4-2019

14th Annual Focus on Creative Inquiry Poster Forum Program

Clemson University

WHERE

COLLABORATION RESEARCH INNOVATION CREATIVITY

HAPPENS

2019

14TH ANNUAL FOCI

Focus on Creative Inquiry

POSTER FORUM

APRIL 1&2

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CREATIVE INQUIRY

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Creative Inquiry students, led by Victor Liao and Dr. Rajendra Singh, unveil new solarstations in Fall 2018.

This CI team is collecting oysters in Georgetown, SC to study the effects of climate change on oyster populations.

14TH ANNUAL FOCI

FOCUS ON CREATIVE INQUIRY

The Focus on Creative Inquiry (FoCI) Poster Forum is an annual event in which Creative Inquiry (CI) teams can present their research and project accomplishments through posters and interactive displays. It is a celebration of student and mentor collaborations and accomplishments! Teams take this opportunity to develop and hone their communication skills.

In addition to student presentations, the Plenary Session highlights the recipient of the Phil and Mary Bradley Award for Mentoring in Creative Inquiry. The faculty award winner presents her or his experience as a mentor to undergraduate researchers as well as their overall research.

After the Plenary address, the winners of the annual Creative Inquiry Graduate Student Mentor Award and the winners of the poster contests are announced.

WHAT IS CREATIVE INQUIRY?

Creative Inquiry 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 1,370 projects enrolling more than 48,000 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

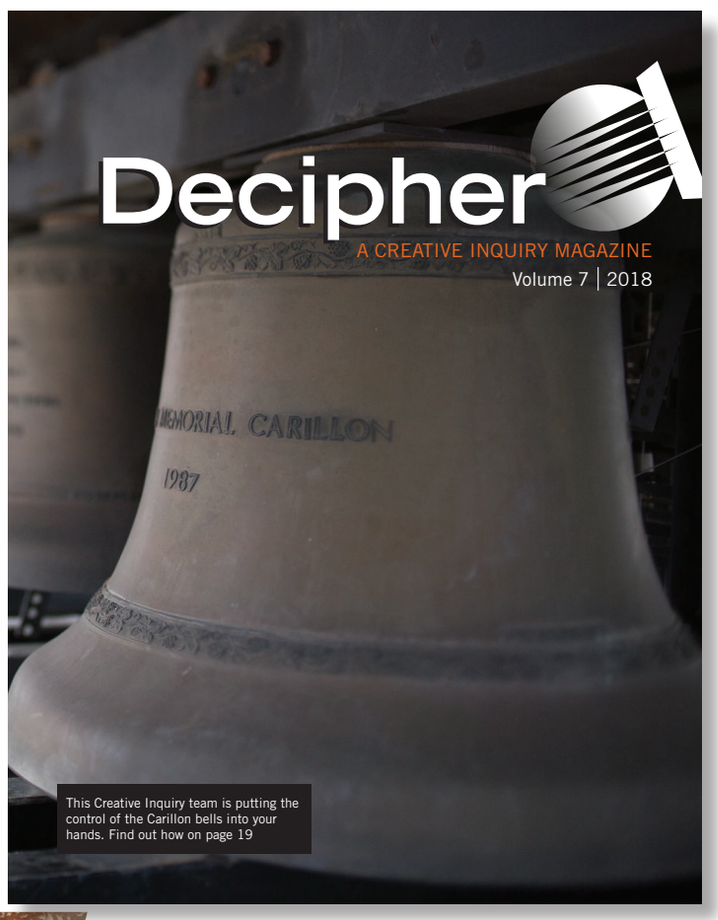
CREATIVE INQUIRY COMMITTEE

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

Jennifer Bisson, *Psychology*
Matthew Boyer, *Education and Human Development*
Steven Brandon, *General Engineering*
Margaret Condrasky, *Food, Nutrition and Packaging Sciences*
David Detrich, *Art*
Troy Farmer, *Forestry and Environmental Conservation*
JoAnna Floyd, *Research*
James Gaubert, *Marketing*
Alan Grubb, *History*
Bobby Hollandsworth, *Library*
David Knox, *Clemson Thinks2*
Janice Lanham, *Nursing*
Chad Navis, *Management*
Suzanne Price, *Student Affairs*
Michael Sehorn, *Genetics & Biochemistry*
Thomas Simpson, *Institutional Research*
Tzuen-Rong Tzeng, *Biological Sciences*
Kuang-Ching Wang, *Electrical and Computer Engineering*
Holly Williams, *Honors College*

ABOUT *DECIPHER*

Decipher is written and produced by Clemson's undergraduate students to describe the accomplishments of their peers in Creative Inquiry projects. Each year, approximately 4,000 Creative Inquiry students investigate topics ranging from alligator ecology to the European Union's impact on trade to developing a biodegradable filament for 3D printing. The *Decipher* student team selects approximately 30 projects to highlight in the magazine. The students interview, write, photograph and layout the design for the magazine.



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

1 APRIL - WATT ATRIUM

8am - 9:30am	Students Setup/Install Posters (Posters 1-34, see map pgs. 74-75)
10am - 12pm	Morning Poster Session (1-34)
1pm - 3pm	Afternoon Poster Session (35-68)

2 APRIL - WATT ATRIUM

8am - 9:30am	Students Setup/Install Posters (Posters 69-101, see map pgs. 76-77)
10am - 12pm	Morning Poster Session (69-101)
1pm - 3pm	Afternoon Poster Session (102-136)
3:10pm - 4:15pm	**PLENARY SESSION,** WATT AUDITORIUM

Welcome - Dr. Todd Marek, *Executive Director, Watt Family Innovation Center*

Featured Plenary Speaker - Dr. Arelis Moore de Peralta, *Assistant Professor of Languages and Youth, Family and Community Studies*

Award Announcements -
Poster Competition Award Announcements

4:15pm - 5pm	Students Remove Posters

WELCOME

DR. TODD MAREK

Executive Director, Watt Family Innovation Center

Todd C. Marek, Ph.D. joined the Watt Family Innovation Center as its executive director on May 9, 2016. Previously, Dr. Marek held leadership positions at Scientific Research Corporation in Atlanta, where he served as senior vice president for the company's communications, networks and electronics division. He also worked at the Massachusetts Institute of Technology – Lincoln Laboratory and North Carolina State University. Dr. Marek is an alumnus of Clemson University, and received his Ph.D. in Computer Engineering from North Carolina State University.

PLENARY SPEAKER

DR. ARELIS MOORE DE PERALTA

Assistant Professor, Department of Youth, Family and Community Studies *&* Department of Languages

Arelis Moore de Peralta (MEd, MPH, MD, Dominican Republic; PhD, Clemson) is a medical epidemiologist and social scientist with experience in quantitative, qualitative, and mixed methods research; particularly on health disparities among Hispanics in the US and Latin-America and the Caribbean. She is currently an assistant professor with an inter-disciplinary joint appointment between the Department of Languages and Department of Youth, Family and Community Studies (YFCS) at Clemson University. Dr. Moore de Peralta is also the Internal Evaluation Team Coordinator for NSF funded Tigers Advance project. Prior, she was the director of the Center for Community Services (CCS), an activity of CU/IFNL located in Simpsonville, SC, and the Hispanic family outreach and support program Café Cultura. Dr. Moore de Peralta has published on behavioral health and community-based participatory research in peer-review journals including Hispanic Health Care International, Journal of Immigrant and Minority Health, GHS Proceedings, Revista Panamericana de Salud Pública, American Journal of Infection Control, and South Carolina Nurse. She received the Vera Paster Award in October 2009, by the American Orthopsychiatric Association in recognition of her work with Latino immigrants, and she received the Kimbrough-Melton Parents Award in April 2010. She also received a Graduate Student Advising and Mentoring Award from the College of Behavioral, Social and Health Sciences in 2015.

PHIL & 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.'"

FACULTY AWARD

PREVIOUS FACULTY AWARD RECIPIENTS

2018 — Arelis Moore de Peralta, *Youth, Family and Community Studies* & *Languages*
2017 — Vladimir Reukov, *Bioengineering*
2016 — Michael Sehorn, *Genetics & 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*

ABOUT THE AWARD

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.

GRADUATE STUDENT AWARD

PREVIOUS RECIPIENTS

2018 — Christopher Mayerl, *Biological Sciences*
Drew Morris, *Psychology*
2017 — Dotan Shvorin, *Industrial Engineering*
2016 — Alice Brawley, *Psychology*

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.

APRIL 01 POSTER SESSION

POSTER #1

Bamboo Reinforced Concrete
Mentor: Weichiang Pang, Civil Engineering
Student: Mayank Patel

The purpose of this experiment is to explore the use of bamboo stalks as an alternative to steel rebar in reinforced concrete. Using bamboo as reinforcement could potentially reduce costs of construction, be more readily available than steel, and improve stability in buildings in poor countries. To test bamboo reinforcement in concrete beams, two rectangular forms with beam sizes measuring 1 ft x 2 ft x 12 ft were built. Then, bamboo stalks were split into stalks and steamed to become more workable. Once fully steamed, the bamboo was formed into hooks and rings, then dried to hold the shape. Then, steel ties were used to connect the bamboo strips into two frames, similar to that of a steel concrete frame. After lowering the frame into the forms, concrete was poured and set. Once set, a bamboo reinforced masonry wall was built on top of the foundation beam. The bamboo reinforced masonry wall was tested in full-scale in a shear wall test frame for in plane load to simulate earthquake loading. Good performance was observed. The preliminary finding is that bamboo is a viable alternative to steel as reinforcement for concrete or masonry structures, in particular, for developing countries.

POSTER #2

Effects of Bright Light Exposure on College Students' Feelings of Daytime Sleepiness
Mentor: June Pilcher, Psychology
Students: Dylan Erikson, Emily Scircle

College students have unique schedules, which typically result in sleep deprivation and daytime sleepiness. The purpose of this study was to investigate the relationship between bright light exposure and daytime sleepiness in the college population. Thirty college students (20 females, 10 males) participated in the study. The participants were randomly split into 2 groups based on condition (i.e., Experimental Light and Standard Light) and several tasks were administered during 3 testing times (baseline, after 20 minutes of light exposure, after 60 minutes of light exposure). After 1 hour, the results of a pairwise comparison across time indicate that bright light significantly reduced the reaction time and number of errors made for executive function tasks, but does not significantly decrease subjective sleepiness. These findings suggest that short-term bright light exposure may improve executive function for partially sleep deprived college students.

POSTER #3

Antioxidant Properties and Biocompatibility of Nanocrystalline Ceria
Mentor: Vladimir Reukov, Bioengineering
Co-Author: Misha Bredikhin
Students: Jillian Bostek, Alyssa Breedlove, Robert Gallup, Helena Guo, Cameron Schnabel, Kevin Shrake, Brendan Stewart, Ryan Van, Kerri Wong

Every year, congestive heart failure affects around 6 million adults in the United States. Within the first five years of the diagnosis, the mortality rate increases drastically to approximately 50%. One of the most common causes of these high death rates is the loss of myocardial function, from oxidative damage caused by reactive oxygen species (ROS). To diminish this oxidative damage in the myocardium, two classes enzymes are produced by the body: superoxide dismutase (SOD) and catalase. However, the problem lies in that SOD and catalase activity are inhibited by their dismutation

products. It is herein proposed that nanocrystalline cerium dioxide (nanoceria) is used in conjunction with SOD and catalase to scavenge superoxide radicals. Nanocrystalline cerium dioxide is synthesized via solvothermal method. SOD-nanoceria conjugates were prepared by physical absorption. The conjugates' antioxidant activity is assessed by enzymatic activity assays and has been found to have significantly higher antioxidant activity when compared to non-functionalized nanoceria and pure SOD.

POSTER #4

A Comparison of Water Quality Parameters in Artificial and Natural Habitat of the Eastern Hellbender

Mentors: Lauren Diaz and Cathy Jachowski, Forestry & Environmental Conservation

Students: Hailey Malone, Erin Mcdaniel

Sedimentation has contributed to declines of the hellbender salamander (*Cryptobranchus alleganiensis*) by filling in rock cavities used for breeding. Artificial shelters have been developed to mimic natural breeding cavities. Three designs are in use: the modified boot design, which can have a solid or open bottom, and the open bottom hydrodynamic design. While hellbenders use artificial shelters frequently, it is unclear whether water quality is similar between natural and artificial shelters. This is important because lower water quality may reduce nest success. Our goal is to determine if artificial shelters provide suitable nesting habitat for hellbenders by comparing water quality among natural and artificial shelters. We predict that water quality in artificial shelters will be lower than that in natural cavities, but artificial shelters with open bottoms will provide more similar conditions to natural cavities.

POSTER #5

Production of Recombinant Spider Dragline Proteins for Novel Materials Development

Mentor: William R Marcotte Jr, Genetics & Biochemistry

Students: Rya Glasshof, Kadie Hudson

While much is known about one of the strongest and most flexible biomaterials, spider silk, there still exists a lack of understanding on the basic biochemistry of spider silk fiber formation. The purpose of this study is to further understand the molecular processes that spider's use to convert a soluble and liquid protein into an insoluble fiber. Specifically, much remains to be discovered about how the N terminal domains of the spider fibroin proteins contribute to the spider's fiber self-assembly process. Currently, our group is interested in determining if covalent cross linking between protein molecules contributes to spider silk assembly and fiber strength. This research is important because a better understanding of the self assembly process will enhance efforts that might lead to new fibrous materials.

POSTER #6

There is Something Very Fishy Going On

Mentors: Michael Childress, Kara Noonan, and Kylie Smith, Biological Sciences

Students: Saanga Alikhail, Kevin Arango, Alexandria Blake, Katie Braffitt, Eric Branan, Jaden Corell, Alexandria Cousart, Kelsey Fisher, Dalton Fox, Cameron Gentry, Emily Gleaton, Jordan Gower, Lauren Greene, Nariah Haeffner, Kori Hays, Coral Holt, Karlee Isbell, Mia Iwan, Kalyn Johnson, Hannah Johnson, Ashley Joines, Lydia Kinard, Michelle Logan, Amari Lott, Julianne Lutz, MuskanZehra Momin, Maddison Parker, Emily Powell, Rachel Radick, Madeline Saverance, Manav Shah, Claire Smith, Madison Stroud, Tyler Young

Something Very Fishy is an educational outreach program that has served over 3,000 local elementary school students in partnership with the Pickens Performing Arts Center and Clemson University's Something Very Fishy Creative Inquiry Team. This program involves Clemson students from various educational backgrounds that collaborated to create a performance that informs children about marine conservation. The first half of this interactive experience was a live musical performance that portrayed the fictional town of Little Fishing Village. After the musical, the children explored the theater by rotating around ten different stations manned by Clemson students representing different marine conservation professions. At these stations, they interacted with the scientists, asked them questions about the profession, and took part in an activity related to that career. Our team is currently working with the local schools to assess the program and incorporate these lessons into the classroom.

POSTER #7

The Effect of Probiotics and Alcohol on the Development of *Caenorhabditis elegans*

Mentor: Min Cao, Biological Sciences

Students: Caitlin Barkley, Kyle Russi, Sean Lary

Caenorhabditis elegans is a favorable model organism for research. Upkeep is easy and inexpensive as they consume *Escherichia coli* for food, occupy minimal space, can be stored cryogenically, and reproduce by self-fertilization. Their genome has been fully sequenced, and they share many genes and molecular pathways with humans. Our undergraduate research lab studies microbe host interactions relating to probiotics, alcohol, and other substances. *C. elegans* grown on *Bacillus coagulans* and *Bacillus subtilis* for multiple generations have shown an increase in lifespan. Substituting *E. coli* with *B. coagulans* on day 2 of growth of *C. elegans* increases lifespan compared to growth on *E. coli*, suggesting time of probiotic administration is a factor. *B. coagulans* also appears to increase egg laying. However, in our studies, *B. subtilis* spores showed decrease egg laying. *C.elegans* growth on increased alcohol concentrations of 0.5% and 1.0% appear to affect motility and egg laying. However, more assays are required to further support these undergraduate hypotheses. Although this research is in the developmental stages, it holds promise for future analysis to understand the potential underlying mechanisms.

POSTER #8

Blood Glucose Changes in Patients Undergoing Hyperbaric Oxygen Therapy: A Retrospective Study

Mentors: Dotan Shvorin and Kevin Taaffe, Industrial Engineering

Students: Robert Hulsey, Kayla Adkins

Hyperbaric oxygen therapy (HBOT) involves breathing pure oxygen in a pressurized room; it is a well-established treatment for decompression sickness, serious infections, bubbles of air in the blood vessels, and diabetic foot wounds. Recent animal studies have reported that HBOT also reduces blood glucose levels. The aim of this study is to analyze previous patient data in order to assess what changes in blood glucose occurred in response to the course of the patients' hyperbaric therapy. The study is

a retrospective chart review using a within-subjects design. The sample will be obtained from recurrent HBOT patients. We will be able to analyze our data and compare our results to that found in rats in order to determine whether HBOT is an efficacious and financially-justified treatment for glucose levels in humans. We would like to thank the Emergency Medicine Department at Greenville Memorial Hospital and Clemson Creative Inquiry for sponsoring our research.

POSTER #9

Low Resistance Actuated Valve for Cardiovascular Experiments

Mentors: Ethan Kung and Masoud Farahmand, Mechanical Engineering

Students: Ray Kean, Aparna Mahendranath, Joshua Dale

A heart valve works by allowing blood to flow in one direction but restricting flow in the other. When the pressure upstream is greater than the pressure downstream, the valve opens. Blood regurgitation causes the heart to work harder leading to health problems such as blood clotting and heart palpitations. Commercially available mechanical valves have resistances that are too high for realistically mimicking heart valves. The goal of this project is to design and construct a low-cost valve which can be actuatedto maintain unidirectional flow by preventing backflow. The valve needs to respond quickly and there needs to be little resistance across the valve when it is open. Using a push-pull solenoid, a motor, a reservoir, and a t-junction with a valve, we created a flow loop in which we used the solenoid to block flow. Observations of data shows a push-pull solenoid and a valve can effectively act as a valve to prevent backflow in a flow loop. Leakage is prevented through the use of rubber o-rings located in front of the actuating arm within the conduit, along with two rubber rollers that tightly enclose the actuating arm on the exterior of the model. The actuating arm is designed to push forward to block flow and return to a position where fluid naturally flows through from the first tube, into the conduit, through the actuating arm, out of the conduit, and out of the second tube.

POSTER #10

Gap Passability Judgments in a Dynamic Environment

Mentors: Christopher Pagano, Kathryn Lucaites, and Hannah Solini, Psychology

Students: Jessica Tota, Brie Weiss, Maegan Reed

A crucial component of daily locomotion and mobility is the successful navigation of apertures (e.g., doorways, lanes, corridors). While much research has studied an actor's ability to perceive their action capabilities in a static environment, far less work has assessed how action capabilities change in a dynamic environment. Two ways to quantify a dynamic environment are the amplitude (the amount of overall movement) and the predictability of the movement. The current experiment assessed the extent to which the amplitude and predictability of a gap whose width is oscillating impacts an actor's judgments of their ability to pass through the gap. In an immersive virtual environment, participants were seated in a wheelchair rolling toward a door while the door moved to various widths. The patterns of oscillation were manipulated in terms of their amplitude (low, medium, & high) and predictability (low, medium, & high) in a 3X3 within-participants design. Participants gave judgments of passability within a temporal occlusion paradigm. Results showed that judgments of passability were impacted by the average width on each trial. Further, the amplitude, but not the predictability, of the oscillation pattern impacted judgments of passability. Participants made more conservative judgments when the sequence of oscillation had a higher amplitude compared to when it had a lower amplitude. Results are discussed in terms of their practical applications.

POSTER #11

Optimization of an Electrospinning Mechanism to Apply Protein-Treated Fibers to Surgical Sutures
Mentors: Jorge Rodriguez, Bioengineering
Co-Authors: G Korneva, JS Lee
Students: McKenzie Fletcher, Katherine Magee, Jack Mckeehan, Adam Samuta, Ethan Veideman

To improve the effectiveness of sutures and healing from procedures, medicines and proteins are being spun onto the surface of sutures giving rise to specific bio-responses in the body. Since this type of electrospinning is new and there is not a standardized method of applying the fibers to the suture, there is a need for an optimized mechanism for the fiber application for research sample composure. This device, made to fill the need, has been designed in SolidWorks. The individual parts were then built and assembled by 3D printing and machining. Once a generation of the device is complete, fibers are spun around sutures with the new assembly. These samples are analyzed using scanning electron microscopy to determine how well individual fibers align to coat the suture surface. The machining of the device has led to smoother mechanism operation, improved usability, and variability in motor type, rotational velocity settings, and brush head size for the device. Looking forward, the team will use the device to optimize electrospinning procedures by utilizing the mechanism's variability to construct ideal parameters to produce the fiber-wrapped sutures.

POSTER #12

Quick Alcohol Treatment to Increase Water Passage and Salt Rejection of TFC Reverse Osmosis Membranes
Mentors: Jaime Idarraga Mora and Scott M Husson, Chemical & Biomolecular Engineering
Co-Author: Steven Weinman
Students: Michael Lemelin

This poster discusses the effect of C1-C4 alcohols on the transport properties of thin-film composite reverse osmosis membranes. Five commercial membranes were studied using direct-flow filtration to quantify the changes in water permeance and sodium chloride rejection before and after contact with five different C1-C4 alcohols. Membrane performance was correlated with active layer characteristics. Young's modulus measurements of the surface showed decreased stiffness of the active layer after contacting the membranes with alcohol, suggesting a plasticization effect. Water permeance generally increased without decreasing rejection after short-term alcohol contact. The extent of these changes depends on the membrane and alcohol used. Analysis of the data using a dual-sorption model found correlations between the change in water permeance after alcohol contact and both the initial water permeance of the membrane and the change in free energy of mixing of water and the alcohols. We suggest that the mixing of water with the alcohols facilitates penetration of the alcohols into the active layer, likely by disrupting inter-chain hydrogen bonds, thus increasing the free volume for water permeation. Our studies provide a modeling framework to estimate the changes in transport properties after short-term contact with C1-C4 alcohols.

POSTER #13

How Affordable is it? Autism Severity and Object Affordances
Mentor: Jennifer Bisson, Psychology
Students: Alyssa Davis, Tiffani Paul

Affordances are an individual's perceived uses of an object or the possible actions that an object suggests (Gibson, 1979). Autism Spectrum Disorder (ASD) is a neurodevelopmental disorder often characterized by a preoccupation with certain objects or parts of objects. Because of the increased focus on objects and object parts, we hypothesized that ASD severity would be positively associated with the number of reported object affordances. The sample included 25 participants with ASD. Using an online survey,

participants were asked to list the uses (affordances) for 6 objects: duct tape, paperclip, rubber band, string, and two novel objects. Each unique verb was counted as one affordance. Participants also completed the RAADS-14, a measure of ASD severity. Pearson's correlations were computed between the RAADS-14 scale score and the number of reported affordances for each object. With the exception of the novel objects, the number of object affordances was positively associated with autism severity. Based on these findings, healthcare providers may want to consider differences in object affordances (or object use) as an additional criterion for identification of ASD. Participant recruiting is ongoing.

POSTER #14

Temporal Patterns and Environmental Correlates of Age-0 Southern Flounder Abundance Along the Northern Gulf of Mexico

Mentors: Troy Farmer, Meghan Angelina, and Jared Chrisp, Forestry & Environmental Conservation

Student: Mason Collins

Southern Flounder (*Paralichthys lethostigma*) is an economically important species across the U.S Atlantic and Gulf Coasts. In recent years, both adult abundance and fishery harvests have declined, with some of the sharpest declines occurring across the northern Gulf of Mexico. Despite these declines, we know relatively little about temporal patterns in juvenile Southern Flounder recruitment for the northern Gulf of Mexico. Resultantly, it is also unknown the extent to which juvenile recruitment to estuaries may have also declined in response to, or preceding declining adult abundance. Additionally, we know relatively little about the environmental conditions that constitute preferred habitat of juvenile Southern Flounder in estuaries along the northern Gulf of Mexico. This study 1) developed an index of age-0 abundance and 2) explored environmental correlates of age-0 Southern Flounder catches in Mobile Bay, Alabama. This study used 35 years of data from a historical bottom trawl survey conducted by Alabama Department of Conservation and Natural Resources (MRD) to develop an index of juvenile abundance. Initially, monthly catch rates of Southern Flounder were investigated. Catches of smaller individuals (< 200 mm) peaked during May - June. Otoliths from historical MRD and Auburn University collections were aged and determined that all individuals < 165 mm were age-0. Therefore, catches of Southern Flounder < 165 mm during May-June were used as an index of annual juvenile southern recruitment to Mobile Bay. Temporal trends indicate recruitment has declined considerably from peaks in the mid-1980s, mid-1990s and early 2000s. Catches of age-0 Southern Flounder were negatively correlated with salinity and water depth.

POSTER #15

Andy Warhol: Portraits and the Everyday

Mentor: Denise C Woodward-Detrich, Art

Students: Tiffany Oliver, Mary Watson

Lee Gallery presented Andy Warhol: Portraits and the Everyday on the Clemson campus. Andy Warhol is a household name but many individuals are unfamiliar with the breadth of his artistic research. In order to assist visitors in understanding this internationally recognized artist the Lee Gallery along with Clemson Curates examined different programmatic strategies to engage and educate our audiences about this artist. What components are needed to mount an exhibition of work by such a high-profile artist? What kinds of care and security requirements are needed when handling and displaying exceptionally high valued works of art? What kinds of interpretative materials are needed to assist a range of audiences visiting the exhibition? What types of support materials are needed to assist different audiences to acquire a fuller understanding of the magnitude of his creative research and what decisions are made in regards to what to include and what not to share with a particular audience? Overall our research touched on the many different facets involved in exhibition planning and management.

POSTER #16

Optimization of Western Blotting via Mold-Cast Gel

Mentor: Orrod Zadeh and Marc Birtwistle, Chemical & Biomolecular Engineering

Students: Baylee Westbury, William Interiano, Jonah Huggins

Western and micro Western blots are the lab standard for analyzing proteins, but each technique has its own drawback along with the procedure being time and labor intensive. The western blot limits the number of sample while the micro western blot necessitates expensive and demanding equipment. Our research enables the analysis of hundreds of concurrent protein samples, vastly expanding the throughput for western blots, and makes the technique accessible by eliminating the need for expensive equipment. To cast a gel, we assembled the mold and filled it with a 9.5% polyacrylamide gel-producing mixture. After the mixture has fully polymerized, the gel is loaded with protein samples. Electrophoresis is conducted on the gel to cause the proteins to migrate and separate based on size. The proteins are transferred to a nitrocellulose membrane using wet transfer. The membrane is analyzed with infrared imaging. Initial results displayed that the protein ladder did carry on the custom polyacrylamide gel, and protein migration occurred. Utilizing a standard wet-transfer apparatus allowed the custom gel to transfer the protein ladder onto a nitrocellulose membrane. The 3D printed mold allows users to easily cast a gel in any custom shape. Hundreds of 1 microliter wells can be arranged to allow high-throughput western blot analysis. Proteins can migrate through the gel via electrophoresis and transfer to a membrane through established wet-transfer methods. In addition, a pipetting robot can be programmed to load samples into the gel to further increase time efficiency.

POSTER #17

Biodigesters

Mentors: David Vaughn, Engineering, Computing, and Applied Sciences

Students: Marguerite Azzara, Ria Naab, Hannah Sarver, Jenna Sinkevitch

Biodigesters in developing countries provide a method to safely dispose of human waste in order to prevent water contamination and the spread of diseases such as cholera. These systems retain and break down waste through anaerobic digestion before releasing the decontaminated by-products back into the environment. In addition, the system produces methane gas from the waste, which can be used as a more sustainable energy source. Currently, the CEDC biodigesters team is working on a plan to improve and expand the technology that has been implemented in Cange to many other villages in the Central Plateau. This semester, the Biodigesters Team is creating a number of documents, including a Design Guide, Site Evaluation, educational booklet, Community Health Assessment, and Implementation Plan. These documents will be useful resources in future semesters and in the execution of biodigesters across Haiti.

POSTER #18

Can You Adapt to a Virtual Rollercoaster? Using Stomach Activity and Surveys to Assess Simulator Sickness Over Time

Mentors: Eric R. Muth and Sarah Beadle, Psychology

Students: Bryson Daniels, Nicole Dischiavi, Lydia Henderson, Chloe Hourigan

The purpose of this study is to evaluate the efficacy of desensitization and adaptation to a virtual reality rollercoaster. Commercial virtual reality (VR) experiences have been known to cause simulator sickness, a subset of motion sickness that can cause drowsiness, disorientation, or at worst vomiting. Previous research suggests that with repeated exposure to the latency of a head-mounted display (HMD), participants can adapt to sickness shown primarily through subjective report (Kinsella, 2018). Desensitization is described as a reduction of psychological response to a stimulus, as opposed to sensory adaptation which is a change in the peripheral nervous system (Rankin et al., 2009). This

study will explore the differences between sensory adaptation and desensitization using subjective and physiological measure. Twenty participants will come to the lab 3 times, each separated by 48 hours, and experience several minutes of a VR rollercoaster. Sickness will be recorded using the simulator sickness questionnaire (SSQ) before and after the virtual rollercoaster. EGG recordings will be collected via three electrodes on the abdomen, with a baseline before the task and during the virtual rollercoaster. EGG will be analyzed using percentage of cycles per minute showing tachygastria, an increase in stomach activity associated with motion sickness. A two (measure) x three (session) ANOVA will be conducted comparing patterns of subjective scores and EGG activity over time. If there is a difference in SSQ but not stomach activity, this supports the idea that we are seeing desensitization (psychological) and not adaptation (physiological). The implications of this expected finding are that with prolonged usage, individuals may have subjective comfort but still have negative physiological effects. This can be used by VR designers to integrate physiological and psychological metrics to avoid sickness in their users.

POSTER #19

Effect of B-site Cation Position and Spin Ordering on the Stability of Cesium Loaded Hollandite
Mentor: Scott E Brame, Environmental Engineering & Earth Sciences
Student: Ryan Moseley

Approximately twenty percent of the total electricity generated in the United States comes from nuclear power plants, a process which produce nuclear waste that will remain radioactive well into the future. Materials called waste forms are designed to contain potentially harmful radionuclides from spent nuclear fuel. One such material is the mineral hollandite; its tunnel-like structure allows for the containment of harmful ions, such as radioactive cesium (Cs). The stability of hollandite and, in turn, the potential for Cs containment depends on the chemical composition of the waste form. Specifically, the atomic arrangement of the B-site cations that make-up the tunnel structure has been shown to vary depending on the amount of Cs in the tunnel. Additionally, Cs mobility in the tunnel may be influenced by the small magnetic moment associated with transition metal ions in the B-sites. Quantification of the impact of both the atomic and electronic ordering in hollandite requires quantum-mechanical calculations, which enable evaluation of the electron density associated with specific atomic and electronic configurations across a range of hollandite compositions.

POSTER #20

Joint Replacement Research: Clemson Orthopedic Retrieval Program (REPRO)
Mentor: Melinda Harman, Bioengineering
Students: Harper Abbott, Granville Baxa, Lauren Davis, Molly Gundermann, Cole Harp, Samantha Kodikara, Alexander Kullman, Elliot Mercado, Kaela O'Leary, Mary Beth Reno, Chelsea Rose, Whitney Schroeder, John Sykes

Approximately 7 million Americans are living with a hip or knee joint replacement. Unfortunately, a small percentage of these implants fail due to loosening, infection, bone fracture, material failure, or other medical problems. Trends in device failurescan be assessed systematically using implant retrieval collections. The Clemson Orthopedic Retrieval Program (REPRO) was established in 2008. This IRB-approved program includes a network of 11 hospitals in South Carolina to acquire explanted joint replacements. The REPRO repository includes nearly 750 explanted hip and knee replacements. The overall goal of REPRO is to evaluate design features that are critical for implant performance, ultimately improving patient care. REPRO research projects focus on performance of modular attachments used to accommodate bone loss, mechanical testing of surgical instruments, corrosion analysis, polyethylene wear analysis, development of a training tool for implant feature recognition, and database management.

POSTER #21

The Effects of Forest Management Practices on Fish Diversity in the Santee Experimental Forest, South Carolina

Mentors: Troy Farmer and Alex Chow, Forestry & Environmental Conservation

Students: Jacob Moreland, Ashley Padgett, Alicia Rivera

The effects of standard forest management practices may have direct impacts on the nutrient composition and water quality of nearby watersheds. The objective of this study was to determine how forest management practices affect downstream water quality, and subsequently, seasonal fish diversity and abundance in forest streams. We compared species diversity across three watersheds located in the Santee Experimental Forest of coastal South Carolina in the spring versus the fall: a control or reference watershed, a treatment watershed that received controlled burning, and a downstream watershed containing flow from both watersheds. In each watershed, pH, total nitrogen, total suspended sediments, total organic carbon, and conductivity were measured bi-weekly from April - November 2018. The Shannon-Wiener Diversity Index was used to quantify species diversity and revealed that the watershed with combined flows from control and burned watersheds had the greatest diversity during both sampling seasons, as expected to move from smaller 1st order to larger 2nd order streams. The burned watershed had lower diversity than the control watershed during the spring, however, this trend was reversed during the fall. Conductivity and TOC were significantly higher in the control watershed compared to the treatment watershed throughout April - October 2018. These preliminary results indicate that water quality parameters may differ significantly following controlled burning. Notably, diversity increased in the burned watershed during the fall, possibly indicating that habitat conditions improved from the immediate impacts of the controlled burn. However, fish community composition was not consistently different between treatment and control watersheds.

POSTER #22

Informing Medical Device Design and Reprocessing through Human Factors Engineering and User Validation

Mentors: Zachary Hargett, Delphine Dean, John D DesJardins, and Melinda Harman, Bioengineering, David Neyens, Industrial Engineering

Co-Author: Sarah Zemitis

Students: Jacqueline Beals, Joseph Bryant, Abigail Hines, Katherine Kropilak, Kasey Murrell, Kimmy Sanna, Mark Livingstone, Heather Peer, Lanie Ratterree, Chandler Sizer, Brittany Swafford, Julie Wagner

The long-term goal of this Creative Inquiry (CI) is to introduce the tools and techniques used in human factors engineering and to apply those skills to medical device design. Learning content is facilitated through lecture, case studies, and industry collaboration. This CI consists of 12 undergraduate students from the Industrial Engineering and Bioengineering departments. Currently there are four undergraduate student initiated projects ongoing. Project topics include reprocessing of BVMs in low-resource settings, disorganized tubing systems of infusion pumps, ESU grounding pad reuse, and surgical instrument assembly/disassembly. For the BVM reprocessing team, students are collaborating with an industry partner to assess variability in current reprocessing protocols used in Tanzania. This team has developed a study protocol and is waiting for IRB approval. The infusion pump team is working with the nursing department at Clemson to developing a study to understand obstacles related to untangling infusion pump tubing. Study development and IRB approval are next steps for this team. The ESU grounding pad team is developing a testing protocol for grounding pads reused in low-resource settings by identifying or developing a biomimetic material appropriate for device functionality. The student team working on surgical instrument assembly/disassembly is still in its infancy state but is collaborating with an industry partner to define milestones for their project.

POSTER #23

Relationship between Blood Pressure, Emotional Dampening, Alexithymia, and Risk Behavior using a Lottery Simulation

Mentor: James A McCubbin, Psychology

Students: Lindsay O'Toole, Marisa Puderbach, Rachel Shaughnessy, Brie Weiss, Anna Kadau, Gabrielle Cummings, Taylor Miguelino

Central Nervous System control of blood pressure is intimately related to emotional responsivity, and this relationship may be important in development of essential hypertension. Recent studies from our laboratory have shown that blood pressure is associated with self-reported risk behavior, risk-taking in a driving simulator, and financial risk. However, the potential relationship between emotional responsivity and risk taking is not well understood. Moreover, alexithymia, a personality trait affecting emotional appraisal, may also influence this relationship. The current study was designed to determine the role of affect perception and alexithymia on the relationship between blood pressure and risk taking behavior. Normotensive adult men and women are being recruited to the laboratory for a study of blood pressure, emotional responsivity, and financial risk taking. Participants rest while systolic (SBP) and diastolic (DBP) blood pressures are assessed with an automated Dinamap V100 vital signs monitor. Emotional responsivity is assessed by recognition of emotions in a series of facial expressions, and by responses on the Toronto Alexithymia Scale (TAS-20). Risk behavior is assessed by a simulated paired-choice lottery task. Data are analyzed by multiple regression to examine the relationship between blood pressure and risk after adjustment for recognition accuracy for facial expression of emotions and alexithymia. To date, results are available for 19 participants, including 15 women and 4 men. Preliminary results show average blood pressures are 109.1 +/- 2.15 mmHg SBP and 63.9 +/- 1.46 mmHg DBP. Average risk as a percent of total possible risk was 50.5 +/- 5.1, average percent correct recognition of facial expressions was 56.6 +/- .015, and average alexithymia score was 57.7 +/- 1.05.

POSTER #24

Effect of High School Football Season Impacts on Facemasks

Mentors: Gregory Batt and Andrea Fisher, Food, Nutrition & Packaging Sciences

Students: Andrea Longacre, Aaron Mantia, Amanda Sall

Football has been around since the late 1800's, and even though about five million athletes play football in the U.S., football facemasks have yet to be tested individually. By working with nine players on a local high school football team, we sought to answer the question: does a season of on-field high school football impacts produce a measurable difference in facemask stiffness and its ability to absorb energy? To answer this, we executed two novel tests developed at Clemson University on two groups of facemasks (control group and field group). The first test was a stiffness test, which measured facemask stiffness before and after a season of play. The second test was a destructive dynamic test, which analyzed the facemasks' ability to absorb energy. In addition, video analysis was used to quantify the number and types of impacts facemasks sustain during a season. Based on stiffness testing results, a measurable difference in facemask stiffness was observed due to one season of use.

POSTER #25

Fighting Back: Antibiotic Resistance in Student Athletic Facilities

Mentors: Xiuping Jiang and Caren Mccollum Food, Nutrition & Packaging Sciences

Students: Amber Baker, Nykira Sutton

As human beings living in such an advanced day and age, the only true threat to civilization besides ourselves is microscopic. With the invention and advancement of new ways to battle microorganisms, such as antibiotics, even this problem has a solution. However, the problem that is being faced now is microbial resistance to these antibiotics. As time goes on, bacteria become a lot more crafty in how they

evade the effects of antibiotics which could pose a potential problem in the future. The purpose of this creative inquiry study to determine whether there are antibiotic resistant bacteria in the campuses fitness facility and if so then what bacteria are there. To determine this, different locations were swabbed at two different fitness facilities (Fike and Lightsey Gym) and then the samples were streaked on plates containing Tetracycline and Methicillin. At lightsey we took samples from 10 different locations. From the 10 samples, it was determined that 7 out of 10 locations swabbed had some form of antibiotic resistant bacteria present. These 7 locations include the fan, a free weight grip, treadmill buttons, the gym floor, the outside of the clorox container, and a rusty free weight grip; these locations had the highest CFU/mL out of all the locations. Out of these 7 locations, a vast majority of bacteria grew vigorously on methicillin plates. Finding from our study as a whole could help determine how officials approach their cleaning methods in these facilities considering the fact they are constantly in use.

POSTER #26

Keep Calm and Parent on: Gender Differences in Parent Stress

Mentors: Sarah Sanborn and Jennifer Bisson, Psychology

Students: Anne Burger, Danesha Dennis, Logan Denny, Madeline Huffman

In the past, caregiving studies have rarely included fathers. This study is one of the first to explore differences in parental perception between fathers and mothers. As part of a larger study on parent-infant attachment, parents (n = 236; 209 female, 27 male) of infants 12-months of age or younger completed an online survey regarding their attachment to their child, parental stress, infant temperament, and parenting confidence. Results showed that mothers (M = 28.85, SD = .60) reported significantly higher levels of parent distress compared to fathers (M = 23.96, SD = 1.63), $t(235) = 2.70$, $p = .008$. However, there were no significant gender differences in parental perceptions of infant temperament, $p > .05$. The cause of this higher stress in mothers thus does not seem to stem from the child; further analyses will be done to better understand this disconnect. Initial analyses of open-ended questions posed to parents on the challenges relating to the birth of their child indicate that mothers more frequently discussed physical postnatal challenges, whereas fathers listed job-related challenges. Results from this study can be used to modify parents' expectations about the transition to parenthood, enhance the parent-child relationship, and provide new information that could be useful in the reduction of parental distress.

POSTER #27

Unpacking the Movie Magic: an Analysis of PBIS Films from 2015-2019

Mentor: Shanna Hirsch, Education & Human Development

Co-Author: Sharon Walters

Students: Abigail Baytes, Cierra Black, Madison Pesicka, Emily Pilot

Positive behavior interventions and supports (PBIS) is a proactive framework designed to support student behavior. Over the course of the past decade, schools have adopted videos as a medium to support their instruction. However little is known about the specific content of such videos. The purpose of this project is to analyze five years of PBIS films. We will present information related to the content and quality of PBIS Films.

POSTER #28

Ready Retail Robots! Two Studies Examining the Influence of Frontline Robots on Retail Consumption Behaviors

Mentor: Michael Giebelhausen, Marketing

Students: Shane Dunlavey, Emily Garrett, Dave Geyer, Emory Heffron, Kaylee Lindsey, Amy Lucisano, Grace Mcglynn

Unlike "back-of-house" manufacturing robots, frontline service robots and artificial intelligence entities are designed to interact with the end consumer. The goal of these two studies is to better understand how that interaction impacts consumption behaviors and satisfaction with the service experience. On this poster we describe two studies being conducted in partnership with the Sunoco Institute's CUshop. In Study 1, participants are asked to solicit a robot's opinion during a simulated retail shopping experience. That feedback is presented either as the robot's personal opinion or the result of a mathematical algorithm. Key outcomes of interest include whether or not the participant takes the recommendation of the robot – and how they evaluate the robot depending on whether or not its preference matched their own. In Study 2, participants are asked to view a robot that is ostensibly designed to pick delicate items (e.g., fresh fruit or small bags of chips) from store shelves and place those items in bags for a curbside grocery pickup. The goal of this study is to see if the robot's behavior (e.g., selecting an apple vs. chips) will influence participant's perceptions of social norms and, thus, nudge their own choice of an apple or chips to align with those norms. Reactance, an individual difference variable measuring the extent to which individuals "resist the attempts of others to influence me" are also considered.

POSTER #29

Using Acoustic Telemetry to Study Homing Behavior in Juvenile Caribbean Spiny Lobsters
Mentor: Michael Childress, Biological Sciences
Student: Shelly Mccomb

Caribbean spiny lobsters are one of the most important commercial fisheries. However, the sudden loss of sponges and corals have dramatically changed the availability of crevice shelters essential to their survival. Here we describe an acoustic telemetry study to ascertain measures of homing behavior, den fidelity, and daily home range size for juvenile lobsters. Our study focused on a set of nearshore coral patch reefs in the middle Florida Keys with an array of 32 Vemco VR2 receivers placed in a hexagonal grid pattern. Juvenile lobsters were captured, tagged, and released after being displaced 0m (control), 75m (short) or 125m (long) from their point of capture. Displaced lobsters show a clear pattern of orientation and distance traveled in a fashion that would indicate homing to a familiar reef. However, lobsters handled, but not displaced, and lobsters displaced after disorientation, showed random movements with respect to initial point of capture. These results suggest that lobsters have the ability to home toward familiar reefs, but that this homing can also be disrupted by physical and/or geomagnetic disturbances.

POSTER #30

The Effect of Low Dose Radiation on Human Aortic Smooth Muscle Cells
Mentors: Endre Takacs, Physics & Astronomy, Delphine Dean, Bioengineering
Co-Author: Aniqa Chowdhury
Students: Kelvin Aduma, Riley Garvey, Megan Hill, Rebecca Keller, Chris Petty, Andrew Rifkin, Justin Napolitano

The Clemson Radiation CI is a multidisciplinary team containing bioengineering, biosystems engineering, genetics, biochemistry, and physics majors. Our recent research has focused on using x-rays at varying doses and dose rates to irradiate Vascular Smooth Muscle Cells. Our hypothesis is that the rate at which you dose cells with ionizing radiation has an impact on how they react to that dose. To determine this, we measured cellular proliferation that correlates to the number of cells present. We also performed other assays including Live-Dead, real time polymerase chain reaction, and immunofluorescence to determine if other aspects of the cell phenotype are impacted. The results of our experiments have so far indicate that these cells do respond differently to different x-ray dose rates. Our results could have broad implication. Everyone experiences some radiation through normal exposure

routes, such as CT scans and X-rays, which are common and assumed safe. Our goal is to not only learn what these tests do to human cells, but if there is a way to improve these tests to be safer for those who receive them.

POSTER #31

Advancing Public Awareness and Education of Alligator Ecology in South Carolina
Mentors: Cathy Jachowski and Anje Kidd-Weaver, Forestry & Environmental Conservation
Students: Anastasia Chardt, Colleen Goff, Lexi Greulich, Tristan Lowe, Carissa Tice

American alligators (*Alligator mississippiensis*) are large, predators, that depend on freshwater habitats. Alligators often live in close proximity to humans because residential areas and golf courses offer a reliable source of freshwater. Often, these alligators become overly habituated humans and rarely move away when approached. While alligator attacks are extremely rare, humans living near habituated alligators can develop a false sense of security and may be more likely to engage in illegal behaviors, such as feeding alligators, that lead to dangerous human-alligator interactions. We are developing a website to advance the public's understanding of alligator ecology and the implications of human behavior around alligators. Our website will highlight alligator biology, results from ongoing alligator research, and tips for avoiding dangerous alligator encounters. This resource will simultaneously increase public safety and promote alligator conservation through public education.

POSTER #32

Overcoming Database Barriers to Successful Citizen Science Programs
Mentors: Melissa Heintz and Christie Sampson, Biological Sciences
Students: Gary Grear, Alyssa Taylor

Nearly 2 million people become involved with citizen science projects every year. Citizen science engages adolescents and adults without formal qualifications in research science outside of academia. One of the biggest barriers to citizen science is inaccurate recording or inputting of observations and data into the database. In response, we developed an activity to familiarize participants using the South Carolina Adopt-A-Stream program with the website and database system. The activity itself functions to walk the user through the basics of the South Carolina Adopt-A-Stream database. This database houses data relevant to numerous streams across the state. The questions for the activity are designed to encompass a wide range of the features of the database to give a general overview for the user. We then examined the efficacy of this scavenger hunt activity to facilitate active engagement in the process of scientific learning and critical thinking. To do so, a survey was administered to determine if the user can accomplish the guided activities on their own without instruction. By accomplishing tasks such as analyzing different watersheds or identifying trends in water quality parameters of the stream, the learner developed skills that they can then apply for their own data collection and analysis. Results of preliminary implementation (n=50) indicate that users' level of comfort and understanding of the database increased following the activity. Users were successfully capable of interpreting and finding information without guidance following participation in the activity.

POSTER #33

Observations of Anatomical Elements of Shell Repair in the Eastern Oyster, *Crassostrea virginica*
Mentor: Andrew Mount, Biological Sciences
Students: Michael Groce, Nicole Hickman, Jonathan Stewart

Crassostrea virginica, commonly termed the Eastern Oyster, has been the target of many studies. However, the processes surrounding tissue damage and repair are still the subject of active research and the true mechanisms are still unknown. Current hypothesis places hemocytes at the center of this process. In this study, we notched shells of *C. virginica* in order to instigate the shell repair process via

detailed anatomical observations of the mantle. Using time lapse imaging, this process was observed at 10X magnification, with images taken every 30 seconds over the course of six days using a custom Python script. Mantle tissue samples were then extracted from the specimen and fixed using an 8% paraformaldehyde solution, allowing samples of mantle tissue to be removed before undergoing critical point drying (CPD). Imaging these samples through Scanning Electron Microscopy has provided unique insights into the minutia of the shell repair process, specifically, hemocyte ingression and the presence of many fibrous elements. Thus, increasing the understand of the mechanisms of shell formation used by oysters.

POSTER #34

Healthy Body, Healthy Mind: Diet, Sleep, and Exercise Associated with Mental Health and Enthusiasm in College Students

Mentor: June Pilcher, Psychology

Students: Arya Soman, Jacob Spencer, Taylor Whaley

The purpose of this study was to determine if college student's sleep, physical activity levels, and diet have an impact on subjective mental health and enjoyment over the course of an academic year. A study of forty-six students at Clemson University mean age 19.8, SD = .707, answered a set of identical surveys five months apart. Survey sessions took 20 minutes and included surveys about exercise, sleep, and nutrition. Results indicated a decline in mental health and enthusiasm to get things done throughout the academic year. There were positive correlations between subjective mental health and physical activity, sleep quality, and fruit and vegetable consumption. Physical activity was also positively correlated with subjective enthusiasm to get things done. These results suggest that getting good sleep, regular exercise, and eating a healthy diet can improve mental health in college students.

POSTER #35

Developing Standard Operating Procedures for the Artec Eva 3D Scanner

Mentor: Todd Schweisinger, Mechanical Engineering

Students: Matthew Samstag, Jonathan Baum, Jared Gaidjunas, Persia Ghotbi-Taheri, Mackinzie Hills

The primary objective of the Clemson University Makerspace Creative Inquiry was to develop a set of standard operating procedures that instructs individuals how to operate a 3D scanner. The biggest challenge in this goal was to design these instructions in a manner that clearly communicates how to operate the 3D scanner to an inexperienced user. To meet the goals of the Makerspace Creative Inquiry, we created a field guide for the 3D scanner. This tangible document was created so that students with no prior background in 3D scanning or modeling could begin operating the Artec Eva in a matter of minutes. Designing this document involved critically thinking of ways to translate complicated technical language to everyday language that is more inviting for students to read. To promote student use of our 3D scanner, we are scanning and 3D printing recognizable landmarks around Clemson's campus. These scans include a member of the Clemson University marching band in full uniform, as well as the prominent tiger statues located near Clemson's football stadium. It is our hope that all interested Clemson students, not just those in engineering or computer majors, would begin to use the scanner for whatever applications they may have. Our team envisions more ways to utilize our 3D scanner ranging from analyzing hail damage on a vehicle to scanning human body parts for medical applications.

POSTER #36

Effects of Vehicles on African Wildlife Activity and Behavior

Mentors: David Jachowski and Laura Gigliotti, Forestry & Environmental Conservation

Students: Kayla Goodman, Kara Rhodes, Sarah Stewart, Martha Stowasser, Zoey Chapman

As urbanization and human development increase across the globe, it is necessary to understand how these changes affect the ecology and behavior of wildlife. In particular, increased vehicle activity may

influence the behavior of wildlife, particularly in areas such as Africa, where tourism is centered around wildlife-viewing from vehicles. Our objective was to quantify impacts of vehicle activity on the activity patterns of mammals in Phinda Private Game Reserve in South Africa. We collected data from 76 camera traps, which were placed on roads and game trails, between August 7, 2018 and October 22, 2018 and identified species or the presence of vehicles in the photos. We calculated a coefficient of overlap between the activity patterns of all species and vehicles, and used generalized linear models to determine if vehicle use intensity affected the nocturnality of species. We found that several species such as red duiker and impala had activity patterns with high degrees of overlap with vehicles, but that vehicle use intensity did not affect nocturality. Our results suggest the importance of continuing to research how vehicles might be affecting wildlife.

POSTER #37

Atmospheric Carbon Dioxide Flux Perturbations Resulting from Clemson University Football Games
Mentor: Scott E Brame, Environmental Engineering & Earth Sciences
Student: Gerald Proctor

The impact of the influx of 80,000+ attendees for a Clemson football game on carbon dioxide fluxes for a small college town was investigated. The eddy covariance (EC) method was used to quantify exchanges of carbon dioxide and water vapor between the ground and the atmosphere. The Clemson EC tower was placed within a quarter mile of Clemson Memorial Stadium. Atmospheric fluxes were measured during multiple home games throughout the fall of 2018. Data was collected the day before and after the game as well as on game day. The night game hosted at 7 PM on 11/17/18 showed atmospheric CO2 fluxes increased from near 0 µmol m2 s-1 throughout the day to over 30 µmol m2 s-1 in the hour leading up to the game. This was followed by a sharp drop in flux during the game. The flux then peaked back to 30 µmol m2 s-1 right after the game was over. On the game hosted at noon on 11/04/18 a flux of near 0 µmol m2 s-1 was recorded throughout the day until a peak of 25 µmol m-2 s-1 was reported right after the game was over. These extreme shifts in atmospheric CO2 flux were attributed to tailgating and movement toward the stadium as the game was about to begin and then movement away from the stadium after the game ended.

POSTER #38

Stories of Mothers with Addiction and Recovery: A Qualitative Study
Mentors: Heide Temples and Mary Wright, School of Nursing
Students: Olivia Chafe, Kelly Edwards, Jacob Estrada, Emily Guthrie, Colton Hunter, Elizabeth Johnson, Rebekah Lannamann, Carla M Lautenschlager, Haley McKee, Danny Rafalski, Jennifer Rumsey, Brooks Woody, Lauren Drum, Emily Shores, Molly Yost

There is a stigma of being a mother with a substance use disorder that acts as a barrier to care. The purpose of the study is to understand the maternal experience of substance exposure during pregnancy and raising a family, to better inform service delivery to affected families. The qualitative story design used Nursing as Caring & Bronfenbrenner's Social Ecologic Systems Theory as the theoretical framework. Eleven mothers were recruited from recovery centers, participated in telling their story of substance use and recovery via phone. The stories were analyzed using narrative inquiry and the Atlas.ti program. The primary themes for addiction were abuse, inconsistency in life, guilt, shame and lack of social support systems. The themes for recovery were empowerment, environmental influences, and children as a motivator for recovery. The value of this research is to understand the underlying themes for addiction, identify barriers for recovery and improve service delivery to families.

POSTER #39

Unraveling the Mystery of the Rare Rocky Shoals Spider Lily

Mentors: Althea Hagan, Forestry & Environmental Conservation, William C Stringer, Entomology, Soils & Plant Sciences

Students: Hannah Jellema, Kailey Schafer

Hymenocallis coronaria (Rocky Shoals Spider Lily) is a threatened species endemic to Georgia, Alabama, and South Carolina. The purpose of this research is to study two existing populations of Rocky Shoals Spider Lily along Stevens Creek in McCormick, South Carolina. One of the populations is healthy and thriving while the other has decreased in extent and vigor over the last 20 years. Following South Carolina's Adopt-A-Stream water quality testing protocol, information on the quality of water was collected at both sites. Soil samples were also taken to determine if there were any nutrient deficiencies in the soil. Data on hypothesized herbivory impacts was collected by placing a game camera at each site. The goal of the project is to identify the driver of the reduction of extent and vigor in the Rocky Shoals Spider Lily population by comparing it to the healthy population. We hypothesize that one or more of the following variables: herbivory, water quality, or soil properties are driving the decline in Rocky Shoals Spider Lily on Stevens Creek. Identifying the reason for the stunted growth could help determine the environmental parameters needed for a healthy population. In the future we hope to identify new sites to plant Rocky Shoals Spider Lily based on the parameters identified in this research.

POSTER #40

Supporting Cognitive Stimulation and Social Engagement among Persons with Alzheimer's Disease

Mentors: Cheryl J Dye and Caitlin Torrence, Public Health Sciences

Students: Mariah Adler, Bethany Ghent, Claudia Li, Logan Martin, Jamie Plummer, Hannah Mcgrew

This CI led to the grand opening of the IEA Brain Health Club in September of 2018. In a community setting, the Brain Health Club provides cognitively stimulating programming and intergenerational socialization to persons with Alzheimer's disease and related dementias. After receiving dementia capable training, students developed and implemented activities to promote cognitive stimulation and social engagement at the Brain Health Club. Students assessed participant engagement using the Cincinnati Observation Checklist. Activities were delivered through a Montessori theoretical framework to foster participant choice and autonomy. This was assessed by students using the Cohen-Mansfield Agitation Scale. Using the data, students analyzed the effectiveness of activities to support continued program improvement and quality. The results show the activities were well-received by participants. Overwhelmingly, participants appeared interested and engaged. Further, caregivers commented that their loved one's were excited and eager to attend.

POSTER #41

Optimization of Gene Editing Tools for Precise Gene Editing

Mentors: Renee Cottle and Lawrence Fernando, Bioengineering

Students: Ethan Addlestone, Gabriel Nadolski, Kienan Salvadore

A major challenge impeding the therapeutic application of CRISPR-Cas9 nucleases is the absence of studies on how to design simple yet effective homologous donor templates for gene targeting in clinically relevant cell types. The objective of this study is to develop critical design rules for making donor templates that provide high gene targeting rates in hepatocytes. In preliminary studies, we observed detectable levels of HDR-mediated gene modification in the Hepa 1-6 cell line nucleofected with Hpd-aiming CRISPR-Cas9 along with a linear double stranded donor template. In contrast, we observed lower HDR for the same donor sequence as a plasmid DNA. Ongoing work focuses on determining the minimum homology arm lengths needed in the donor template to obtain high levels of HDR in the Hepa 1-6 cells line and primary hepatocytes.

POSTER #42

Global Health Design

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

Co-Authors: Julia Harrison, Zachary Hargett

Students: Byron Byars, Kyle Cannon, Maren Downing, Maggie Elpers, Benjamin Hargett, Mara Hartsell, Azrin Jamison, Taya Lee, Mark Livingstone, Zoey Morton, Kaleigh Neely, Hayden Pagendarm, Habib Rafka, Taylor Ryan, Jason Shaffer, Garrett Springer, Rachael Staino, Alex Tedeschi

The overall goal for our Creative Inquiry project is to design or develop medical devices for developing countries. We have many teams working on different projects. One project is working on designing a cup for dysphagia while allowing the chin to be tucked and allow a controlled flow from the cup to avoid spills. Another is designing a urinalysis test to allow doctors to know more about the effectiveness of Antiretroviral Drugs in their patients which is prescribed for patients with HIV/AIDS. Another design, called the Kifua Pampu,is designing a filter incorporated into a breast pump to inactivate HIV in breast milk and reduce mother to child transmission. Additionally, a team is aiming to develop a novel, rapid results tuberculosis detection device using biomarkers present in TB positive urine. Also, a team is focusing on using ECG signals to detect arrhythmias. Finally, a couple of teams have begun working on umbilical cord care and the reprocessing on single-use devices.

POSTER #43

Does Family Size Make a Difference for Parental Income's Relationship to One's Conscientiousness?

Mentor: Joseph Ligato and Fred S Switzer III, Psychology

Students: Macy Morrow, Alden Parker

Conscientiousness has been the Big 5 trait linked closest with academic success (Richardson, 2009). Conscientious people are characterized as being hardworking and are predicted to outperform people who score low on this factor in academic domains (Costa and McCrae, 1982). Additionally, parental educational achievement has been linked to student continuation in school and the pursuit of future educational achievement (Hao, Bonstead-Bruns 1998). Further, research also shows that in low-income families and areas, (low educational levels), 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 as well (Okapala, et al. 2001). The parents with more financial ability have more opportunities to give to their offspring that are beyond the ability of less wealthy parents such as private schools, better technology and tutors (Rindermann & Baumeister, 2015). However, as income has been established to play a role in academic settings, the variable of family size has been shown in previous literature to affect income level per capita, thus affecting academic success (Lazear & Michael, 1981). In a previous study, we found a positive correlation between parental income and parental education level and academic conscientiousness (R^2=.053, p=.007). In the present study, it was hypothesized that caregiver education, income and the interaction will be positively related to academic conscientiousness, specifically that the moderated relationship of parental income between parental education and academic conscientiousness would be moderated by family size.

POSTER #44

Color-Coding Organization Scheme to Improve Hospital Stockrooms

Mentor: Hannah Cash and Delphine Dean, Bioengineering

Students: Ellen Colborn, Serena Gilmore, Taylor Seawell

The primary goal of the "Engineering for Modern Healthcare" project is to cater to the need for a more effective method for obtaining and documenting healthcare items. More importantly, we have taken into account cost-effectiveness while considering various solutions. By cutting down on time spent looking for items, hospital staff will have more time to properly document these items and focus on

patient care. Currently, we have teamed with local hospitals to create a balance in providing exceptional healthcare in an adequate amount of time by interviewing clinicians, nurses, and other staff members in order to gain a better understanding of current practices. Receiving advice from first-hand users and having access to the actual stockrooms has allowed our team to further analyze current methods and identify areas in need of improvement. Ultimately, by utilizing a more organized method of color-coding items, the time spent searching for items in stockrooms can be cut significantly.

POSTER #45

Infrastructure

Mentor: Jennifer Ogle, Civil Engineering

Co-Authors: Matthew Peterson, Jeffrey Nabozna, Kevin Halliday

Students: Aidan Powers, Caroline Marshall, Joseph Gunst, Yen Vo, Samuel Zhou, Isaiah Del Campbell

The Transportation Infrastructure Group of Engage was tasked with the Sulfur Springs and water quality of natural bodies of water in Dominica. The Sulfur Springs Project aims to create a tourist attraction located upstream of the city of Soufrière, Dominica. The project split into separate groups specializing in concrete pavement, marketing, botanical, and water channel research in order to tackle the project's multiple challenges The second project includes water quality research of natural bodies of water in Dominica. This project is focused on identifying harmful toxins and bacteria in various natural streams and pools of Dominica. This data will be used to identify solutions for clean water in Dominica. Furthermore, the group is designing a portable incubator to bring to Dominica in order to effectively preserve samples effectively. This Spring, Engage is taking a trip to Dominica in order to collect data for our projects and provide community service to the people of Dominica.

POSTER #46

Produce Rx

Mentor: Margaret Condrasky, Food, Nutrition & Packaging Sciences

Students: Javin Goodine, Christian Krantz, Violet Kryshak, Amber Martinez, Lindsey Messick, Haley Newton, Ashley Oneill, Alexis Ott, Aaron Price, Andrew Rast, Lily Shackleford, Matt Yeates

Produce Rx has focused on improving the diabetic symptoms of eight clients by introducing produce into their diet daily. Produce Rx gathers fresh produce from the student organic farm every week. Students arrive to weigh out and collect four shares of produce for the clients. The produce picked up varies on the season which has included sweet peppers, radishes, okra, eggplant, sweet potatoes, arugula, kale and other greens. The produce batches are then transported to the Clemson Free Clinic and distributed to four of the eight diabetic clients every week as the clients alternate pick-up weeks. These program participants are below the poverty line, uninsured, and some are employed at fast food restaurants, child care and other areas. Given the clients' occupations, their availability to fresh healthy foods may be limited. Since the beginning of August, every 3 months the clients' hemoglobin A1C levels have been measured by the doctor in the free clinic. This program has given students the chance to apply their classroom knowledge to communicating with clients, evaluating the clients use of the produce, and handling fresh produce. Additionally, the clients benefit by learning to expand their diet to delicious, healthy options they may have never considered previously. This semester, on April 7th, the Produce Rx team is hosting an event at the student organic farm for clients and their families to come together to share their newfound knowledge of healthy dishes.

POSTER #47

Design and Evaluation of a Melting Pot: Culture and Cuisine Summit

Mentor: Margaret Condrasky, Food, Nutrition & Packaging Sciences

Students: Caroline Brookshire, Angie Castillo, Carly Duffy, Amy Grace Funcik, Ashley Garwatoski, Carlie Lewis, Amber Martinez, Toney Nesbitt, Genna Pesce

Program design, recipe testing, and practice of teaching techniques has taken this team to a new level of cooking confidence, and in the practice of nutrition education strategy. The team created a professional agenda to assist in teaching (n=30) 4-H high school students in the Culture and Cuisine of five ethnic menus for 'The Melting Pot' Healthy Habits Summit. At the summit held in Chapin, SC in January 2019 the team shared the recipes, power points, and activities for the high school students to use in facilitation of summer cooking camps for children ages 9 to 14 years planned in their 10 home counties in SC. A pre and post knowledge and confidence in cooking techniques questionnaire was administered to the Summit participants. Preliminary data review indicates that an increased confidence in stir-frying, saute work, and knife skills was recognized at the summit.

POSTER #48

Longleaf Pine Groundcover Restoration in the Wiregrass Gap: Seed Source, is Local Best?

Mentors: Althea Hagan, Forestry & Environmental Conservation, Joan L Walker, Plant & Environmental Sciences

Co-Author: Elizabeth Johnson

Students: Rosa Kome, Christopher Scercy

Historically, the longleaf pine ecosystem once covered over 90 million acres across the Southeastern United States. The Historic Camden Foundation recently acquired 476 acres of mixed-use forestry land that they wish to convert back to its historic longleaf pine condition. This is in part driven by their interest in reenacting Revolutionary War Battles on the actual sites where they were fought. This project is interesting because the site is located in a unique portion of the state known as the "Wiregrass Gap". For reasons unknown, this area of the state does not have the typical longleaf understory of wiregrass (Aristida stricata) found across most of this ecosystem's historic range. Instead, the understory of Camden Battlefield is mostly little bluestem (Schizachyrium scoparium). Our project looked into the germination rates of different seed sources of little bluestem, a factor that may enhance or inhibit the seeds' ability to properly establish if used to restore the site. We utilized five sources, three from professional seed producers (Roundstone, TX, NRCS Pinehill and NRCS Coastal, NC) and two collected from local sites (Camden Battlefield and Fort Jackson, SC). We recorded germination dates and rates for each of the seed sources to help determine which source is best suited for restoring the site. The next step is to use the result from the germination trial to set up a site preparation study at the battlefield site.

POSTER #49

Clemson Biodiesel Creative Inquiry

Mentors: Jazmine Taylor, Rui Xiao, and Terry Walker, Environmental Engineering & Earth Sciences, David Haines, Univ Facilities: Recycling Services

Students: Elena Miyasato, Carrington Moore, Evan Patrohay, Jacob Simmons, Nicholas Tuttle, Natalie Whitaker, Tiffany Yeung, Clara Zhuo

The 40-gallon Clemson Biodiesel pilot plant was created in 2014 and is housed within a portable trailer currently docked at the Cherry Crossing composting facility. Here, the Creative Inquiry team learned how to create diesel engine-compatible fuel derived from local cooking oil. In the Clemson plant, this cooking oil is mixed with methanol and potassium hydroxide to produce golden-colored biodiesel and the richly dark by-product glycerol via transesterification. The fuel and glycerol is gravity-filtered, and

the former is pumped out, cleaned, and filtered. Alongside this process students learned how to ensure that the fuel is up to industry standards by conducting four specific tests: the Sandy-Brae for water content, an acid level Titration to determine necessary amounts of reactants, a "27/3" test for reaction completion, and a "50/50" test to ensure purity. Furthermore, students learned the costs and benefits of biodiesel fuel as compared to normal diesel, as well as the ways this eco-friendly fuel can help bring Clemson University and the local community towards carbon neutrality.

POSTER #50

Clemson Smart & Savvy Students- Brain Tips

Mentor: June Pilcher, Psychology

Students: Keri Barker, Abbey Knox, Emily Koger, Taylor Whaley, Stephanie Six

As a team, our focus is to use social media as an outreach platform. Our goal is to provide our followers with credible, interesting, and helpful daily tips. We sift through scientific articles and chose topics that are compelling and best suited for our followers. These can be articles regarding daily health, the impact of technology, social relationships, studying tips, and more. The tips are posted daily to the Clemson Smart & Savvy Students Facebook, Instagram, and Twitter. We create our social media posts by summarizing the articles and adding photos that will catch the readers eye. Recently, the use of hashtags has helped widen our reach and attract more viewers to our pages. We aim to equip our followers with some of the brain's own tools for success in all areas of life.

POSTER #51

Evaluation of Swine Mammary Glands: a Model for Development, Cancer and Environmental Cues

Mentors: Heather Dunn, Animal & Veterinary Sciences

Co-Author: Matt Moss

Students: Paula Lewis, Hannah Oswalt, Shelby Smith, Amber Stone, Greig Vaughan, Brooke Redmond, Sabrina Carrel

Triple negative breast cancer (TNBC) is one subtype of breast cancer associated with aggressive metastasis, high mortality, and poor outcomes. TNBC has been implicated in stem-like activity similar to signaling mechanisms found in the pre-pubertal mammary gland. The objective of this study was to evaluate the genetic expression of swine mammary glands to provide insight for normal growth and development and to increase knowledge of cellular signaling in some breast cancers including TNBC. The swine model has been identified in studies due to the biochemical, genetic, and physiological similarities to humans. Swine mammary tissue was collected using fine needle biopsy techniques from newborn pigs through day 40. RNAseq gene expression analysis was performed using an alignment to the SusScrofa11.1 reference genome assembly. Comparing gene expression to dbEMT, heirarchial euclidian distance based clustering indicated early and late clusters based on gene expression profiles. Morphological and immunohistochemical analysis of developing mammary tissue from young swine indicated ductal outgrowths for the later time points.

POSTER #52

Stop the Clock Because I Can't Stop: Time Pressure, but not Monitoring Pressure, Impairs Response Inhibition Performance

Mentor: Kaileigh Byrne, Psychology

Students: Njisane Adesegun, Stephanie Six, Danesha Dennis

Previous research suggests that psychological pressure can exert detrimental effects on cognitive tasks that depend on attentional control. However, the effect of psychological pressure on inhibitory cognitive processes has been relatively overlooked. Consequently, the goal of this study was to examine the effect of psychological pressure on response inhibition performance. In Experiment 1, participants (N = 125)

were assigned to either a time pressure condition in which a monetary bonus could be earned depending on one's time-constrained performance or a control condition. Participants (N = 149) in Experiment 2 were assigned to either an explicit monitoring pressure condition in which their performance was video-recorded or a control condition. Participants in both experiments completed the Stop Signal Task to assess response inhibition performance. The results demonstrate that time pressure, but not explicit monitoring pressure, significantly impairs stop signal accuracy. These findings are in line with the distraction theory of performance pressure. Time pressure leads individuals to prioritize speed over inhibitory accuracy--responses are fast, but inhibition suffers.

POSTER #53

Finding Your Voice: An Outdoor Recreation Camp for Girls

Mentors: Denise Anderson, Parks Recreation & Tourism Mgt, Alexsandra Dubin, PRTM Leisure Skills

Students: Kayleigh Beecher, Jenna Bradfute, Haley Daniel, Charis Dorman, Skylar Hayes, Sydney Mandrgoc, Taylor Moore, Jenna Moosey, Darcy Roberts, Carsyn Saverance, Kirby Self, Talina Van Overeem, Kelsey Wallace

Individuals who are highly physically active are more likely to have a 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 to develop their sense of self-esteem and body image. Women who participate in recreation report becoming empowered to engage in a wider variety of activities (McNiel, Harris, Fondren 2012). However, little is known about the effects of outdoor recreation education on adolescent girls. The purpose of this research is to understand how participating in Finding Your Voice influences body esteem and physical activity self-efficacy. Preliminary data suggests this camp positively influences those who attend, however since camp will be held April 5th through April 7th, 2019, there is not yet data from this year regarding the efficacy of camp.

POSTER #54

Controlling Callery Pear (*Pyrus calleryana*) with Prescribed Fire: Ecological and Management Considerations

Mentor: Donald Hagan, Forestry & Environmental Conservation

Students: Jonathan Anderson, Patrick Christ, Richard Drose, Caroline Sharpe, Robert Sparks, Brian Tate, Brayden Williams

Callery Pear (*Pyrus calleryana*), an invasive tree native to Asia, is an emerging threat to forest ecosystems across the southeast. In this study, we explore the use of prescribed fire as a management tool for controlling this problematic invader. We address this topic from multiple angles, with experiments designed to answer questions such as: How does *P. calleryana* modify the forest floor fuelbed, and how might this influence the probability of ignition? At what point is *P. calleryana* too big to be killed by prescribed fire? Does prescribed fire kill P. calleryana seeds? And, how long does it take for burned *P. calleryana* twigs to decompose to the point that their thorns can no longer puncture the tires of forestry vehicles. Here we present a project overview, along with preliminary results.

POSTER #55

Overstory and Understory Responses to Severe Wildfire in the Southern Appalachian Mountains

Mentor: Donald Hagan, Forestry & Environmental Conservation

Co-Author: Matt Vaughan

Students: Richard Drose, Caroline Sharpe, Brian Tate, Hannah Bailey, Christopher Williamson

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 how overstory trees and understory vegetation respond over time to severe wildfire. To answer these questions, monitoring plots have been established to collect information on the size, composition and health of vegetation 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. Here we present preliminary findings, 2 years post-fire.

POSTER #56

Primary School

Mentor: Jennifer Ogle, Civil Engineering

Students: Jacob Bauer, Trevor Guynup, Sydney Langley, Derek Kosydar, Arghya Samantaray

In the Fall of 2018 the main objectives of the Soufrière Primary School Division were to design and build a chicken coop in Dominica, implement a garden near the primary school, and incorporate STEM education and activities within the primary school. The team successfully created design plans and a cost analysis for the construction a chicken coop in Dominica. Design plans were also created for a potential new primary school along with an estimated building cost. Research was completed on the import and export controls on soil samples for further testing an analysis. In the future, the team has plans to successfully import soils from Dominica for testing, build a bridge to easily cross a ditch outside of the primary school, and create a manual to describe the caretaking of chickens and the collection of eggs.

POSTER #57

Constructing Neural Circuits: an Integrated Optical Tweezer Microelectrode Array System for Directing the Axonal Cytoskeleton and Modulating Synaptic Strength

Mentors: Joshua Alper, Physics & Astronomy, Marshall Trout, Electrical & Computer Engineering

Students: Kimberly O'Brien, Rachel Eimen, Mackenna Judge, Devante Kee-Young, Dominic Marosok, Jacob Nikkila, Alexis Taylor

The effectiveness of computational metaphors for describing brain function has motivated models that promote the neuron as the fundamental functional unit of the brain, asserting that memory and cognition emerge from the spatial arrangement of neurons into networks. The evolution of such models has led to network models capable of mimicking limited forms of learning and intelligence while methods for manipulating and recording neural activity have become increasingly precise. Despite these developments, our only means of constructing neural circuits with single-cell resolution resort to physically confining the cells, compromising the very adaptability that underlies the learning mechanisms we seek to understand. To avoid this compromise, we developed an integrated optical tweezer microelectrode array system (MEA) that adjusts intracellular Ca2+ to reconfigure the axonal cytoskeleton to effectively direct the growth cone of live neurons. Moreover, the optical tweezer enables the precise arrangement of individual neurons onto the surface of an MEA, which permits the electrical excitation and recording of neural activity. This system will be used to relate the electrical and mechanical characteristics of optically-induced synapses to structural changes in the cytoskeletal components of the growth cone. Additionally, we will investigate changes in polymerization rate and density of post-synaptogenic actin to changes in intracellular Ca2+explored as a potential method for directly modulating synaptic strength.

POSTER #58

Testing if Coke Life has REAL Coke Taste?

Mentor: Paul Dawson, Food, Nutrition & Packaging Sciences

Students: Joleah Mccomb, Megan Johnson, Brooke Leech, Carrie Mattox, Katarina Williams, Matthew Suffern

The objective of this study was to test the advertising claim that Coke Life really has real Coke taste. In order to determine this we constructed a triangle test using 80 Clemson University students. This test was conducted using chilled Coke Life and Coke cans, which were poured, into cups immediately before being served to the testing groups. Each student participant completed a survey that recorded demographics information to determine if these factors affected the likelihood of a student correctly distinguishing between Coke and Coke Life. Although there was small evidence to show that people who drink soda regularly were more likely to identify the difference between Coke and Coke Life products there wasn't sufficient evidence that any demographic significantly affected whether or not an individual could correctly identify the difference between Coke and Coke Life products.

POSTER #59

Rivalries as Relational Schemas

Mentors: Scott Swain, Marketing, Oswald King, Languages

Students: Lucas Ball, Bailey Bottini, Tanner Dieterich, Connor Enright, Olivia Pescatore, James Ruddy, Brad Uscilla, Bailey Whetter, Cameron Zavaski

Individuals, teams, organizations, and even countries often find themselves competing with each other for the same valued resources or outcomes (e.g., parking spots, championships, market share, or territory). Over time, some parties choose to single out others as rivals. Our research examines social media conversations to explore the idea that rivalry can be distinguished from mere competition in the sense that rivals (more so than competitors) possess cognitive schemas that involve interconnected representations of the self, the target, the dyad, and a shared competitive history. Accordingly, individuals should view rivalries as more embedded in an ongoing narrative and as more consequential for perceptions of legacy, relative status, and self-worth. Further, since rivalries represent higher (socio-cognitive) stakes than mere competition, individuals should also be more likely to endorse performance- (versus process-) orientated stances and to pursue eager (versus cautious) strategies, including a greater propensity for "trash-talk" and unethical behavior.

POSTER #60

Nanotube Reinfoced Carbon Fiber Composites

Mentors: Garrett Pataky, Mechanical Engineering, Andrew Cannon, Chemical & Biomolecular Engineering

Students: Adam Wilkie, Andres Argenal, David Matthews

In this CI we are researching the mechanics of carbon fiber composites and how carbon fiber embedded with carbon nano-tubes will perform in stress and impact testing. The two forms of carbon fiber being compared are the control, IM-7, an aerospace grade carbon fiber manufactured by Hexcel, and the nano-stitch carbon fiber, manufactured by Hexcel with carbon nano-tubes added by N12 Technologies. Each carbon fiber sample is created using the manufacturer's recommended curing process. One sample takes around 4 hours to complete and the process involves vacuum sealing, hot pressing, and a 3 hour post-press cure in an oven at 390 degrees Fahrenheit. The samples are varied in how many plies of carbon fiber are used (between 8 and 12) and the orientation of the plies (uni-directional vs. quasi) to adjust the strength. Each sample will be subjected to a tensile test performed at Clemson University and a super-sonic impact test performed at NC State. For the tensile tests, we expect to see a 10-15% increase in the interlaminar strength of the N12 specimens when compared to the control specimens. For the impact testing, we expect the N12 to perform better than the control.

POSTER #61

El Serrano Bridge Replacement Project

Mentor: Mark A. Schlautman, Environmental Engineering & Earth Sciences

Students: Andres Argenal, Robert Gore, Nicholas Queen

The Clemson University student chapter of Engineers Without Borders is working to design and implement a pedestrian/motorcycle bridge in the town of El Serrano, Nicaragua. The project is currently in the design phase and we are working with a structural engineer to design the bridge. We will need to make another follow up assessment trip to gather the remaining data so that we can finalize the design, and can hopefully implement the new bridge in the summer of 2020. The project brings in all aspects of a construction design and build engineering project, but adds many new challenges associated with building in a very remote area of a developing country. Our team consists of roughly 20 students and two professional mentors.

POSTER #62

Survey and Interview Data of Parents of Children in a Low-income, Predominantly Hispanic Afterschool Program

Mentors: Karen A Kemper, Public Health Sciences

Co-Author: Brian Helsel

Students: Shellie Davis, Lucy Devaney, Violet Kryshak, Sophia Lamb, Rachel Reid, Kyle White, Rebekah Woodard

Our project, funded in part by the Department of Education 21st Century Community Learning Center Grant, examined healthy nutrition and physical activity practices to combat obesity and diabetes in predominantly Hispanic families in an afterschool program. We surveyed parents using two instruments: Family Nutrition and Physical Activity Survey and Finnish Type 2 Diabetes Risk Score. We also conducted 7 semi-structured face-to-face interviews with parents. Our surveys showed 30.6% of the 36 parents who participated are at moderate or high risk of developing diabetes and over 80% of them are overweight or obese. Preliminary analysis of our qualitative data suggests that parents recognize diabetes is a serious problem that can be prevented with healthy eating and exercise. Parents also indicated that challenges to getting satisfactory health care include lack of insurance, cost, and providers not speaking Spanish. In addition to our research, we implemented two Family Engagement Nights this year: one involved sharing our research findings with the families and the other providing healthy recipe demonstrations in partnership with Dr. Condrasky's "Cooking with the Chef" Creative Inquiry class. Our data confirm the need for health promotion and diabetes risk prevention in this community.

POSTER #63

Encapsulation and Delivery of Cas9 in Polymeric Nanoparticles

Mentor: Jessica Kelly, Chemical & Biomolecular Engineering

Students: Sara Edgecomb, Christopher Rovero

There are very limited treatments available for central nervous system disorders, although the global burden of these diseases is very high. Treatments are limited by the presence of the blood-brain barrier, which has been bypassed in felines with GM1 gangliosidosis by the Larsen Lab. We aim to expand and optimize this technology to the delivery of Cas9-base editors to neurons, which would have the potential to be therapeutic in a multitude of neurologic disorders. Our work is focused on the development of techniques to analyze the effectiveness of our Cas9 analogs to knock down fluorescence in an MCF10A cell line genetically altered to fluoresce green (CLOVER). We have established appropriate cell culture techniques, including fluorescence imaging. We have also encapsulated Cas9 into polymersomes, which will ultimately be compared to base-line Cas9 knockout data at various doses established through electroporation of Cas9 and guide RNA. The nanoparticle developed in this project is a platform of tunable components, with polymers already FDA approved that respond to various other stimuli and

encapsulate alternative large molecular weight proteinaceous cargos, that could be applied to treat a wide variety of disorders that warrant similar therapeutic gene editing.

POSTER #64

Clemson Engineering Without Borders in El Serrano, Nicaragua

Mentors: Mark A. Schlautman and Jerry Wylie, Environmental Engineering & Earth Sciences

Students: Bradley York, Nicholas Queen

The Clemson University student chapter of Engineers Without Borders has partnered with a rural community in Nicaragua called El Serrano. Throughout this partnership, we have assessed their drinking water system and infrastructure, designed a plan for improvement, and have implemented the first steps of the overall plan. The project plan includes designing and building a bridge, creating a new water supply source, and improving the current water purification system. Each week, we come closer to completing these goals while developing a relationship with the community of El Serrano. This project combines classroom engineering with real world problem solving.

POSTER #65

Alcohol and Other Drug Misuse among College Students

Mentors: Crystal Burnette and McKenzie McNamara, Student Health Center

Students: Audrey Atkinson, Christopher Baltimore, Rebecca Bonner, Ashlyn Chea, Katherine Giraldo Escobar, Braxton Howell, Marta Zwolski

The purpose of the Alcohol and Other Drugs Creative Inquiry is to research and aid in prevention of alcohol and other drug misuse among Clemson University students. The purpose of this project was to examine the effects of alcohol and other drug misuse on mental health and other health concerns among college students. Quantitative analyses of the National College Health Assessment (2010-2018) and the College Prescription Drug Study (2018) were conducted. Corresponding qualitative data was also collected through in-person interviews with current college students at Clemson University. The results were presented to directors of various campus organizations and departments. These findings help identify high-risk alcohol and other drug use among Clemson students and inform student programming and resource needs.

POSTER #66

Autonomous MAV Package Delivery for Urban Last Mile Project and Artificial Intelligence for Racecar Project

Mentor: Yiqiang Han, Mechanical Engineering

Co-Author: Wenjian Hao

Students: Phillip Do, Alexander Krolicki, Jae Eui Lee, Dhruval Patel, Nathan Witebsky, Curdin Gantenbein, Meg Nuttall, Jeremiah Ballard, Jamal Nasser, Nathaniel Powers, Steven Sheets, Duncan Nicholson, Tony Wang

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, emergency response, survey and patrolling, etc. Autonomous control of an Unmanned Air Vehicle for a package delivery mission is specifically considered in this project. Students in the first project will showcase their customized drone build and also the computer simulation environment for vision-based navigation model training. 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. The second project involves a technical display of a fully-autonomous 18th scale racecar finishing racing on a track. Guests can also try to control the racecar using a joystick and compete with the trained AI model.

POSTER #67

Physician Distraction in the Emergency Department

Mentor: Dotan Shvorin, Industrial Engineering

Students: Alexandra Smith, Sydney Hughes, Kayla Adkins

Within the chaos of the emergency department physicians can easily become distracted from their task at hand and in many cases produce unnecessary mistakes. In this project we have gained additional insight into the impact of different types of distractions that physicians encounter in the emergency department and have analyzed the impact of the quantified distractions. Through this process we have discovered how to minimize error in emergency medicine by creating relationships between physiological changes and distractions using EMOTIV technology. Thus improving the understanding of the discovered sources and repercussions.The EMOTIV technology measures eye movement, electroencephalogram (EEG), heart rate, temperature, Electrodermal Activity (EDA), and ACC.

A special thanks to the Clemson Creative Inquiry program and the Greenville Memorial hospital emergency department for their continued support through this entire project.

POSTER #68

Lionfish (*Pterois volitans*) as Biomonitoring Species for Oil Pollution Effects in Coral Reef Ecosystems

Mentor: Peter Van den Hurk, Biological Sciences

Students: Jacob Hahn, Ryan Davis, Shelly Mccomb, Elizabeth Rogers

With oil spills being a continuous threat to coral reef systems, the use of the invasive lionfish (*Pterois volitans*) might be a good option to monitor pollution effects in potentially exposed fish in the Caribbean and western Atlantic. Establishing the biological effects of environmental disasters like the Deep Horizon oil spill and the sinking of hundreds of boats in the Florida Keys during hurricane Irma could benefit from a standardized biomonitoring protocol using one fish species. The rapid expansion of lionfish in our coastal waters would make the lionfish a suitable candidate as biomonitoring species for oil pollution effects. However, so far very little has been published on the responses of lionfish to environmental pollutants. We collected lionfish in the Florida Keys a few weeks after hurricane Irma came through, and during the winter and early spring after that, and measured several biomarkers that are indicative for exposure to oil compounds. To establish if these biomarkers are actually inducible in oil exposed lionfish, we also performed a dosing experiment with several concentrations of crude oil. The results showed minimal to no effects in the biomarkers in the field collected fish, while the controlled exposure demonstrated that lionfish show strong effects in the biomarkers even at the lowest concentration tested (0.22 mg/l total PAHs). Based on its widespread distribution, relative ease of collection, and biomarker responses in the controlled dosing experiment, we conclude that lionfish has good potential to be used as a standardized biomonitoring species for oil pollution in its neotropical realm.

POSTER #69

Development of a Decision Support System for a Precision Wire Manufacturing Line

Mentors: David White and D. Hudson Smith, Watt Family Innovation Center

Students: Benjamin Hetherington, Javarrus Mickle, Jess Lloyd, Jacob Waldrop

The Fourth Industrial Revolution is impacting industry across the globe, transforming entire systems of production and management. Characterized by a fusion of physical, digital and biological technologies (reference) driven in-part by access to vast amounts of data and analytics. Industries are realizing rapid technological advancement and automation. Ulbrich Specialty Wire Products, located in Westminster, South Carolina, uses specialized mills to produce products that are used from medical devices to SpaceX rockets. Mills are integrated with real-time quality control devices that allow an operator to maintain product parameters within required specifications during run-time. However, current workflows and processes are limiting and do not facilitate access to sophisticated analytics that realize improved efficiencies and production. This CI is working with Ulbrich to study how data can be used to improve mill performance through the following key research questions: 1. Analytics: In a manufacturing context, such as found at Ulbrich, what are the distinct metrics within the production process (e.g. running a machine, fixing a machine, changing a process, etc.) that best identify performance associated with production processes; and what information can quickly be acted upon by operators, floor managers and management? 2. Visualization: How can visualizations be designed in order to support the specific processes and how should visualizations be specialized for the different processes?

POSTER #70

The Relationship between Perceived Health Threat and Immigration Attitudes

Mentor: K. Amber Curtis, Political Science

Students: Madison Beasley, Annalisa Bell, Carly Bouts, Lauren Mccormick, Sarah Reynolds, Megan Walling

Scholars have produced a vast amount of knowledge enumerating the various economic, political, cultural, and personal factors that help explain attitudes towards immigration. There is also ample research documenting the health problems migrants may face during their journeys or upon reaching their new host societies. Left underexplored is the extent to which health concerns factor into natives' assessments of immigration. Which kinds of citizens are most likely to perceive immigrants as a health risk? To what extent does perceived health threat affect individuals' openness to immigration? And how strong is this explanation compared to other extant findings? We answer these questions using original survey data collected in Germany, Poland, the United Kingdom, and the United States. Given today's increasingly globalized world, our findings shed light on a new potential consideration behind people's positions on immigration.

POSTER #71

Timing of Crystallization and Metamorphism of Rocks Juxtaposed along the Seneca Fault near Clemson, SC using U-Pb Geochronology

Mentor: Scott E Brame, Environmental Engineering & Earth Sciences

Student: Mckinzie Campbell

The Seneca Fault is a significant structural discontinuity between the Six Mile and Walhalla thrust sheets in the Inner Piedmont of upstate South Carolina. Metamorphic rocks of the Tallulah Falls Fm. associated with the Six Mile thrust sheet compose the hanging wall of the Seneca Fault and the

footwall is composed of meta-igneous rocks belonging to the Table Rock Gneiss suite associated with the Walhalla thrust sheet. The Tallulah Falls Fm., exhibiting amphibolite facies mineral assemblages, is mostly composed of muscovite schist, biotite gneiss, and amphibolite. The protoliths of these rocks are considered sedimentary with volcanic inputs. The Table Rock Gneiss consists of a leucocratic biotite gneiss, a hornblende-biotite gneiss, and a minor amphibolite component.

Improved age constraints on the timing of peak metamorphism in the Six Mile and Walhalla thrust sheets is important to refining tectonic models for the Piedmont zone of the Appalachian orogeny. To better understand this timing, igneous and metamorphic age domains within zircons were separated from three samples from the hanging wall of the Seneca Fault and two samples from the footwall and dated using U-Pb techniques. This project significantly refines the spatial and temporal resolution of metamorphism within this zone.

POSTER #72

A Creative Inquiry in Humanitarian Aid to Support Ethnic Reconciliation

Mentor: Vladimir Matic, Political Science

Students: Michael Bell, Samantha Hayes, Abigail Mccarter

Throughout the 1990's, the former state of Yugoslavia experienced a tragic and bloody dissolution involving intense ethnic conflict. This period of conflict is often forgotten about or written about only as an inconsequential afterthought in today's history books; however, it is still a relevant piece of history from which students can learn a great deal about international relations and ethnic reconciliation. In 1995, around 8000 Bosniaks were massacred by Bosnian Serbs in a town called Srebrenica. This event sparked anger, divisions, and resentment that still simmer today in the Balkans. When Clemson students travel to the Balkans each year for the summer study abroad program, they meet with survivors of the massacre along with students who claim it never occured at all. Through these conversations, Clemson students are able to witness firsthand the tensions that the people of the Balkans are still working through. These experiences inspired Clemson students to design a Creative Inquiry program with the aim of providing humanitarian aid to promote ethnic reconciliation in the Balkans, with a specific focus on Srebrenica. Each year, the students raise money by putting on various educational events on campus, requesting donations from friends and families, selling baked goods, and more. The money that the students raise is used to purchase school supplies for elementary school aged students in Srebrenica. By participating in this project, Clemson students are able to gain valuable experience with providing humanitarian aid as well as gain a new perspective on democracy building and ethnic reconciliation.

POSTER #73

Protein Polymer Blends for Additive Manufacturing

Mentor: Vladimir Reukov, Bioengineering

Students: Ashley Babinchak, Andrew Crim, Drayton Gambrell, Sarah Spence

The additive manufacturing (3D printing) industry shows great promise in a variety of areas, from printing out toys to organs. Many of these new and exciting objects are printed using plastic filaments in a Fused Deposition Modeling printer. This manufacturing industry generates plastic waste that ends up in our landfills and oceans. This Creative Inquiry project focuses on ways to lessen the environmental impact of this industry by improving the biodegradation of these filaments. To enhance biodegradation, we are adding soy protein to improve water solubility. We will create filaments of soy protein with various plastic polymers (such as ABS, PLA, PVA, HDPE, and polyethylene) by grinding, mixing, and then extruding protein and plastic mixtures to create a filament. After creation of a protein-polymer filament, we will test their biodegradation properties as well as perform mechanical tests on these filaments to assess their viability of use in the 3D printing industry.

POSTER #74

Hazing and Bullying

Mentor: Robin Kowalski, Psychology

Students: Leah Bourque, Hailey Bednar, Stephen Wells

Although recent years have seen an increase in media attention devoted to hazing, empirical attention to the topic has been sparse and has focused almost exclusively on hazing victims. This study filled gaps in the literature by examining experiences with and perceptions of hazing among victims, perpetrators, and, notably, witnesses. The study also examined the overlap of hazing with bullying. One hundred ninety-nine workers on Mechanical Turk completed a survey examining their experiences with hazing, as well as completing Bandura et al.'s (1996) Mechanisms of Moral Disengagement Scale. Prevalence rates of experiencing (victims) and witnessing hazing were high (nearing 70%), with parallel experiences and perceptions reported by victims and witnesses. Reported perpetration rates were much lower. Victims and witnesses alike reported few consequences attached to the hazing they experienced/observed. Hazing and bullying shared certain characteristics in common, particularly a power imbalance; however, they are distinct behaviors. Significant correlations between both hazing perpetration and victimization with moral disengagement emerged. The data suggest that high schools and colleges need to be clear regarding channels for reporting hazing, and that accountability is needed among group leaders, advisors, and alumni.

POSTER #75

Building a Schoolhouse in Uganda, Africa

Mentor: Mark A. Schlautman, Environmental Engineering & Earth Sciences

Student: Sarah Catherine Rowell

Engineers Without Borders Uganda is building a schoolhouse for a small community in Jinja, Uganda. The schoolhouse will be for 150 children, ages 6-16. The community currently has no school and no capability to build one. The previous building that had been used as a school for the children was unsafe, and actually collapsed in December 2018. Currently, some children are attending another school farther away while other children are unable to afford to go to school at all. Throughout this project, we are working with the community to design and ultimately build a new schoolhouse while also researching the requirements to do so. We presently are working on alternative designs and preparing for our trip in May 2019!

POSTER #76

Vehicle Dynamics Characterization

Mentor: Gregory Cocchiola and Gregory Batt, Food, Nutrition & Packaging Sciences

Students: Desi Ferreira, Mason Mclamb, Ryan Nielson

Quantifying the effect of vehicle dynamic parameters on the resulting motion input to packaged products during transport is important for optimum package design. Lacking within the industry is and understanding of the effect of parameters such as tire pressure and vehicle loading on vibration transmitted to packaged products in the vehicle. In this study, a tow-behind trailer is dynamically modeled and characterized to serve as a test bed for exploring the effects of tire pressure and vehicle loading on the acceleration of the trailer floor. The trailer is modeled as a two degree of freedom system with linear stiffness and viscous dampening, and it is characterized through dynamic and quasi-static laboratory testing. The vehicle acceleration response to various road hazards is measured at various speeds and compared to model predictions to enable understanding of the effect of tire pressure and vehicle loading on resulting vehicle motion.

POSTER #77

Gunshot Wound Interpretation: Correlations between Locality and Manner of Death

Mentor: Katherine Weisensee, Sociology & Anthropology

Students: Lauren Cory, Hazel Hudson, Kalyn Johnson, Christina Martinson, Sue Wright

Recognizing and interpreting gunshot wounds is a fundamental aspect of forensic investigation in order to determine manner of death. The two principle manners of death that involve gunshot wounds are homicide and suicide. In an attempt to determine specific patterns that can be correlated with manner of death locally, records from known homicide and suicide cases from Pickens County, South Carolina are examined, spanning from 1969 – 2018. Research shows that certain patterns exist. For instance, multiple gunshot wounds are usually indicative of homicide, but not always. Three cases examined with multiple gunshot wounds uncover suicide as manner of death, which is characteristically atypical. Depending on the type of weapon utilized, additional patterns emerge. In the case of gunshot-related suicide by handgun, oftentimes the wound location tends to be at the frontoparietal or temporoparietal region. However not all cases are clear-cut, and it can be difficult to ascertain the exact nature of gunshot wounds without an in-depth investigation. With the examination of Pickens County Coroner data, we aim to elucidate specific patterns that occur, which can benefit forensic investigators in their pursuit of distinguishing whether a case is suicide or homicide.

POSTER #78

Evaluating the Effects of Artificial Versus Natural Reef Structures on Fish Communities in the Florida Keys

Mentors: Michael Childress and Kara Noonan, Biological Sciences

Students: Emma Crowfoot, Riley Garvey, Kelsey Sox

Coral reefs are crucial to maintaining ocean biodiversity by acting as a sustained source of food and shelter for fish populations. However, coral reef ecosystems are decreasing at alarming rates as a result of natural and anthropogenic disturbances. Therefore, understanding what components of coral reefs is most essential for sustaining fish populations is critical to the survival of these irreplaceable regions of biodiversity. This project aims to identify which reef structures benefit fish communities the most and whether we can use artificial structures to mediate the loss of natural reef habitats. Four sites were selected in the Florida Keys National Marine Sanctuary to identify overall fish prevalence and associations with natural and artificial structures through the use of time-lapse photography. We found that functional feeding groups utilized artificial and natural structures differently which may have large implications for the future of reef fish biodiversity in declining reef habitats.

POSTER #79

Physics-Based Wear Simulation on Fabric

Mentors: Victor Zordan, School of Computing, Olga Kuksenok, Materials Science & Engineering

Co-Author: Luis Bermudez

Students: Steven Borisko, Ethan Mcaninch, Colton Smith, Addison Blackman

This Creative Inquiry was funded by the VF Corporation to have students explore the tools of simulation for products in the clothing and apparel industry. Within this context, we identified a project that focuses on phenomena in cloth appearance change including effects of wrinkling, wear, and general use. We present a simulated approach to measure wear on fabric due to everyday use, e.g. laundering and exercise. The technique combines a physics-based model with adaptive wrinkle history and responsive rendering. Our method is highlighted by denim fabric interactions with washers and dryers. To demonstrate the generalizability of the effort, we also generate forces from interaction with articulated human limbs. The simulation can be used to measure the lifetime of a fabric, or to generate desired pre-wear patterns to clothing. Current solutions include purely physics-based solutions or

manual testing, which results in high computational costs or high manual work hours. We propose a solution which reduces computational costs and minimizes manual testing.

POSTER #80

Getting to Mars Using Microorganisms
Mentor: Mark Blenner, Chemical & Biomolecular Engineering
Students: Brice Martin, Melissa Nolan, Luke Mabry

Anything we want to send to other planets must first be able to get into orbit around Earth. The amount of energy required to do this increases exponentially with mass, making weight reduction a necessity. One way to reduce mass is to reduce what needs to be carried. Food, medicine, and construction materials are heavy and critical for obvious reasons, but can be reduced with the clever use of microorganisms. Mass can be saved by sending microbes engineered to produce these products and growing them on waste generated within the craft, rather than sending large amounts of premade materials. These organisms must be able to survive long-term storage, grow with minimal human participation, and allow easy recovery of the desired product. This work aims to determine the methods and parameters required for safe microorganism preservation and resuscitation using the yeast Yarrowia lipolytica as a test case. Before this can happen, the microorganisms must be engineered to produce the products we need. CRISPR has been used recently to facilitate this engineering, however the best time to activate the system's key enzyme is not yet known. We will attempt to determine this time for our yeast by controlling the enzyme's activation behavior.

POSTER #81

Engineering Yeast for Sustainable Production
Mentor: Mark Blenner, Chemical & Biomolecular Engineering
Students: Will Burnette, Nicole Franaszek, Meredith Bailey

This CI is focused on engineering yeast for biochemical production using genetic engineering. The group works on a class of yeast that are considered, oleaginous, meaning they can accumulate at least 20% of their mass as lipids. The ability of these yeast to make a lot of lipids makes them good for producing bulk fatty acids for biofuels, specialty fatty acids for nutraceutical and polymers applications, oleochemicals, and other molecules that are derived from fatty acids precursors, such as natural product pharmaceuticals. Three mini-projects are pursued: The first is the production of flavonoids, a large class of naturally occurring polyphenolic substances with pharmacological properties. Metabolic engineering approach of *Yarrowia lipolytica* was utilized for the first time to allow for de novo synthesis of pinocembrin. We determined the best enzymes for maximal product yield and are further optimizing the pathway. A second project studies the effect of significant ER-membrane protein overexpression on *Y. lipolytica*. Strains engineered to make omega-3 fatty acids are studied for the activation of the stress-response pathway called the unfolded protein response. Finally, we have studied the production of lipids from lignin, a low-value component of plant biomass. We characterized 35 different oleaginous yeast species' ability to grow on 6 model mono-aromatic compounds representative G, H, and S lignin. We determined *Cutaneotrichosporon oleaginosus* is of special interest, due to their highly oleaginous behavior, and growth on hydrolysate. We also found *C. oleaginosus* grows in lignin hydrolysates without requiring nutritional supplementation.

POSTER #82

Clemson Public Art: Atelier InSite
Mentors: David M Detrich, Joseph Manson V, and Denise C Woodward-Detrich, Art
Students: Joseph Alewine, Carrie Bull, Addie Coward, Stan Jones, Lauren Konopka, Jordan Wright, Katherine Comen, Nicole Embree, Kendall Massey

Atelier InSite's mission is to create anew paradigmfor the implementation of site-specific public art that capitalizeson across-disciplinary and inclusive approach,that is predominatelystudent driven.

POSTER #83

Contemporary Art & Practice

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

Students: Laura Lemere, Hannah Rodgers, Katherine Comen, Addie Coward, Anna Davis, Nicole Embree, Hannah Horowitz, Geneva Hutchinson, Sophie-Earle Mccraw, Samuel New, Mary Watson, Savannah Wood

This Creative Inquiry is designed to examine issues pertinent to the development of Bachelor of Fine Arts (BFA) students preparing to become professional artists. We explore topics related to concerns of young artists with students preparing portfolios, conducting research, interning in the Lee Gallery, and visiting NYC to experience galleries and museums firsthand. Students complete various projects related to their BFA Senior Exhibition hosted at the Lee Gallery at the end of their exhibition semester. Students also assist Gallery staff with specific projects during the semester. The internship compliments the BFA studio curriculum by providing students with access to professional practices in exhibition design and execution.

POSTER #84

Soil Judging Project

Mentor: Elena Mikhailova, Forestry & Environmental Conservation

Students: Taylor Boykin, Jennings Bryson, George Crow, Gregory Fincher, Kimberly Mcmillan, Laurens Nicholson, Austin Ruple, Tyler Snively

The Soil Judging Creative Inquiry 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 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 #85

Habitat Complexity Influences Locomotor Morphologies in Teleost Fishes

Mentors: Samantha Price and Olivier Larouche, Biological Sciences

Students: Bailey Benton, Dominique Gross, Brian Kessler, Carley Mcglinn

Teleosts, a large and diverse group of ray-finned fishes representing 96% of all living fish species, have colonized most aquatic habitats. Differences in habitat complexity are expected to select for specific morphologies that reflect locomotor performance. To test this, we compared morphological differences of marine teleost reef species (complex) against non-reef species (simple). Using accepted biomechanical models, the reef fishes were expected to display deeper body morphologies reflecting high agility. In contrast, the non-reef fishes were expected to display streamlined morphologies reflecting sustained locomotion. We evaluated possible anatomical trends across various linear measures of shape in relation to the phylogeny of teleost fish using the software R. Statistically significant differences were observed between reef and non-reef teleosts when comparing size standardized max body depth and minimum caudal peduncle depth and width. Reef teleosts had greater values in all three categories and, on

average, had deeper bodies. This supports our predictions that complex habitats drive deeper body morphologies, and fishes in simple habitats have evolved streamlined shapes for cruising. Funding was provided by NSF DEB 1256894 and Clemson CI.

POSTER #86

Absorbing Cerium Oxide Nanoparticles into an ePTFE Hernia Mesh

Mentor: Vladimir Reukov, Bioengineering

Students: Devin Broyles, Maria Camargo, Karen Gutierrez, Hyein Kim, Apoorva Mehta, Quann Moses, Jacob Nikkila, Keagan Riser, Nicholas Tourville

Hernia meshes are an integral piece in the healing process of hernia repair. A commonly used mesh material, expanded Polytetrafluoroethylene (ePTFE), allows easy tissue attachment and prevents hernias from reoccurring. Although modern meshes are found to be mostly inert, development of inflammatory responses are still observed. It is believed a potential solution lies in cerium oxide (nanoceria/ceria/CeO2) nanoparticles. Nanoceria exhibits special antioxidative characteristics, specifically the ability to scavenge reactive oxygen species (ROS) seen in the presence of inflammation. This prompted a study to coat ePTFE, an absorbable mesh, in a nanoceria suspension. Saturated with nanoparticles, the ePTFE was placed in multiple different cell cultures, and ROS concentrations were measured over time by a cellROX assay. Promising results were seen through a significant decrease in ROS in all cerium coated, ePTFE plates. Future work will involve testing on a variety of mesh samples.

POSTER #87

Decision Making under Fatigue in a Target Acquisition Game

Mentor: Dotan Shvorin, Industrial Engineering

Students: Katarina Bialkowski, Abigail Campbell, Anna Beth Eitel, Coby Jeffcoat, Hayden Mullen

The impact of fatigue on the 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 a higher level 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 #88

Social and Cognitive Engagement is Associated with Enhanced Memory Capabilities in Older Adults

Mentor: Kaileigh Byrne, Psychology

Students: Savannah Busto, Dana Phan

Previous research on the rate of cognitive decline, social engagement, and effort expenditure is minimal. However, recent research suggests that engagement in tasks that require sustained cognitive effort can potentially benefit age-related cognitive functioning. The current study examined how regular social engagement and willingness to engage in cognitively effortful tasks influenced a variety of cognitive abilities as well as decision-making outcomes. We predicted that regular social engagement and an increased willingness to engage in cognitively demanding tasks positively impacts cognition. Older adults (N = 50; age 65-89) and young adults (N = 50; age 20-34) participated in various memory, effort, and

decision-making assessments. Consistent with predictions, greater social engagement in older adults was associated with higher short term-memory scores. Likewise, willingness to engage in cognitively effortful tasks was also positively correlated with enhanced long-term memory scores in older adults. There were no significant findings for willingness to exert physical effort. These age-related findings have novel implications concerning enhanced cognitive functioning for the older adult population.

POSTER #89

Evaluation of a Rake Sampling Method to Estimate Biomass of Submersed Aquatic Vegetation in South Carolina Managed Coastal Wetlands

Mentors: Richard Kaminski and Nicholas Masto, Forestry & Environmental Conservation

Students: Stephanie Braswell, Jess Eidson, Harold Farah, Robert Leland, Caroline Sharpe, Jonathan Tolson, Tristan Turner, Caleb Watson

Managers of brackish, impounded wetlands in coastal South Carolina manipulate water depth, duration of flooding, and salinity to stimulate growth of widgeongrass and other submersed aquatic vegetation (SAV) as forage for waterfowl and other waterbirds. Researchers need efficient and cost-effective methods to estimate SAV biomass in order to fulfill conservation objectives of the North American Waterfowl Management Plan. We evaluated the accuracy and precision of using garden rakes to estimate total and species-specific, above- and below-ground SAV biomass within five managed tidal impoundments (MTIs) at Bear Island Wildlife Management Area (32.6130° N, 80.4438° W) in the Ashepoo-Combahee-Edisto Rivers basin of South Carolina. In August 2016, we collected 10 random samples of SAV within each of our five MTIs (n = 50) using a garden rake and by hand within a 0.2-m2 quadrat. We calculated rake efficiency and presence of SAV species at each site and used linear regression to evaluate our rake sampling method in predicting total and species-specific SAV biomass. We detected a total of three SAV species. Rake efficiency was 77.95% for total SAV biomass and ranged from 68.82–77.11% for individual species. Widgeongrass was present at 86% of our sites, muskgrass at 50%, and dwarf spikerush at 22%. Our rake sampling method predicted 95% of the variation in total SAV biomass. Additionally, our rake method predicted 95% of total widgeongrass biomass, 97% of dwarf spikerush biomass, and 97% of muskgrass biomass. Based on our results, we conclude that our rake sampling technique adequately predicts total and species-specific SAV biomass.

POSTER #91

A Targeted Intervention for Decreasing Burnout and Improving Resiliency in Oncology Nursing Teams

Mentors: Marissa Shuffler and Chelsea LeNoble, Psychology

Co-Authors: Chloe Wilson, Elyssa Johnson

Students: Michaela Brown, Winifred Charlesworth, Audrey Crocker, Cavan Peters, Rebecca Lindgren, Kathleen Wirth, Rebekah Williamson

Clinician burnout is a nationwide crisis, and oncology nurses are particularly susceptible to burnout due to long hours and a special patient population. Therefore, this research investigated the factors contributing to their fatigue. Using a mixed-methods approach, 40 interviews and observations were conducted of nursing units at Prisma Health Upstate. Through analysis, various stressors, including feelings of helplessness, rumination of work after the shift, unproductive interruptions, and physical discomfort were identified. Baseline survey data indicate that 40% of respondents experience symptoms of burnout and 25% experience daily physical fatigue. Stress management interventions were developed to positively impact team resiliency, retention, coping patterns, and the patient experience. This systematic approach to identifying and addressing team stress and resilience will be relevant to many healthcare disciplines interested in improving clinician well-being, team efficiency and quality of patient care.

POSTER #92

Targeted Inhibition of Clinically Relevant *Bacteroides dorei*

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

Students: Dillon Armstrong, Ronnie Austin, Jennifer Cabezas, Margaux Palmentiero, Blaire Scott, Dani Petersen

Type I diabetes (T1D) is an autoimmune disorder characterized by the destruction of pancreatic β-cells. Research indicates that the onset of this response may be attributed to changes in gut microbes, particularly in the relative abundances of *Bacteroidetes* and *Firmicutes*. Our research focuses on reducing the abundance of *Bacteroidetes* through the inhibition of their starch utilization system (SUS). We previously investigated a novel therapeutic approach using acarbose, an α-amylase inhibitor. When exposed to acarbose, starch degradation and growth by *Bacteroides* species is inhibited. This inhibition could potentially delay or prevent the onset of T1D. Our results have shown this concept works in lab strains of Bacteroides, and we have now begun testing clinically relevant species like Bacteroides dorei. We also are investigating the carbohydrate utilization capabilities of the clinical isolates. Future directions include investigating the mechanism by which acarbose binds to SUS.

POSTER #93

Road to Morne Michel

Mentor: David Vaughn, Engineering, Computing, & Applied Sciences

Co-Author: Jessica Dooley

Students: Ryan Donahue, Reid Hoffman, Lisa Uy, Grant Hummel

Morne Michel is a village located at the peak of a mountain in Haiti's Central Plateau. It consists of residential homes, a school, and a church. There is no market, medical access, access to clean water, or many other basic necessities. To access hospitals or markets, the people of this community must hike down the side of a mountain with no established pathway. The lack of an established pathway also limits emergency vehicles from helping those who need it. With the implementation of a road to Cange, the people of Morne Michel would have an easily accessible path to another community. Cange offers established markets, a hospital, access to clean water, and roadways to other communities. While this road will aid people who are trying to travel to locations away from Morne Michel, the road also allows for emergency vehicles to access the people in Morne Michel.

POSTER #94

Development and Validation of a Situational Judgment Test

Mentors: Michelle Flynn and Marissa Shuffler, Psychology

Students: Erin Huff, Rachel Hume, Reid Demass

Given the changing nature of today's workforce is becoming increasingly common, and at times even vital, for employees to be well-prepared for navigating complex social situations to fulfill everyday organizational demands (Grossman, Thayer, Shuffler, Burke, Salas, 2014). However, while effective interpersonal interactions are clearly required in many occupations, an ongoing deficiency of critical interpersonal knowledge, skills, and abilities (KSAs) among employees has been widely recognized. The current study seeks to answer a critical call in the literature for better methods of assessing and developing employee interpersonal KSAs, especially in terms of how to assess employee effectiveness in the application of these KSAs to socially complex situations. Specifically, the current study develops and provides initial validity evidence for a situational judgment test (SJT) of critical social thinking (CST), the underlying set of processes that put interpersonal KSAs into practice. This poster will present the results of the development and initial validation study of this measure, based upon a sample of 200 participants collected via Amazon Mechanical Turk. The results show that the measure has high internal consistency (α = .87) and a reliable factor structure. Future research for this study seeks to validate this

measure in a healthcare sample of employees.

POSTER #95

Development and Analysis of a Tissue Engineered Intervertebral Disc Xenograft Scaffold

Mentors: Jeremy Mercuri and Dan Simionescu, Bioengineering

Students: Lindsay Hannah, Mario Krussig, Henry Randall, Christopher Rood

Intervertebral disc (IVD) degeneration is experienced by 80% of Americans in their lifetime, yet current treatments are palliative. This demonstrates the need for creating a treatment that restores native IVD physiology. Previous work has yielded a biomimetic whole-IVD scaffold for tissue engineering derived from decellularized cow tail IVDs. The objective of this work was to determine scaffold cytocompatibility. Annulus fibrosus and nucleus pulposus regions of the scaffold were isolated and seeded with ovine adipose derived stem cells in vitro. To test for cell viability and attachment on scaffolds, Live/Dead staining, Alamar Blue assays, and H&E staining were performed after 7, 14, and 21 days in culture. Results indicate that IVD scaffolds can sustain cell viability and metabolism for up to 21 days. This suggests that creating an IVD xenograft scaffold that mimics the biochemistry of human IVDs may enable the creation of a living, tissue engineered replacement for patients suffering from IVD degeneration.

POSTER #97

Project Fusion: Identifying Key Characteristics of Spaceflight Multidisciplinary Systems with Historiometric Analysis

Mentors: Marissa Shuffler, Psychology

Students: Liz Alvarado, Jordan Smith, Grace Falgoust, Akasha Nelson, Maggie Scott, Taylor Pederson

To address the increasingly complex demands of spaceflight, it is necessary to expand beyond many of the current operating structures utilized in spaceflight missions. Future missions will require personnel to contend with previously unprecedented challenges (increased communication delays, greater physiological stress, and extended periods of isolation). Accordingly, consideration must be made separately for the needs of these future systems—namely, how to ensure spaceflight missions can successfully operate not as a single large team, but as an interconnected set of expert teams who must rely on one another to achieve complex goals. Therefore it is necessary to develop a more comprehensive understanding of the unique characteristics of such spaceflight multiteam systems (SFMTSs). In Project FUSION, we are presently addressing these needs via field studies involving: (1) observations of training simulations, ISS operations, and interactions with international space agencies; and (2) interviews with NASA personnel; and (3) historiometric analysis of extracted incidents from these interviews and observed interactions, as well as archival documentation from prior SFMTS-involved missions and analogs. Results of data collections thus far provide several key themes, namely support for four distinct types of SFMTSs that have their own defining characteristics and potential triggers. In the presentation we will highlight additional findings and discuss how they will be incorporated into other Project FUSION research approaches. We will also describe future directions in terms of how to best utilize the findings to inform the development of countermeasures aimed at improving SFMTS mission success.

POSTER #98

The Fun of Fidgeting: Children's View of Bouncy Bands

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

Students: Addy Dame, Hanna Kent, MaKensey Klaasmeyer, Caroline Knight, Savannah Noel, AnnaWade Strawsburg

Bouncy Bands (elastic bands that attach to students' desks- http://bouncybands.com) are marketed as a way for students to release energy without distracting others. The purpose of this study was to examine the feedback of children who have used Bouncy Bands. Thirty-two second grade students, 18 males and 14 females, from two traditional classrooms participated in this study. A pre, mid, and post-assessment were given to students to obtain self-report feedback on: how good they felt (i.e., personal affect), their reading stamina, their feelings towards reading, their feelings towards Bouncy Bands, and their band use. A Pearson's correlation showed that band use was positively related to: how good students felt, favorable feelings towards reading, and how much they liked the bands. Results suggest that Bouncy Bands use may enhance students' mood and feelings towards reading. Objective measurements are needed to confirm these results.

POSTER #99

Psychology of Religion and Spirituality

Mentors: Zhuo Job Chen and Randle Aaron Villanueva, Psychology

Students: Dominique Black, Emily Brooke, Courtney Gouge, Morgan Jackson, Elise Kao, Holly Koch, Nicole Merics, Loren Myers, Janki Patel, Faith Word

Study of attitudes and behaviors influenced by religious beliefs and/or spiritual experiences.

POSTER #100

Social Media Listening Center Digital Analytics

Mentor: Amanda Moore, Communications

Students: Ashley Crunk, Mallory Douglass, Ely Middleton

As the pace of technology continues to out pace society, it's vital to investigate our technological society functions. Currently, Clemson University's Social Media Listening Center (SMLC) serves as a 21st century newsroom and research center. The center brings together faculty, staff, students and external partners to foster undergraduate inquiry through social media listening. Each semester, students select a topic to focus on and explore in-depth. This semester, students have elected to take a different approach by exploring a different topic each week and focusing on the question of "What makes effective social media?" Through this question students have created case studies each week on a particular topic, however each week, their analysis becomes more in-depth. Through the exploration of emerging technologies and digital analytics, the Social Media Listening Center Data Analytics Creative Inquiry enables students to become experts in social media strategy, providing tips for external clients on how to refine and tailor their messaging. Students in the CI use the software associated with the SMLC gain a deeper understanding of leveraging digital analytics in the digital sphere. Here we present our findings on a case study conducted on Ethical Consumerism. This presentation will provide a case study overview of Ethical Consumerism and associated brands, as well as provide the social media analytics around the global and local conversation.

POSTER #101

Introducing Emergency Medicine Physician to his New Working Environment by Utilizing Virtual Reality Training

Mentors: Dotan Shvorin, Industrial Engineering

Co-Authors: Shivani Reddy Surusani, Meirav Goldhour, Ronald Pirrallo, Karen Lommel

Students: Gabriel Lara, Keaton Clause

The emergency medicine clinical environment is filled with uncertainties, working under pressure, and urgency of treatment resources. A physician's ability to navigate their workspace can significantly affect the quality of care they provide to a patient. Utilizing Virtual Reality (VR) environment to establish a training module that can support the orientation of an emergency medicine physician. The layout of an emergency department will be recreated in a virtual environment using Unity. Participants will be immersed in the environment, and their wayfinding performance will be evaluated. We anticipate that the use of this VR module will have a critical impact on the orientation process for incoming emergency medicine physicians. This study will determine the effectiveness of this VR module as an orientation tool for emergency medicine physicians.

POSTER #102

Connected Care Application Development
Mentor: Janice Lanham, School of Nursing
Students: Julia Barre, Marissa Brock, Kayla Farquhar, Nicole Flores, Tristan Gordon, Christian Kalacanic, Alex Murrant-Johnson, Shannon Rybecky

This Creative Inquiry aims to develop a multi-disciplinary, individualized, mobile, hybrid application connecting patients to both individual and corporate providers. This project will create a protected home health care matching platform containing home health information for patients, families, and healthcare providers. The platform will allow convenient access to patient health logs, healthcare provider reviews, patient care team communications, transportation options, skill review resources, and payment/insurance information. Wewill visually display the application's functionality by demonstrating a screen to screen flow from the patient user's perspective. The team will actively describe and answer questions regarding Connected Care's intentions, purpose, and direction within today's healthcare system.

POSTER #103

Using Polyphenol Antioxidants to Reduce Cytotoxic Oxidative Stress in *Escherichia Coli*
Mentor: Julia Brumaghim, Chemistry
Student: Henry Baird

The generation of the hydroxyl radical by iron or copper-mediated reduction of hydrogen peroxide (H2O2) is the primary cause of DNA damage and subsequent cell death in humans. This radical at aberrant levels can induce cellular oxidative stress and is known to be involved in the development of a myriad of maladies including cancer and Parkinson's disease. Various groups of antioxidants prevent this metal mediated oxidative damage. Polyphenols prevent oxidative stress and DNA damage in vitro by binding to Fe2+; however, limited research has been published. Exposure of *Escherichia coli* cultures to low concentrations of H2O2 initiates oxidative stress and subsequent oxidative DNA damage. In this project, wild type AN387 and AB1157 K12 *E. coli* strains, as well as, a ferric uptake regulator mutant strains were used as model systems to examine the antioxidant abilities of polyphenol moiety compounds. First, the strains' exponential growth phases were determined via ultraviolet-visible (UV-vis) spectroscopy. Strains were then challenged with 2.5 mM H2O2 to establish reproducible cell killing. Finally, catechol and pyrogallol polyphenol moiety compounds, methyl-3,4-dihydroxybenzoate (MEPCA) and methyl-3,4,5-trihydroxybenzoate (MEGA), respectively, were introduced to these cultures prior to challenge at 1, 5, 25, and 100mM concentrations to determine their efficacy in reducing cytotoxic oxidative stress and promoting cell survival. Exponential growth phases and reproducible cell killing upon H2O2 challenge were established in both WT strains with an average percent survival of 34.996% (±12.347) and 45.249% (±7.884) in AN387 and AB1157, respectively.

POSTER #104

Single Molecule Study of Axonemal Dynein to Understand Unique Flagellar Undulation in *T. Brucei*

Mentors: Joshua Alper, Physics & Astronomy, Subash Godar, Physics & Astronomy

Students: Parastoo Amlashi, Hayes Hoover, Samuel Kistler, Ethan Lopez, Samantha Markley, Katherine Wentworth, Valerie Hinsch

Kinetoplastids are a class of flagellated eukaryotic protists, including *trypanosome* and *leishmania*, that threaten to cause disease in more than 350 million people, globally, and current treatments for kinetoplastid diseases have limited effectivity, are difficult to administer, or are dangerous. Because the flagellar motility of kinetoplastids is essential for multiple aspects of virulence and exhibits a unique bending wave that propagates from the tip to the base rather than base-to-tip, as all other eukaryotes, (including humans) do, flagellar proteins are potentially promising candidates for pan-kinetoplastid drug development. We hypothesize that tip-to-base beating is due to unique biophysical spatiotemporal coordination mechanisms of axonemal dynein motor proteins acting in teams. We are purifying and characterizing axonemal dynein from *T. brucei* to make single-molecule measurements of its fundamental biophysical properties. We used RNA interference to knockdown flagellar attachment proteins to enable mechanical shearing and isolation of the flagellum from the trypanosome cell bodies. We then modified the well-established dynein extraction and purification protocols for *Chlamydomonas reinhardtii* and adapted it to obtain *T. brucei* dynein. Furthermore, to facilitate purification and biophysical (including binding of dyneins to microspheres for tweezer assays or fluorescence labeling of dyneins, and for HISTrap affinity purification) we are expressing a BCCP His8, eGFP tagged version of LC2 (light chain on outer dynein arm) on *T. brucei*. The purified outer arm dynein motor proteins will then be used to make direct measurements of single dynein motor undergoing its power-stroke and quantify the force dependence of dynein's biophysical properties like; microtubule binding and unbinding rates, step size, power-stroke and speed.

POSTER #105

TLC

Mentor: Jennifer Ogle, Civil Engineering

Students: John Borelli, Alexi Hecht, McKinnon Reece, Mason Hammond

The Tool Lending Center group aims to establish a nonprofit that lends construction tools and safety equipment to local residents in an effort to aid in the recovery from Hurricane Maria. Following the devastation from Hurricane Maria, many people were left with a severely damaged home or without a home. As a result of the devastation their economy, dependent on agriculture and tourism, has suffered significantly. We hope that providing the community with the resources necessary in the rebuilding process will stimulate their economy and improve the conditions of the community. In the Fall of 2018, we completed research on the operations of tool libraries. While most of our research was done online, we visited a tool library in Asheville. We spoke with the co-founder and asked several questions that came up from our research on how a tool lending program is established and ran. This semester we hope to design and coordinate a management system to track the tools.

POSTER #106

Anti-Cancer Effects of the Poha Plant and *Vernonia cinerea* **Less Plant**

Mentor: Yanzhang Wei, Biological Sciences

Students: Megan Fogle, Margaret Sulzbach, Hannah Allison, Mary Catherine Smith

The goal of this project was to test the anti-cancer effects of samples from the *Physalis peruviana* L., also referred to as the Poha plant, and *Vernonia cinerea* Less plant on A549 and HEK293 cell lines. This was done using MTS anti-proliferation assays on cultured lung tumor cells (A549) after the cells were treated with differing concentrations of plant samples. We also conducted an MTS assay on human embryonic

kidney cells (HEK293) after treatment with the same plant samples. By testing the anti-proliferation of both tumor and non-tumor cell lines we were able to choose the samples that had the highest toxicity to the tumor cells while also having the lowest toxicity to the non-tumor cells, which made these samples good possible candidates for cancer treatment. Sample 1, sample 4, and sample Poha at 50 ug/mL concentration showed the most positive result for possible anti-cancer treatment because they showed higher anti-proliferation in the A549 cells than the HEK293 cells.

POSTER #107

Bendy to the Bone: a Comparison of Vertebral Morphology and Locomotor Modes
Mentors: Richard Blob and Kelly Diamond, Biological Sciences
Student: Grace Forker

The life cycle of the Hawaiian stream goby fishes presents a unique set of challenges as young fishes migrate from the ocean to freshwater habitats. Through these migrations, fishes must evade predators and in some species, climb waterfalls in order to reach adult habitats. Predators in this system cannot climb, allowing climbing species to live in predator-free waters. We predicted that stiffer backbones would aid in climbing, whereas fish that must evade predators would possess more flexible backbones. To test these predictions, we digitized the anatomy of vertebrae from three goby species using computed tomography scans. Lengths of vertebrae from climbing fish were longer, with shorter intervertebral spaces indicative of stiffer bodies, when compared to fish that live consistently with predators. These results indicate a potential impact of environmental pressures on the morphology of fishes, specifically that modifications to vertebrae aid in the response to predatory attacks.

POSTER #108

Biodiversity in a Pendleton Woodland
Mentor: John R Wagner, Environmental Engineering & Earth Sciences
Student: Sydney Belt

A unique woodland area located on the property of Pendleton Elementary School in Pendleton, South Carolina is home to a wide variety of plant and animal species. The site contains a small stream system which provides excellent opportunities for scientific research on biological communities as well as outdoor environmental education activities for the elementary school students. An on-going research project has surveyed aquatic macroinvertebrates and vertebrates, ranging from small insects to tadpoles, frogs, and salamanders, during different seasons of the year. Students involved in this project have made repeated observations and collected samples using nets to gather and record the data. The research has shown that a surprising number of these organisms are found in the stream year-round. This project was supported in part by the Clemson University Creative Inquiry Program and Pendleton Elementary School.

POSTER #109

Effects of Ponderosa Pine (*Pinus ponderosa*) Thinning on Forage Quality and Quality in the Northern Great Plains of Montana
Mentors: David Jachowski and Keifer Titus, Forestry & Environmental Conservation
Co-Author: Gustavo Lascano
Students: Melissa Ferral, Erin Mcdaniel, Fiona Noel Slater, Gillian Taylor, Jacob Murray

Increasing densities of ponderosa pine (*Pinus ponderosa*) in grassland systems reduces nutrient biomass and accessibility for both wildlife and livestock while increasing wild fire hazard. Due to this concern, we aim to better understand the influence of variable intensity timber thinning regimes on forage quality and quantity of prairie vegetation in central Montana. We are interested in identifying factors that influence site condition and the resulting vegetation community available for livestock and wildlife

on the Frosty Creek Ranch in Roundup, Montana. This research is a continuation of a long-term project as a part of the Clemson University Montana Summer Field Program Creative Inquiry. In the summer of 2015, six - 900 m2 vegetation monitoring plots were established which controlled for three variables: slope, aspect, and stand basal area. Within each treatment plot, nine sub-plots were evenly distributed for our long-term sampling points. Since the summer of 2016, vegetation samples were collected through systematically trimming all vegetation in each pre-determined sub-plot and compiling samples into three categories: grasses, forbs, and shrubs. We sorted, dried, and weighed samples to estimate available biomass and ground them for future nutrient analysis. We found differences in wet and dry biomass amongst our treatment groups. Preliminary results suggest that increasing basal area may reduce forage availability and alter understory vegetation community. Nutritional results will be discussed in light of recent analyses. This research will aid in developing management strategies to increase forage quality while reducing risk of wild fire in the Great Plains.

POSTER #110

Using Bacteria for Engineering Better Biosensors

Mentor: Mark Blenner, Chemical & Biomolecular Engineering

Students: Samantha Hutter, David Kindervater, Calvin Martin, Lane Norris

Bacteria have the ability to sense and respond to their environment through exquisitely specific protein mediated interactions. This CI explores three parallel ways of using bacteria for making better biosensors. The first involves the development of an enzyme that specifically reacts tributyl phosphate (TBP), a neurotoxin, and solvent used in nuclear reprocessing, using a poorly characterized enzyme, cytochrome P450 (CYP201A2) from *Rhodopseudomonas palustris*. We will recombinantly overexpress cytochrome P450 in the soluble fraction, demonstrate its substrate specificity towards TBP, and eventually, create a immobilized enzyme based biosensor. A second approach is to connect biomolecular recognition elements with enzymes. Here, we are connecting split antibody binding domains with split luciferase reports such that ligand binding controls luciferase activity. We will eventually explore the modularity of this approach. Finally, we are exploring the use of whole microbes as biosensors of radiological weapons development. This work aims to determine if model and environmental microbes elicit unique responses to radiation exposure and engineer those unique responses into a biosensor capable of discerning radiation type. Transcriptome analysis of irradiated *Pseudomonas putida* has revealed unique candidates for biosensor development. Promoters of these genes will be engineered into broad host range plasmids to control the expression of a fluorescent protein. This approach can overcome the limitations of conventional radiation detection systems.

POSTER #111

16S rRNA Gene and Metagenomic Analysis of Lucinid Clam Symbionts from the Bahamas

Mentor: Barbara Campbell, Biological Sciences

Students: Michelle Baldassare, Erin Walker, Erika Nachman

Lucinid clams have been known to have chemoautotrophic endosymbionts in their gills. These gammaproteobacteria symbionts are known to oxidize sulfur to fix inorganic carbon for their host. However, the diversity of these symbionts in *Codakia orbicularis*, *Lucina pensylvanica*, and *Ctena orbiculata* from the Bahamas are not as well understood and warrant further investigation. These clams were collected in 2017 from the Bahamas from four different sites and our goal was to use the 16S rRNA gene and metagenomic data to analyze the symbiotic relationships between the bacteria and their specific host. There were a number of different symbionts in the three hosts between the four different sites, but only ten main Operational Taxonomic Units (OTU) present. These top ten OTUs mainly consisted of *Candidatus* Thiodiazotropha, Micavibronales, Tepidimonas, Burkholderiaceae, and Endozoicomonas. Four of the OTUs were identified as previously recognized symbionts within the *Candidatus* Thiodiazotropha. This confirms the potential horizontal gene transmission in these relationships. Our

future research aims to shed deeper insights into the functional activity in these microbes and how it relates to their hosts.

POSTER #112

Medical Partnerships

Mentor: Jennifer Ogle, Civil Engineering

Students: Paloma Wlasiuk, Sydney Bertram, Serena Gilmore, Cierra Oliveira, Julie Wagner

The main goal Clemson Engage Medical Partnerships is to collaborate with the people of Dominica to improve their living conditions through the creation of realistic and sustainable changes within the health system. In our Spring 2019 semester, we are working towards this goal through 3 main projects: Developing a survey to evaluate and better understand the current health system in Dominica, providing first aid education and supplies to citizens, and making connections to healthcare professionals on the island. The Medical Partnerships team has developed a survey to investigate the knowledge of health behaviors, medical care access, and attitudes toward healthcare to gauge community needs or disparities in the current healthcare system. We are currently collaborating with citizens on the island to develop a plan to administer the survey. To best prevent potential bias, we plan to hire citizens on the island to proctor the study to other citizens. Once survey data is collected, the team aims to work with the community to create program-based solutions to any identified health disparities. Moreover, a lack of first aid materials and trained personnel is a specific issue identified by Dominican professionals. Medical Partnerships aims to renew the island's first aid training and provide restocked first aid kits to citizens.

POSTER #113

Predicting Future Ocean Acidification Effects on Foraminifera, Scotts Head and Champagne Beach, Dominica

Mentor: Scott E Brame, Environmental Engineering & Earth Sciences

Co-Author: Kelly Lazar

Students: Rebecca Sutherland

The Lesser Antilles are composed of an volcanic island arc chain in the Caribbean. On the island of Dominica, interaction of meteoric water with a relatively close to surface magma chamber has created numerous fumaroles that expel boiling water containing sulfur dioxide and carbon dioxide. Some of these fumaroles are located off shore. At those locations CO2 levels are elevated as well as the acidity of the water. This acidity decreases the pH and promotes dissolution of calcium carbonate making shell development difficult for calcareous organisms such as foraminifera. Two locations along the Dominica coastline, Scotts Head Beach and Champagne Beach, were compared to determine the relationship between the amount of dissolved CO2 in water and benthic foraminifera abundance. Eleven sand samples from the two nearshore environments were collected and analyzed for foraminiferal content. The reef at Scotts Head, representative of normal marine conditions, served as the control location with an average pH = 8.1. Champagne Beach serves as the acidized scenario with an average nearshore pH of 7.8 resulting from out-gassing. Foraminifera were nearly absent from Champagne Beach, with only seven tests and six species identified across all samples. Foraminifera were abundant at Scotts Head and included approximately fifty different species.This study found a relationship between pH levels and foraminifera abundance. The data indicate that, as pH decreases, foraminifera abundance also decreases, which suggests that, if average ocean pH levels continue to decrease as predicted, calcareous organisms may find it more difficult to survive.

POSTER #114

Interactions of *Lactobacillus* in the Gastrointestinal Tract of the Human Body

Mentors: Kristi Whitehead and Krista R Rudolph, Biological Sciences

Students: Leah Gamble, Rya Glasshof, Clancy Kerr, Hillary Reeves, Arianna Conti, Kensey Jones

Microbes have significant roles in the human body, ranging from causing detrimental bodily infections to helping maintain a healthy immune system. The goal of this study is to determine how a common bacterium, *Lactobacillus reuteri*, impacts host metabolism through bile salt hydrolase activity and possible involvement in obesity. Bile salt hydrolase (BSH) activity impacts the host by mediating the initial reaction in the bacterial metabolism of bile acids, but the benefit to bacteria with this activity is unclear. In addition, certain dietary components, including artificial sweeteners, are known to impact the microbiota in ways that are not fully understood. We are investigating the roles of BSH activity and the potential impact of artificial sweeteners on *L. reuteri*. This research is important because understanding the interactions between microorganisms within the gastrointestinal tract can lead to a better understanding of maintaining host health.

POSTER #115

Analyzing ER Stress and UPR Activation in Highly Producing Chinese Hamster Ovary (CHO) Cell Lines

Mentor: Mark Blenner, Chemical & Biomolecular Engineering

Students: Sierra Gurtler, Valerie Peters, Tara Richbourg, Zach Williamson

Chinese hamster ovary (CHO) cells are common protein production platforms due to efficient post-translational modification machinery and endoplasmic reticulum (ER) quality control. Secretion levels needed for industrial cell lines likely leads to an imbalance in ER homeostasis, resulting in increased cellular stress and the unfolded protein response (UPR). This research aims to demonstrate higher specific productivity would result in unavoidable associated ER stress and impact product quality. Alternatively, it is also feasible that highly productive lines have acquired the ability to cope better with ER stress. Currently, we achieve high and low specific productivity with two cell lines, one producing immunoglobulin G (IgG) and the other producing erythropoietin (EPO-Fc). CHO-K1 cell line produces no recombinant protein and was used as a control. Our current work is focused on measuring the time-dependence of the UPR across cell lines under fed-batch and chemically-induced conditions. CEDEX bioanalyzer and HPLC were used to investigate IgG and EPO-Fc titer, respectively. Western blot and quantitative polymerase chain reaction (qPCR) were used to investigate the time course of the UPR, which is then correlated to product titer and gene expression. Fold change calculations were used to determine changes in protein levels and gene expression.

POSTER #116

Soil Inventory of Private Lands in South Carolina

Mentors: Elena Mikhailova and Christopher Post, Forestry & Environmental Conservation

Students: Shanaya Andres, William Fox, Alianna Pearson

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 suitability's 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 #117

Tigers Together Advocacy Training: A Controlled Trial of Impact on Knowledge and Behavioral Change

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

Students: Dylan Erikson, Amanda Nicks, Rebecca Roth, Daniel Solomon, Kenedey Ward, Rachel Wayt

Suicide is the second leading cause of death among college students. Gatekeeper trainings address this public health concern through training community members to recognize warning signs and refer at-risk persons to resources. Few studies have examined the effects of gatekeeper trainings on college campuses on outcomes such as behavior change. The purpose of this study is to examine the impact of a campus gatekeeper training program (Tigers Together Advocacy Training) on suicide prevention knowledge, behavior, and self-efficacy. We utilized a quasi-experimental design to compare outcomes between an intervention group and control group at pre-test, post-test, and three month follow-up. Results from repeated measures ANOVAs (n = 96) show an increase in knowledge, self-efficacy, and gatekeeper behaviors over the three periods of time, with the intervention group showing greater improvements than the control group. In conclusion, these findings demonstrate the efficacy of the Tigers Together training in preparing individuals to prevent suicide on college campuses.

POSTER #118

Hydrogen Gas Production from Waste Peaches with *Thermotoga neapolitana*

Mentor: Caye Drapcho, Environmental Engineering & Earth Sciences

Co-Author: Nidhi Nalin

Students: Patrick Cusack, Parker Raymond, John Walker, Mallory Ware

With climate change threatening the well-being of all organisms on Earth, sustainable energy sources must be developed. Hydrogen gas, a sustainable energy source, is produced by the bacterium *Thermotoga neapolitana* as it undergoes fermentation. In this Creative Inquiry, the fermentation of cull peaches by *T. neapolitana* is being studied. The bacteria was first inoculated into four serum bottles containing a low-cost fermentation medium containing waste blended peaches as the organic carbon source. It was then incubated for two days at 77°. The composition and concentration of gases in the bottle headspace will be analyzed with GC with thermal conductivity detector.As the semester progresses, we plan to design a system to capture the hydrogen gas as well as develop a pilot scale fermentation system, including heat exchangers, a solar water heater, and a PEM H2 fuel cell.

POSTER #119

Wood Duck Use of and Production in Artificial Nest Boxes: Clemson University Undergraduate Research in Piedmont Region, South Carolina

Mentors: Nicholas Masto and Richard Kaminski, Forestry & Environmental Conservation

Students: Marcus Dudley, Chandler Gray, Jordan McCall, Granger Rabon, Nathaniel Schmidt, David Singletary, James Taylor

A recent study evaluated wood duck (*Aix sponsa*) and other avian use of artificial nest boxes in coastal South Carolina (Croft 2018). We are monitoring wood duck boxes on Clemson's Experimental Forest (CEF; 30,351 ha) in the piedmont region of South Carolina. Our objectives are to: 1) establish protocols for monitoring and maintaining nest boxes, 2) determine nest box use (≥1 egg) and reproduction (≥1 egg hatched) by wood ducks and other birds, 3) identify variables that predict probability of use of nest boxes by wood ducks, and 4) compare results between piedmont and coastal regions. We monitored nest boxes biweekly from late January-August 2018. Our study area included two distinct regions of the CEF, the North (n = 21 boxes) and South (n = 24) Forests. We initiated monitoring this year in January 2019. We will determine internal volume of each nest box, height of boxes to ground or water, water depth, nest-box entrance area, and its shape (circle or ellipse). We will use nest-box measurements to predict the

probability of nest box use by wood ducks. Results from 2018 revealed that wood ducks used 52% of the boxes in the South Forest and contained 375 eggs, with an average clutch size of 22 eggs/box. Thirty-six percent of the boxes in the North Forest were used and contained 63 eggs with an average clutch size of 13 eggs/box. We posit that greater use and egg production in the South Forest resulted from nest boxes being conspicuously placed over water in the open.

POSTER #120

An Evaluation of Bottlenecks in Cancer Care Delivery to Enhance Patient Care

Mentors: Dana Verhoeven and Marissa Shuffler, Psychology

Student: Holly Koch

Navigating across care providers is often a challenging process for patients that is exponentially more cumbersome for those receiving treatment from multiple physicians. This is a common issue that those diagnosed with cancer face, as they are challenged to coordinate across providers to get appropriate scans, biopsies, and appointments scheduled prior to their diagnostic appointment. However, this is only the first step in their care process. After receiving their diagnosis and tumor staging, patients must then work with their care team to decide what treatment options to pursue by coordinating and filtering information across medical oncology, radiation oncology, and surgical oncology. However, patients often face delays in care throughout this process, as teamwork and communication errors continue to trouble healthcare delivery. To better understand when and why such delays in care occur, this research project takes a multi-methods approach to examine between team coordination and communication in esophageal cancer care to identify potential bottlenecks and delays in the care delivery process, as patients are transferred from one group of providers to the next. To examine when delays occur, we evaluated the care pathway for esophageal cancer patients using archival patient data to determine the number days it takes to transition between providers and phases of care in comparison to the clinical practice guidelines. Then, we conducted interviews with providers and patients to better understand the driver behind these delays. Leveraging this information, we provide evidence-based recommendations for process improvements to help mitigate such delays in the future.

POSTER #121

Household Appliances Operating on Local Direct Current Power Networks

Mentor: Rajendra Singh, Electrical & Computer Engineering

Co-Author: Prahaladh Paniyil

Students: Anthony Carambia, Daniel Carrillo, Precious Galvez, John Kimsey, Kaylee Osteen

The energy sector is on the brink of a paradigm shift due to the increasing impact of photovoltaics (PV) emerging as the lowest cost technique of providing sustainable and clean electric power. In 2018, the global PV installations reached 108 Gigawatts. Photovoltaics generates direct current (DC) power and the batteries store DC power. As compared to alternating current (AC) power, more than 30% energy and capital cost is saved by using local DC power network based on PV and batteries. In order to take advantage of local DC power, we need efficient appliances that can operate on DC power. We can see the emergence of 12V, 24V and 48V DC appliances that are more energy efficient across many nations of the world. Of these voltages, 48V is the most widely adopted standard for a DC powered electrical appliance. In this regard, the focus of our research project is to create a DC-powered induction cooktop that works on 48V. Most of the induction cooktops commercially available today are AC powered. However, by incorporating a DC powered cooktop at a 48V standard in solar network, we can demonstrate the energy efficiency of DC powered appliances over the conventional and existing AC network. The cooktop can be incorporated with IoT-enabled sensors to make it a smart cooktop, further increasing its energy efficiency. The research project aims to showcase the larger goal of ultra-low-cost electricity infrastructure for all by creating an everyday household appliance and integrating with a solar and battery power network.

POSTER #122

Talk the Talk: A Content Analysis on Language Use in Academic Sources Related to ASD
Mentor: Jennifer Bisson, Psychology
Students: Lindsey Miller, Maria Starr

Modified labeling theory suggests that the way researchers talk about Autism Spectrum Disorder (ASD) may be related to their perception of individuals with ASD. Three main structures of language exist when discussing ASD; person first language (PFL), disability first language (DFL), and no person language (NPL). This study explored factors associated with language use in academic articles related to ASD, including publication year, number and gender of authors, and categorization of article as empirical or literature review. 242 articles were analyzed from several academic databases. Results showed that female first authors used significantly more PFL and less DFL and NPL than males. Publication year was also significantly positively related to use of PFL and significantly negatively related to DFL. Additionally, literature reviews used NPL more often than empirical articles. Results suggest the contribution of multiple factors to the language structures used to describe individuals with autism. Future studies should explore whether these findings are replicated in media portrayals of ASD.

POSTER #123

Sanitation Level of Eating Surfaces and Transfer of Bacteria on Surfaces by Cleaning
Mentor: Paul Dawson, Food, Nutrition & Packaging Sciences
Co-Authors: Rose Martinez-Dawson, Ahmet Buyukyavuz
Students: Lindsay Cannon, Bradley Hieronymus, Kenny Johnson, Claudia Meza, Zachary Whittington, Javin Goodine

Wiping contaminated surfaces with cloths offer the possibility that bacteria can be transferred by a cleaning cloth to other surfaces. An ATPase test swab was used to determine the sanitation level of various surfaces in the Clemson area where people eat. Over 81 percent of the eating surfaces sampled were found to be in the unsafe sanitary range. A second controlled experiment was conducted to measure how wiping a contaminated surface followed by wiping a clean surface with the same wipe transferred bacteria from one surface to another. Bacteria was recovered from four surfaces wiped in sequence after first contacting the contaminated surface. Thus once table and counter tops become contaminated, contamination can be spread to other surfaces during “cleaning” with cloth and paper wipes.

POSTER #124

Inspiration from the Design and Function of the Butterfly Proboscis
Mentors: Konstantin Kornev, Materials Science & Engineering, Charles E Beard, Plant & Environmental Sciences
Co-Author: Tatiana Stepanova
Students: Allison Kaczmarek

Because nature’s mysteries are often beautiful and complex, engineers can draw new perspectives from them to approach modern scientific problems. For years, scientists studying surface phenomena have been tasked with understanding physical and chemical interactions on surfaces that facilitate transport. However, these interactions appear simpler from the perspective of common butterflies and moths. These insects use a highly sensitive, motile fiber called a proboscis to uptake fluid during feeding. This composite fiber consists of two hollow C-shaped tubes. Early studies into the feeding mechanism of these insects conclude that fluid transport is influenced by both the chemical and mechanical characteristics of the proboscis’s structure and composition. Furthermore, preliminary mechanical micro-tensile testing shows that while the proboscis is known to be composed of the structural polysaccharide, chitin, it exhibits the behaviors of a ceramic material. These results imply that some geometric and compositional factors influence the performance of this flexible fiber. Furthermore, these

results are currently being investigated by turning to Thermal Gravimetric Analysis (TGA), Differential Scanning Calorimetry (DSC), and analysis using optical and electron microscopy to determine how the other factors contribute to the performance of the butterfly proboscis during feeding.

POSTER #125

Translating Signal Transduction Pathways into Mathematical Models by INDRA
Mentors: Cemal Erdem and Marc Birtwistle, Chemical & Biomolecular Engineering
Students: Kathleen Buda, Nicolina Slenkovich, Carson Brackett

Our team works to create models and runs simulations of drug and drug combinations in cell line models, predominantly with respect to cancer. We work with the software called Integrated Network and Dynamical Reasoning Assembler (INDRA), a python package developed for automated model assembly. Here, we mostly utilize INDRA's ability to turn structured natural language text into executable mathematical models. To do so, we use Jupyter Notebook, an open-source web-based application to generate and run python codes. In short, we generate models of biomolecular interactions by: writing strings of text, reading into INDRA, generating the underlying statements, converting them to network topologies, and exporting the model of kinases and their receptors. Then, to visualize and run the specific models, we use RuleBender, a rule-based modeling software, making parameter scans and other model explorations manageable. So far, we have replicated ligand-receptor cooperativity results in our original work on pan-cancer modeling of signaling pathways. By continually expanding the body of work to develop larger cascades and analyzing these models to match earlier work, we will create one of the most comprehensive mechanistic models in the literature.

POSTER #126

Characterization and Application of Quantum Dots for Drug Delivery and Cancer Cell Tracking
Mentors: Vladimir Reukov and Anastasia Frank Kamenetskii, Bioengineering
Students: Rashed Abdel-Tawab, Melanie Hedge, Lanz Patrick Pasig, Aleena Thomas, Will Ashley

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 #127

Identification of a New Mutant in the Autoregulation of Nodulation Regulatory Pathway in *Medicago Truncatula*
Mentor: Julia Frugoli, Genetics & Biochemistry
Co-Author: Elise Schnabel
Students: Cameron Corbett

Legumes utilize a long-distance signaling pathway to regulate the number of nitrogen-fixing symbiotic nodules that form on their root systems. In the current model for this process in *Medicago truncatula*, two CLE peptides (MtCLE12p and MtCLE13p) produced in developing nodules travel via the xylem to the shoot where they interact with the receptor-like kinase SUNN which triggers a return signal to the roots putting a halt to further nodulation. The isolation of mutants defective in the autoregulation process has also led to the identification of additional components of the pathway including the hydroxyproline arabinosyltransferse RDN1, which is necessary for modification of the CLE12 peptide in roots, and the pseudokinase CRN, which acts along with SUNN in the shoot, potentially in complex with the receptor-like protein CLV2. We report the characterization of another autoregulation mutant,

8XV1, which was generated by fast neutron bombardment. We determined through grafting that the lesion in 8XV1 acts in the root to increase nodule number, although it is not clear if it influences signaling to the shoot or response to signals from the shoot. We mapped the 8XV1 lesion to the middle of chromosome 2 and have identified a deletion that includes a candidate gene based on RNASeq data in mutant versus wild type plants. We report attempts to rescue the mutant phenotype with a functional copy of the candidate gene currently underway, using transformation of mutant roots by Agrobacterium rhizogenes. This work is supported by NSF IOS # 14444 and # 1733470 and a Clemson University Creative Inquiry grant.

POSTER #128

Tendon Structure and Properties as it Relates to Sports Injuries

Mentor: Olivia Newkirk and Delphine Dean, Bioengineering

Students: Cassie Bednarek, Melissa Judge, Ryan Lee, Kenneth Lindsey, Alyssa Santore, Kyle Schindler, Alexis Seilkop, Madeline Shannon

Tendon and ligament injuries, particularly overuse injuries, are commonly sustained by athletes, and can have long-term health, and career ramifications. These injuries involve micro tears in the tissue which trigger an inflammatory response by the body. The aim of this CI is to investigate the effects of both radiation and physical stresses on the mechanical properties of tendons and ligaments, in an effort to understand and offer guidance on how to prevent and treat injury. Tendons from porcine forefeet are excised and moved to an in vitro environment, before being exposed to either a dose of radiation at incrementally increasing levels, or cyclic uniaxial loading to just before the point of failure. Observation of the structure of the tendon fibers and cellular activity through histological analysis, both before and after application of stress, and an analysis of the mechanical properties, elucidates potential future injury risks caused by the radiation or physical stress.

POSTER #129

Low Resource Medical Device Design - Clemson-Arusha Collaboration

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

Students: Benjamin Banaszak, Mark Blasko, Kelsey Conner, Robert Falconer, Meredith Hatchett, Emalie Houk, Christina Hummel, Lisette Jenkins, Keegan Kolf, Amanda LeMatty, Sanjana Mandilwar, David Mcleod, Nicole Meilinger, Rachel Moen, Diego Nigoa, Alexandra Nukovic, Heather Peer, Shenghao Tan, Skyler Ward

This CI aims to improve global health while promoting collaboration with Arusha Technical College in Tanzania. Many of the health issues in low-resource areas are challenging, but can be changed through collaboration with engineers and engineering students more familiar with the target medical environment. We designed a portable infant insulating and monitoring device for transport, a mobile device enabled method to verify the authenticity of antimalarials using thin layer chromatography, and a method for fabricating a low cost upper limb prosthesis from a five gallon bucket. In addition, we are working to identify current reprocessing practices within Tanzanian hospitals at different tiers. We are collaborating with Engineering World Health to develop a low cost test kit for oxygen concentrators that teaches basic soldering and circuit skills and engineering outreach module with Elephant Dentures for K-12 students here and in Tanzania. Funding provided by NIH R01 MH111366.

POSTER #130

Developing a Technology-Enhanced Teamwork Training Program for Higher Education: Initial Design & Pilot Study Across Disciplines

Mentor: Marissa Shuffler, Psychology

Co-Authors: Riley Mccallus, Jonathan Powers

Students: Rebecca Lindgren, Taylor Petrucci, Lauren Rothermel, Jennifer Welsh, Maria Roberts

The goal of this project is to integrate our collective Watt Fellow team's research capacities as well as the Watt Center resources to identify the unique skills and challenges for students and faculty working in interdisciplinary research teams, as well as to pilot interventions aimed at improving interprofessional team creativity and collaboration for courses and teams already utilizing the Watt Center space. As creativity continues to be projected as the "it" factor that will distinguish and advance teams in the future, it is imperative that more research identifies effective methodologies by which teams can solve problems and produce valid evaluations of creativity. Our line of research seeks to incorporate the rich input and insight from a cross-disciplinary team science perspective in order to address identified challenges in teams such as effective integration of group work in the classroom, determining how faculty and students can best utilize the Watt Center and its technological capacities, validation of team interventions to foster critical competencies in undergraduate and graduate students and faculty, and how to innovatively use the Watt Center technology to capture and expand teamwork and team creativity. This project seeks to expand our collective understanding of these issues, with a longer-term research initiative aimed at advancing the Watt Center as Clemson's landmark resource for innovative, evidence-based approaches to developing creativity and teamwork competencies across disciplines.

POSTER #131

The Effect of Environmental Factors on the Functional Potential and Activity of Microbes in the Chesapeake Bay and Delaware Bay

Mentor: Barbara Campbell, Biological Sciences

Co-Author: Jason Gholamian

Students: Brady O'Boyle, Megan Zeaser, Cooper Hall, Alexis Harris, Suraj Katragadda, Elijah Weber

Microbes are contributors to ecosystem function in a variety of habitats. The Delaware Bay and Chesapeake Bay are estuaries where marine and freshwater mix, providing a salinity gradient that leads to environmental stratifications like salinity. These conditions structure the diversity of microbes which are influenced by environmental factors. Here, we investigate the relationship between environmental factors on bacterial functional potential and activity using metagenomics and metatranscriptomics. Samples were collected from the Delaware and Chesapeake bays and characterized based on location, season, salinity, size fraction, and time of day. The samples underwent metagenomic and metatranscriptomic sequencing, contigs were assembled into metagenome assembled genomes (MAGs), and then annotated. A phylogenetic tree was generated from RAxML and MEGA comparing shared genes and MAGs. The coverage of all MAGs was found using iRep. Genes were compared against KEGG and RAST databases. RNAseq with DESeq2 was used to determine differential gene expression levels. Fifteen MAGs were generated; eleven were Betaproteobacteria and four were Bacteroidetes. Both of these groups had a relatively high expression of proteorhodopsin, a protein that utilizes light energy to function in proton pumping. Common pathways among the Betaproteobacteria MAGs include one-carbon metabolism, oxidative phosphorylation, and carbon fixation. Carbohydrate metabolism, translation, amino acid metabolism, and membrane transport were categories common to MAGs in the Bacteroidetes. A highly transcribed gene from all MAGs was proteorhodopsin, suggesting a photoheterotrophic role in both groups. Some MAGS were abundant in a few samples, while others were less abundant indicating that environmental factors influence microbial composition and activity.

POSTER #132

Development of Custom Assistive Devices for K-12 Participation in Archery

Mentors: Meredith Owen and John D DesJardins, Bioengineering

Students: Cassidy Barringer, Caroline Bove, Adam Burnette, Nolan Dow, Jack Lipold, Kaela O'Leary, Tyler Piel, Amanda Chernick, Reece Fratus

The ARCHER CI was developed in collaboration with Anderson School District 4 (ASD4) 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 is 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 a student with limb deformities. Goals for the project include: Create a base that can hold and lock bows in certain positions that is easy to maneuver and set up, transition from a wired approach for VI assist to a wireless approach using bluetooth sensors, and work one-on-one with students to design a personalized device. Devices will be used by students in the school district and evaluated for effectiveness. Special acknowledgments to ASD4 and the Clemson University Creative Inquiry program.

POSTER #133

Design Morphology

Mentor: Carlos Barrios, School of Architecture

Students: Cameron Gambrell, Heather Kimbrell, Edward McAbee, Lori North, Brendan Swinehart

This project presents experiments in design variations from a simple set of small elements and simple rules. Student begin to explore in how many different ways can a fixed number of identical repetitive parts can be combined to create different designs. The initial goal is to discover the possible maximum number of combinations. Then students proceed to make small variations of individual parts to study the effects on the designs. Students show how their designs are applied to project in a context.

POSTER #134

848 Creative Play

Mentor: Carlos Barrios, School of Architecture

Students: Christian Bravo, Peyton Davy, Danny Jarabek, Edward McAbee, Keith Sosebee, Michael Urueta

This project presents a series of models depicting architectural languages from traditional Palladian villas to modern designs, to original designs made by students. Students use the Shape Grammar formalism to create rules and new designs in the same language of the originals. The project stars by looking the work of a designer or several designers from which students conduct an analysis to identify the formal composition features of the original work. Students proceed to generate rules that will reproduce the original works with accuracy. Once the rules are set, students proceed to use the same rules to create additional designs in the language, thus creating new originals that may or may not have been created by the original designer. The new models are said to be in the same design language or the original designs. Students then reflect on their findings and use this knowledge to create their own original designs either by changing the rules they determined, or by creating new rules of their own.

POSTER #135

1083 Biomimicry and Biomimetics

Mentor: Carlos Barrios, School of Architecture

Students: William Aldridge, Joseph Busher, William Debeljak, Connor Deyoung, Thomas Fair, Connor Staudmyer

This project is examining two invasive natural species: Asian Golden Clam (*Crobicula Fluminea*) and Lion Fish (*Pterois spp.*). In particular this project aims to create awareness of the dangers associated with invasive species in the environment as well to learn from the environment in which they live.

POSTER #136

Cities, Memories and Models

Mentor: Carlos Barrios and Ufuk Ersoy, School of Architecture

Students: Victor Mardikian, Katherine Massa

"Pallasians in Charleston" is inspired by the science fiction novel Lesabéndio (1913) in which the bohemian author Paul Scheerbart sharply criticized modern society and cities through the eyes of an alien body watching the Earth from a better world. In a similar way, projects in this studio are based on allegorical fictions that would let some supernatural eyes, which can see what we cannot, critically observe the city of Charleston and suggest a better architecture. Particularly, each project aims to make the city perform as a museum that engages its urban life with its forgotten pasts and changing environmental conditions.

CO-AUTHOR DIRECTORY

CO-AUTHOR	POSTER #
Abbott, Harper	20
Abdel-Tawab, Rashed	126
Addlestone, Ethan	41
Adesegun, Njisane	52
Adkins, Kayla	8, 67
Adler, Mariah	40
Aduma, Kelvin	30, 30
Aldridge, William	135
Alewine, Joseph	82
Alikhail, Saanga	6
Allison, Hannah	106
Alvarado, Liz	97
Amlashi, Parastoo	104
Anderson, Jonathan	54
Andres, Shanaya	116
Arango, Kevin	6
Argenal, Andres	60, 61
Armstrong, Dillon	92
Ashley, Will	126
Atkinson, Audrey	65
Austin, Ronnie	92
Azzara, Marguerite	17
Babinchak, Ashley	73
Bailey, Meredith	81
Bailey, Hannah	55
Baird, Henry	103
Baker, Amber	25
Baldassare, Michelle	111
Ball, Lucas	59
Ballard, Jeremiah	66
Baltimore, Christopher	65
Banaszak, Benjamin	129
Barker, Keri	50
Barkley, Caitlin	7
Barre, Julia	102
Barringer, Cassidy	132
Bauer, Jacob	56
Baum, Jonathan	35
Baxa, Granville	20
Baytes, Abigail	27
Beals, Jacqueline	22
Beasley, Madison	70
Bednar, Hailey	74
Bednarek, Cassie	128

CO-AUTHOR	POSTER #
Beecher, Kayleigh	53
Bell, Annalisa	70
Bell, Michael	72
Belt, Sydney	108
Benton, Bailey	85
Bermudez, Luis	79
Bertram, Sydney	112
Bialkowski, Katarina	87
Black, Dominique	99
Black, Cierra	27
Blackman, Addison	79
Blake, Alexandria	6
Blasko, Mark	129
Bonner, Rebecca	65
Borelli, John	105
Borisko, Steven	79
Bostek, Jillian	3
Bottini, Bailey	59
Bourque, Leah	74
Bouts, Carly	70
Bove, Caroline	132
Boykin, Taylor	84
Brackett, Carson	125
Bradfute, Jenna	53
Braffitt, Katie	6
Branan, Eric	6
Braswell, Stephanie	89
Bravo, Christian	134
Bredikhin, Misha	3
Breedlove, Alyssa	3
Brock, Marissa	102
Brooke, Emily	99
Brookshire, Caroline	47
Brown, Michaela	91
Broyles, Devin	86
Bryant, Joseph	22
Bryson, Jennings	84
Buda, Kathleen	125
Bull, Carrie	82
Burger, Anne	26
Burnette, Adam	132
Burnette, Will	81
Busher, Joseph	135
Busto, Savannah	88

CO-AUTHOR	POSTER #
Buyukyavuz, Ahmet	123
Byars, Byron	42
Cabezas, Jennifer	92
Camargo, Maria	86
Campbell, Mckinzie	71
Campbell, Abigail	87
Cannon, Kyle	42
Cannon, Lindsay	123
Carambia, Anthony	121
Carrel, Sabrina	51
Carrillo, Daniel	121
Carrouth, Pierce	30
Castillo, Angie	47
Chafe, Olivia	32, 38
Chapman, Zoey	36
Chardt, Anastasia	31
Charlesworth, Winifred	91
Chea, Ashlyn	65
Chernick, Amanda	132
Chowdhury, Aniqa	30, 30
Christ, Patrick	54
Clause, Keaton	101
Colborn, Ellen	44
Collins, Mason	14
Comen, Katherine	82, 83
Conner, Kelsey	129
Conti, Arianna	114
Corbett, Cameron	127
Corell, Jaden	6
Cory, Lauren	77
Cousart, Alexandria	6
Coward, Addie	82, 83
Crim, Andrew	73
Crocker, Audrey	91
Crow, George	84
Crowfoot, Emma	78
Crunk, Ashley	100
Cummings, Gabrielle	23
Cusack, Patrick	118
Dale, Joshua	9
Dame, Addy	98
Daniel, Haley	53
Daniels, Bryson	18
Davis, Shellie	4, 62
Davis, Ryan	68
Davis, Anna	83
Davis, Lauren	20
Davis, Alyssa	13
Davy, Peyton	134
Debeljak, William	135
Del Campbell, Isaiah	45
Demass, Reid	94
Dennis, Danesha	26, 52
Denny, Logan	26
Devaney, Lucy	4, 62
Deyoung, Connor	135
Dieterich, Tanner	59
Dischiavi, Nicole	18
Do, Phillip	66
Donahue, Ryan	93
Dooley, Jessica	93
Dorman, Charis	53
Douglass, Mallory	100
Dow, Nolan	132
Downing, Maren	42
Drose, Richard	54, 55
Drum, Lauren	32, 38
Dudley, Marcus	119
Duffy, Carly	47
Dunlavey, Shane	28
Edgecomb, Sara	63
Edwards, Kelly	32, 38
Eidson, Jess	89
Eimen, Rachel	57
Eitel, Anna Beth	87
Elpers, Maggie	42
Embree, Nicole	82, 83
Enright, Connor	59
Erikson, Dylan	2, 117
Estrada, Jacob	32, 38
Fair, Thomas	135
Falconer, Robert	129
Falgoust, Grace	97
Farah, Harold	89
Farquhar, Kayla	102
Ferral, Melissa	109
Ferreira, Desi	76
Fincher, Gregory	84

CO-AUTHOR DIRECTORY

CO-AUTHOR	POSTER #
Fisher, Kelsey	6
Fletcher, McKenzie	11
Flores, Nicole	102
Fogle, Megan	106
Forker, Grace	107
Fox, Dalton	6
Fox, William	116
Franaszek, Nicole	81
Fratus, Reece	132
Funcik, Amy Grace	47
Gaidjunas, Jared	35
Gallup, Robert	3
Galvez, Precious	121
Gamble, Leah	114
Gambrell, Cameron	133
Gambrell, Drayton	73
Gantenbein, Curdin	66
Garrett, Emily	28
Garvey, Riley	30, 30, 78
Garwatoski, Ashley	47
Gentry, Cameron	6
Geyer, Dave	28
Ghent, Bethany	40
Gholamian, Jason	131
Ghotbi-Taheri, Persia	35
Gilmore, Serena	44, 112
Giraldo Escobar, Katherine	65
Glasshof, Rya	5, 114
Gleaton, Emily	6
Goff, Colleen	31
Goodine, Javin	46, 123
Goodman, Kayla	36
Gordon, Tristan	102
Gore, Robert	61
Gouge, Courtney	99
Gower, Jordan	6
Gray, Chandler	119
Grear, Gary	32, 38
Greene, Lauren	6
Greulich, Lexi	31
Groce, Michael	33
Gross, Dominique	85
Gundermann, Molly	20
Gunst, Joseph	45
Guo, Helena	3
Gurtler, Sierra	115
Guthrie, Emily	32, 38
Gutierrez, Karen	86
Guynup, Trevor	56
Haeffner, Nariah	6
Hahn, Jacob	68
Hall, Cooper	131
Halliday, Kevin	45
Hammond, Mason	105
Hannah, Lindsay	95
Hao, Wenjian	66
Hargett, Benjamin	42
Hargett, Zachary	42
Harp, Cole	20
Harris, Alexis	131
Harrison, Julia	42
Hartsell, Mara	42
Hatchett, Meredith	129
Hayes, Samantha	72
Hayes, Skylar	53
Hays, Kori	6
Hecht, Alexi	105
Hedge, Melanie	126
Heffron, Emory	28
Helsel, Brian	4, 62
Henderson, Lydia	18
Hetherington, Benjamin	69
Hickman, Nicole	33
Hieronymus, Bradley	123
Hill, Megan	30, 30
Hills, Mackinzie	35
Hines, Abigail	22
Hinsch, Valerie	104
Hoffman, Reid	93
Holt, Coral	6
Hoover, Hayes	104
Horowitz, Hannah	83
Houk, Emalie	129
Hourigan, Chloe	18
Howell, Braxton	65
Hudson, Kadie	5
Hudson, Hazel	77
Huff, Erin	94

CO-AUTHOR	POSTER #
Huffman, Madeline	26
Huggins, Jonah	16
Hughes, Sydney	67
Hulsey, Robert	8
Hume, Rachel	94
Hummel, Christina	129
Hummel, Grant	93
Hunter, Colton	32, 38
Hutchinson, Geneva	83
Hutter, Samantha	110
Interiano, William	16
Isbell, Karlee	6
Iwan, Mia	6
Jackson, Morgan	99
Jamison, Azrin	42
Jarabek, Danny	134
Jeffcoat, Coby	87
Jellema, Hannah	39
Jenkins, Lisette	129
Johnson, Elyssa	91
Johnson, Elizabeth	32, 38
Johnson, Hannah	6
Johnson, Megan	58
Johnson, Elizabeth	48
Johnson, Kalyn	6, 77
Johnson, Kenny	123
Joines, Ashley	6
Jones, Kensey	114
Jones, Stan	82
Judge, Mackenna	57
Judge, Melissa	128
Kaczmarek, Allison	124
Kadau, Anna	23
Kalacanic, Christian	102
Kao, Elise	99
Katragadda, Suraj	131
Kean, Ray	9
Kee-Young, Devante	57
Keller, Rebecca	30, 30
Kent, Hanna	98
Kerr, Clancy	114
Kessler, Brian	85
Kim, Hyein	86
Kimbrell, Heather	133

CO-AUTHOR	POSTER #
Kimsey, John	121
Kinard, Lydia	6
Kindervater, David	110
Kistler, Samuel	104
Klaasmeyer, MaKensey	98
Knight, Caroline	98
Knox, Abbey	50
Koch, Holly	99, 120
Kodikara, Samantha	20
Koger, Emily	50
Kolf, Keegan	129
Kome, Rosa	48
Konopka, Lauren	82
Korneva, G	11, 51, 101
Kosydar, Derek	56
Krantz, Christian	46
Krolicki, Alexander	66
Kropilak, Katherine	22
Krussig, Mario	95
Kryshak, Violet	4, 46, 62
Kullman, Alexander	20
Lamb, Sophia	4, 62
Langley, Sydney	56
Lannamann, Rebekah	32, 38
Lara, Gabriel	101
Lary, Sean	7
Lascano, Gustavo	109
Lautenschlager, Carla M	32, 38
Lazar, Kelly	113
Lee, JS	11, 101
Lee, Jae Eui	66
Lee, Taya	42
Lee, Ryan	128
Leech, Brooke	58
Leland, Robert	89
LeMatty, Amanda	129
Lemelin, Michael	12
Lemere, Laura	83
Lewis, Paula	51
Lewis, Carlie	47
Li, Claudia	40
Lindgren, Rebecca	91, 130
Lindsey, Kaylee	28
Lindsey, Kenneth	128

CO-AUTHOR DIRECTORY

CO-AUTHOR	POSTER #
Lipold, Jack	132
Livingstone, Mark	22, 42
Lloyd, Jess	69
Logan, Michelle	6
Lommel, Karen	101
Longacre, Andrea	24
Lopez, Ethan	104
Lott, Amari	6
Lowe, Tristan	31
Lucisano, Amy	28
Lutz, Julianne	6
Mabry, Luke	80
Magee, Katherine	11
Mahendranath, Aparna	9
Malone, Hailey	4, 62
Mandilwar, Sanjana	129
Mandrgoc, Sydney	53
Mantia, Aaron	24
Mardikian, Victor	136
Markley, Samantha	104
Marosok, Dominic	57
Marshall, Caroline	45
Martin, Brice	80
Martin, Calvin	110
Martin, Logan	40
Martinez, Amber	46, 47
Martinez-Dawson, Rose	123
Martinson, Christina	77
Massa, Katherine	136
Massey, Kendall	82
Matthews, David	60
Mattox, Carrie	58
McAbee, Edward	133, 134
Mcaninch, Ethan	79
McCall, Jordan	119
Mccallus, Riley	130
Mccarter, Abigail	72
Mccomb, Joleah	58
Mccomb, Shelly	29, 68
Mccormick, Lauren	70
Mccraw, Sophie-Earle	83
Mcdaniel, Erin	4, 62, 109
Mcglinn, Carley	85
Mcglynn, Grace	28

CO-AUTHOR	POSTER #
Mcgrew, Hannah	40
McKee, Haley	32, 38
Mckeehan, Jack	11
Mclamb, Mason	76
Mcleod, David	129
Mcmillan, Kimberly	84
Mehta, Apoorva	86
Meilinger, Nicole	129
Mercado, Elliot	20
Merics, Nicole	99
Messick, Lindsey	46
Meza, Claudia	123
Mickle, Javarrus	69
Middleton, Ely	100
Miguelino, Taylor	23
Miller, Lindsey	122
Miyasato, Elena	49
Moen, Rachel	129
Momin, MuskanZehra	6
Moore, Carrington	49
Moore, Taylor	53
Moosey, Jenna	53
Moreland, Jacob	21
Morrow, Macy	43
Morton, Zoey	42
Moseley, Ryan	19
Moses, Quann	86
Mullen, Hayden	87
Murrant-Johnson, Alex	102
Murray, Jacob	109
Murrell, Kasey	22
Myers, Loren	99
Naab, Ria	17
Nabozna, Jeffrey	45
Nachman, Erika	111
Nadolski, Gabriel	41
Nalin, Nidhi	118
Napolitano, Justin	30, 30
Nasser, Jamal	66
Neely, Kaleigh	42
Nelson, Akasha	97
Nesbitt, Toney	47
New, Samuel	83
Newton, Haley	46

CO-AUTHOR	POSTER #
Nicholson, Laurens	84
Nicholson, Duncan	66
Nicks, Amanda	117
Nielson, Ryan	76
Nigoa, Diego	129
Nikkila, Jacob	57, 86
Noel, Savannah	98
Nolan, Melissa	80
Norris, Lane	110
North, Lori	133
Nukovic, Alexandra	129
Nuttall, Meg	66
O'Boyle, Brady	131
O'Brien, Kimberly	57
O'Leary, Kaela	20, 132
O'Toole, Lindsay	23
Oliveira, Cierra	112
Oliver, Tiffany	15
Oneill, Ashley	46
Osteen, Kaylee	121
Oswalt, Hannah	51
Ott, Alexis	46
Padgett, Ashley	21
Pagendarm, Hayden	42
Palmentiero, Margaux	92
Paniyil, Prahaladh	121
Parker, Alden	43
Parker, Maddison	6
Pasig, Lanz Patrick	126
Patel, Dhruval	66
Patel, Mayank	1
Patel, Janki	99
Patrohay, Evan	49
Paul, Tiffani	13
Pearson, Alianna	116
Pederson, Taylor	97
Peer, Heather	22, 129
Pescatore, Olivia	59
Pesce, Genna	47
Pesicka, Madison	27
Peters, Cavan	91
Peters, Valerie	115
Petersen, Dani	92
Peterson, Matthew	45

CO-AUTHOR	POSTER #
Petrucci, Taylor	130
Petty, Chris	30, 30
Phan, Dana	88
Piel, Tyler	132
Pilot, Emily	27
Plummer, Jamie	40
Powell, Emily	6
Powers, Nathaniel	66
Powers, Aidan	45
Powers, Jonathan	130
Price, Aaron	46
Proctor, Gerald	37
Puderbach, Marisa	23
Queen, Nicholas	61, 64
Rabon, Granger	119
Radick, Rachel	6
Rafalski, Danny	32, 38
Rafka, Habib	42
Randall, Henry	95
Rast, Andrew	46
Ratterree, Lanie	22
Raymond, Parker	118
Redmond, Brooke	51
Reece, McKinnon	105
Reed, Maegan	10
Reeves, Hillary	114
Reid, Rachel	4, 62
Reno, Mary Beth	20
Reynolds, Sarah	70
Rhodes, Kara	36
Richbourg, Tara	115
Rifkin, Andrew	30, 30
Riser, Keagan	86
Rivera, Alicia	21
Roberts, Darcy	53
Roberts, Maria	130
Rodgers, Hannah	83
Rogers, Elizabeth	68
Rood, Christopher	95
Rose, Chelsea	20
Roth, Rebecca	117
Rothermel, Lauren	130
Rovero, Christopher	63
Rowell, Sarah Catherine	75

CO-AUTHOR DIRECTORY

CO-AUTHOR	POSTER #
Ruddy, James	59
Rumsey, Jennifer	32, 38
Ruple, Austin	84
Russi, Kyle	7
Ryan, Taylor	42
Rybecky, Shannon	102
Sall, Amanda	24
Salvadore, Kienan	41
Samantaray, Arghya	56
Samstag, Matthew	35
Samuta, Adam	11
Sanna, Kimmy	22
Santore, Alyssa	128
Sarver, Hannah	17
Saverance, Madeline	6
Saverance, Carsyn	53
Scercy, Christopher	48
Schafer, Kailey	39
Schindler, Kyle	128
Schmidt, Nathaniel	119
Schnabel, Cameron	3
Schnabel, Elise	127
Schroeder, Whitney	20
Scircle, Emily	2
Scott, Blaire	92
Scott, Maggie	97
Seawell, Taylor	44
Seilkop, Alexis	128
Self, Kirby	53
Shackleford, Lily	46
Shaffer, Jason	42
Shah, Manav	6
Shannon, Madeline	128
Sharpe, Caroline	54, 55, 89
Shaughnessy, Rachel	23
Sheets, Steven	66
Shores, Emily	32, 38
Shrake, Kevin	3
Simmons, Jacob	49
Singletary, David	119
Sinkevitch, Jenna	17
Six, Stephanie	50, 52
Sizer, Chandler	22
Slater, Fiona Noel	109
Slenkovich, Nicolina	125
Smith, Mary Catherine	106
Smith, Colton	79
Smith, Jordan	97
Smith, Shelby	51
Smith, Alexandra	67
Smith, Claire	6
Snively, Tyler	84
Solomon, Daniel	117
Soman, Arya	34
Sosebee, Keith	134
Sox, Kelsey	78
Sparks, Robert	54
Spence, Sarah	73
Spencer, Jacob	34
Springer, Garrett	42
Staino, Rachael	42
Starr, Maria	122
Staudmyer, Connor	135
Stepanova, Tatiana	124
Stepp, Ryan	30
Stewart, Jonathan	33
Stewart, Brendan	3
Stewart, Sarah	36
Stone, Amber	51
Stowasser, Martha	36
Strawsburg, AnnaWade	98
Stroud, Madison	6
Suffern, Matthew	58
Sulzbach, Margaret	106
Surusani, Shivani Reddy	101
Sutherland, Rebecca	113
Sutton, Nykira	25
Swafford, Brittany	22
Swinehart, Brendan	133
Sykes, John	20
Tan, Shenghao	129
Tate, Brian	54, 55
Taylor, Alexis	57
Taylor, Alyssa	32, 38
Taylor, James	119
Taylor, Gillian	109
Tedeschi, Alex	42
Thomas, Aleena	126

CO-AUTHOR	POSTER #
Tice, Carissa	31
Tolson, Jonathan	89
Tota, Jessica	10
Tourville, Nicholas	86
Turner, Tristan	89
Tuttle, Nicholas	49
Urueta, Michael	134
Uscilla, Brad	59
Uy, Lisa	93
Van, Ryan	3
Van Overeem, Talina	53
Vaughan, Matt	55
Vaughan, Greig	51
Veideman, Ethan	11
Vo, Yen	45
Wagner, Julie	22, 112
Waldrop, Jacob	69
Walker, John	118
Walker, Erin	111
Wallace, Kelsey	53
Walling, Megan	70
Walters, Sharon	27
Wang, Tony	66
Ward, Kenedey	117
Ward, Skyler	129
Ware, Mallory	118
Watson, Mary	15, 83
Watson, Caleb	89
Wayt, Rachel	117
Weber, Elijah	131
Weinman, Steven	12
Weiss, Brie	10, 23
Wells, Stephen	74
Welsh, Jennifer	130
Wentworth, Katherine	104
Westbury, Baylee	16
Whaley, Taylor	34, 50
Whetter, Bailey	59
Whitaker, Natalie	49
White, Kyle	4, 62
Whittington, Zachary	123
Wilkie, Adam	60
Williams, Brayden	54
Williams, Katarina	58
Williamson, Rebekah	91
Williamson, Christopher	55
Williamson, Zach	115
Wilson, Chloe	91
Wirth, Kathleen	91
Witebsky, Nathan	66
Wlasiuk, Paloma	112
Wong, Kerri	3
Wood, Savannah	83
Woodard, Rebekah	4, 62
Woody, Brooks	32, 38
Word, Faith	99
Wright, Sue	77
Wright, Jordan	82
Yeates, Matt	46
Yeung, Tiffany	49
York, Bradley	64
Yost, Molly	32, 38
Young, Tyler	6
Zavaski, Cameron	59
Zeaser, Megan	131
Zemitis, Sarah	22
Zhou, Samuel	45

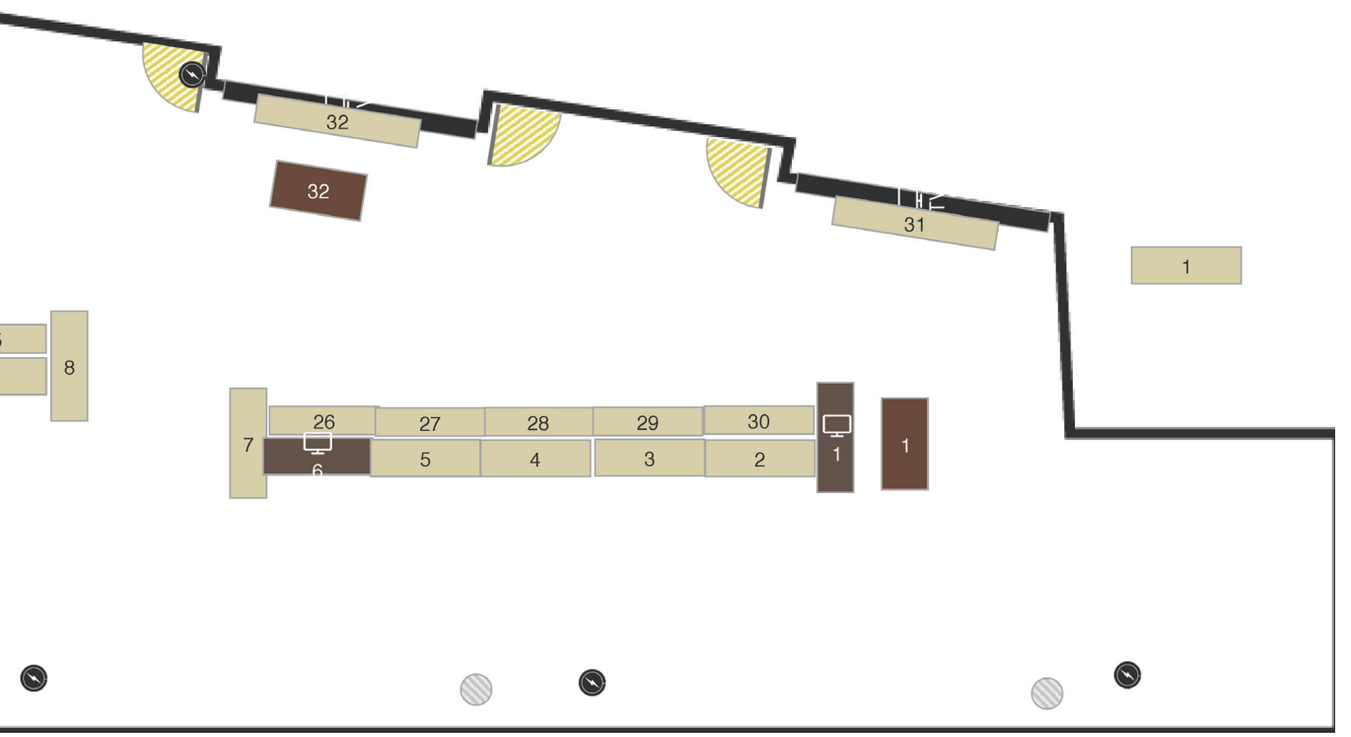
MENTOR DIRECTORY

MENTOR	POSTER #
Alper, Joshua	57, 104
Anderson, Denise	53
Angelina, Meghan	14
Barrios, Carlos	133, 134, 135
Batt, Gregory	24,76
Beadle, Sarah	18
Beard, Charles E	124
Birtwistle, Marc	16, 125
Bisson, Jennifer	13, 26, 98, 122
Blenner, Mark	80, 81, 110, 115
Blob, Richard	107
Brame, Scott E	19, 37, 71, 113
Brumaghim, Julia	103
Burnette, Crystal	65
Bussell, Kristi	117
Byrne, Kaileigh	52, 88
Campbell, Barbara	111, 131
Cannon, Andrew	60
Cao, Min	7
Cash, Hannah	44
Chen, Zhuo Job	99
Childress, Michael	6, 29, 78
Chow, Alex	21
Chrisp, Jared	14
Cocchiola, Gregory	76
Condrasky, Margaret	46, 47
Cottle, Renee	41
Curtis, K. Amber	70
Dawson, Paul	58, 123
Dean, Delphine	22, 30, 42, 129
DesJardins, John D	22, 42, 129, 132
Detrich, David M	82
Diamond, Kelly	107
Diaz, Lauren	4
Drapcho, Caye	118
Dubin, Alexsandra	53
Dunn, Heather	51
Dye, Cheryl J	40
Erdem, Cemal	125
Ersoy, Ufuk	136
Farahmand, Masoud	9
Farmer, Troy	14, 21
Fernando, Lawrence	41
Fisher, Andrea	24

MENTOR	POSTER #
Flynn, Michelle	94
Frank Kamenetskii, Anastasia	126
Frugoli, Julia	127
Giebelhausen, Michael	28
Gigliotti, Laura	36
Godar, Subash	104
Hagan, Donald	54, 55
Hagan, Althea	39, 48
Haines, David	49
Han, Yiqiang	66
Hargett, Zachary	22
Harman, Melinda	20, 22
Heintz, Melissa	32
Hirsch, Shanna	27
Husson, Scott M	12
Idarraga Mora, Jaime	12
Jachowski, David	36, 109
Jachowski, Cathy	4, 31
Jiang, Xiuping	25
Kaminski, Richard	89, 119
Kelly, Jessica	63
Kemper, Karen A	62
Kidd-Weaver, Anje	31
King, Oswald	59
Kornev, Konstantin	124
Kowalski, Robin	74
Kuksenok, Olga	79
Kung, Ethan	9
Lanham, Janice	102
Larouche, Olivier	85
LeNoble, Chelsea	91
Ligato, Joseph	43
Lucaites, Kathryn	10
Manson V, Joseph	82, 83
Marcotte Jr, William R	5
Masto, Nicholas	89, 119
Matic, Vladimir	72
Mccollum, Caren	25
McCubbin, James A	23
McCullough, Melissa	42, 129
McNamara, McKenzie	65
Mercuri, Jeremy	95
Mikhailova, Elena	84, 116
Moore, Amanda	100

MENTOR	POSTER #
Mount, Andrew	33
Muth, Eric R.	18
Newkirk, Olivia	128
Neyens, David	22
Noonan, Kara	6, 78
Ogle, Jennifer	45, 56, 105, 112
Owen, Meredith	132
Pagano, Christopher	10
Pang, Weichiang	1
Pataky, Garrett	60
Pilcher, June	2, 34, 50, 98
Post, Christopher	116
Price, Samantha	85
Reukov, Vladimir	3, 73, 86, 126
Richardson, William	42, 129
Rodriguez, Jorge	11
Rudolph, Krista R	114
Sampson, Christie	32
Sanborn, Sarah	26, 98
Schlautman, Mark A.	61, 64, 75
Schweisinger, Todd	35
Shuffler , Marissa	91, 94, 97, 120, 130
Shvorin, Dotan	8, 67, 87, 101
Simionescu, Dan	95
Singh, Rajendra	121
Smith, Kylie	6
Smith, Dane	69
Solini, Hannah	10
Stringer, William C	39
Swain, Scott	59
Taaffe, Kevin	8
Takacs, Endre	30, 30
Taylor, Jazmine	49
Temples, Heide	38
Thompson, Martha	117
Titus, Keifer	109
Torrence, Caitlin	40
Trout, Marshall	57
Van den Hurk, Peter	68
Vaughn, David	17, 93
Verhoeven, Dana	120
Villanueva, Randle Aaron	99
Wagner, John R	108
Walker, Joan L	48
Walker, Terry	49
Wei, Yanzhang	106
Weisensee, Katherine	77
White, David	69
Whitehead, Kristi	92, 114
Whitehead, Daniel	92
Woodward-Detrich, Denise C	15, 82, 83
Wright, Mary	38
Wylie, Jerry	64
Xiao, Rui	49
Zadeh, Orrod	16
Zinzow, Heidi	117
Zordan, Victor	79

APRIL 01 POSTER MAP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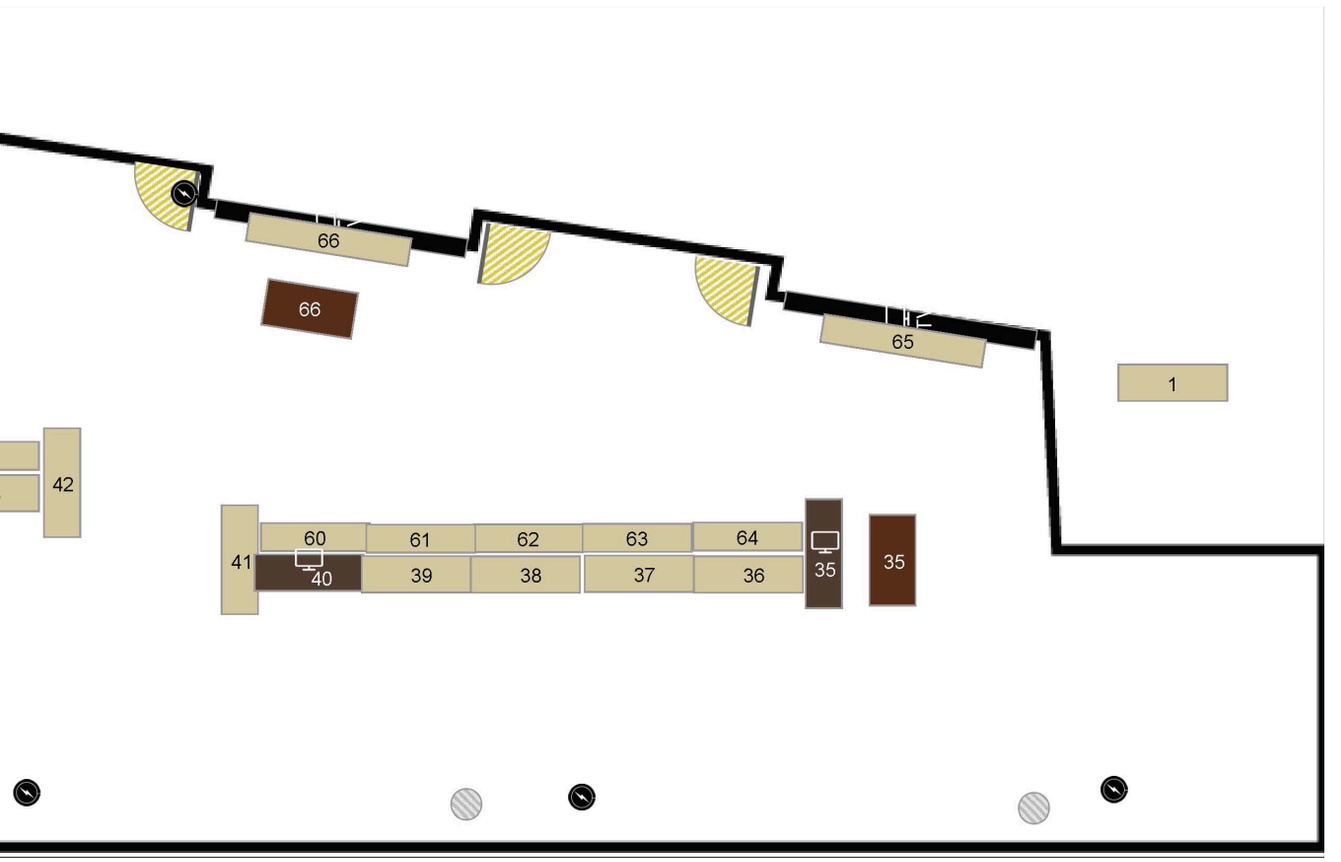
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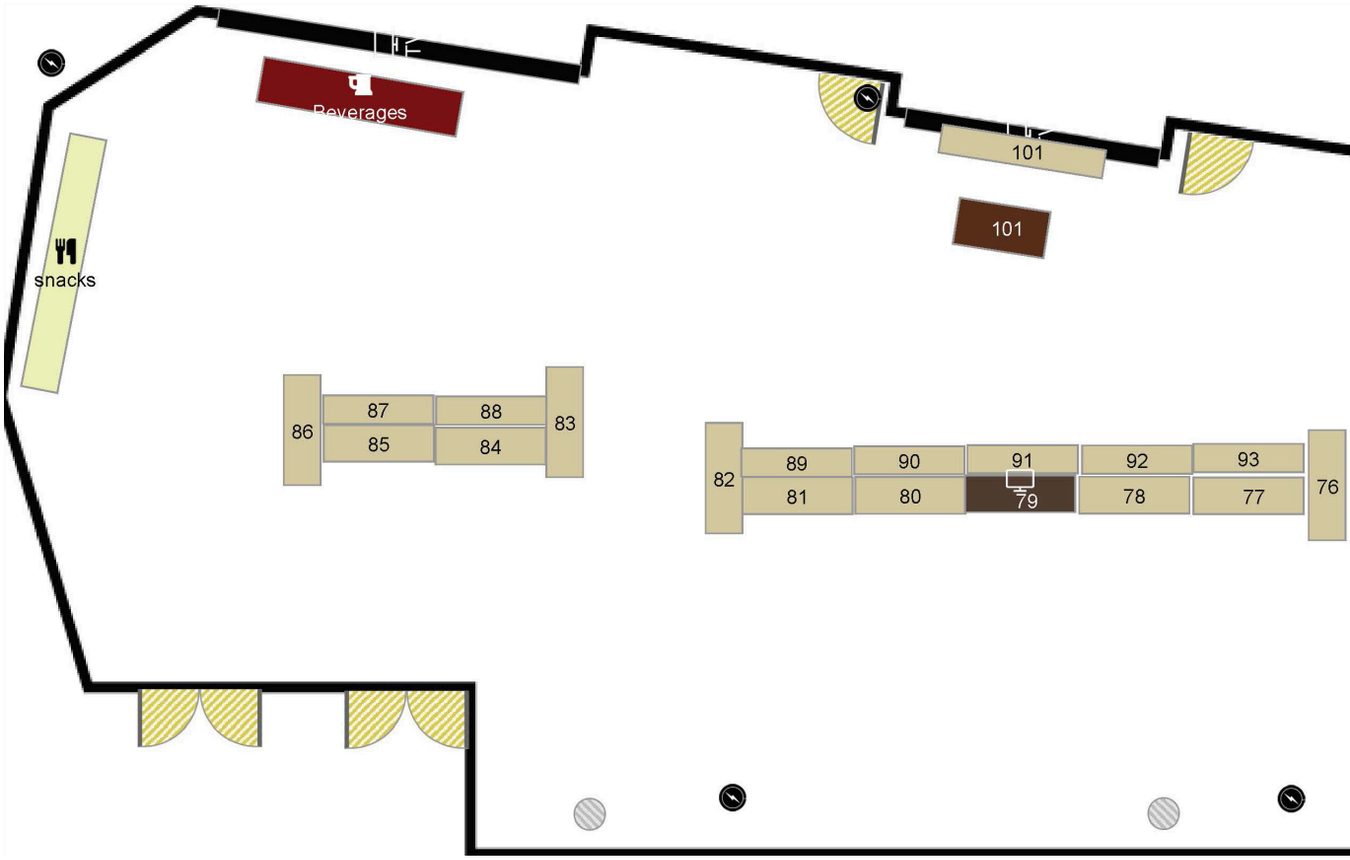
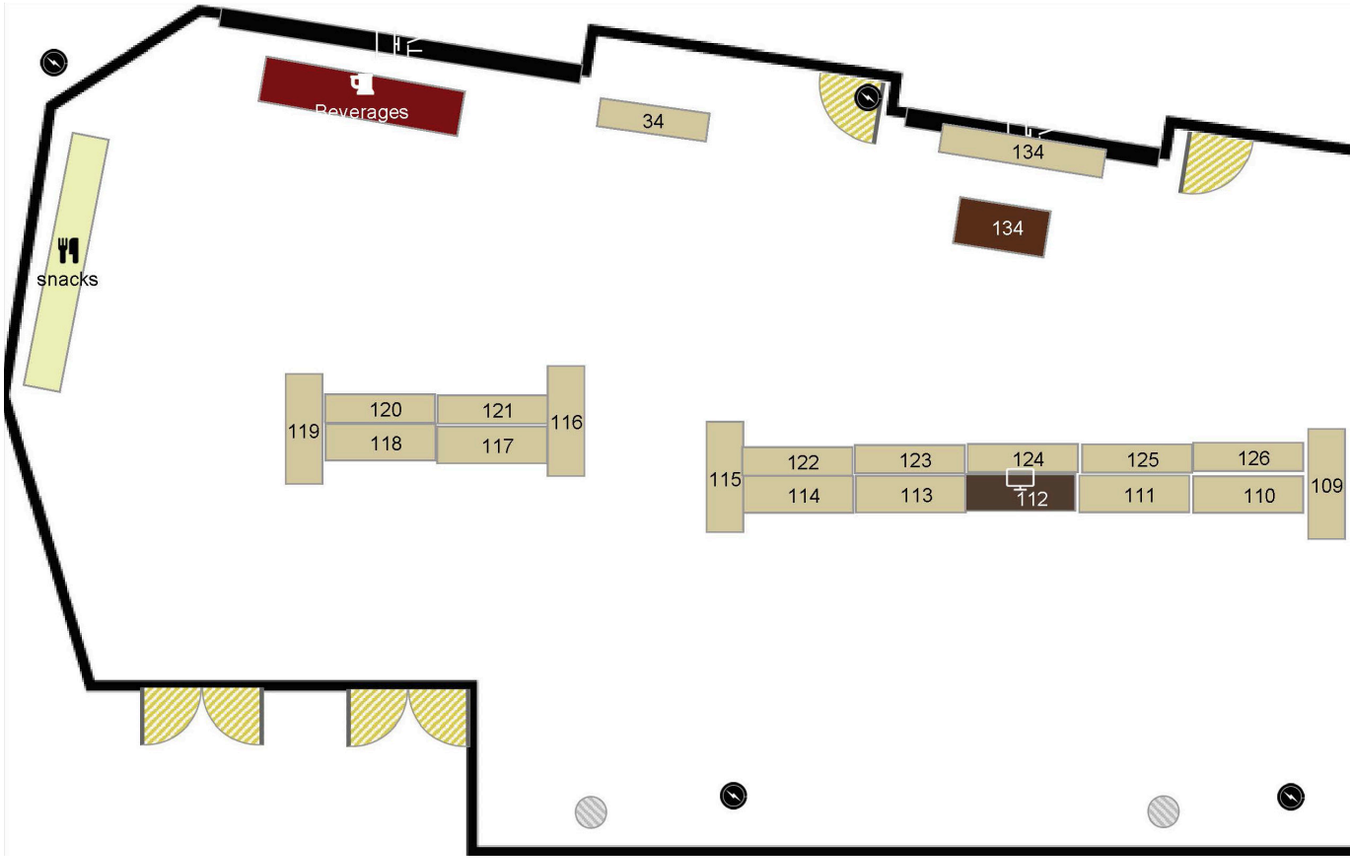
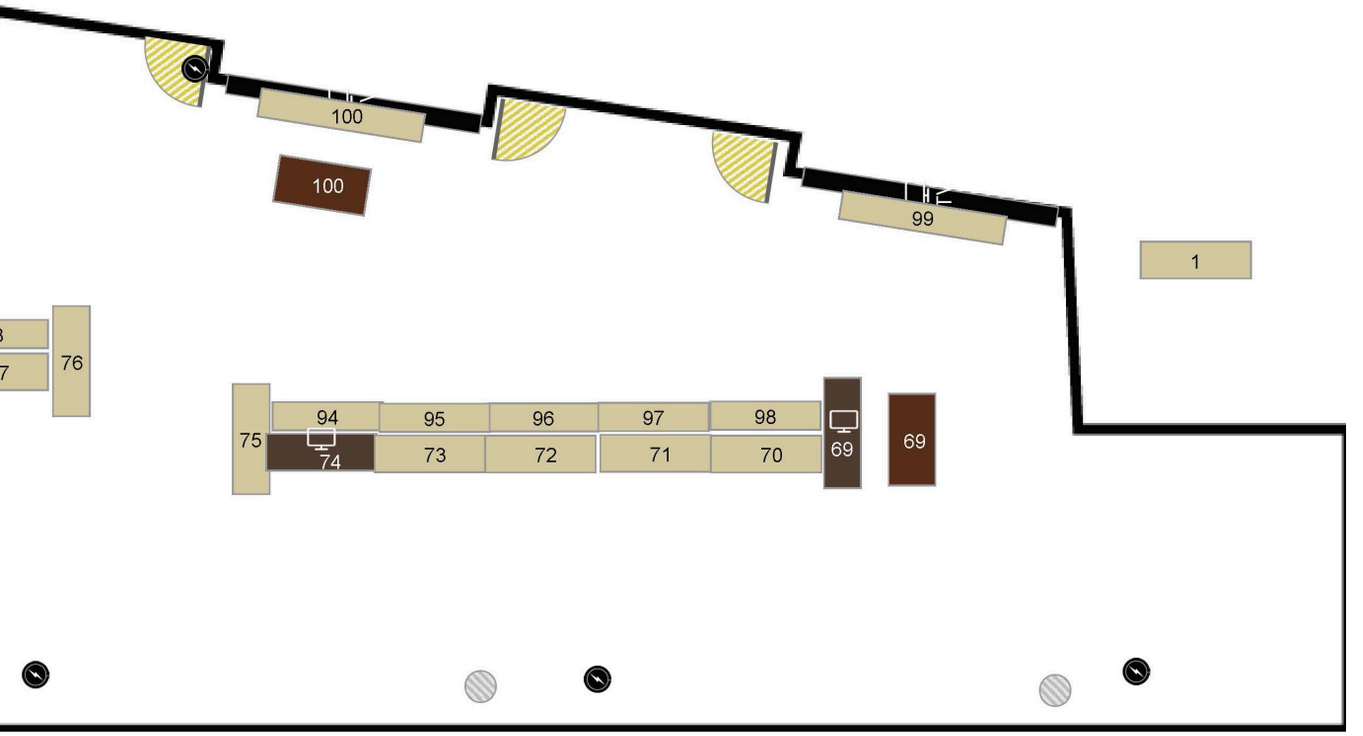
APRIL 02 POSTER MAP



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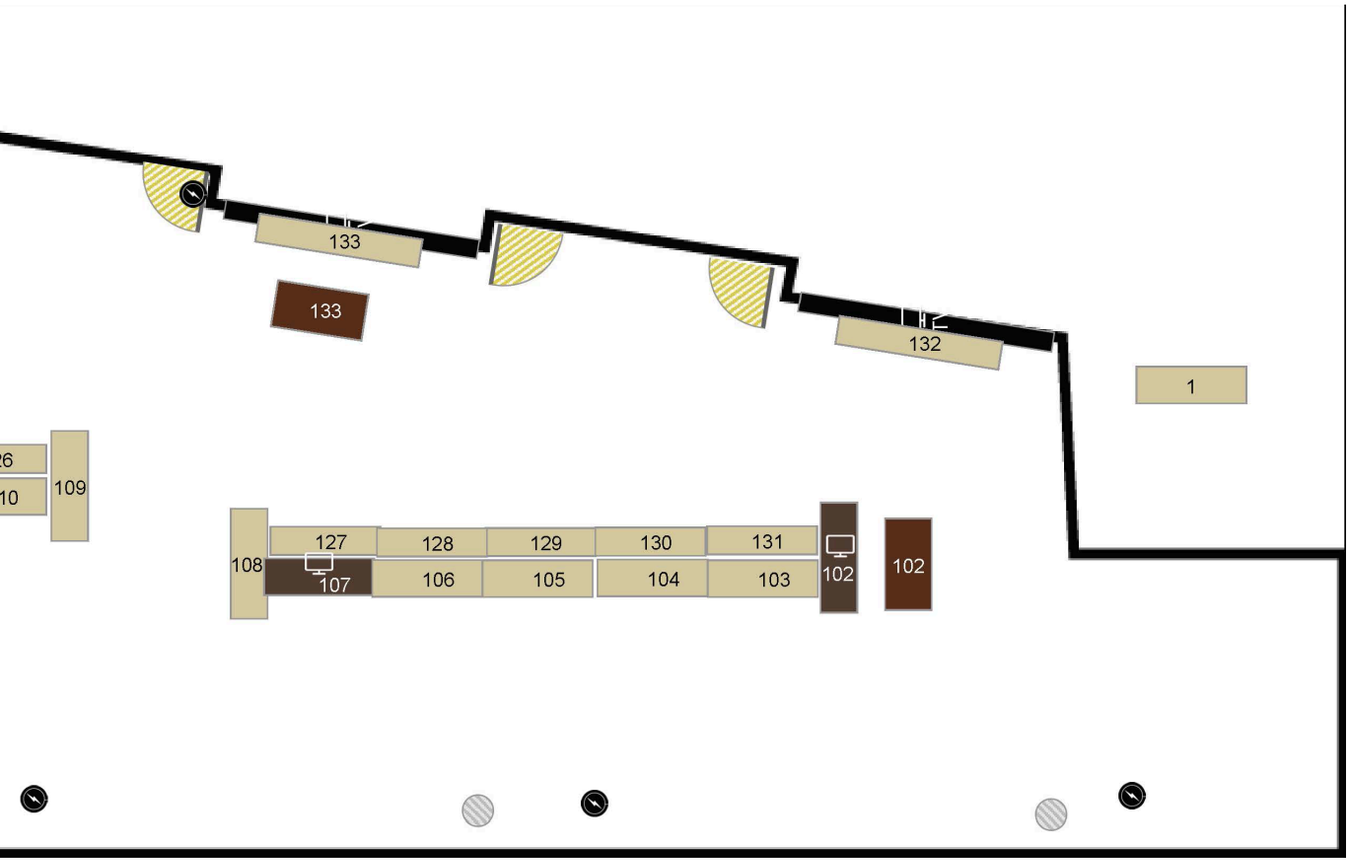
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106
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104
103
102
102

OPPORTUNITIES & EVENTS

There are a lot of opportunities to interact with Creative Inquiry throughout the year. Below we present some of the newer opportunities for Creative Inquiry facult and students. For more information, visit clemson.edu/ci or contact the CI office.

CORPORATE CI

The Corporate Creative Inquiry (CCI) program allows industries to engage intelligent, creative Clemson undergraduates and faculty in industry-relevant projects and in doing so contribute to building the workforce of the future. A Clemson University faculty member will mentor the undergraduate team as they work on the project. Some projects may be co-mentored by an experienced graduate student.At the discretion of the company, selected students may be offered internships at industry sites. Current CCIs are sponsored by: Siemens, VF Corporation, IBM Watson and Ulbrich.

CLEMSON CREATIVE INQUIRY CORPORATE

CARR FAMILY ENDOWMENT

The Carr Family Endowed CI award is given annually. This award is supported by the Carr Endowment (Lori Ann and Chalmeres Carr). This award provides funding for one year to enhance eligible research projects. New or exiting CI projects are eligible to apply. Projects must focus on one or more of the following areas:

Rural Economic Development
Rural Community/Business Development
Fruit, Vegetable/Crop production
Production Agriculture Industries

CLEMSON CREATIVE INQUIRY CARR FAMILY ENDOWMENT

SUMMER CI & UR PROGRAM

Each year, Creative Inquiry mentors are invited to nominate undergraduate students to participate in this eight week summer research program. Selected students will continue research projects that the CI started in the academic year. Student recipients will receive summer salaries for eight weeks (May 6-June 30). A series of optional professional development opportunities will be available suring lunch seminars in the summer. All participants will present interactive, digital poster presentations at the Summer CI & UR Showcase and Fall Kick-off event held in August.

CREATIVE INQUIRY IS...

COLLABORATION

CAREER PREPARATION

HANDS-ON RESEARCH

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