the middle school girls who attend the program. Data from prior camp sessions suggests that this camp positively impacts the participants, however since camp will be help April 13th through April 15th, 2018 there is not yet any data regarding the efficacy of this years camp program.

POSTER #24B

Understanding Effective Composition of Interdisciplinary Teams

Mentors: Marissa Shuffler , Psychology, Michelle Flynn, Animal and Veterinary Sciences, William Kramer, Psychology

Students: Olivia Burns, Reid Demass, Elizabeth Parler

Many of the greatest scientific feats accomplished come not from lone scientists and researchers, but from teams of individuals collaborating around the world. This leads us to the question of how to best prepare interdisciplinary teams such that they positively leverage their differences and avoid dysfunctional behaviors. Despite the amount of research that has been done on interdisciplinary team processes and performance, there seems to be a gap in the literature when considering how to best compose interdisciplinary teams. Our research addresses this gap by qualitatively determining what some of these individual characteristics might be. To provide answers, 30-min semi-structured interviews were conducted with professors leading interdisciplinary teams. The semi-structured interview was specifically designed by an interdisciplinary team to tap into three major topics: important individual characteristics for those on interdisciplinary teams, the advantages and challenges to interdisciplinary teams and the teams' achievement of goals.

POSTER #25A

Studying Eating Behavior with Mobile Health Technologies

Mentors: Eric R. Muth, Psychology, Sarah Beadle, Psychology

Students: Stephanie Cavanaugh, Bryson Daniels, Christianna Messinger, Lindsey Russell, Della Waters, Hope Wegner, Chloe Hourigan

The purpose of this research is to study the eating environment and social, technological and ecological factors that influence consumption. With a growing population of overweight individuals, mobile health solutions are being employed to help people reduce eating intake. Studies in our lab use a wrist-worn device called the Bite Counter to inform participants about their eating behavior. In Experiment 1, we investigated if eating to a specific bite target was easier than eating to a calorie target. Bites are at least as easy to use as calorie information to assess intake. In Experiment 2, the question was whether participants took larger bites and ate faster when they had to enter meal information in a phone based interface. Those using the phone based method had a shorter meal duration than those who were able to begin eating the same meal immediately. Future research will examine how aspects of feedback can be used to influence consumption and how mobile health technologies can employ these strategies, ultimately looking to be a part of a technological solution to overeating. Students contributed to the efforts of NIH Grant #11241DK091141-01A1 awarded to Dr. Muth.

POSTER #25B

Development of a Revised Biopsy Needle Design to Improve the Ergonomics of Sample Collection

Mentors: Heather Dunn, Animal and Veterinary Sciences, Jeremy Mercuri, Bioengineering

Students: Omar Abdeladl, Nicholas Baxter, Sarah Dorsey, Jacob Garland, Bryce Kunkle, John Mcgreevey, Cameron Schnabel, Emily Wood

The goal of this project is to design and prototype an improved biopsy needle device that has superior ergonomics and lower manufacturing cost compared to competitor products. Our iterations of the prototype were designed in Solidworks 2016, and were 3D printed using polylactic acid (PLA) or acrylonitrile butadiene styrene (ABS) plastic. We performed tests focused on verification of the functionality of the biopsy device and improvement of ergonomics. For ergonomics, questionnaire results show that our most recent prototype received an average score of 4.25 out of 5 while the competitor device currently used received an average score of 3.17. Based on the preliminary testing results, combined with the positive feedback received from the qualitative questionnaire, our results demonstrate that we have been

successful in building a more ergonomic animal model biopsy device than the competing device that we started with. Further improvements of the device could lead to a reusable device that will provide cattle farmers a cost effective way to perform genetic sequencing of their herds which has major implications in the cattle industry.

POSTER #26A

Establishing a Bioreactor System for Microbial Fermentation

Mentor: Mark Blenner, Chemical and Biomolecular Engineering

Students: Adam Beitz, Nicole Franaszek

This project describes the setup, validation and use of a new bioreactor for microbial fermentation. The bioreactor is important in demonstrating the potential to scale up any of our engineered microbial systems. We will present preliminary data describing performance enhancement gains for fatty alcohol and omega-3 producing strains of *Yarrowia lipolytica*.

POSTER #26B

The Effects of Exercise, Nutrition and Sleep Habits on Weight in College Students

Mentors: June Pilcher, Psychology, Drew Morris, Psychology

Students: Tyler Holt, Emily Smith, Dylan Erikson, Carolyn Yochum

Obesity has increased in prevalence over the past half century, worldwide. Obesity is associated with increased hypertension, cancer, cardiovascular disease and many other serious conditions. College students have been shown to be particularly susceptible to weight gain due to a significant change in lifestyle. There are many factors that influence body mass including exercise, diet and sleep habits. Researchers are particularly interested in these factors as potential areas of intervention to prevent weight gain in college students. This study assesses the correlation between health habits such as sleep habits, exercise, diet and weight in college students.

POSTER #27A

Soil Inventory of Private Lands in South Carolina

Mentors: Elena Mikhailova, Forestry and Environment Conservation, Christopher Post, Forestry and Environment Conservation

Students: Geddings Jhant, Kelly Shugh, Ryan St Laurent, Gibson Wall

Most of South Carolina's land is currently owned by private families or individuals. The objectives of this study were to conduct soil inventories of private lands in various locations in South Carolina using the Web Soil Survey, to collect soil samples, to analyze these collected soil samples using Clemson University Agricultural Service Laboratory and to make management recommendations. Various soil series were identified within the private lands and rated based on their suitabilities and limitations (*e.g.*, building site development, land classifications and management, vegetative productivity and waste management). Soil nutrient analysis recommendations are discussed to maximize agricultural productivity while minimizing environmental impact.

POSTER #27B

Anti-Microbial Evaluation of Synthetic Nanoparticles and Small Molecules

Mentors: Kristi Whitehead, Biological Sciences, Krista R Rudolph, Biological Sciences

Co-Authors: Daniel Whitehead, Anthony Santilli

Students: Caroline Marhefka, Richard Speers, Arianna Conti, Kyleigh Connolly, Brooke Maddie

Nanoparticles are used in cleaning products to produce films to keep surfaces clean, enhance soap to reduce environmentally harmful byproducts, and act as antibacterial agents. Dr. Daniel Whitehead's lab has successfully designed nanoparticles that capture volatile organic compounds in the atmosphere. Dr. Daniel Whitehead's lab has also synthesized trial antimicrobial compounds that are structurally similar to beta-lactams. Our lab is focusing on testing these nanoparticles and new compounds as antimicrobial agents. For the trial antimicrobial compounds, our lab ran cultures of ***Escherichia coli*** and ***Staphylococcus epidermidis*** with new compound in the spectrophotometer at 600nm. The second measurement was conducted 18 hours after the compound was added. For the nanoparticle testing, our lab conducted weekly assays at 0 and 120 minutes and monitored the growth of *E. coli* and ***Staphylococcus aureus***. At 0 minutes, the cultures were analyzed by a spectrophotometer, diluted and plated at the 10-5 to 10-7 dilutions, and then the nanoparticle was added. At 120 minutes, the cultures were plated at the same dilution. Effectiveness of each drug was determined by the number of colony forming units on the plates between 0 and 120 minutes. There is no significant decrease in the growth of either microbe with added nanoparticle or the trial antimicrobial compound. We plan on running new nanoparticles with *E. coli* and ***S. aureus*** as well as testing all nanoparticles with more bacteria. For the trial antimicrobial compounds, we plan on reforming our methods to decrease contamination and testing with more bacteria.

POSTER #28A

Microbial Feedstocks from Astronaut Wastes - Towards a Closed Loop Biomanufacturing System

Mentor: Mark Blenner, Chemical and Biomolecular Engineering

Students: Matthew Brabender, Mia Maciorowski

Yarrowia lipolytica is an industrial yeast that has been used in the sustainable production of fatty acid-derived and lipid compounds due to its high growth capacity, genetic tractability and oleaginous properties. This is the first in-depth investigation that examines the potential of using urea or urine as a low-cost alternative source of nitrogen for growth a metabolism in *Y. lipolytica*. At stoichiometric equivalent concentrations, we observed that urea or urine as a nitrogen source enabled significantly improved biomass accumulation when glucose was used as a carbon source. In the case of synthetic urine experiment, higher lipid yields were also observed relative to ammonium sulfate. *Y. lipolytica*'s potential to tolerate waste type feeds is demonstrated when we grew the microbe in untreated human urine and obtained improved biomass accumulation. By increasing the molar carbon : nitrogen ratio, higher lipid titers were attained in an engineered *Y. lipolytica* strain grown in urea or urine relative to ammonium sulfate. The transporters responsible for uptake of urea are also characterized using real-time PCR. The work presented here highlights the potential of using cheaper media components as well as exploiting and recycling non-treated waste streams for biotechnology processes.

POSTER #28B

Diet Content Analysis of Bartram's Bass–a Savannah River Endemic

Mentor: Brandon Peoples, Forestry and Environment Conservation

Co-Author: Emily Judson

Students: Austin Rodgers, Wesley Moore

Bartram's Bass (*Micropterus sp. cf. cataractae*) is an undescribed species of black bass that is endemic to the Savannah River Basin of South Carolina and Georgia. Little is known about Bartram's Bass feeding habits. In spring/summer 2017, 589 individuals were collected from 53 sites. We recorded length, weight, gut weight and diet content of each individual. Individuals ranged from 31 mm to 433 mm in length. Two hundred and thirteen individuals were captured with empty stomachs. Overall prey prevalence in the diet showed that 61.8% of the individuals consumed soft-bodied macroinvertebrates, 13.6% consumed crayfish, 18% consumed fish and 5.5% consumed organic matter. Analyzed by weight, diets consisted of 53% crayfish, 35.8% fish, 8.8% soft-bodied macroinvertebrates and 1.4% organic matter. As Bartram's Bass grow, we found that their diet steadily shifts from benthivorous to piscivorous. The transition to piscivory occurs in Bartram's Bass individuals at 124mm of growth. Our results suggest that there is an ontogenetic shift that occurs as individuals grow but that individuals will consume soft-bodied macroinvertebrates throughout life.

POSTER #29A

Soil Judging Project

Mentor: Elena Mikhailova, Forestry and Environment Conservation

Students: Lloyd Barringer, George Crow, Alan Diehl, Riley Kammerer, John Larson, Cody Lattimore, Carlos Morales, Gibson Skeppstrom, Alan Taylerson

The Soil Judging Project teaches students important skills for field identification of soil types, their properties and interpretations for use. The Soil Judging Project can be beneficial to students as well as government agencies and the private sector. The objective of this study was to learn how to describe the soil morphological properties (*e.g.*, horizons, texture, color, structure, consistency and redoximorphic features), interpret soil profile properties (*e.g.*, infiltration, hydraulic conductivity, available water, soil wetness class), identify site characteristics (*e.g.*, position of site, parent material, slope, surface runoff, erosion potential) and classify soil. A Southeastern Region Soil Judging Handbook was used by students from various disciplines (*e.g.*, business, accounting, etc.) to master the skills of soil description, identification and interpretation in the field. The Soil Judging Project can significantly improve soil education and mitigate problems associated with land use management.

POSTER #29B

Understanding Knowledge Transference Between Generations

Mentors: Anastasia Thyroff, Marketing, Jennifer Seimens, Marketing

Students: Tanner Dieterich, Erica Huber, Christopher Norman, Ian Robinson, Allison Wagner, Jack West, Hanna Wink, Vincent Devenoge, Tanner Parsons, Helen Mcdowell, Elizabeth Lynch, Bailey Hack, Devin Ostermann

In 2017 we were approached to work with Creative Inquiry to help Siemens Corporation with a looming problem: they were expecting

thousands of baby boomers in their industry to retire over the next several years, and were faced the task of replacing those workers with a new generation of millennials. Working with Siemens Corporation executives, we honed in on three specific research questions focused on understanding the knowledge transfer process. Specifically our research questions included: 1. what is the most effective way to transfer knowledge between a seasoned employee and someone new to the industry? 2. how do you implement the transfer? and 3. what is the role of technology during this process? The overarching goal was to develop a model for knowledge continuity. As a CI team, 41 interviews were conducted and two focus groups were conducted. The result was a 600 page text. The text was then coded and analyzed for findings that centered around mentorship, training and succession planning. The current CI students are now diving further into these findings, studying the culture difference between millennials, Gen X and Baby-boomers across the various work groups at Siemens Corporation.

POSTER #30A

Exploring the Effect of Phyletic Dwarfism on the Static Allometry of Reproductive Performance: Fecundity, Egg Size and Reproductive Output in the Pygmy Crab *Petamithrax pygmaeus*

Mentor: Juan Antonio Baeza Migueles, Biological Sciences

Student: Hayden Mullen

The marine crab *Petamithrax pygmaeus* is one of the smallest crabs in the superfamily (Majoidea) reaching body sizes no larger than 7.0 mm carapace width (CW). Little is known about the reproductive biology of marine invertebrates exhibiting phyletic dwarfism. This study reports on egg production (fecundity, egg size and reproductive output) of this dwarf species. Fecundity varied between 75 and 310 eggs crab-1 with a mean ± SD of 150 ± 53 eggs crab-1 and increased significantly with female CW. Embryo volume varied between 0.13 and 0.19 mm3 with a mean ± SD of 0.15 ± 0.01 mm3 and did not increase with female CW. Reproductive output (RO) represented a mean ± SD of 5.92% ± 2.05% of female dry body weight (DBW), and a significant correlation was observed between female DBW and dry weight of the egg mass. The brood mass (RO) of *P. pygmaeus* increased proportionally (isometrically) with increases in female body size. Fecundity and egg size are within expected ranges for minute species of crabs in the superfamily Majoidea and thus, phyletic dwarfism does not appear to affect reproductive performance in this species.

POSTER #30B

Tensile Strength and Structure of the Butterfly Proboscis

Mentors: Konstantin Kornev, Materials Science and Engineering, Charles E Beard, Plant and Environmental Sciences

Students: Alison Arling, Allison Kaczmarek

Histological investigation has shown that Lepidoptera proboscises are composed of two concave galea that connect via "hooks" called legulae. The proboscises contain a food canal, tracheae, muscles, and nerves, and are composed of soft tissue surrounded by tough cuticle. In order to create a synthetic fiber that mimics the proboscis's unique properties, we explored the effects of the chitin composition and unique geometry of the proboscis on its mechanical properties. Considering Monarch butterflies, we used modified DMA testing to measure the Young's Modulus, yield strength, and ultimate strength of each galea. Repeatable elastic deformation was observed within a small load application of 0.1 N, and using 3D microscopy, we observed fracture patterns and measured the cross sectional area on the scale of 0.005 mm^2 to calculate the normal stress on the fracture cross section. This knowledge will help us design new, self-cleaning fiber micro tubes with applications in hazardous and nuclear waste disposal.

POSTER #31A

Periop Mobile Learning System

Mentor: Kevin Taaffe, Industrial Engineering

Students: David Fant, Alexis Fiore, Alexander Geiger, Sierra Richardson, Marisa Shehan, Hayes Sherman, Emily Huffer

In today's healthcare system, professionals are often faced with an overwhelming amount of patient information and little ability to effectively communicate this information to other doctors, nurses and medical staff. Periop Mobile Learning System (Periop MLS) was developed to solve this problem by optimizing patient flow through a hospital system on the day of surgery. Developed in conjunction with Greenville Health System (GHS), the mobile application displays patient information including the tasks that need to be completed prior to surgery and the patient's location throughout each of the three perioperative stages. To test and demonstrate the application's functionality, a discrete-event simulation model was created using Arena to simulate patient flow through the application and collect feedback for further tests.
In order to evaluate the usability of the application and its effectiveness in improving communication and coordination, our team is now conducting user tests to model common scenarios that are encountered by users of Periop MLS. Based on the feedback received from this user testing, we will modify the application as needed.

POSTER #31B

Analysis of Suicides in Pickens County Related to Sex and Age

Mentor: Katherine Weisensee, Sociology and Anthropology

Students: Maddie Lucas, Anne Shillinglaw, Sue Wright

This study examines the difference in suicide methods between sexes and age groups in a coroner's sample from Pickens County, SC. Previous research on suicide suggests that males commit suicide more frequently using firearms, while others report that as age increases firearms are used more often. This study utilizes a database from the Pickens County Coroner's office. This database provides detailed information regarding deaths that were investigated by the county coroner's office. The deaths are geospatially located in the county using an ARCGIS database. The database currently contains deaths from 1968-1978. The database is being constructed as part of a Creative Inquiry project (ANTH 4960) as a service-learning project in partnership with the coroner's office. For this research project, we will identify individuals whose manner of death was determined to be suicide from the individuals currently in the database. We will then compare the specific methods used in the suicide related to sex and age in the sample. There were a wide range of methods used in suicide and these will be contextualized based on sex and age in the sample.

POSTER #32A

Patterns and Drivers of Overstory Tree Mortality Following Wildfire in the Southern Appalachian Mountains

Mentor: Donald Hagan, Forestry and Environment Conservation

Co-Author: Matt Vaughan

Students: Hannah Bailey, Simeon Hallman, Adam Mcclure, Caroline Sharpe, Christopher Williamson, Caroline Wolfe

The wildfires of fall 2016 burned larger areas of forest in the southern Appalachian Mountains than in any other season in recent history. Drought conditions and extreme fuel accumulation made for unprecedented fire behavior across the region. Whereas the immediate effects of smoke and char are readily apparent, the more subtle and variable effects on vegetation over time remain unknown. This project will evaluate such effects to determine (1) how overstory trees respond to stress induced by severe wildfire over multiple years and (2) what factors contribute to this response. To answer these questions, monitoring plots have been established to collect information on the size, composition and health of trees in three watersheds impacted by the Rock Mountain Fire (NE GA). Control plots were established in adjacent unburned watersheds. We anticipate that the effects of wildfire will continue for many years to come, as manifested by increased rates of windthrow, and delayed mortality from the compounding effects of insects, disease and stress. Understanding the effects of novel wildfire events will enable managers to better predict how forests will respond, thereby equipping them to manage their forests in a future where such events will likely be more commonplace.

POSTER #32B

Systematic Investigation of Doped Ferrites for Increased Energy Conversion in MagMED

Mentor: Olin Mefford, Materials Science and Engineering

Students: Christopher Bleyer, Lee Patterson, Carol Stegura, Christopher Young

Magnetically mediated energy delivery (MagMED), formally known as magnetic field hyperthermia, has been a heavily researched area in the magnetic community for many years. The concept being that an alternating magnetic field is applied to magnetic particles. The particles convert the energy of the magnetic field and deliver it locally to the surrounding medium. The efficiency of this transfer is defined by the specific absorption rate of the material which can be measured by placing a sample in an alternating field and measuring the temperature change of the medium over time. The energy produced during this time period is related to both the frequency (number of cycles) and the field magnitude as each field flip can be seen as a minor hysteresis loop with the area of the loop being the energy released in a single magnetization event. To maximize the area in these minor hysteresis loops, two main materials properties can be manipulated. The first being the effective anisotropy which is an intrinsic value based on the material composition and the second being particle volume. The ability to control and change effective anisotropy and particle volume present a unique opportunity to produce materials that can be optimized for maximum power output at a given field and frequency. By maximizing the effective anisotropy through Zn doping, as well as identifying optimal volume for energy release using a novel drip synthesis the optimization of cobalt ferrite based materials for application in MagMED is possible.

POSTER #33A

Blood Pressure, Emotional Dampening and Financial Risk-Taking in a Simulated Lottery

Mentor: James A McCubbin, Psychology

Students: Rachel Demas, Phillip Garrison, Lindsay O'Toole, Gabrielle Cummings, Taylor Miguelino, Ashley Sitarik, Rachel Basiura

Elevated blood pressure (BP) levels are associated not only with risk for hypertension development, but also with dampened emotional responsivity. Current theory suggest that perception of threat is a critical motivator in avoidance of risk. We hypothesize that blood pressure-

associated dampening of threat assessment may be associated with increased financial risk-taking. Ninety-three normotensive men and women were recruited for a study of resting BP and financial risk-taking behavior using a simulated paired-choice lottery task. We also assessed the potential roles of delay discounting, impulsivity, sensation seeking and perceived stress. Correlations across all participants indicate that higher systolic BP was associated with increased lottery risk-taking ($r[91]=-.219$, $p=.035$). Multiple regression indicates that the relationship between systolic BP and lottery risk is independent of delay discounting, impulsivity, sensation seeking and perceived stress. These findings may provide insight into central nervous system control of BP and emotional responsivity in the early stages of hypertension development.

POSTER #33B

Fatigue Crack Growth in High Entropy Alloys

Mentor: Garrett Pataky, Mechanical Engineering

Co-Author: Wm Matthew Williams

Students: Samuel Jenkins, Martha Piness, Diana Burden, Daniel Collins

This Creative Inquiry focused on exploring the fracture characteristics of high entropy alloys (HEAs) using digital image correlation (DIC). HEAs are a new class of materials that consist of nearly equiatomic proportions of 4 or more elements within a solid solution. This project focused on two specific HEAs, CoCrFeMnNi and CoCrMnNi. The specific interest of the experiments was the fatigue crack growth properties of the materials. Using a servohydraulic load frame, a stress was applied to a sample of the material uniaxially. By cycling the stress to a given amplitude, the sample underwent repeated cycles of stress initiating a crack which grew until eventual failure of the specimen. DIC, an optical technique, was used to measure the deformation of the material. This method worked by comparing several images taken at discrete intervals while the sample was experiencing the cyclic loading and comparing the position of extremely fine dots between pictures. The analysis continued with the calculation of local strain fields within the material and provided a deformation map of the sample during testing. The goal of the experimentation was to identify the materials' resistance to fatigue crack growth. Due to the relatively new age of these materials, there is few studies in the literature about HEAs.

POSTER #34A

Prescription Drug Misuse Among College Students

Mentor: Martha Thompson, Public Health Sciences, Crystal Burnette, Student Health Center, Morgan Danyi, Student Health Center

Students: Melissa Bales, Rebecca Bonner, Imani Carter, Mimi Foster, Angela Loiselle, Tessa Schwarze, Kylie Truong

Prescription drug misuse is an increasing concern across the country. Colleges and universities have begun evaluating prescription drug misuse on their campuses to inform associated programs and initiatives. The Alcohol and Other Drugs Creative Inquiry team conducted a literature review that examined the reasons for misuse, personal characteristics of users, and associated policies, interventions and preventions. Reasons why college students misuse prescription drugs include academic purposes, to awake, party, experiment, get high and self-medicate. Personal characteristics such as academic performance, gender, age, general health and student involvement contributed to prescription drug misuse. Lastly, various federal, state and university policies, preventions and interventions surrounding prescription drug misuse are in place. To be most effective, initiatives must be as specific as possible for the population. These findings have allowed our team to narrow our research from the general college student population to Clemson's campus through research questions that the upcoming College Prescription Drug Survey will help us answer.

POSTER #34B

CEDC - Center of Excellence

Mentors: David Vaughn, Engineering, Computing, Applied Science, Caleb Cantrell, Microbiology and Molecular Medic

Students: Riley Garvey, Elijah Harding, Seth Gruendling

Billions of people on Earth do not have access to clean water, sanitation, reliable energy, food security, education, healthcare and other key societal needs. In order to foster growth in underdeveloped areas, these important needs must be addressed. Our mission is to establish a global health, infrastructure, community and education institute at Clemson and establish Centers of Excellence in key partner countries, and to work on projects that address global challenges and sustainable development goals. This clean energy living-learning laboratory will set an example and teach others how to design, build and maintain systems in a financially sustainable manner. This consortium will establish regulatory agencies, develop ethical standards, create financial strategies, coalesce the best practices for the region, understand the current and future demands within the country, create standards for components and improve access to quality imported components. The long-term goal of this project is a constructed, self-sustained Center of Excellence in Haiti as well as other developing countries, targeting East Africa and South America. There are eleven key aims for this project. The team is conducting a literature review to deepen their knowledge of each of the eleven key aims and to determine the best methods in which to incorporate them into a final design. Upon conclusion of this research the team will create a blueprint of the building and work to secure the necessary funding to make the Center of Excellence a reality.

POSTER #35A

Static and Dynamic Judgments of Aperture Passability in Novice Walker Users

Mentors: Kathryn Lucaites, Psychology, Christopher Pagano, Psychology

Student: Hope Wegner

Affordances are capabilities for action that are determined by the relationship between properties of the individual (both morphological and dynamic) and characteristics of the environment. The present study investigated whether one's perceptions of their affordances differs when they are standing still compared to when they are producing dynamic movements. Novice users of assistive walking devices judged whether or not they could pass through various doorways. Judgments were completed in three phases: Static (participant stands still), Dynamic (participant uses the walker to walk towards the doorway before making their judgment), then Static again. Results indicate that participants were less likely to judge the same doorway as passable during the dynamic phase compared to both static phases. This suggests that dynamic movement allows for additional exploration of the environment and further informs the individual of their own action capabilities.

POSTER #35B

Is Teamwork a Bulwark Against Burnout? A Study of First-Year Emergency Medicine Residents

Mentors: Marissa Shuffler , Psychology, Nastassia Savage, Psychology

Students: Brianna Carmona, Erin Mcelhenny, Cavan Peters

Effective teamwork is necessary to save lives in the fast-paced world of emergency medicine (EM) but is it also saving the clinicians? EM stressors contribute to higher burnout rates than other areas of medicine. Burnout has also been associated with negative outcomes, including higher medical errors. We seek to explore the connection between team cohesiveness and physician and resident burnout. To look into this further, we conducted focus groups and on-shift observations with 10 first-year EM residents in a large hospital system to identify contributors to burnout. The topics of these focus groups were determined through a literature review and discussions with directors of the program and were reviewed to identify how relationships and team cohesiveness impact self-reported feelings of burnout. Preliminary results indicate that the quality of interactions with others, including supervisors, colleagues and patients, have a significant effect on their level of satisfaction and frustration. These results may impact EM work processes and provide directions for future research, practice and interventions.

POSTER #36A

Conservation Drones: Using UAVs to Better Evaluate and Manage Natural Resources

Mentors: Christopher Post, Forestry and Environment Conservation, Elena Mikhailova, Forestry and Environment Conservation

Students: Jesse Bridgeman, Wesley Edwards

Unmanned Aerial Vehicles (UAVs) or drones are becoming a critical tool for natural resource management. As part of our project we are learning how to safely and legally fly UAVs, including how to become a certified part 107 remote pilot with the Federal Aviation Administration (FAA). Aerial image capture is processed through a number of tools to create orthomosaics and three-dimensional representations of the land surface. A restored stream on the Clemson University campus has been imaged and evaluated for wetland extent and vegetation growth.

POSTER #36B

Molecular Dynamic Simulations of the Anthrax Pore-Forming Toxin

Mentor: Sapna Sarupria, Chemical and Biomolecular Engineering

Students: Waring Hills, Kamryn Kant

The goal of our research is to use molecular dynamics simulations to study how anthrax toxin infects target cells. In this research project, we will focus on the mechanism by which the anthrax toxin binds to the receptor in the cell membrane. We will also study the formation of the pore and translocation of the proteins that cause cell damage/death. These simulations are the first of their kind and we will use previous experimental work to validate our findings.

POSTER #37A

Evaluating Mammalian Detection Rates in Response to Different Olfactory Lures

Mentors: Robin Eng, Forestry and Environment Conservation, David Jachowski, Forestry and Environmental Conservation

Students: Devin Burnes, Zoey Chapman

Scent based cues are an important method of animal communication. We tested the effects of scent lure treatments on the detection rates of mammals at baited camera stations. We evaluated three scent treatments: a skunky-smelling lure represented an olfactory signpost, cherry oil represented a sweet food, and a control treatment with no scent lure. We hypothesized that visitation of herbivores and omnivores would

be higher at cherry oil sites, gusto sites would have higher visitations overall, and larger animals would visit gusto sites more often than smaller animals. Each station had every scent treatment for 4 weeks and was additionally baited with sardines. Bait and scent lures were refreshed biweekly. We used generalized linear models and linear regression to compare species visitation rates, but found no significant support for our hypotheses. We conclude that lure treatments may have little effect on mammalian behavior. However, the presence of sardines at all sites may have confounded our results, and the use of a true control may better determine the efficacy of scent lures.

POSTER #37B

Human-Elephant Conflict in Myanmar

Mentor: Christie Sampson, Biological Sciences

Students: Juliana Humphreys, Kara Rhodes

Wild Asian elephants are in an ongoing battle for resources with the local villagers of Myanmar. The focus of this project is to find better ways for coexistence between humans and elephants in places of conflict such as Myanmar. Education and outreach is at the forefront of this issue and by helping children as well as adults better understand the root of the problem, we can positively increase community support for the conservation of Asian elephants. Part of this project will be using a GPS transmitter and stuffed elephants to create a mock tracking exercise. This shows the process of how endangered species such as the Asian elephant can be safely followed and studied in the wild. An application for electronic devices with background information on the topic as well as quizzes and videos will also accompany the tracking activity.

POSTER #38A

Understanding Deep Learning for Computer Vision Systems

Mentors: Melissa Smith, Electrical and Computer Engineering, Ankit Kulshrestha, Computer and Network Services, Edwin Weill, Electrical and Computer Engineering

Students: Ryan Macrae, Casey Sumner

Computer vision has become ubiquitous in today's society, with applications ranging from medicine to visual diagnostics to aerial monitoring to self-driving vehicles. Common approaches to these problems involve hand-crafting features to be able to localize objects within a scene; however, this can be a very time consuming task if the algorithm is intended to be generalizable. As part of the DLBD Creative Inquiry project, we investigate a different strategy to solving these problems (*i.e.*, utilizing deep learning for automatic feature extraction and localization of data). As members of the CI, we have created deep learning models for detection of barcode labels on boxes in a warehouse as well as models detecting objects from an aerial view surveillance drone. We have also been exposed to deep learning concepts and methods that allow us to optimize these networks properly for the tasks. We would like to acknowledge BMW for sponsoring part of the work done by the CI.

POSTER #38B

Wild Myanmar: Human-wildlife conflict and poaching mitigation strategies to save Myanmar's wildlife

Mentor: Christie Sampson, Biological Sciences

Student: Sarah Jayne Kerr

Species are being lost to extinction due to human impact all across the globe. In Myanmar, both human-wildlife conflict and illegal poaching threaten wild animal populations. However, there is a severe lack of educational outreach materials available to the people in the rural communities where these animals are being taken from that provide information about these species' ecology, endangered status, and importance in the ecosystem. It is critical that local communities understand the value of their wildlife, and the challenges facing wild populations, in order to gain their support for conservation efforts and citizen science projects. To fill this knowledge gap, I am creating a field guide providing this information, and detailing the threats facing each of the species (***i.e.***, poaching for medicinal purposes, valuable commodities such as ivory, or conflict with rural humans). In addition, I highlight the issues facing the Asian elephant population in Myanmar, a species targeted for both poaching and human-elephant conflict. I also discuss mitigation efforts underway to stem further elephant population declines, and demonstrate how researchers use GPS-satellite collars to monitor wild elephant populations. This field guide will be used not only as an educational outreach product but also in citizen science projects where local community members document the occurrence of poaching and the illegal wildlife trade. It will be distributed to at least 100 villages throughout Myanmar, given to the rural schools visited by our educational outreach team, and included in the capacity build tools our research team has developed for the Myanmar government.

POSTER #39A

Clemson University Retrieval of Explants Program and Registry in Orthopaedics

Mentor: Melinda Harman, Bioengineering

Students: Lauren Adams, Granville Baxa, Julia Brisbane, Matthew Burt, Madyson Coggins, Britta Frenzel, Elizabeth Gaston, Molly Gundermann, Cole Harp, Samuel Insignares, Elliot Mercado, Helen Nguyen, Whitney Schroeder, Preston Walker

It is estimated that approximately 10 percent of the U.S. population currently has an implanted medical device, which includes over 1 million Americans with a hip or knee joint replacement. While these devices typically last 15-20 years, revision joint replacement is sometimes required due to wear, loosening or joint infection. The revision rate reported by international registries is approximately 1 revision for every 10 primary joint replacements. The goal of CU-REPRO is to develop a state-wide registry to answer questions relating to the in vivo performance of joint replacements. Such registries are essential for progress in the orthopaedic industry. The CU-REPRO repository now includes over 680 devices that have been removed, or "explanted", from patients. Students collaborate with the major hospital systems across South Carolina to collect and evaluate these explants. This semester, REPRO research is focused on seven projects, including outreach, implant archive, implant classification, database development, studying polyethylene wear, mechanical testing of implant modularity and identifying corrosion damage. Utilizing new digital literacy skills [Adobe Creative Cloud], the aim is to creatively communicate the purpose and findings of these projects for a scientific audience and/or a general public audience.

POSTER #39B

Evaluating the Effectiveness of a Water Quality Outreach Program

Mentors: Lauren Garcia Chance, Plant and Environmental Sciences, Christie Sampson, Biological Sciences

Students: Mallory Ware, Delaney Lann, Jared Davis

In the "What's in Our Waters?" (WOW) educational outreach program, university students work with local high school classes to educate them about the human impact on local water systems, demonstrates techniques for water quality sampling, and communicate the results of a water quality study in at a local science conference. Following the program, each high school student completes an online survey which asked questions regarding scientific theories, if and how the program influenced their future career path, and what they took away from this learning experience. In this creative inquiry, the undergraduate students act as mentors in the WOW program, develop instructional videos of field sampling protocols for use by the mentors and other volunteers all across the southeast United States, and analyze the survey results from the high school students' participation in the program. The survey results demonstrated that the WOW program provides a positive experience leading to an increased awareness of water quality, and an increased confidence in the high school student's scientific abilities. The instructional video has been made available to all Adopt-A-Stream volunteers and the results of the survey are being included in the publication outlining the WOW program framework.

POSTER #40A

Improving Decision Making Awareness When Considering Conditions of Fatigue

Mentors: Kevin Taaffe, Industrial Engineering, Dotan Shvorin, Industrial Engineering

Students: Emaleigh Beeler, Garrett Gallagher, Joe Stephenson

The impact of fatigue on player performance can be mitigated by higher levels of physiological awareness in the decision making process. While the physiological condition of the player changes during the game, fatigue is proven to degrade the player performance over time. Players with higher levels of awareness are more likely to adapt their strategic and tactical decisions to accommodate for these physiological changes, in order to maintain a higher level of performance over time. The key to sustain performance over time lies with the player's capability to balance invested effort with recuperation requirements. With advance technological capabilities, bio-data can be captured in real-time and data sets can be created, in order to understand how player's balance their physiological condition during the game. This research will demonstrate this balancing act, through a tennis game with various objectives, and analyze the impact of the player's awareness on his decision making process. As a result, by elevating the players awareness, players improved their performance and adapted their decision making to accommodate for physiological degradation over time.

POSTER #40B

An Evaluation and Recommendation for Emergency Department Physician Consultation

Mentors: Dotan Shvorin, Industrial Engineering, Kevin Taaffe, Industrial Engineering

Students: Paul Glenn, Aynsley Hartney

Healthcare is in flux, and healthcare organizations must not only focus on patient care but must also ensure their financial sustainability – forcing a paradigm shift toward a business-minded institution. This necessary adaption presents a paradoxical challenge – how to leverage high quality patient care while providing for efficient patient throughput in the same encounter, all while bending the cost curve. Emergency

departments (ED) reside at the interface of these two goals with the scrutinized metric of patient length of stay (LOS). A patient's treatment path, while in the ED, often requires the opinion of a sub-specialist in the decision making process post-stabilization. Although critical to the treatment process, challenges exist that prevent sub-specialty consultation from being seamless, including triage priorities, patient queuing and physician staffing patterns. These can all contribute to wait times, sub-optimal patient outcomes, ED overcrowding and financial burdens. This research will evaluate the difference between stated consultation protocols and the reality of their implementation. Our analysis will demonstrate the impact of consultation on LOS and quality of care. Our findings will inform critical discussions regarding solutions aimed at overcoming challenges in consultation to decrease LOS while maintaining high quality patient care.

POSTER #41A

The Impact of Wearable Technology on Health Behaviors: A Review of Literature

Mentor: Nancy K Meehan, School of Nursing

Students: Lawson Bishop, Renee Bourgeois, Margaret Foushee, Lauren Owens

How does wearable technology impact health behaviors? These popular devices pair fashion with health-monitoring technology in order to cater to increasing public interest in both health monitoring and technology. A systematic literature review was conducted, examining recent research related to the impact of wearable technology on health. The review focused on health behaviors, sleep patterns, device compliance and social media incorporation. Nineteen articles were selected for review. Study samples from the literature varied and included college students, adults, United States citizens, international citizens and mixed American and international citizens. Our results show that wearable devices are becoming increasingly useful in medical research and clinical settings. Based off of previous literature, we conclude that these devices can promote healthy behaviors. Our research is sponsored by Clemson Calhoun Honors College and Creative Inquiry.

POSTER #41B

Therapeutic Hypothermia Post Cardiac Arrest

Mentor: John Whitcomb, School of Nursing

Students: Sarah Boyd, Caitlyn Dest, Katie Dzoba, Courtney Griffith, Courtney Hayward, Sam Kanny, Effie Lambrinos

Therapeutic hypothermia (TH) is an induced, controlled lowering of body temperature used to treat patients that have suffered a cardiac arrest event. The goal of this treatment is to prevent or limit neurological damage during the cardiac arrest period. While this treatment is widely used, there is not a standardized method. The objective of the project is to identify key treatment variables of TH treatment after a cardiac arrest event that will result in survival with positive neurological outcomes. A retrospective chart review will be completed on patients who suffered a cardiac arrest event and were treated with TH at Greenville Memorial Hospital in the last 5 years. Collected data will be analyzed to look for commonalities in variables used with successful neurological outcomes. Insight into the exact variables that affect the success of TH may help standardize a treatment protocol and improve patient outcomes.

POSTER #42A

Factors Impacting the Health, Lifestyle and Culture of Peruvian Street Children

Mentor: Janice Lanham, School of Nursing

Student: Hailey Bednar

This Creative Inquiry (CI) project examined the situational and causal factors impacting the health, lifestyle and culture of Peruvian street children. Street children are defined by the United Nations Children's Fund as "any girl or boy who has not reached adulthood, for whom the street in the widest sense of the word, including unoccupied dwellings, wasteland, and so on, has become his or her habitual abode and/or source of livelihood, and who is inadequately protected, directed, and supervised by adults." Street children have different social, economic and political roles in each culture, which is evident cross-culturally; the combination of these roles affect lifestyle risk behaviors and status of street children populations. A comprehensive literature review was conducted to explore the effects of street children demographics, roles and risk factors on health and the communities in which they reside.

POSTER #42B

Ocean Under the Magnifying Glass

Mentors: Andrew Mount, Biological Sciences, Bin Chan, Biological Sciences

Students: William Best, Elizabeth Burgin, Colleen Cooper, Michael Groce, Nicole Hickman, Brock Manley

The Eastern Oyster, ***Crassostrea virginica***, is a native and important commercial fisheries species, which ranges from South Texas to Atlantic Canada. The excessive release of carbon dioxide by human activities has caused as much as 4 degrees C ocean temperatures increase on the South Carolina Coast in the past 37 years, placing the state's oyster reefs under increasing duress. The excessive CO2 release also creates another environmental problem of ocean acidification. To understand the underlying mechanisms of climatic impacts, we aim to examine the shell forming processes of larval oysters using microscopy under high CO2 conditions. In this study, we cultivated wild oysters in a recirculating artificial seawater system. This will allow gonad conditioning and induced spawning experiments in order to observe different effects of climate change on the oyster's growth and development. Abnormalities during the embryonic and shell forming stages of life are documented using microscopy. These experiments will allow greater insight into the effects of ocean acidification on the oyster and may provide valuable information to improve fishery management.

POSTER #43A

Designing a Simulator for Training Clinicians for Effective Hemodialysis Cannulation

Mentor: Ravikiran Singapogu, Institute for Biological Interfaces of Engineering

Student: Mary Stoddard

Hemodialysis is the process whereby a patient's blood is filtered by an external machine called a dialyzer. Patients require regular hemodialysis when their kidneys no longer function normally to remove fluid waste. Hemodialysis requires multiple visits to a dialysis clinic weekly, each session typically lasting 3 to 4 hours. One of the most traumatic experiences for a patient undergoing hemodialysis is the experience of being "stuck" (cannulated) with a large needle to draw blood which is necessary every time the patient undergoes hemodialysis. Often the patient is cannulated multiple times in one visit, if the clinician is unsuccessful in finding their vascular access (commonly an AV fistula).

The goal of our Creative Inquiry project is to build and test a simulator to improve patient health outcomes by enhancing the skills of nurses and healthcare technicians who perform cannulation at dialysis clinics.

POSTER #43B

Parental Education Correlation with Student's Academic Conscientiousness

Mentors: Joseph Ligato, Psychology, Fred S Switzer III, Psychology

Students: Kelly Barry, Macy Morrow, Alden Parker

Conscientiousness has been the Big 5 trait linked closest with academic success (Richardson, 2009). Research has shown that the facets of conscientiousness (self-efficacy, orderliness, dutifulness, achievement striving, self-discipline and cautiousness) can be applied to an individual's locus of control, including the academic part of one's life (Costa, *et al.* 1991). Furthermore, parental educational achievement has been linked to student pursuit of future educational achievement (Hao, Bonstead-Bruns 1998). In low-income families, academic achievement in the students was low; as parental and community expectation relating to the multi-faceted levels of conscientiousness in the academic setting was low was well (Okapala, *et al.* 2001). In this study, we will analyze the relationship between one's conscientiousness and parental educational standing utilizing a generalized scale (Johnson, 2014) and fully contextualized questions related to academics. The conducted hypothesis was that there is a strong positive correlation between parental education and income with academic conscientiousness. Participants were recruited through Amazon Mechanical Turk to complete an online survey through Qualtrics. They were asked to report demographic data such as gender, level of college completed, GPA, parental educational standing and parental income. 400 participants were recruited to complete the survey. To assess academic success and the relationship between conscientiousness, we are using Cohen's Perceived Stress Scale (Cohen, 1994). We calculated the results of surveys, and combined the academic conscientiousness questions into a scale. We found that there was a positive correlation between participant's parental education level and their academic conscientiousness scale. Further, we found that this data, or factor, explains 22.4% of its variability by its relationship to other factors such as generalized scales. Also, when conducting post hoc t tests using LSD corrections, we found that most levels of income had significant differences in levels of conscientiousness. We will be continuing to explore and analyze this data.

POSTER #44A

Engineering Our Future: Engaging Youth in Hands-On STEM Activities

Mentor: Melissa Smith, Electrical and Computer Engineering

Students: Tara Hathaway, Darbie Barr, Aayahna Herbert, Andrew Holmes, Parker Hooten, Cameron Keats, Michaela Loar, Mindy Earnest

The Future Engineers program was developed by Dr. Smith in 2008 and since has provided a platform for undergraduate and graduate students at Clemson University to excite elementary school students (specifically 4th and 5th graders) about STEM disciplines through hands-on projects. The mission of this Creative Inquiry Team outreach is to engage students at a young age and let the 'fun factor' of the activity overcome the 'fear factor' of not only trying something new but also learning and proving the science and math concepts taught in the classroom. CU students participating in this CI develop and deliver these engaging activities at two local elementary schools during a six-week period each semester (serving 20+ students at each school per semester) and also have the opportunity to share these experiences at youth camps and school STEM nights (reaching hundreds of students per year). The program is also a permanent offering at the YMCA Camp Thunderbird (Greater Charlotte area) each summer.

POSTER #44B

Engineers Without Borders: The Gambia - Rope Pump

Mentor: Mark A. Schlautman, Environmental Engineer and Earth Science

Co-Author: David Boles

Student: Sarah Catherine Rowell

The women's garden of Brufut, The Gambia is a large community garden maintained by women. To begin with, we achieved a successful assessment trip of the water supplied by the wells of the periphery garden. Testing the wells then indicated the Brufut Women's Garden had a healthy, long term water supply and the issue was the access to it. To supply the access to the water, our team decided the best solution was to install a number of eight rope pumps on hand selected wells of the Women's choice. After a prototype was developed and installed in The Gambia during one of the teams trips, the decision was made to develop and install pumps for the remaining seven wells. There are now eight functioning pumps in the Women's Garden in Brufut which were installed in the most recent trip. Currently our project team is working to finish the project. To do so, our project team deemed it important to improve anchoring system for specific wells with pumps already installed. This anchoring system is to improve the length of time the pumps will last on the well. Aside from the anchoring system we plan to leave the community with a very detailed operation and maintenance manual, so each woman has the ability to use and repair the pump without any issue even when the team is not present.

POSTER #45A

Targeting Childhood Obesity Using Informational Classroom Games

Mentor: Janice Lanham, School of Nursing

Students: Stephani Aliakbari, Abigail Coskrey, Elizabeth Dudas, Philip Johnston, Amanda Loftis

Following a comprehensive literature review on childhood obesity, we found a significant correlation between obesity rates and lifestyle behaviors in early stages of development(pre-pubertal stage/school-age children). The overall goal of this CI project will be to conduct an evidenced-based, age-appropriate educational intervention for school-age children which promotes health and healthy behaviors. This intervention will be composed of age-appropriate educational sessions which incorporate physical activity, followed by a Jeopardy-style game. Prizes will be awarded to student teams with the most correct responses. Interacting with school-age children in this way creates an opportunity to not only provide education but also provide it in a way which is fun and rewarding.

POSTER #45B

Bioinspired Designs

Mentor: Carlos Barrios, School of Architecture

Students: Mckenzie Betfort, Joseph Busher, Thomas Curry, Nicholas Day, Thomas Fair, Jillian Gaskins, Bradley Kittrell, Chris Matthews, Connor Staudmyer

This poster presents a small collection of designs done by architecture undergraduates inspired by natural specimens collected by students in the local areas.

POSTER #46A

Coding for the Carillon: Bringing the Clemson Bells to Everyone

Mentors: Brian Dean, School of Computing, Linda Dzuris, Performing Arts

Students: Joey Bonitati, Biraj Dahal, Earl Honeycutt, Jenna VanPelt

The Clemson Memorial Carillon is the largest instrument in all of South Carolina, and it makes an important contribution to the Clemson experience for students, faculty, and visitors alike by ringing music across campus. Previously, the bells could only be played by hand by a few students who were selected each semester. Our goal was to make this important landmark more accessible by giving it a complete digital makeover. Funding from the IT Student Advisory Board allowed for the purchase of a new mechanical system that can play the carillon instrument automatically and remotely. On top of this system, we developed a user-friendly web app that brings access to the carillon to anybody on campus through a "social music" platform, which allows people to vote for their favorite songs to hear on the bells. This is the first time that a university carillon has been able to be directly controlled by the people listening to it, and it will enhance the Clemson experience for years to come.

Poster #46b

Prosthetics Technology

Mentor: Christopher W. Norfolk, Chemical and Biomolecular Engineering

Students: Meaghan Cahill, Kayla Charles, Lawton Hilliard, Stasia Iwuc, Bailey Leopard, Ally Smallwood

This CI is focused on two issues which affect amputees and how they interact with their prosthetic systems. The volume of an amputated limb

fluctuates; it changes over the course of a day and over the course of months, it tends to shrink due to the atrophy of muscles which are no longer used for mobility. This variability means that the fit between the residual limb and the prosthetic socket will change, as well. There are multiple actions which might address a socket which does not fit well, including small actions which an amputee might take during the course of the day, and larger actions, including replacing the socket. However, all actions require better information regarding the fit of the socket to the limb, and the residual limb often has difficulty determining before damage has occurred. This CI has previously developed a sensor which will quantify the fit of the socket to the amputated limb, and is working to demonstrate this system. The use of prosthetic systems deactivates the most active cooling mechanisms the body has. This results in overheating and sweating inside the prosthetic system, which compromises the fit of the system and encourages the growth of bacteria. This CI has analyzed the heat transfer in this system analytically, and built a model system to use in analyzing the effect of different cooling technologies which might be added to the prosthetic system.

POSTER #47A

Choosy Farm to Belly: Preschool Children Fruit and Vegetable Recognition and Eating Preferences

Mentor: Sarah Griffin, Public Health Sciences

Students: Zoe Alpert, Madeline Anderson, Megan Hooks, Philip Johnston, Cody King, Madeline Mazoue, Emily Radziwon

Does Choosy Farm to Belly improve fruit and vegetable recognition and eating behaviors in preschool children? Choosy Farm to Belly is a nutrition and physical activity program at two SHARE Head Start Centers in west Greenville, SC, an area of high poverty. Choosy is a multifaceted curriculum around growing, cooking and sharing food through classroom-based moving and learning activities. Evaluation efforts include classroom observations with interactive group interviews to assess fruit and vegetable recognition and marketing influences. Lunch observations, utilizing plate waste photography methods, are conducted to determine fruit and vegetable preferences and eating behaviors. Results show a steady increase in fruit and vegetable recognition. Marketing character assessment indicates that the Choosy character is as recognized as other popular food marketing and Disney characters. Based on lunch observations at the beginning of the school year corn and yams were consumed the most while zucchini, beets and brussel sprouts were the least consumed foods.

POSTER #47B

Synthesis of Titanium Carbide and Silicon Carbide through Carbothermal Reduction of Renewable Paper Precursors

Mentor: Rodrigo Martinez-Duarte, Mechanical Engineering

Students: Joshua Sparks, Theresa Earls, Jackson Grubbs, Samantha Hutter

Here we present an environmentally-friendly and sustainable approach for the synthesis of porous carbides. The carbide materials are synthesized by the carbothermal reduction of metallic ethyl esters which have been embedded into a high-purity, cellulosic paper matrix. This methods has many benefits including the use of renewable precursors in the form of paper instead of the typical petroleum process. Additionally, the use of a paper as the matrix precursor allows us to shape the material into complex structures before pyrolization instead of after the carbide is formed, which is difficult to do. Our goal is to produce titanium and silicon carbide due to their importance in the field of composite engineering and because of their unique and superior properties including a high melting temperature, abrasion resistance, compressive strength, and low density.

POSTER #48A

The Role of Tbx1 in Tufted Chicken Mutants

Mentor: Susan Chapman, Biological Sciences

Student: Jon Aldinger

This study aims to identify cardiac and ear anomalies in the tufted Araucana chicken in order to understand its relationship to DiGeorge syndrome, a human genetic disorder. DiGeorge syndrome presents with a variety of symptoms, including improper cardiac, craniofacial and otological development. Our earlier studies found that the tufted Araucana has a deletion of the Tbx1 gene in one or both alleles of chromosome 15. Tbx1 is a causative gene in 22q11 deletion patients that present with DiGeorge syndrome. We are using morphological analysis, tissue sectioning, histology staining and imaging techniques to compare the wild-type, clean-faced, and tufted phenotypes of Araucana embryos at various developmental stages.

POSTER #48B

The Relationship Between Morphology, Behavior and Performance in Swimming Turtles

Mentors: Richard Blob, Biological Sciences, Christopher Mayerl, Biological Sciences

Student: Catherine Petty

Form and function are often closely correlated in biological systems, and variation in the morphology of organisms (*i.e.* shape, size, structure) often has a profound effect on performance in different environments. In turtles, the two main lineages (cryptodires and pleurodires) possess differences in the morphology of the hindlimb that might impact their swimming performance (function). In cryptodires the pelvic girdle can rotate freely within the shell, whereas in pleurodires the pelvic girdle has a derived morphology that renders it immobile due to fusion with the shell. To test if this difference in morphology relates to differences in swimming kinematics and performance between these taxa, we filmed representative species of cryptodire (*Chrysemys picta*) and pleurodire (*Emydura subglobosa*) turtles during swimming, and measured the movements of each limb. We expected to find differences primarily in hip movements due to pelvic girdle fusion in pleurodires. We found that the two species differed primarily in the timing of their behavior, rather than the absolute differences in their angular excursion. We also found that the pleurodire exhibited more stereotyped (*i.e.* lower variance) limb movements than the cryptodire. These data help to clarify that locomotor performance in animals involves a complex interplay between morphology, behavior and neuromotor control of behavior.

POSTER #49A

Individual Versus Systems in Cinema

Mentor: Graciela Tissera, Languages

Students: Jesse Bynum, Hannah Cheeks, Alex Ekam

This project analyzes social, philosophical, political and economic issues in the Hispanic world through videos and pertinent materials from world renowned authors and film directors. Students explore confrontations between individuals and systems to analyze strategies, values and ultimate consequences while establishing a theoretical framework to the research. The analyses focus on the complex relationships portrayed inside and outside systems in multicultural environments and relate to a wide diversity of topics: psychoanalysis, metaphysics, ethics, technology, health, business and gender.

POSTER #49B

Dielectrophoresis of *Trypanosoma brucei* Using Titanium Microelectrode Arrays

Mentors: Rodrigo Martinez-Duarte, Mechanical Engineering, Devin Keck, Mechanical Engineering

Students: Allison Mills, Callie Stuart, Emily Gullette, Meredith Hammer, Mary Heustess

Trypanosoma brucei (*T. brucei*) is a parasite prevalent in sub-Saharan Africa that causes Human African Trypanosomiasis (HAT). Screening for HAT typically starts with a Card Agglutination Trypanosomiasis Test (CATT), but this test is limited to detection of only one strain of the disease and often produces false positives. Additionally, CATT cards must be stored at lower temperatures, which are usually unfeasible in the impoverished areas that HAT resides. We propose the use of dielectrophoresis (DEP) to aggregate *T. brucei* and provide a more appropriate and accurate diagnostic tool. In DEP parasites are placed in a titanium microelectrode array and polarized using an ac function generator. This polarization causes the cells to attach to the edges of nearby electrodes. We have found that the apparatus effectively traps the parasites at 5 V with frequencies between 500 kHz and 2 MHz. From this we conclude that DEP is an efficient tool for achieving rapid parasite agglutination.

POSTER #50A

Expressions of Awe: Narrative and Psychometric Data from the 2017 Solar Eclipse

Mentor: Cynthia Pury, Psychology

Students: Griffin Bridges, Caroline Evatt, Sarah Fitzgibbon, Kyle Jardim, Megan Mckinney, Lindley Russell, Elizabeth St.Onge-Denton

Awe is an emotional response to vastness and the need for accommodation (Keltner and Haidt, 2003). The 2017 Great American Eclipse provided a unique, real-world opportunity to refine our measurement of awe. One hundred eleven participants (85 female, 26 male; mean age 48.9 (sd = 15.5); 95 with 4 years college degree) who observed totality completed online surveys within 24 hours of the end of the eclipse and 2 - 3 months following the eclipse. At each time, participants were asked for narrative descriptions of their eclipse experience as well as quantitative ratings of their awe at the eclipse. We coded narratives into positive emotional experiences (such as beauty, amazement, impact, and a sense of unity); negative emotional experiences (such as feeling overwhelmed or confused); factual statements (such as neutral observations of the eclipse and making plans for later in the day); and social experiences (including positive, negative, and neutral interactions). These codings were compared to participants' quantitative ratings at both times.

POSTER #50B

Detection of Early Diabetic Ulcers with Near-Infrared Camera

Mentor: Vladimir Reukov, Bioengineering

Students: Ally Below, Haven Hendrix, Ryan Reyes, Martha Stubbs

High levels of deoxygenated blood can cause poor circulation and increase the risk of ulceration. Deoxygenated blood leads to an increased risk of Peripheral Arterial Occlusive Disease (PAOD), or diabetic foot ulceration, which is the leading cause of lower extremity amputation. A cost effective NiR camera using Raspberry Pi 2.0 System, in addition to optical filters in combination with MATLAB image analysis tools, was developed to self-monitor the advancement of ulceration. To visually assess the deoxygenated blood, the best wavelength of optical settings was determined. The range of 800-850 nm provides the best viewing of the deoxygenated blood under the Raspberry Pi 2.0 System. Further development includes the improvement of the optical lenses and narrow the wavelengths for the optimal visualization, in order to make a product that is both cheap and widely accessible to the population. We would also like to make the MATLAB code more efficient and condense it to one program for the processing and analysis of photos.

POSTER #51A

The Effect of Depressive Symptoms on Risky-Decision-Making

Mentor: Kaileigh Byrne, Psychology

Students: Hunter Willis, Caitlin Peters

This study examined the effect of depressive symptoms on risk-taking under time pressure. Results indicate that, in reward contexts, depressive symptoms predict increased risk-taking under time pressure. However, in loss contexts, depressive symptoms predict reduced risk-taking under pressure, suggesting that loss aversion overrides time pressure effects on risk-taking.

POSTER #51B

Domestic Politics and Multilateralism Under President Trump

Mentor: Jeffrey Peake, Political Science

Students: Maeve Cuddy, Virginia Forrester

Obama submitted the fewest treaties of any president in recent decades, and the Senate approved fewer treaties during his presidency than ever before. This change has led many scholars to declare the death of treaties as a means of enacting foreign policy. Obama avoided using treaties and instead relied on his unilateral executive powers to partake in multilateral agreements, thereby leaving Congress out of the process. President Trump has continued Obama's trend of avoiding treaties, and has changed the nature of international agreements by largely avoiding multilateralism. In Trump's first year, he has submitted zero treaties to the Senate, ended US participation in the Paris Climate Accord and the TPP, and has questioned the benefits of multilateralism more generally. Trump's "America First" perspective, in conjunction with Obama's disuse of treaties, poses the question: are treaties and multilateralism relics of the past? We analyze the politics behind the president's decision making concerning the Paris Agreement, the JCPOA, and other major multilateral agreements. We also systematically analyze Trump's rhetoric on diplomacy, to assess the degree to which he has abandoned multilateral approaches to diplomacy.

POSTER #52A

The Search for a Cohort in a Mystery Invader

Mentor: John Hains, Biological Sciences

Students: Venkata Kolluru, Joanna Bauer, John Curnow, Mollie Davidson, Emily Mason, Amelia Katherine Rzeczycki, Taliyah Smith, Luke Stoudemayer

The invasive freshwater snail, ***Bellamya japonica*** (von Martens 1861), is a well-known invasive in habitats throughout North America. While its basic biology is well-known, little is understood of its ecological interactions. Our understanding of their population dynamics has suffered from an inability to determine even such characteristics as lifespan. Our studies have shown that in temperate climates, there is a seasonality to their production of offspring. They have the greatest fecundity in spring and early summer with little or no reproduction during colder fall and winter months. Because of this trend, our recent investigations have attempted to discover a means of identifying cohorts in order to better understand their overall population dynamics.We employed several morphological measures to compare two established populations of ***B. japonica*** which appear to have different growth characteristics. Populations in Lake Greenwood (SC) have the same seasonality as in Lake Hartwell (SC) but have individuals of much greater size and shell characteristics than those from Lake Hartwell. Females from Lake Greenwood also tend to have greater maximum numbers of offspring although the offspring themselves seem to be similar. In past studies, we speculated that this difference was due to nutritional differences between the two lakes. We also understand that maximum lifespan may differ between the two lakes, which could also contribute to the observed differences.In this study we compared the allometric and morphological characteristics of these two populations in order to discover a means of defining population cohorts. If successful, this would provide a better basis for other ecological comparisons. By applying exploratory data analysis to a large comparative dataset, we report here what our current observations are and how they might be improved. The study is ongoing and, once completed, will compliment other descriptive and experimental studies on this invasive species.

POSTER #52B

Human Factors Forensics of Child Elevator Accident

Mentor: Benjamin R Stephens, Psychology

Students: Kristin Free, Renea Cox, Angela Giovinazzo, Zachary Khoury, Taylor Martin, Emily Martin, Margaret Tutaj

This case study illustrates the application of human factors science to accident analysis. Cliff and his family were vacationing in a house with an elevator. The elevator should operate only when both the external wooden door and interior accordion door were closed. Cliff (5-yr-old) was left alone in his bedroom for 3-5 minutes. His parents heard "Help!", and rushed to see Cliff's foot protruding between the elevator floor and the floor of the hallway: he was suspended upside-down in the elevator shaft. His injuries included partial blindness. The accordion door switch had failed. Cliff only closed the wooden door, so as the elevator ascended, a 7" gap was created into which Cliff fell. Measurements reveal that there was a high contrast (92.7%) of the doorknob versus the wooden door, as well as a high conspicuity angle of the doorknob. Cliff's attention likely was focused on the "moving" doorknob, which likely led to his fall. Defense argued that Cliff was reckless, and that parental supervision was not adequate. Yet, Cliff's cognitive skills, and normal parental supervision research, rebut that argument. The case was settled prior to trial.

POSTER #53A

Swarm Robotics

Mentor: Yongqiang Wang, Electrical and Computer Engineering

Co-Author: Timothy Anglea

Students: Joshua Harvey, Edward Bear

The goal of the Robot Networks Creative Inquiry is to achieve a platoon of coordinated Roomba robots via decentralized control. The Roombas are controlled by a Raspberry Pi microcontroller programmed in Python. The Roombas form a decentralized network, where each Roomba operates independently of each other, and no robot directly commands any other robots. They are able to communicate with each other and send information wirelessly. Using the information collected from the other Roombas and from onboard inertial measurement sensors, each Roomba is able to navigate its way into position within the desired formation. The decentralized nature of the network allows for more robots to join the formation seamlessly. Students gain experience with wiring electrical circuits and sensors, and with programming microcontrollers to interface with the sensor data and achieve the desired robotic behavior.

POSTER #53B

Aquaponics: Safe Way of Growing Food for the Future

Mentor: Lance Beecher, Plant and Environmental Sciences

Students: John Coligado, Elizabeth Elmore, Anna Fisher, James Plexico, Caroline Wolfe

This Creative Inquiry immersed students in the production of aquatic (fish, shrimp) animals in recirculating systems and expanded the unit for creating a dual or polyculture unit. Traditional aquaculture systems have bio filtration units to reduce nutrient loading and to clean the water efficiently for reuse in the system. However, because of high land, water and energy cost, systems must be able to produce more by-products to be competitive in the food market and at the same time be environmentally stable; an aquaponics system provides this. The system is comprised of a fish system and a plant system. The fish system consists of fish holding tanks, solids capture filtration and bio-filtration. Bio-filtration is needed to house the bacteria discussed above so that nitrification can take place. Ammonia, which comes directly from the fish, is converted to nitrite and then to nitrate in an oxygen rich environment. Nitrate is the final product of nitrification and is the main element for plant production. The plant system can be designed to suit the needs of the owner and all systems have both positive and negative aspects to production. The project will investigate processes for aquaponics and hone in on specific deficiencies of the system which include passive heating techniques to reduce costs, system design (airlift technology) considerations for efficiency and power dependency, automation for system productivity and bacterial control for food safety considerations.

POSTER #54A

The Impact of Deliberate Practice on the Mastery of Urinary Catheterization

Mentors: Jean Zavertnik, School of Nursing, Leslie Ravan, School of Nursing

Students: Courtney Conger, Katharine Peh

Catheter associated urinary tract infections (CAUTIs) are associated with higher morbidity and mortality, increased healthcare costs and prolonged hospital stays. To prevent these complications, nursing students must be able to insert a urinary catheter using sterile technique. This research aims to determine if deliberate practice (DP) increases mastery of nursing students' sterilization techniques over time. A nonequivalent-experimental, posttest-only control group design was used. Both the intervention group and control group were evaluated in mastery of urinary catheterization with simulation and skill performance check-offs. Preliminary results showed total of 35 out of 46 Clemson nursing juniors passed the skills assessment on their first try. Additional data will be collected in subsequent semesters to examine knowledge retention. With DP, nursing students may reduce CAUTI rates and improve patient outcomes.

POSTER #54B

3D Printing of Eloquent Structures for Preoperative Surgical Planning

Mentors: Jorge Rodriguez, Bioengineering, Delphine Dean, Bioengineering

Students: Omar Abdeladl, Megan Cavrak, Delayne Di Gangi, Julia Hannam, Katherine Magee, Adam Samuta, Ryan Branco, Evan Keating, Emily Bartlett

Preoperative planning for challenging and high risk surgical procedures is an emerging field that allows risk reduction. Using a patient's MRI data, a 3-dimensional brain model can be rendered and fabricated to provide surgeons with a practice tool prior to surgery. This CI project aims to develop the engineering process to fabricate a brain model with distinguishable areas of interest for vast neurosurgeons interests. Gray matter and white matter have been fabricated using a gelatin-oil based compound in a high resolution mold to mimic structural and mechanical properties. MRI scans with high contrast in the brain vasculature have been converted into a file format capable of being 3D printed. A printer has been retrofitted such that it is able to print soft materials like hydrogels, which mimic the material properties of brain vessels, in a high precision manner that can replicate their complex nature. Nerves are being developed to provide feedback using electro-sensitive materials that light up upon contact.

POSTER #55A

Hydrology of a Small Watershed in Pendleton, South Carolina

Mentors: John R Wagner, Environmental Engineer and Earth Science, Jacob Archer, Environmental Engineer and Earth Science

Students: Ashley Bright, Joseph Galmarini, Hannah Jellema, Henry Reed, Kelly Shugh, Gabriella Stefano, Morgan Thomas, Jaiquan Winns

The Pendleton Elementary School property, in Pendleton, South Carolina, incorporates a unique, relatively undisturbed, woodland ecosystem that serves as the headwaters for a small un-named stream that flows southward under East Queen Street, eventually discharging into Town Creek, Three-and-Twenty Creek and Lake Hartwell. The three primary tributaries to that stream originate on the property and provide a unique opportunity for students at the school to physically visualize the concept of a watershed, trace overland water flow patterns and study the complex interactions between ground and surface water. The property also contains a wetland area, just above the East Queen Street culvert, that fluctuates in size in response to long-term rainfall patterns. The woodland is ideal both as an easily accessible site for undergraduate student research in hydrology and ecology, and as a site for conducting inquiry-based outdoor science experiences for the elementary school students. Clemson undergraduate students in previous semesters constructed a 790 feet long nature trail that winds through the woodland site accessing as many different ecological points of interest as possible. The main focus of this year's research team has been to survey the hydrology of the site and design hands-on activities related to that topic appropriate for several of the elementary school classes at the school.

POSTER #55B

Fishing Lures: The Science of Catching the Big One!

Mentors: Lance Beecher, Plant and Environmental Sciences, Webb M Smathers Jr, Plant and Environmental Sciences

Students: Thomas Azzarelli, Brenden Clark, Matthew Coon, Geddings Jhant, Jonathan Mackey, Neilan O'Connor, Parker Simmons, Allan Stack, Kaleb Strange, Tristan Turner

Presently, the fish tackle business in the US is estimated to be worth over 5 billion dollars. Today a significant amount of research is put into artificial bait technology and the opportunity to investigate and inspire fishing lure design and manufacturing with various materials and artistic graphics is critical. Different composites, special design techniques, various scents and innovative mechanical techniques will be evaluated for realistic movement in the bait for effective strikes. Hook strategy will also be explored for safe catch and release practices. Students in the CI will test prototype lures and collect data to determine which bait performs the best.

POSTER #56A

Inclusive Excellence in Science and Technology

Mentor: Meredith Morris, Genetics and Biochemistry

Students: Taylor Creighton, Sarah Demaria, Arlett Fernandez, Rya Glasshof, Karen Hawkins, Elizabeth Johnson, Rebecca Keller, Krista Knowles, Bhoomi Patel, Anna Pitman, Brett Sherley, Loryn Weer

CU Investors was created to increase the number of minority and economically-disadvantaged students who pursue careers in Science, Technology, Engineering and Math (STEM). Our objective is to increase diversity in the scientific community to mirror the racial and economic landscape in the Upstate of South Carolina. To achieve this goal, we are working with Title 1 schools to provide students an opportunity to participate in science experiments designed to enforce the concepts they are learning in the classroom. Program success is assessed via teacher feedback and the Investors' observations of student engagement and documented knowledge gain. Future plans include a mentorship program to establish and maintain long-term relationships that allow continued interactions in scientific endeavors. Here, we will summarize experimental design and implementation and discuss some of the challenges we face in program assessment.

POSTER #56B

Responses of Transplanted and Natural Coral Colonies to Thermal Stress Events

Mentors: Kylie Smith, Biological Sciences, Michael Childress, Biological Sciences

Students: Caroline Stroud, Reanna Jeanes

Climate change threatens coral reefs with fluctuations in water temperatures triggering bleaching events that lead to increased mortality. To combat the decline in coral cover, researchers have transplanted colonies to understand how species respond to environmental changes. We examined the impacts of two thermal stress events on transplanted and natural coral colonies in the Florida Keys. We monitored two coral species on seven reefs for evidence of bleaching (discoloration) over four years. Our results indicate that ***Porites*** colonies are more susceptible to bleaching than ***Siderastrea*** colonies. We also found site specific responses, with some sites remaining unbleached. However, we did not find significant differences between the responses of transplanted and natural corals. These findings suggest that while certain species are better prepared for increasing temperature, coral survival may depend strongly on local adaptations to reef location.

POSTER #57A

Supporting Healthcare Superheroes Through Leadership Development

Mentors: Chelsea LeNoble, Psychology, Marissa Shuffler , Psychology

Students: Diamond Brown, Monique Dobson, Tessa Schwarze

Healthcare is a complex, emotionally charged industry. Ensuring leaders possess the right skills and attributes is critical for hospital staff and patients in their care. Therefore, it is vital to better understand the role of leaders and leadership development in healthcare organizational effectiveness. In two studies, we examined (1) the relationship between leadership program features and HCAHPS scores and (2) the extent to which leadership development programs positively influence leaders' non-work lives. A checklist was developed to evaluate leadership programs of hospitals nationwide. Results indicate a positive relationship between the number of recommended leadership program features and hospital quality scores. Further, data from local hospital employee and leadership sources were analyzed to examine the role of leadership development programs in leaders' non-work lives. Results indicate that a leadership program focused on self-awareness and emotional intelligence leads to positive work-life enrichment. Together, these findings provide evidence for the important role of leadership development programs for leaders and patients alike.

POSTER #57B

Clemson EWB Nicaragua Bridge Project

Mentor: Mark A. Schlautman, Environmental Engineer and Earth Science

Co-Author: Craig Harwood

Student: Nicholas Queen

El Serrano Nicaragua is a mountainous community of approximately 3,000 people. The community is very rural and almost entirely agriculturally dependent. On an assessment trip for our water project counterpart, our traveling team noticed a bridge that crosses the river that separates the community was in very bad shape. Once we spoke with the community about this they said that they would be open into diving into another project with us to construct a new pedestrian/motorcycle bridge. The current bridge is three halved down the middle logs that they laid over the river and poured concrete on top of. The logs are currently termite infested and rapidly deteriorating, one of the logs has even collapsed and washed down the river. The bridge takes a high volume of foot traffic as well as motorcycle traffic. It is currently sitting at about a 20 degree cross slope and this is extremely unsafe. Our group is currently working on designing and planning the implementation of a new bridge, we are partnered with a structural engineer from Flour who is helping with the calculations. We are currently planning on traveling in August 2018 for a final data collection trip, and are planning on implementing our bridge in the summer of 2019.

POSTER #58A

International Collaborative Biomedical Engineering Design

Mentors: William Richardson, Bioengineering, Melissa McCullough, Bioengineering, John D DesJardins, Bioengineering, Delphine Dean, Bioengineering

Co-Authors: R Turbeville, K Cannon, J Chester, M Elpers, K Guion, B Hargett, A Harrison, J Hurd, A Jamison, M Judge, M Livingstone, D McLeod

Students: Benjamin Banaszak, Jessie Boulos, Michaela Christine Cattell, Tracy Donaldson, Rachel Fenner, Elizabeth Gaston, Megan Grahne, Jennifer Hadley, Kylie King, Sanjana Mandilwar, Rachel Moen, Helen Nguyen, Diego Nigoa, Victoria Straga

In collaboration with students from Arusha Technical College in Tanzania, the design team works to develop useful medical devices that are built to last in developing countries with lack of resources and available technology. We have several key projects including an accessory to a blind cane, an infant warming system, a portable patient monitor and an oxygen concentrator. One team is focused on designing an attachment to a traditional blind cane in order to detect low-level hazards and drop-offs that can be dangerous in developing countries due to lack of infrastructure. Another team aims to develop a transportable, premature infant, insulated device that enables the child to get from a remote low resource area to a more well-developed health care facility while keeping the baby warm and monitoring vitals. The third team is designing a fully portable, modular patient monitor that can track pulse oximetry, EKG, and blood pressure using battery power. The last group aims to design a low-cost oxygen analyzer for testing oxygen concentrators which often break in rural Tanzanian clinics. Our team meets virtually with Tanzanian engineering students once a month to discuss, collaborate and improve our projects.

POSTER #58B

Development of a Three-Dimensional Measure of the Calling Work Orientation: Assessing Craftsmanship, Kinship and Serving Orientations

Mentor: Thomas W. Britt Jr, Psychology

Student: Kensley Deanhardt

Our study provides assessments of the craftsmanship, kinship and service components of the calling work orientation. The *craftsmanship* orientation refers to working because of a focus on the quality of work produced as an end in itself. The *kinship* orientation refers to working because of the strong relationships formed at work. The *serving* orientation refers to working because of the beneficial impact of work outcomes on other people. Participants in the study completed a 45-minute online survey that assessed the conceptual definitions of craftsmanship, kinship and serving. The results demonstrate evidence of construct validity between the three work-orientation measures, as all items were rated significantly higher on their intended calling subscale in comparison to the other two subscales. Developing new measures of these dimensions will facilitate our understanding of the work orientations, including the unique antecedents and consequences associated with each orientation.

POSTER #59A

Diversity of Chemosymbionts in Lucinidae Clams

Mentors: Jean Lim, Biological Sciences, Barbara Campbell, Biological Sciences

Students: Briana Knight, Erika Nachman, Jill Walton, Louie Alexander

Lucinidae bivalves are commonly found in shallow marine environments and are hosts to gill-associated thioautotrophic bacterial endosymbionts that supplement clam metabolism. However, research on the taxonomic, genetic and metabolic diversity of bacteria found in the gills is lacking. This project focuses on using 16S rRNA gene sequencing, metagenomics and metatranscriptomics to analyze different aspects of diversity in the lucinid-bacteria chemosymbiosis. To date, gill and foot specimens of five different lucinid clam species (*Phacoides pectinatus*, *Ctena orbiculata*, *Stewartia floridana*, *Codakia orbicularis*, *Lucina pensylvanica*) inhabiting various sites in Florida and the Bahamas have been collected. In addition to metagenomics and metatranscriptomics analyses, quantitative PCR was also used to confirm the metabolic activity of candidate symbionts in pathways of interest, including vitamin B12 synthesis, nitrogen assimilation and C1 compound metabolism. Results demonstrate the utility of this integrated approach in validating the range of symbiont functions in lucinid clams and furthering understanding of the lucinid-bacteria chemosymbiosis.

POSTER #59B

Health Promotion and Diabetes Assessment in a Low-income, Predominantly Hispanic Afterschool Program

Mentor: Karen A Kemper, Public Health Sciences

Co-Author: Brian Helsel

Students: Megan Clack, Amanda Aycock, Audrey Crocker, Riley Dunnam, Megan Friscia, Elizabeth Haas, Serena Khaleghi, Alison Kuehhas, Anuj Patel, Adrina Patterson, Nia Pressley, Rachel Reid, Kathryn Rusher, Bridgette Sauder

Our project, funded in part by the Department of Education 21st Century Community Learning Center Grant, promotes healthy nutrition and physical activity practices to combat childhood obesity and diabetes in predominantly Hispanic families in an afterschool program. We created 16 interactive health lessons for 100 children, collected height and weight data, surveyed families using the Family Nutrition and Physical Activity Survey and Finnish Type 2 Diabetes Risk Score, interviewed school staff about local resources, conducted windshield tours of the community and implemented a school Health Fair attended by 40 families. Our data show that 27% of 22 parents surveyed are at moderate or high risk of developing diabetes, 17.5% of 97 children meet BMI criteria for overweight, and 41.2% of children meet BMI criteria for obese. Our data confirm the need for health promotion and diabetes risk prevention in this community.

POSTER #60A

TrypSpotting: Identifying Lipid Droplet Proteins in *Trypanosoma brucei*

Mentor: Kimberly Paul, Genetics and Biochemistry

Students: Ellen Featherstone, Rachel Hannah, Sripriya Raja

Trypanosoma brucei, the protozoan parasite that causes African sleeping sickness, alternates between mammalian and tsetse fly hosts, which offer dramatically different environments to which the parasite must adapt in order to survive. The host tissues encountered by *T. brucei* differ in their availability of nutrients, such as fatty acids. In environments where fatty acids are scarce, the parasites will have to rely on fatty acid synthesis and stored fatty acids to meet its needs. A potentially important source of stored fatty acids comes from lipid droplets, which are dynamic organelles involved in lipid storage and homeostasis. Lipid droplets in *T. brucei* are largely uncharacterized. To identify proteins involved in lipid droplet formation and dynamics in *T. brucei* we have screened the TrypTag imaging database for proteins whose GFP-tagged localization resembles the punctate staining pattern expected for lipid droplets. For each candidate lipid droplet protein, we have generated RNA interference cell lines for the inducible knock-down of each gene's expression. For each candidate, we will examine the effect of RNAi-mediated knockdown on (1) cell growth using flow cytometry; and (2) lipid droplet staining patterns using a fluorescent lipid droplet stain, LipidTox. We will also confirm the localization of each candidate protein using an *in situ* epitope tagging approach independent of that used in the TrypTag database. Candidate genes with a confirmed effect on lipid droplets upon RNAi induction, and/or confirmed lipid droplet localization will be further characterized for their role in *T. brucei* growth and survival in its mammalian and tsetse fly hosts. This work was supported by funds from the NIH (P20 GM109094-01A1) and Clemson University Creative Inquiry.

POSTER #60B

Characterizing Deformation During the Pumping of an Unconfined Aquifer in Pendleton, SC

Mentor: Scott E Brame, Environmental Engineer and Earth Science

Student: Riley Blais

Hydromechanical well tests use deformation to characterize aquifers during pumping of a well. These tests have been widely performed in fractured rock, but little work has been performed in an unconfined aquifer. The objective of this project was to characterize deformation in an unconfined saprolite aquifer located in Pendleton, South Carolina. The deformation was characterized by measuring tilt using a two component tilt meter installed in the vadose zone. A pumping test was conducted by pumping a well for 4 hours at a rate of approximately 1.5 gallons per minute. Drawdowns of 2.5 meters in the pumping well were measured and correlated with measureable tilt 9 meters away. The tilt responded abruptly when pumping started and tilt increased rapidly during the first 45 minutes before changing more gradually during the remaining duration of the test. When the pumping stopped, the tilt abruptly reversed and returned to the initial value prior to pumping. These preliminary tests provided encouraging results that this type of test could be a viable alternative for characterizing unconfined aquifers. Moreover, the strongly observed response in the vadose zone was achieved without having to drill into the saturated zone. The ability to characterize an unconfined aquifer without penetrating the saturated zone has many potential applications including decreasing costs and smoothing out logistics in contaminated sites where characterizing the aquifer can be expensive.

POSTER #61A

Increasing Student Holistic Wellness through the Aspire to be Well Program

Mentors: Martha Thompson, Public Health Sciences, Diamond Brown, Student Health Center, Chloe Greene, Student Health Center

Students: Tiffany Grooms, Rachael Zugg

Developing Peer Delivered Initiatives to Foster the Promotion of a Healthy Campus Creative Inquiry focuses on the Aspire to Be Well Program. A Clemson University new student requirement, Aspire, highlights the topics of mental health and suicide prevention, alcohol and other drug misuse, interpersonal violence prevention and holistic wellness. Students learn warning signs, symptoms and bystander intervention strategies to help maintain a safe campus and community. In connection to holistic wellness, the Aspire to Be Well Program and CI have an increased emphasis on the eight dimensions of wellness and tips that can increase a student's toolbox in identifying and increasing their wellness behaviors.

POSTER #61B

A Comparison Study of Carbon Dioxide Flux from Two Fields During the Summer Growing Season in Clemson, SC Using an Eddy Covariance System

Mentor: Scott E Brame, Environmental Engineer and Earth Science

Student: Henry Reed

The goal of this project was to determine the impact on carbon dioxide flux from different management styles of two agricultural fields in the Clemson area during the 2017 growing season. Data was collected at the Calhoun Field Laboratory (unofficially called the Bottoms) and the Church Field located in the Fants Grove region of the Clemson Forest at different times throughout the spring, summer and fall. Carbon dioxide concentration, vertical wind speed, temperature and air-water concentrations were collected 20 times per second using an eddy covariance (EC) tower. The EC tower was mounted on a trailer and equipped with a LI-7500RS analyzer, an open path infrared CO2 analyzer, and a 3-D sonic anemometer. The data was averaged at 30 minute intervals to create a net carbon dioxide flux that is the product of soil carbon dioxide flux minus the carbon dioxide removed from the air by plant respiration and atmospheric mixing. Between the beginning and end of the growing season, the net flux was expected to peak in the middle of the growing season. Daily fluctuations show a higher flux during the night when plant respiration is at a minimum.

POSTER #62A

Building and Testing a System to Probe Engineered Neuronal Circuitry

Mentor: Joshua Alper, Physics and Astronomy

Students: Elizabeth Carman, Rachel Eimen, Mackenna Judge, Kimberly O'Brien, Landon Phemister, William Scammon

Optical tweezers are a well-established means of precisely manipulating biological systems at the microscale. Microelectrode arrays (MEAs), a separate technology, enable the recording and stimulation of electrical activity in cell cultures and have become equally commonplace in the lab. Moreover, combining the precise manipulation abilities of optical tweezers with the robust spatial recordings granted by MEAs result in a powerful and flexible experimental setup for analysis in multiple fields, including neuroscience. Adopting such a system is, however, cost-prohibitive for many labs due to the need to have MEA system manufacturers customize current MEA technology for integration with the optical tweezer. We required such integration to create neural circuits and, rather than pay a premium for a custom system, constructed our own. We accomplished this by using a field programmable gate array as a signal generator to trigger electrical activity in neuron cultures. We also designed and built the electronics to record signals generated by the neuronal circuits constructed on the optical tweezer. Our setup included a custom mount that attaches the MEA to the optical tweezer, a circuit board that connects to the electrodes on the MEA, a second board that transmits signals from the neurons into a custom-built amplifier, and an oscilloscope for data collection. While standard MEA systems cost well over $50,000, our custom system only cost about $2,000 in total. This system will enable us to construct and study simple neuronal circuits and networks and promises to fuel future discoveries in a variety of scientific disciplines.

POSTER #62B

Mineralogical Analysis of Volcanic Rocks from the Island of Dominica, Lesser Antilles

Mentor: Scott E Brame, Environmental Engineer and Earth Science

Co-Author: M.K. Fidler

Student: Sawyer Hipp

The island of Dominica in the Caribbean has nine potentially active volcanoes and is comprised almost entirely of volcanic rocks. The source of the volcanic rocks is a large magma body of molten rock that formed from friction when the Caribbean Plate collided with the Atlantic Plate about 8 million years ago forming a volcanic island arc. In the beginning only basaltic lava was extruded to form the island but over time the magma body differentiated as lighter elements rose to the top of the magma chamber. As the Atlantic Plate continued to subduct under the Caribbean Plate, molten rock was added to the chamber from the bottom. The increased pressure in the chamber forced the more compositionally light material at the top to the surface to erupt as lava from one of the volcanic centers. This lava reflects the shift to an andesitic composition. This compositional change is reflected in the pyroclastic flows which have dominated the eruptive style on the island for the last 40,000 years. Selected samples from outcrops along major roads were collected around the island for petrographic analysis. Thin section analyses reveals that the samples collected from the Roseau ignimbrite have an expected composition of minerals found in andesitic rocks that are typical of volcanic island arcs. The mineral assemblages are mainly plagioclase (50%-70%) with clinopyroxene (10%-20%) and orthopyroxene (5%-15%). Samples representing the basaltic composition of the island core contain altered olivine and one sample had iddingsitized olivine (15%) that was zoning from the inside out.

POSTER #63A

Color-Coding for Nursing Stockrooms

Mentor: Delphine Dean, Bioengineering, Hannah Cash, Bioengineering

Student: Kaitlyn Long

With rapid advancements in technology and growing demand for better healthcare, hospitals are struggling to find a balance between providing the best possible care and maintaining a responsible budget. This is especially evident in small hospitals lacking resources and infrastructure to keep up with ever-increasing, modern technology. A complex problem plaguing nurses is retrieving items from the stockrooms in a timely manner. As a result, the hospital is ultimately losing money, and the nurses are frustrated with the complex systems that they are expected to use. The goal of this research was to develop a stockroom system to decrease the amount of time required to locate materials. A study was conducted to determine the efficiency of using a color-coded system versus messy system. It was found that participants located materials quicker in a color-coded system. Thus, a color-coded system in nursing stockrooms may decrease retrieval time and prevent hospitals from losing money.

POSTER #63B

Using Fossils to Determine the Geologic Origin of the Hagood Millstone (Pickens, SC)

Mentor: Scott E Brame, Environmental Engineer and Earth Science

Co-Authors: K Lazar, N.A. Smith

Student: Morgan Thomas

Paleontological investigation of millstones from the 18th and 19th centuries can provide insight into the origin of the millstone, which in turn provides information about local history regarding whether the rock for millstone construction was quarried locally, regionally or imported over longer distances. For example, some North American millstones are known to have originated in France and other parts of Europe. The goal of this study was to determine whether the millstone from Hagood Mill in Pickens, SC, is comprised of Ohio chert (Illinois Basin) or French buhr (Paris Basin) by relating the fossil content of the millstone to previous studies of rocks from these two origins. An abundance of gastropod fossils were found macroscopically, as well as indications of microscopic charophytes. On the surface of the millstone, there are an average of 12.56 visible gastropod fossils for every 100 cm^2. The Hagood Millstone includes numerous charophyte fossils, which have never been documented in samples of Ohio chert. Their relative high abundance in most of the Hagood millstone thin sections indicates an affinity with French buhr. The average size of the charophyte gyrogonites found in the Hagood Millstone is 0.88 mm in diameter compared to the average size of 0.93 mm in diameter of those found in French buhr. Overall, the data strongly suggest that the Hagood Millstone is comprised of French buhr and would have been transported to its current location in the 19th century.

POSTER #64A

Bioelectrical Impedance Analysis Accuracy: Factors that Affect Test Results

Mentors: Caitlin Moore, Joseph F. Sullivan Center, William W Mayo, Joseph F. Sullivan Center, Nancy K Meehan, School of Nursing, Paula Watt, Joseph F. Sullivan Center

Students: Sarah Feus, Brandi Ingram, Maeve Murphy, Jillian Robert

Bioelectrical Impedance Analysis (BIA) is used for determining body composition. Patients undergoing BIA testing are asked to follow guidelines prior to testing in order to obtain the most accurate results. There is scant research that examines the effect of preparatory guidelines on the accuracy of BIA measurements. This research aimed to determine if there was a significant change in BIA accuracy if a patient follows the preparatory guidelines prior to testing. This project used on-experimental prediction study design and assessed for correlations between preparatory guidelines and fat mass to skeletal muscle mass ratio, and intracellular to extracellular water ratio. A retrospective chart analysis was performed to examine the preparatory guidelines patients followed prior to undergoing BIA and the results following analysis. Data was analyzed to determine if there was a relationship between following the preparatory guidelines and obtaining more accurate BIA results. No significant correlations were found between BIA accuracy and preparatory actions. It can be concluded that following specific preparatory guidelines has no impact on BIA accuracy.

POSTER #64B

Integration of Protein into Fused Deposition Modeling Materials

Mentor: Vladimir Reukov, Bioengineering

Students: Eram Alam, Audra Atwood, Jonathan Lopiano, Seth Mccall, Andrew Mika, Michael Ward, Benjamin Young

The field of additive manufacturing has experienced rapid growth in recent years. With this industry becoming more popular, there is a significant increase in the amount of plastic waste produced from these Fused Deposition Modeling (FDM) materials. Polylactic-acid polymer is one of the main types of plastic filament used in additive manufacturing. While it does decompose faster than most plastics, the rate of degradation is still relatively slow. The aim of this project is to increase the biodegradability of PLA filament by integrating natural protein into the filament, thereby increasing its biodegradability. The proteins utilized in the experiment were egg-white powder, whey protein powder and chicken protein meal. These proteins were combined with the plastic by use of solvent, and melt extruded. The filaments were thermally tested using TGA and DSC, chemically tested using FTIR and tensile tested using an Instron. From the initial tensile testing, it was found that none of the blends were as strong as the pure PLA filament. Of the samples, the egg white protein blend had the highest tensile strength of the protein blends. In order to achieve a higher miscibility between the proteins and the polymer, it was decided to implement the use of a plasticizer along with the solvent DCM. The aim of this, is to increase the miscibility of the two substances, thereby making the filament more homogenous. In future experiments, degradability will be further analyzed through testing with UV-light, and mechanical testing of the filaments will begin.

POSTER #65A

Contemporary Art and Practice

Mentor: Joseph Manson V, Art

Students: Shelby Compton, Hannah Cupp, Taylor Deyoung, Jacob Lehmann, Connor Makris, Aimee Mcshane, Sydney Smith, Peden Wright

Studio, gallery, and museum exhibition research.

POSTER #65B

Functional Fidgeting

Mentors: June Pilcher, Psychology, Jennifer Bisson, Psychology, Sarah Sanborn, Psychology

Students: Emma Benfield, Bridget Callahan, Addy Dame, Lindsay Renwick, Georgiana Strawsburg, Ashley Old

Research has suggested that combining physical activity with learning can improve attention and cognitive function (Ratey and Loehr 2011). Bouncy Bands are a functional fidgeting tool that breaks up sedentary behavior in classrooms. This study compares behavioral differences in Bouncy Band use between males and females. Twenty-five elementary aged students, 15 males and 10 females, were videotaped over a 6 week period. For half of the time, Bouncy Bands were attached to the students' desks. We used independent samples t-tests to compare males and females for the overall use of the Bouncy Bands as well as behaviors (on-task/off-task, head orientation, body orientation) of the students. We found no significant difference between males and females in the type or amount of Bouncy Band use. However, when compared to females, males showed significantly more off-task, motor behavior ($p=0.011$) and their body was less oriented towards their desk ($p=.023$) during the time that the Bouncy Bands were on the desks.

POSTER #66A

By Students, for Students

Mentors: David M Detrich, Art, Joseph Manson V, Art, Denise C Woodward-Detrich, Art

Students: Caroline Elizabeth Berry, Katherine Comen, Shelby Compton, Nicole Embree, Amanda Hazell, Connor Makris, Cody Miller, Hailey Nelsen, Mckenzie Fletcher, Caroline Herring, Mary Jo May, Aimee Mcshane, Michala Stewart, Anna Sullivan, Samantha Trivinia

Public Art at Clemson University

POSTER #66B

Bistable Composite Snap Through Characterization

Mentors: Garrett Pataky, Mechanical Engineering, Oliver Myers, Mechanical Engineering

Students: Daniel Wade, Marcus Smyre

Carbon fiber reinforced composites (CFRC) are lightweight alternatives to classic structural materials. CFRC are created by laminating layers, and normal CFRC panels are symmetric through their thickness. Bistable CFRC are asymmetric and have two stable states, convex and concave. Bistable CFRC have potential as energy absorbing structural components, but the force required to cause the snap through between stable states is unknown. An experimental apparatus is required to measure the snap through force and determine the relationship between this force and the size and thickness of the panels. Current efforts focus on the experimental apparatus, how to apply and measure the force, and how to create consistent boundary conditions when holding the bistable panel. The prototype design has variable boundary conditions, constraints at the corners or middle, and a ball screw centered to apply force up or down measured by a load cell. The results from this project will result in a model relating the bistable panel dimensions to the required snap through force advancing the understanding and development of these unique panels.

POSTER #67A

Sustainable Spools

Mentor: Sarah Grigg, General Engineering

Students: Kimberly Green, Gabriella Schoenbeck, Edward Armstrong, Chanty Brown, Justin Napolitano, Kayla Rossow, Douglas Scruggs, Sheldon Smith, Lauren Swift, Kelli Trotter, Avery Vogel

The focus of this Creative Inquiry project is on reducing the impact of 3D printing on the environment by developing sustainable methods of producing printing filament from waste plastics such as discarded soda bottles. The goal is to make our own filament from start to finish; reducing waste and costs of prototyping supplies. This year we are building a 3D printer, shredder and extruder to get started. Problem solving and collaboration skills were strengthened through the process of assembling a 3D printer kit. This 3D printer will ultimately be used to test our filament, but for now we are printing custom designed parts in PET material so that we can learn more about the product. While building the printer, we learned how to read assembly and wiring diagrams which are important as we design and build the shredder and extruder. The team is currently working on CAD designs for the shredder and making adjustments to an extruder prototype. Although the concept of recycling pastic is simple, actually doing so has proven to be challenging, but we are excited to continue working toward waste-free prototyping.

POSTER #67B

Investigation Into Targeted Manipulation of the Gastrointestinal Microbiota Through Disruption of Starch Utilization Systems

Mentors: Kristi Whitehead, Biological Sciences, Daniel Whitehead, Chemistry

Students: Ronnie Austin, Maxime Bilodeau, Blaire Scott, Emmaline Spier Camposano, Megan Floyd, Neal Patel, Hunter Owen, Emily Peters
Type I diabetes is an autoimmune disorder characterized by the destruction of insulin-secreting B-cells in the pancreas. Recent research indicates that the onset of this autoimmune response may be attributed to host-microbe interactions in the human gut microbiota, particularly in the relative abundances of Bacteroidetes and Firmicutes. An increase in lipopolysaccharide presence, likely due to increased Bacteroidetes colonization, is theorized to cause chronic inflammation in the lining of the GI tract. This inflammation provokes an autoimmune response characteristic of the early stages of Type I diabetes. Our research focuses on reducing the abundance of Bacteroidetes present in the gut through the inhibition of their starch utilization system (SUS). The SUS amylase proteins, located in the bacterial periplasm, degrade starch in normal conditions. We are currently investigating a novel therapeutic technique using acarbose, an alpha-amylase inhibitor. When exposed to acarbose, the compound binds to SUS and hinders starch degradation. By inhibiting starch breakdown/utilization with acarbose, our goal is to inhibit Bacteroidetes growth in the human gut, thus delaying the onset of Type I diabetes. We are also looking to understand the relationship between acarbose dosage and amount of growth inhibition. In addition to understanding this relationship, we are using an in vivo model to track the shifts in relative frequency and abundance of the mouse gut microbiota. Future directions include further research into the mechanism by which acarbose binds to SUS.

POSTER #68A
Instrument Calibration and Flow Models for Sounding Rocket Experiments
Mentor: Gerald Lehmacher, Physics and Astronomy
Student: Addison Blackman
In order to successfully interpret observations of pressure and density in the upper atmosphere (above ~100 km) several steps of instrument calibration and modeling molecular flow are necessary. The first step is calibrating the cold cathode ionization gauges used in NASA sounding rocket experiments. We analyze data from two rocket experiments launched in 2012 from Wallops Island, Virginia. One rocket had a higher apogee and longer range and was considerably faster. The raw data are converted to pressures using factory calibrations and our own laboratory calibrations. For that, we must find a specific calibration function for each gauge that best fit our laboratory calibrations. The ratio of the pressure measured deep inside the gauge (near the "stagnation point") and the atmospheric pressure (in the "free flow") is called "ram factor", which depends mainly on Mach number, angle-of-attack and flow geometry. Under the simplifying assumptions of molecular flow (molecules move in straight line paths and make only wall collisions), the ram factor can also be calculated. Ultimately, we must consider the detailed geometry and simulate the supersonic molecular or transitional flow using the DSMC (Direct Simulation Monte Carlo) technique. We use a parallelized FORTRAN code from NASA called DAC97.

POSTER #68B
Fitdesks in the Classroom: Light Physical Activity Makes Reading More Enjoyable Without Impairing Comprehension
Mentors: June Pilcher, Psychology, Drew Morris, Psychology
Students: Arya Soman, Paige Harrill, Timothy Hulett, Jacob Spencer, Taylor Whaley
The goal of this study was to examine the effects of implementing active workstations (FitDesks) into high school English classes with students who were struggling readers. In a standard crossover design, 24 students in a 9th grade Basic English course were assigned to either a FitDesk or traditional desk during the first 8 weeks of the study and switched desk conditions during the second 8 weeks of the study. Students were asked to read at their assigned desk for 40 minutes each class. Lexile reading scores and subjective surveys about how the students felt at their desk were used as measures. Results showed that the students enjoyed reading more on the FitDesks than traditional desks. Results also showed that the FitDesks did not have an effect on cognitive function as their Lexile scores increased over the course of the study regardless of desk condition.

POSTER #69A
Examining the Curatorial Process
Mentor: Denise C Woodward-Detrich, Art
Students: Jeffery Arseneau, Kara Lerchenfeld, Aimee Mcshane, Peden Wright
How are art exhibits created for campus audiences? Many university galleries provide exhibitions for their various audiences. Likewise, contemporary artists explore a broad range of ideas and issues within their various creative endeavors. How do curators bridge these two audiences to create informative exhibitions within a university context? What considerations do curators explore when developing exhibits for a broad range of constituents? How are exhibitions conceptualized, planned and executed and what support materials do curators develop for a successful exhibition project? Through research, analysis and engaged practice Clemson Curates examines these questions while developing exhibitions for the Clemson Campus.

POSTER #69B

How Clean are Can Lids? Transfer and Survival of Bacteria on Lids

Mentor: Paul Dawson, Food, Nutrition and Package Science

Students: Dakota Cook, Javin Goodine, Joleah Mccomb, Andrew Mccullough, Sydney Mckay, Emily Plumb, Heather Stevenson, Lindsey Thomas, Alex Thompson, Rose Werden, Zachary Whittington

Beverages in aluminum cans are offered almost everywhere you go, from gas stations to grocery stores to vending machines. Most often, a person who buys a can, drinks straight from the lid, but this may not be the best idea considering all of the bacteria that can be on the surface. This study was divided into three experiments to determine (1) the cleanliness of randomly collected cans, (2) the transfer rate from hands to can lids and (3) the survival of bacteria on lids. To determine cleanliness over 190 cans were tested for presence of ATP using a standard luciferase enzyme kit. Of the 194 randomly selected cans, 90 (46.39%) were in the dangerous unsanitary category, 60 (30.93%) were considered cautionary as far as sanitation while 44 (22.68%) were categorized as clean. In the second experiment, subjects handled and opened cans with hands inoculated with *E. coli* and greater that 50% transfer to wet cans lids and greater than 30% transfer to dry can lids was found. In the third experiment, inoculated can lids were found to harbor *E. coli* for up to 4 weeks.

POSTER #70A

Sedimentological and Foraminiferal Evidence of Potential Paleostorm Activity on Dominica, Lesser Antilles

Mentors: Kelly Lazar, Environmental Engineer and Earth Science, Stephen Moysey, Environmental Engineer and Earth Science

Student: Stephanie Hibberts

Examining the sediment record for storm deposits provides the opportunity to extend existing hurricane records further back in time. Beach berms may allow for high-energy, storm-transported sediments to become trapped and preserved in the stratigraphic record. A 1.7-meter sediment core was taken just beyond the berm crest at Woodford Hill Beach, on the eastern shore of the Caribbean island of Dominica. Fifteen samples were obtained at each significant sediment change throughout the core for further grain size and foraminiferal analysis. These analyses resulted in identification of at least four distinct environments, or depositional facies: higher-energy normal marine salinity, average-energy normal marine salinity, lower-energy normal marine salinity and volcanic ash horizon. All samples were dominated by poorly-preserved foraminifera. Common species included ***Rotorbinella rosea***, ***Amphistegina gibbosa***, and taxa within genus ***Ammonia***.

POSTER #70B

Factors Affecting South Carolina Students' Mathematics Preparation into College

Mentors: Aubrie Pfirman, Engineering and Science Education, Eliza Gallagher, Engineering and Science Education

Co-Author: Khushi Patel

Students: Christopher Anderson, Kenneth Avallon, Dillon Mckenzie, Joseph Murphy, Louis Schenk, Rachel Staats, Trevor Hanna, Elyse Hanse, Abigail Hines, Tiffani Paul, Shannon Roberson, Lesteria Dunwoody, Julia Brisbane

There are many pathways to an engineering degree, but all of them pass through calculus. Some students complete first semester calculus in high school and start their post-secondary studies ahead of the game, or at least not behind. Others complete calculus in high school, but nonetheless place into courses below calculus at the start of college. Still others do not attempt, or are not even offered, precalculus in high school. In South Carolina, there is a significant racial and socioeconomic disparity between engineering students who place below calculus and those who enter college calculus-ready. In this NSF-funded project, we are analyzing focus group data being collected at technical colleges and four-year institutions across the state. The focus groups are gathering students' experiences of factors that affected their mathematics placement on entering college. In this presentation, we report major themes emerging from the focus group data, which fall broadly into categories of academic choices, family factors, and community/social support.

POSTER #71A

Histological and Mechanical Characterization of a Decellularized Intact Intervertebral Disc Xenograft

Mentor: Jeremy Mercuri, Bioengineering

Students: Alexandra Boulez, Victor Casler, Alexander Garon, Christopher Rood, Karenna Smith, Nicole Wyman

Intervertebral disc (IVD) degeneration is a multifactorial process that culminates in the structural and functional demise of both the nucleus pulposus (NP) and annulus fibrosus (AF). Total IVD replacement with synthetic implants attempt to preserve spinal motion, however they suffer from drawbacks including subsidence and wear particle generation. Thus, research efforts have begun to focus on developing IVD autografting / allografting techniques and whole IVD scaffold constructs to replace or regenerate the degenerate IVD. However, suitable IVDs for grafting are in short supply and whole IVD scaffolds do not approximate the size and biochemical composition of the human lumbar IVD. Previously, we reported on our ability to fully decellularize intact bovine IVDs; a widely available tissue having similar size and biophysical properties as human lumbar IVDs. The objective of this research was to further characterize these decellularized intact IVDs by examining

their biochemical composition and matrix micro-architecture via histology and assess their ability to generate swelling pressure and compressive properties to evaluate their potential as a xenograft for IVD replacement.

POSTER #71B

Not Your Basic Water: A Study on pH

Mentors: Paul Dawson, Food, Nutrition and Package Science, Rose Martinez-Dawson, Mathematical Sciences

Students: Cassidy Fryga, Bradley Hieronymus, Erika Ludden, Sydney Mckay, Trinh Nguyen

The goals of this experiment were to test pH value claims made by different alkaline water brands (Alkaline88, Real Water, TEN and blk bottled water) and the effect of temperature on the pH values of these brands at room, refrigeration and warm temperatures. Previous studies have not reported on the effect of serving temperature on pH of alkaline water. In this study, it was concluded that as a trend, the pH of the water at room temperature was more alkaline than advertised by the companies. Additionally, it was observed that as the temperature of the water increased the pH decreased, thereby reducing the effect of the alkaline properties. These results indicate that the consumer should be aware of the temperature in which they consume their water to achieve the full claimed benefits of alkaline water.

POSTER #73A

Peach Genotypes Differ in Base Temperature and Heat Requirement for Post-Chilling Bud Break

Mentor: Douglas Bielenberg, Biological Sciences

Students: Brodie Cox, Rosa Kome, Tyler Mcintosh, Meredith Mcswain, Halle Murphy, Marcellus Washington

Peach varieties differ in their need for a quantitative exposure to low temperatures (chilling requirement, CR) prior to spring bud break. Whether peach varieties also differ in their quantitative requirement for warm temperatures (heat requirement, HR) following chilling is unknown. Estimating HR of buds requires quantifying the thermal time for development as well as the base temperature which is permissive for development. We selected peach varieties with a range of CR (200-1050 hours) and exposed stem cuttings from these trees to a saturating duration of chilling temperatures (3 C). Following chilling, stems from each variety were forced at 12, 14, 16, 18 and 20 C and bud break progress was observed. The relationship between the inverse of bud break rate and temperature was used to estimate the base temperature and thermal time required for post-chill development in each variety. Results of this work will be used to assess the potential for breeding peach varieties which can avoid spring frost events and to develop phenology models to aid grower decision making. This work was funded by a USDA Specialty Crop Block Grant award and CU Creative Inquiry.

POSTER #73B

The Effects of Specific Fluid Properties on the Leidenfrost Effect in Directed Motion

Mentor: Joshua Bostwick, Mechanical Engineering

Students: Colton Hilleary, Deon Wallace, Evan Haithcock, John Henke

The Leidenfrost Effect is a phenomenon that occurs when a liquid levitates over a surface that has been heated to the Leidenfrost temperature, which depends not only on the properties of the fluid, but also those of the heated substrate. Now whereas the liquid appears to levitate, in reality, the liquid immediately vaporizes upon contact with the substrate creating a vapor layer that acts as a cushion for the fluid thus allowing it to appear to levitate. On a flat plate, this levitated liquid will randomly move around the plate with no apparent pattern. However, drops can be manipulated to create controlled motion through surface patterning such as the ratchet and herringbone geometry. We propose to quantify this directed motion as it depends upon the various physical and chemical properties in our system.

POSTER #74A

Modulating Polymersome Shape to Enhance Cellular Uptake

Mentor: Jessica Kelly, Chemical and Biomolecular Engineering

Students: Aon Ali, Celine Crum, Nicholas L'Amoreaux, Camilo Suescum

Because of the blood-brain barrier (BBB), >98% of small molecule drugs cannot treat the brain. Disruption of the barrier, exploitation of various routes of administration and brain-targeted nanoparticles have all had limited success in translation to the clinic. Modulation of nanoparticle shape impacts nanoparticle transport, thermodynamic stability and cell internalization kinetics. However, the effect of nanoparticle shapes on brain uptake has not been explored. In our work, we try to exploit shape-related uptake by creating polymersomes of various shapes and studying their ability to infiltrate neural cells. Polymersomes are membrane bound vesicles made of amphiphilic polymer that encapsulate hydrophilic and hydrophobic drugs at high efficiencies. By forcing the nanoparticles out of osmotic equilibrium, we are able to create various polymersome shapes while maintaining their beneficial membranes. Furthermore, we can control the size of the polymersomes by varying the initial concentration of block-copolymer used. Our results indicate that polymersome shape and size can be controlled, which should have an impact on cellular uptake at the BBB.

POSTER #74B

Bioelectric Patterns and Living: Cell Membrane Potentials, Growth, Regeneration and Pathology

Mentor: Matthew Turnbull, Biological Sciences

Students: Alexa Corker, Daniel Howard, Sydney Lynch, Richard Melton, Jessie Parker

Living cells produce electrical charge differentials across their membranes through passive and energy-requiring processes, generating membrane potentials that facilitate organization, complexity and physiological processes. In our lab, we currently are investigating the membrane potential patterns associated with stem cell activity and pathological states. Here, we describe two projects underway: 1) characterization of stem cell behavior in the gut of caterpillars during ontogeny and regeneration, and 2) characterization of patterns of membrane potential associated with virus infection. In the first project, we found gut stem cells are easily distinguishable from mature cells by morphology, provide the majority of cells isolated, and are depolarized relative to mature cells; our data also suggest that activation of stem cells during regeneration is associated with stem cell membrane potential changes. In the second project, we found that infection with the virus Autographa californica Multinucleopolyhedrovirus (AcMNPV) induces depolarization of the cell membrane; further, we found that concurrent depolarization of cell membranes during initial stages of AcMNPV infection, using the Na-/K-ATPase inhibitor ouabain, reduces infection, suggesting possible electrostatic interactions between cells and AcMNPV. These projects have application to regulation of pest insects, via chemical or genetic modulation of membrane potential associated with gut stem cell differentiation, and understanding of fundamental principles of bioelectric processes associated with ontogeny and regeneration in animals.

POSTER #75A

Engineering Yeast for Sustainable Production of Fuels, Chemicals and Nutraceuticals

Mentor: Mark Blenner, Chemical and Biomolecular Engineering

Students: Meredith Bailey, Kaelyn O'Neill, Alex Summers

The main goal of this project is to determine an optimal plasmid sequence that will give the strongest, most uniform gene expression. In other words, we aimed to increase plasmid stability on the yeast *Yarrowia lipolytica* by engineering a better means of plasmid replication and dissemination. First, native autonomously replicating sequence (ARS) were identified by our collaborators and isolated by using PCR. The ARS sequence was characterized by performing serial truncations. The sequences were then placed into a plasmid containing the green florescence protein reporter gene though SLIC and then transformed into yeast. Once visible colonies were present, cells were normalized and grown in selective media for 24 and 48 hours. Finally, flow cytometry was used to sort the cells based on florescence strength. The same procedure was then repeated with systematic truncations of the longest ARS sequence, or ARS68; this was done to determine the significance of the base pairs located after the cen sequence. The ARS sequence that contained the truncated cen showed a larger increase in the percent of cells fluorescing at 24 hours, but returned to values matching its peers after 48 hours. Next, the additional ori sequence on the plasmid was removed to test if two ori sequences were necessary. When flow cytometry was performed, there was no significant change in the percent of cells fluorescing or mean florescence indicating the extra ori sequence did not have a significant effect. The next step was to perform a mitotic stability study to quantify a percent loss of plasmid per generation. By growing the strains on selective and nonselective media, it was shown that despite the apparent improvements seen in the GFP study, none of the ARS-derived sequences performed any better or worse than the existing standard ori and cen sequences. Finally, the GFP gene was replaced with a more functional gene that produces PHA to test the practical application of this work. Future work for this project would include exploring the location dependency of the sequences and looking upstream and downstream of the ARS sequences.

POSTER #75B

Vacuum Applications of 3D Printed Materials and Devices for Ion Beam Physics

Mentor: Chad Sosolik, Physics and Astronomy

Co-Authors: Eyob Tarekegn, Patrick Johnson

Students: AJ Miller, Neil Monga, Casey Dowdle

We have investigated the properties of 3D printed materials and devices under high vacuum conditions and in contact with ion beams. In recent years additive manufacturing and 3D printing have exploded into a multi-billion dollar industry for hobbyists, researchers and prototype designers. While this development has changed many approaches to modern innovation and become a popular tool for the scientific community, the properties of such materials under extreme working conditions are poorly understood. In our laboratory we have focused on the integrity of 3D materials under vacuum conditions and their ability, when incorporated into devices, to manipulate and control ion beams in vacuum. Specifically, we have measured the outgassing and mass loss of printed materials exposed to vacuum conditions. In addition, using a combination of conductive and nonconductive layers, we have assembled and tested deflector-type devices that can manipulate ion trajectories. While NASA maintains a large database on material properties under vacuum, very little of that data applies to 3D printed materials. Therefore, our results are both new and useful to the spaceflight community. Also, by developing testbed

applications for 3D printed devices that function in vacuum, such as our ion deflector, we show that one can significantly reduce both prototyping times and setup costs for new vacuum-based technologies.

POSTER #77A

Characterization and Application of Quantum Dots for Drug Delivery and Cancer Cell Tracking

Mentors: Vladimir Reukov, Bioengineering, Anastasia Frank Kamenetskii, Bioengineering

Students: Rashed Abdel-Tawab, Will Ashley, Melanie Hedge, Kacie O'Neill, Lanz Patrick Pasig, Aleena Thomas

The main goal of this project is to synthesize and utilize different types of quantum dots in order to study drug delivery systems. Two types of QD were synthesized including CdSe particles which were made using two precursor solutions of Cd(Ac)2 and Se-Top while the other method involved synthesizing carbon quantum dots using gelatin. The properties of these quantum dots such as purity, size, and toxicity were measured then compared. The characteristics were analyzed using photoluminescence spectroscopy, transmission electron microscopy and toxicity essays. For future studies, it is planned to use these nanocrystals to track different types of cancer cells.

POSTER #79A

Tips and Tricks from Smart and Savvy Students

Mentor: June Pilcher, Psychology

Students: Paige Cantz, Noah Chiles, Abbey Knox, Emily Koger, John Neal, Taylor Whaley

Many of the brain's most useful talents have been uncovered through "tedious" research studies conducted by psychologists. The Brain Tips team purports to sift through scientific articles and share interesting findings with our social media followers. Many of the articles we choose to read and summarize contain tips and tricks of the brain that are unknown to most of the general public. We aim to equip college students with some of the brain's own tools for success in academics, the work place, relationships and more! By consolidating the findings of brilliant researchers into short and sweet summaries, we aim to grab the attention of students and entertain them with topics we think they would enjoy. Our team uncovers topics in educational, social, and cognitive psychology, to name a few, in hopes of providing handy and valuable tips that can benefit college students.

POSTER #79B

Biocementation of Martian Regolith Simulant with In-Situ Resources

Mentors: Zhengshou Lai, Civil Engineering, Qiushi Chen, Civil Engineering

Co-Authors: Rui Xiao, Yi Zheng

Students: Jason Gleaton, Naisha Mcdaniel, Shelly Phillips

Biocementation is expected to be an energy efficient and environmentally benign alternative method for the production of cement products, and it has been extensively studied on Earth. This research is focused on developing bioprocesses to produce bioconcrete columns using Mars-compatible microalgae and simulated Martian regolith. A marine microalga, *Thraustochytrium striatum* was tested to make Martian regolith-based columns in the presence of CaCl2/urea. Three different biogrouting methods were investigated including simultaneous, sequential and batch circulation of microalga cell biomass and CaCl2/urea in the columns. The need of post-biogrouting column soaking was also studied. The columns were characterized by the unconfined compressional strength (UCS), CaCO3 formation by X-ray diffraction (XRD) and microstructure by scanning electron microscope. *T. striatum* is capable of biocementation and can produce urease to produce CaCO3 precipitation for regolith columns. Overall, the sequential biogrouting are better than the simultaneous counterpart. The best UCS value found for the columns reached 523 kPa. Batch biogrouting has potential to achieve high UCS, but fast CaCO3 clogging needs to be overcome in the future research. The column soaking is not needed because it worsened the UCS.

POSTER #80A

Autonomous Package Delivery Using UAVs

Mentor: Yiqiang Han, Mechanical Engineering

Students: Jeremiah Ballard, Curdin Gantenbein, Steven Iannucci, Nathaniel Powers, Duncan Nicholson

Electric-powered Vertical Take-Off and Landing (VTOL) technologies are around the corner and ready to be applied to commercial applications, such as unmanned delivery, emergence response, survey and patrolling, etc. Autonomous control of an Unmanned Air Vehicle UAV) for a package delivery mission is specifically considered in this project. The objective of this project is to design, simulate and test a UAV to perform package delivery mission solely based on vision navigation and autonomous control techniques. This presentation will emphasize the simulation technique developed during this study. A "hardware-in-the-loop" testing approach was adopted. The control board and radio controller were connected to a virtual testing environment to interact with different test conditions. Dynamic response feedback can be used for testing different autonomous control algorithms. The hands-on programming and testing practices can also be applied to many other interdisciplinary projects such as self-driving car researches.

POSTER #80B

Creative Play

Mentor: Carlos Barrios, School of Architecture

Students: Justin Hoppe, Jesse Smith, Emmanuel Taylor, Ayla Wooten

This poster presents highlights of the use of toys in creative design and architecture. Using shape grammars as a computational formalism, students learn about rules of formal composition and apply them to create new designs. A design problem starts with a mathematical basis, but quickly evolves into a creative endeavor.

POSTER #81A

A Systematic Review on the Scientific Translation of Functional Transcranial Doppler Sonography Technology and the Assessment of Asymmetrical Brain Functions

Mentor: Claudio Cantalupo, Psychology

Students: Cole Bensch, Patrick Kilcommons, Anna Lark, Alisha Rice, Erin Newell, Emmaline Paschall

Aaslid's (1980s) research paved the way for the application of Transcranial Doppler Sonography (TCD) in both clinical and experimental research settings. TCD technology has since been increasingly emphasized within studies that investigate lateralized brain function during cognitive and behavioral tasks (*e.g.*, language). This digital presentation intends to provide an overview of some significant findings reported by neurologists and behavioral scientists who have used bilateral TCD to assess brain asymmetry. A collaborative effort was made by our team to broaden our knowledge in this field. To assure the results were comprehensive our search utilized multiple databases (*e.g.*, Medline/PubMed, Google Scholar, PsycInfo, PsycTest, etc.). To increase the efficiency of search results we implemented the use of appropriate key phrases (*e.g.*, cerebral lateralization, brain asymmetry, transcranial Doppler sonography, language lateralization, functional transcranial Doppler sonography (fTDS), cerebral blood flow velocity, etc.). After analyzing the available literature, we found that current research has yet to assess cerebral blood flow in relation to monitoring the measures of blood flow velocity and bilateral tympanic (*i.e.*, eardrum) temperature. Specific factors involved in the observed variance of bilateral tympanic temperature during these tasks remain unclear. These findings led to the development of an experimental design for our future study which aims to assess lateralized brain function within realistic settings by using fTDS technology and a continual measurement of bilateral tympanic and sublingual temperatures. The cognitive tasks assigned to participants of this study include components of language processing and mental rotation. It is the hope of our team that potentially significant findings from our study will advance the application of TCD technologies by facilitating future cross-discipline research collaborations between clinical and behavioral scholars.

POSTER #81B

Makerspaces and Critical Thinking in Nursing Education

Mentors: Nancy K Meehan, School of Nursing, Kristen Lawson, School of Nursing

Students: Andrea Gilliland, Alexandra Mesler, Rebekah Peterson

This paper explores the relationship between Makerspace use and critical thinking test scores of undergraduate nursing students. A Makerspace is a physical location where people gather to share resources and knowledge, work on projects, network and build (Wong and Partridge, 2016). A nurse's ability to think critically to analyze clinical information is essential to providing exceptional care to all patients (Von Colln-Appling and Giuliano, 2016). Articles reviewed examined benefits of Makerspace participation or the application of critical thinking skills in nursing; however, there is limited research establishing a correlation between Makerspace use and critical thinking ability in nursing

students. This research establishes a possible correlation between critical thinking scores and Makerspaces in undergraduate nursing students. The future of this research includes the use of California Critical Thinking Skills Test (CCTST) as another measure of critical thinking, the improvement of the Makerspace at Clemson University by increasing the variety of supplies available to students and the promotion of interdisciplinary collaboration.

POSTER #82A

Global Health Design for Tanzania

Mentors: Delphine Dean, Bioengineering, John D DesJardins, Bioengineering, Melissa McCullough, Bioengineering, William Richardson, Bioengineering

Students: Kyle Cannon, Joshua Cheser, Maggie Elpers, Kaleb Guion, Benjamin Hargett, Alex Harrison, Jacob Hurd, Azrin Jamison, Melissa Judge, Mark Livingstone, Tyler McKeown, Nathan Guion, Rachel Turbeville, Ian Demass, Carson Brewer, Ryan Gilbert

The Global Health Design Creative Inquiry team is dedicated to designing medical devices that are functional in low-resource settings. Our approach is motivated by the lack of medical devices that satisfy the needs of the developing world; namely, the need for devices to be robust, low-cost, reusable and independent of energy grids. This CI is an interdisciplinary team that includes bioengineering, computer science and microbiology undergraduate students. The team has established projects, including designing a portable patient monitor for improved primary care, a novel breast pump to interact with HIV in hopes to lower malnutrition rate and HIV transmission and a maintenance request tracking system to efficiently collect and organize repair information in low-resource hospitals. New projects the team has started this semester include a medical outreach pop-up tent designed for rural areas, a low-cost water filter aimed at filtering out heavy metals such as lead and a device that allows for the detection of antiretroviral (ARV) medications in HIV/AIDS patients. These devices are developed from initial concepts and proceed through iterative rounds of prototyping and verification. The CI team also works with Arusha Technical College in Tanzania to validate device needs and scope this existing medical landscape. This research is valuable because it provides underserved populations with much-needed medical care and expands the perspectives of Clemson students.

POSTER #82B

Tessellations

Mentors: Carlos Barrios, School of Architecture, Brandon Ross, Civil Engineering

Students: Page Cross, Michael Hallinan, Taylor Shank, Jesse Smith

This poster presents an interactive view of design using tessellations. Using repetitive patterns students are able to create a myriad of possible designs following simple rules, the same way that nature does.

POSTER #83A

Development of Assistive Devices for Participation in Archery

Mentors: John D DesJardins, Bioengineering, Meredith Owen, Bioengineering

Students: Benjamin Banaszak, Amanda Chernick, Brendan Elie, Reece Fratus, Amanda Sall, Taylor Seawell

The ARCHER (Accessible Recreational Creations to Highlight Educational Reach) Design Works group was developed in collaboration with Anderson School District 4 to develop engineering solutions that will allow k-12 students with physical disabilities to participate and compete in the archery section of physical education (PE). The goal of the Creative Inquiry is to develop a set of adaptive equipment that be utilized by individuals with varying degrees of physical disabilities. The set of designs encompass ability levels with device functions from fully assistive to minimally assistive. The current set of designs includes a base, an attachment for visually impaired students and an attachment for student with limited muscle strength. Goals for the project include: 1) make the base easier to transport and increase the safety, 2) transition from mechanical approach for VI assist to electrical approach using sensors 3) overall improvements to fully assistive device including adding handles, etc. to improve ergonomics and usability. Devices will be used by students in the school district and evaluated for effectiveness. Special acknowledgments to Anderson School District 4 and the Clemson University Creative Inquiry Program.

POSTER #83B

Science and Pseudoscience In Popular Media

Mentor: Elliot Ennis, Chemistry

Students: Emma Barnett, Mariah Barrett, Kaylen Bradley, Allyson Callan, Alexa Cox, Kelly Coyne, Kaila Hayden, Taylor Kerr, Jamie Malley, Matthew Navarro, Bailey Nestor, Meagan Prescott, Sydney Rush, Brooke Taylor, Ashleigh Walsh, Angeleki Zecopoulos

In the age of social media, people have access to copious amounts of information, but do not always have the skills to discern a good source from misinformation. Because of misinformation people are developing a distrust in science and medicine and are turning to more unproven treatments for everything from viral infections to cancer. The purpose of this project is to allow members to explore the validity of the information in their respective disciplines in the mainstream media. To this end, members have been researching various claims made within their field on social media platforms, you tube, blogs, through seemingly credible websites that upon further examination make claims that are not evidence based. Members have been evaluating the claims made using both classroom knowledge and the peer reviewed scientific literature. To date, team members have found a wide variety of misinformation on many different scientific topics. For instance, we found that articles written for the general public online can oversimplify complex ideas and exaggerate claims made in scientific studies. We ultimately want to find out how misinformed college students and the general public are with respect to scientific topics. To evaluate the knowledge of our population, we plan to create and conduct surveys that can properly discern whether people can tell the difference between credible science and pseudoscience. The surveys could reveal if certain demographics are more susceptible to pseudoscience than others. Eventually, we want all team members to conduct a scenario based survey on the topics they have researched. Based on the surveys we hope to construct some resources that are both accurate, and accessible to the general population.

POSTER #84A

Soil Profiles Tell a Story of What Was and What May Become

Mentor: Dara Park, Plant and Environmental Sciences

Student: John Nisbet

Soils are an integral part of our environment although most do not give them much attention other than that they are under foot. Yet each soil tells a story. Exposing a soil profile reveals how the soil was formed, geologic events and what potential uses it has. The stories of two contrasting soils will be told: an upland Ultisol and a floodplain Inceptisol.

POSTER #84B

Evaluating Creativity of Engineering Students

Mentors: Claire Dancz, Engineering and Science Education, Karen High, Engineering and Science Education

Student: Casey Boudinot

Creative thinking is an essential part of being an engineer. Implementing activities that promote engineering creativity could help improve the engineering curricula and produce more creative engineering graduates from Clemson University. The goal of this research project is to measure the effect participation in a 'creative activity' had on engineering students' creative thinking skills. All students in Conation and Creativity in Engineering (CCE) Creative Inquiry (CI) at Clemson University were first administered the Creative Engineering Design Assessment (CEDA) to obtain benchmark scores for the CCE CI students' creativity levels. Students were then divided into two groups--the "Creative Activities" group and the "Non-Activity" group. The Creative Activities group was given weekly activities known to help boost engineering creative ability, while the Non-Activity group did not participate in these activities. At the conclusion of the activity period, both groups took the CEDA to obtain post-activity results of the students' creativity levels. The authors present statistical analysis of pre-activity and post-activity scores compared between both groups of students in an effort to understand differences in creativity levels between the two groups and the impact of engaging with the creative activities. The results from this research may inform possible ways to help improve creativity across many engineering courses at Clemson University.

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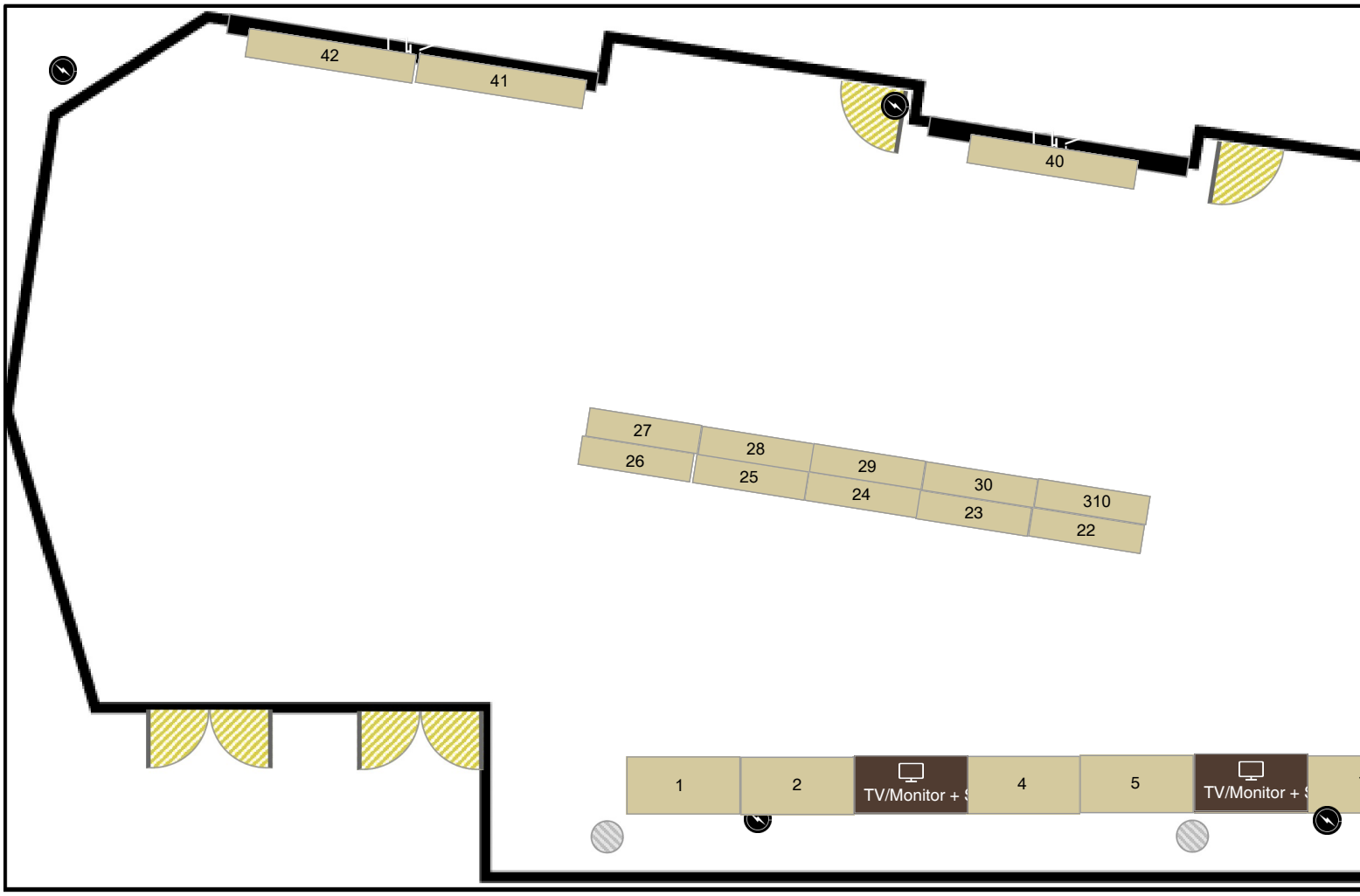

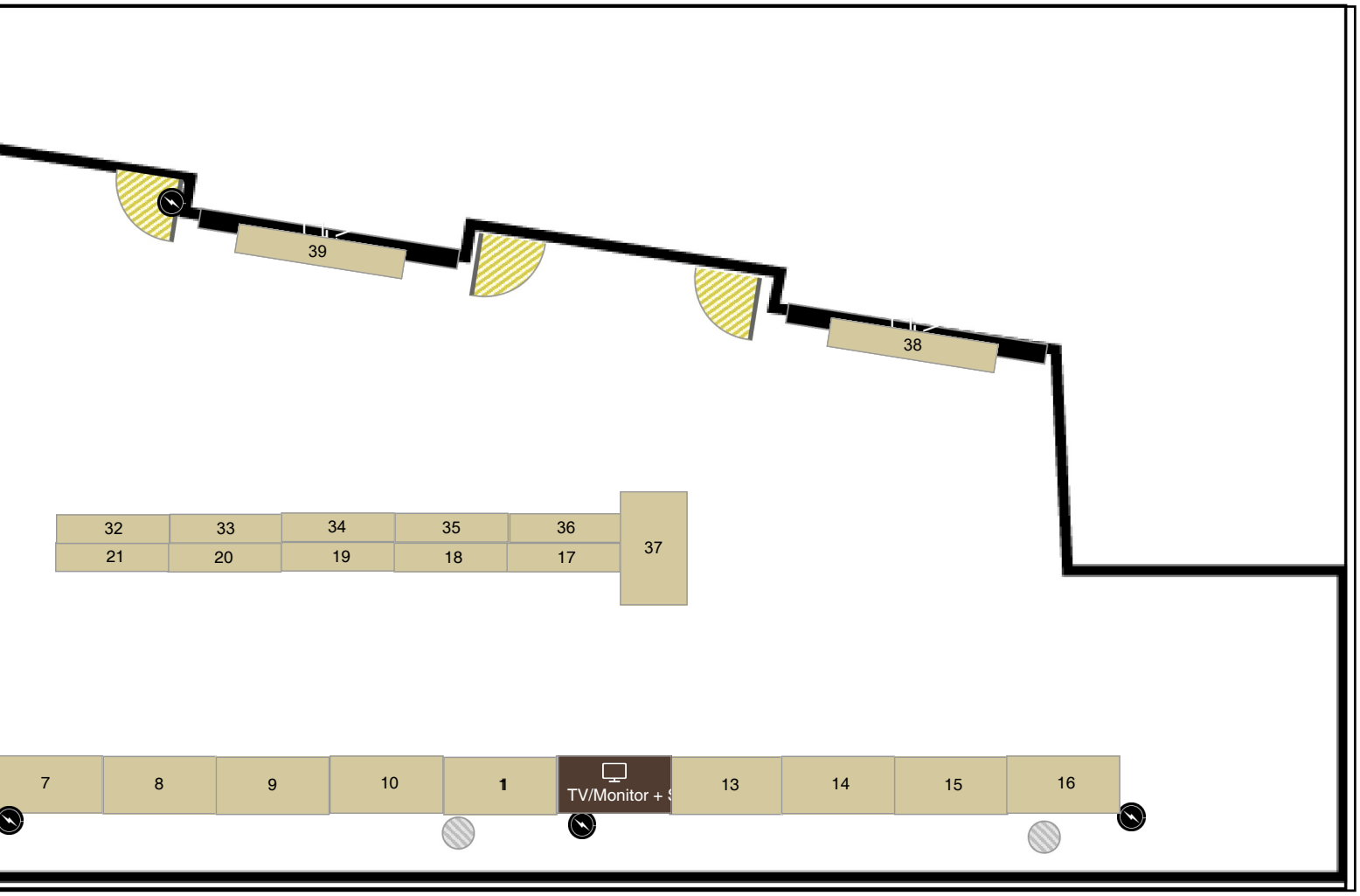
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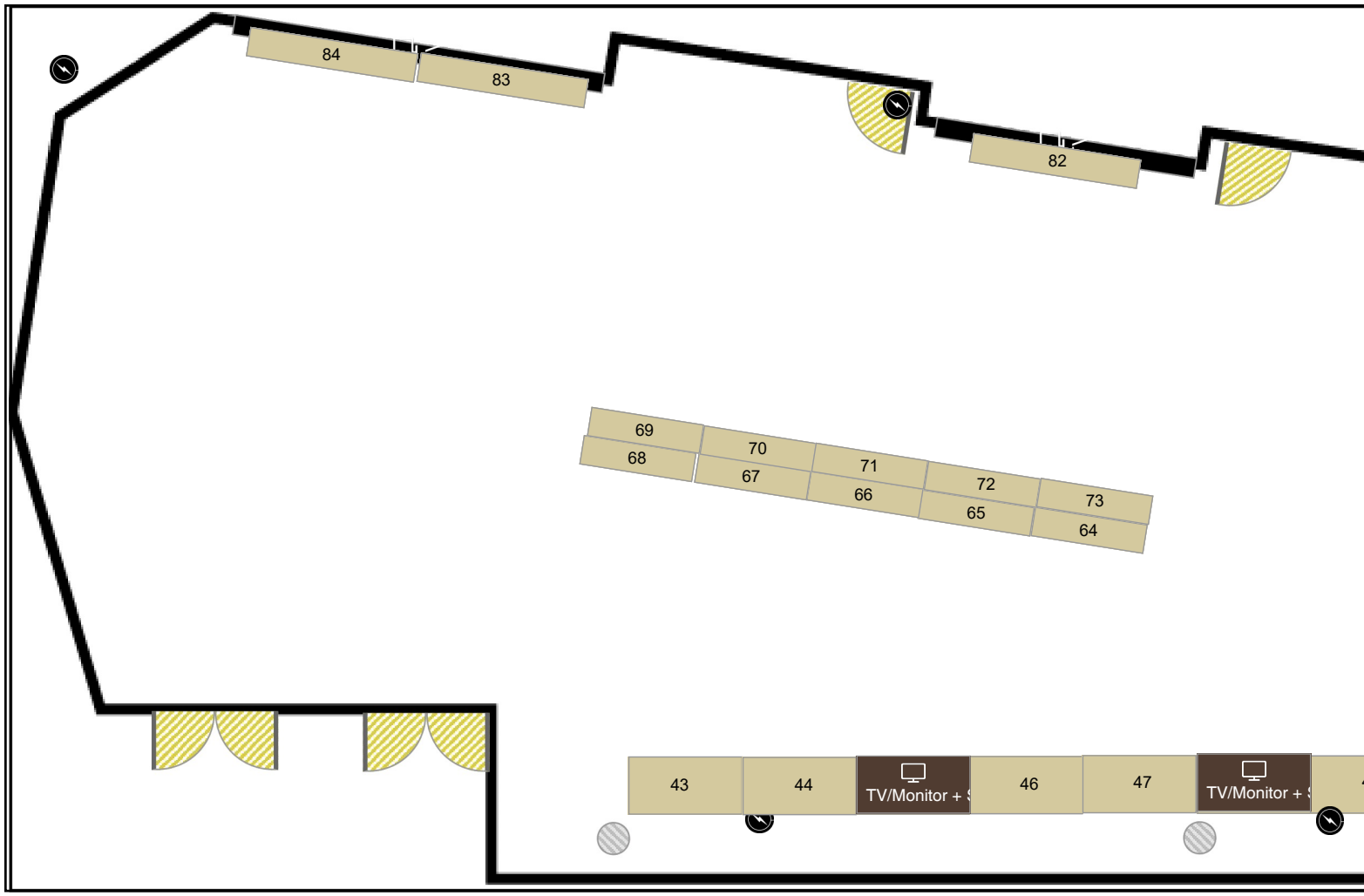

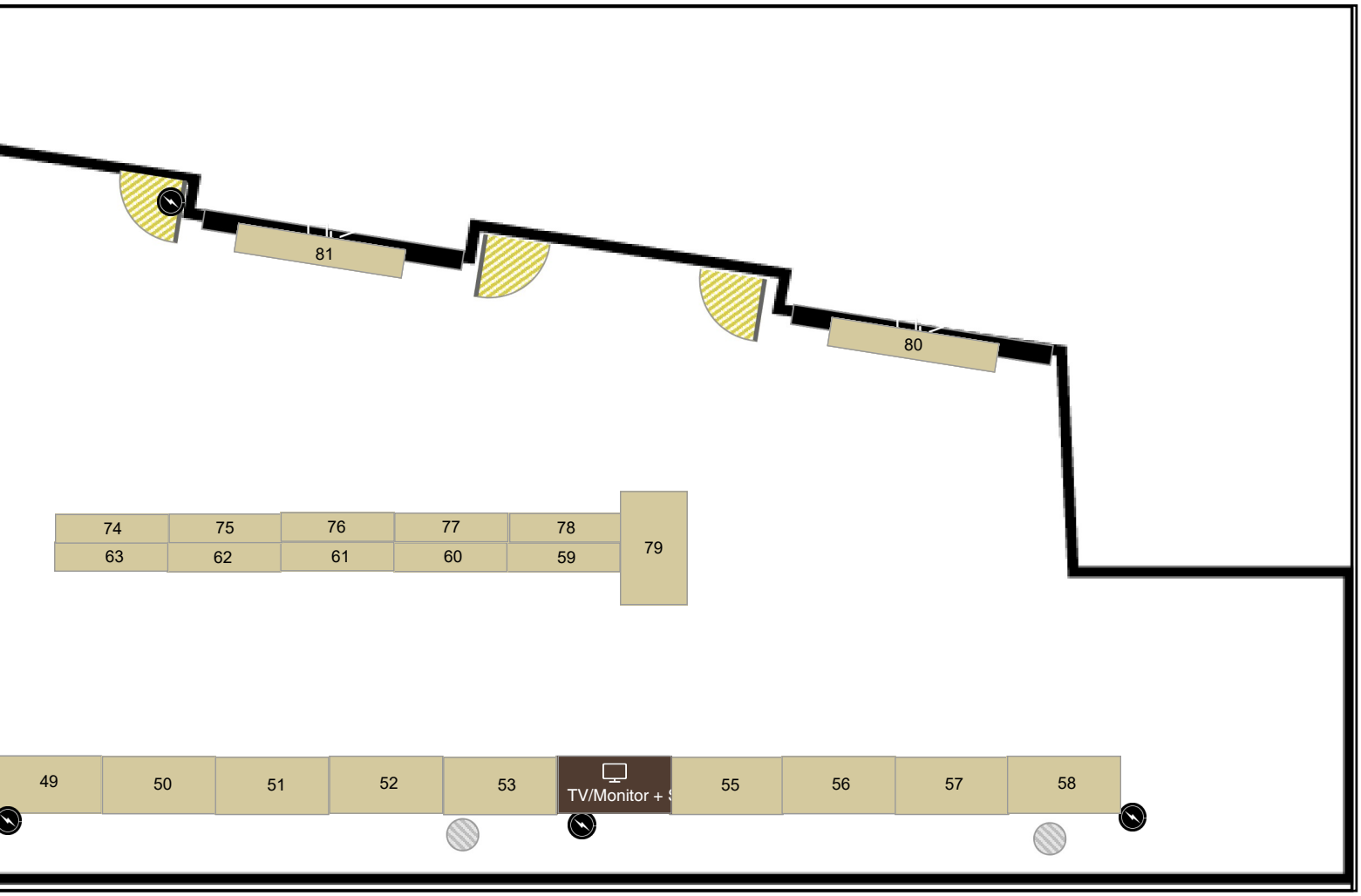
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