FoCI
POSTER FORUM

APRIL 6-8, 2022

AT THE WATT CENTER

17TH ANNUAL

FOCUS ON CREATIVE INQUIRY POSTER FORUM


VIDEO PRODUCTION

17TH ANNUAL FOCUS ON CREATIVE INQUIRY POSTER FORUM

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

This year is the largest FoCI in history! The Opening Plenary Address by Dr. Dori Helms, Provost Emerita and Founder of the CI program, is on April 6 at 3:10 p.m. The Closing Plenary Address by Dr. Mark Schlautman, the 2021 Recipient of the Bradley Award for Mentoring in Creative Inquiry, will highlight Schlautman's mentoring journey with Clemson's Chapter of Engineers Without Borders. To end our 2022 FoCI celebration, the Poster Awards Ceremony will recognize winners of the poster competition.

What is Creative Inquiry?

Creative Inquiry (CI) is a small group learning experience 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 pressing needs of the world around them. Students take ownership of their projects – they ask questions, take risks and get answers.

Since it was established in 2005, the CI program has supported more than 1,900 projects enrolling more than 53,000 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 time in the program 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.

FoCI
POSTER FORUM

EVENT SCHEDULE

APRIL 06

WATT ATRIUM

9AM	AM Session Setup
10AM - 12PM	Morning Poster Session
12PM - 1PM	Lunch in Atrium
12:30PM - 1PM	PM Session Setup
1PM - 3PM	Afternoon Poster Session

PLENARY SESSION, WATT AUDITORIUM

3:10PM

PLENARY SPEAKER - Dr. Doris Helms

APRIL 07

WATT ATRIUM

9AM	AM Session Setup
10AM - 12PM	Morning Poster Session
12PM - 1PM	Lunch in Atrium
12:30PM - 1PM	PM Session Setup
1PM - 3PM	Afternoon Poster Session

APRIL 08

WATT ATRIUM

9AM	AM Session Setup
10AM - 12PM	Morning Poster Session
12PM - 1PM	Lunch in Atrium
12:30PM - 1PM	PM Session Setup
1PM - 3PM	Afternoon Poster Session

PLENARY SESSION, WATT AUDITORIUM

3:10PM

PLENARY SPEAKER - Dr. Mark Schlautman

AWARDS CEREMONY

4:15PM - 5PM Students Remove Posters

ACKNOWLEDGEMENTS

Creative Inquiry Committee

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

Joey Manson, Art
Alan Grubb, History
Margaret Condrasky, Food, Nutrition & Packaging Sciences
Troy Farmer, Forestry & Environmental Conservation
David White, Parks, Recreation & Tourism Management
June Pilcher, Psychology
James Gaubert, Marketing
Ryan Toole, Management
Jessica Larsen, Chemical & Biomolecular Engineering
Steven Brandon, General Engineering
Tzuen-Rong 'Jeremy' Tzeng, Biological Sciences
Michael Sehorn, Genetics & Biochemistry
Ryan Visser, Education & Human Development
Robert Hollandworth, University Libraries
Joanna Floyd, VP for Research
David Knox, Office of Undergraduate Studies
Juan Xu, Institutional Research
Holly Williams, Honors Program

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 fish toxicology to studying democracy in post-conflict societies to address 21st century problems. 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

WELCOME

Barbara J. Speziale

Associate Director, Watt Family Innovation Center
Director, Creative Inquiry + Undergraduate Research Program
Professor, Biological Sciences

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

Dr. Speziale's research, funded by $15,100,000 in external grants, includes projects in aquatic ecology research and STEM education. Recent projects include: SC Life, funded by $6,400,000 from the Howard Hughes Medical Institute, which supported undergraduate research and science outreach to thousands of K-12 students and teachers; a National Science Foundation grant that established Clemson's FIRST program for first-generation college students; and grants for STEM education and award-winning water quality education programs and materials.

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

Cora Allard-Keese

Associate Director, Creative Inquiry
and Undergraduate Research Program

Cora Allard-Keese earned her M.S. in Entomology at the University of Kentucky and a B.S. in Biology at Millikin University. Since joining Clemson in 2004 she studied the efficacy and impact of potential biological control agents on the hemlock wooly adelgid. She also studied the impact of microclimate variations on the breeding phenology of the wood frog, *Lithobates sylvatica*, and the impact of local resident knowledge on research and conservation efforts in highly dissected mountain landscapes.

She was a lecturer and program coordinator in the Department of Biological Sciences where she taught summer courses for science teachers and oversaw the Summer Program for Research Interns. Cora joined the Office of Creative Inquiry and Undergraduate Research as the Associate Director in the fall of 2015.

She has been a collaborator on several funded grants to enhance the pre-college learning experiences in the state of South Carolina, including grants through the Howard Hughes Medical Institute Precollege and Undergraduate Science Education Program. Though diverse disciplines compose her professional background, a reoccurring theme of engaging students in science and research via diverse and innovative methods is prevalent.

CONTACT THE CI + UR OFFICE

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PLENARY SPEAKERS

Doris Helms

Creative Inquiry Founder

Dr. Doris R. Helms received her B.S. in Biology from Bucknell University and Ph.D. in Zoology from the University of Georgia. She served Clemson University as Department Chair of the Biology Program and Associate Dean of the College of Sciences and served as the Provost and Vice President for Academic Affairs, from 2000-2013.

"Dori" served as the Chair of the College Board's Science Advisory Committee, Chief Reader in Advanced Placement Biology, the Council for Academic Affairs representative on the NASULGC Board of Directors and as the Southern Regional representative to the College Board Academic Assembly. She received the Charles H. Townes Award for service to Science and Mathematics Education in South Carolina, the South Carolina Science Council and South Carolina Hall of Science and Technology awards, a Commendation from the State Department of Education for her contributions to teacher education in South Carolina and the Martha Kime Piper award for leadership among women in higher education.

In addition to founding the Creative Inquiry program, she was responsible for envisioning and assisting in the implementation the Clemson Bridge Program, Emeritus College, Academic Success Center, and the UPIC internship program. She also received the Clemson Student Award for Outstanding Teacher in 1995 and Blue Key Outstanding Teacher in 1994. In 2006, Helms was made an Honorary Clemson Alumnus.

Upon her retirement in 2013, Doris R. Helms was awarded the title of Provost Emerita. She currently lives in Charleston, SC.

Mark Schlautman

2021 Bradley Award for Mentoring in Creative Inquiry Recipient

Dr. Mark Schlautman is a Professor of Environmental Engineering and Earth Sciences at Clemson University.

For more than 30 years, he has been involved in teaching, research and consulting in the field of environmental engineering and science. Schlautman received his B.S. degree in Chemical Engineering from the University of Nebraska-Lincoln and his M.S. and Ph.D. degrees in Environmental Engineering Science from the California Institute of Technology (Caltech).

Since beginning his academic career, Dr. Schlautman has taught a wide variety of engineering and science courses, including topics covering waterand wastewater treatment, pollution prevention and industrial ecology, environmental geochemistry, and data sampling and analysis. Schlautman is a past recipient of the U.S. National Science Foundation CAREER Award. Since 2008 he has mentored the Clemson Student Chapter of Engineers Without Borders (EWB) and three EWB Creative Inquiry projects, focused primarily on developing communities in Central America and West Africa.

He currently serves as a Senior Advocate for the Clemson University Tigers Advance Program.

Clemson University Student Chapter of Engineers Without Borders: Humanitarian Engineering + Service Learning (+ so much more!)

Engineers Without Borders USA (EWB-USA) partners with communities around the world to meet their basic human needs. The mission of EWB-USA, as stated on its website, is to “build a better world through engineering projects that empower communities to meet their basic human needs and equip leaders to solve the world’s most pressing challenges.” The term humanitarian engineering is often used to describe the activities of EWB-USA, as well as its overall philosophy. During 2022, EWB-USA is celebrating the 20th anniversary of its official founding in 2002. Several years later, a student chapter of EWB was formed at Clemson University (CU-EWB) and officially recognized soon after. As a student chapter, CU-EWB combines service learning together with humanitarian engineering to accomplish its work. From the beginning, undergraduate and graduate student members of CU-EWB, faculty advisors, and professional mentors have partnered with EWB-USA and community stakeholders in several developing countries to provide drinking water systems and other types of needed infrastructure. Sustainability has been a key aspect of our CU-EWB projects. This presentation will provide a brief overview of the history of CU-EWB, including the countries and communities in which we have worked over the years. The benefits and challenges associated with students working on international projects in developing countries will also be discussed.

Poster #1

Conserving Our Marine Resources by Assessing Reef Community Dynamics in the Florida Keys National Marine Sanctuary - Part I

Mentor: Michael Childress, Kea Payton, Randi Sims, Biological Sciences

Co-Author: Jordan Britt, Psychology

Students: Cem Geray, Environmental & Natural Resources; Madison Ragland, Amanda Turner, Biological Sciences; Ean Tucker, Biosystems Engineering

The Florida Keys is home to a variety of ecologically important marine species. Over the last decade we have assessed these communities in the face of marine heat waves, coral disease, and marine debris removal using SCUBA diver surveys, photo and video sampling, and analysis with varied software platforms (BORIS, ImageJ, CPCe, JMP, R studio, Netlogo). To better understand future disturbances of the reef community, several research projects are underway. These projects include 1) acoustic telemetry to understand lobster homing behaviors, 2) damselfish territoriality affecting the dynamics of goby cleaning stations and their reef fish clients, 3) habitat use, territoriality, sociality, and foraging behaviors of coral eating butterflyfishes, 4) aggregation of coral munching snails, and 5) marine debris removal costs and benefits. These projects allow us to assess the overall health of the coral reef communities. Despite many repeated disturbances including heat waves, disease outbreaks, and hurricanes, many reef species show a high degree of resilience and behavioral plasticity.

Poster #2

Conserving Our Marine Resources by Assessing Reef Community Dynamics in the Florida Keys National Marine Sanctuary - Part II

Mentor: Michael Childress, Kea Payton, Randi Sims, Biological Sciences

Students: Diana Molnar, Kori Hays, Biological Sciences; Lauren Bulik, Environmental & Natural Resources

The Florida Keys is home to a variety of ecologically important marine species. Over the last decade we have assessed these communities in the face of marine heat waves, coral disease, and marine debris removal using SCUBA diver surveys, photo and video sampling, and analysis with varied software platforms (BORIS, ImageJ, CPCe, JMP, R studio, Netlogo). To better understand future disturbances of the reef community, several research projects are underway. These projects include 1) acoustic telemetry to understand lobster homing behaviors, 2) damselfish territoriality affecting the dynamics of goby cleaning stations and their reef fish clients, 3) habitat use, territoriality, sociality, and foraging behaviors of coral eating butterflyfishes, 4) aggregation of coral munching snails, and 5) marine debris removal costs and benefits. These projects allow us to assess the overall health of the coral reef communities. Despite many repeated disturbances including heat waves, disease outbreaks, and hurricanes, many reef species show a high degree of resilience and behavioral plasticity.

Poster #3

Movement Behaviors of Native South Carolina Stream Fish Using Field and Lab Experiments

Mentor: Lauren Stoczynski, Peter Van den Hurk, Biological Sciences

Students: Allison DeLoache, Rachel Robles, Morgan Steiner, Biological Sciences; Madeline Tolerico, Biochemistry

The movement of small, non-game stream fish is a largely understudied area in the field of fisheries research. Additionally, understanding how contaminants may impact stream fish and how fish may act as vectors of contaminant movement is poorly understood. Pharmaceuticals reach aquatic systems via effluent from wastewater treatment plants which are ill-equipped for complete substance removal. This research project used both a lab experiment to quantify how a contaminant may impact exploratory behavior in fish mazes and a field study quantifying fish movement within their natural habitat. The lab experiment used a low and high dose of fluoxetine, an antidepressant, mixed with coconut oil to create a slow-release implant that was injected into the fish. Preliminary results suggest increased exploratory behavior with the high dosage. We also conducted tissue and biomarker analysis to link behaviors to a physiological endpoint. The field study used mark-recapture methods with

8mm PIT tags to explore fish movement in 550m stream reaches broken into 10m segments. We tagged 1500 fish over four streams and revisited each site nine times between summer and fall 2021. We observed site differences in movement between species and species differences in movement when sites were combined. This research strengthens the understanding of how pharmaceuticals may impact native fishes and how fish may be able to carry contaminants when encountered as they move throughout their watersheds.

Poster #4

Water Quality Monitoring

Mentor: David Ladner, Environmental Engineering & Earth Sciences

Students: Sophia Della Rocca, Ada Smith, Biosystems Engineering; Claire Funk, Peyton Smith, Anthony Villanueva, Environmental Engineering; Andrew Stickler, Food Science & Human Nutrition; Karinna Thompson, Geology

With increased development and land-use pressure from multiple societal activities there is a danger of deteriorating water quality in our rivers and lakes. This is especially problematic when our sources of drinking water are impacted. It is important to regularly monitor water quality so that baseline parameters can be known and changes over time can be identified. The Adopt-a-Stream (AAS) program is set up to allow community members and other stakeholders to participate in monitoring water quality. This CI works with AAS to monitor two stream locations each month, measuring temperature, pH, conductivity, dissolved oxygen, and E. coli presence. We then take things a step further by measuring ions like chloride and nitrate, and by using historical drinking water data to make comparisons with current trends.

Poster #6

Functional Redundancy in the Skin Microbiome

Mentor: Barbara Campbell, Biological Sciences

Students: Kourtney Ervin, Kasey Kiser, Sam Stuckert, Microbiology; Rachael Nall, Elijah Toney, Biological Sciences

Functional redundancy is an ecological property used to describe highly conserved functions between microbes living in the same environment. In this study, we examine substrate utilization in the diverse skin microbiome where an overlap of metabolic niches may be present. Functional redundancy in the skin microbiome can give insights as to how bacteria collectively affect the characteristics of the skin and human health. In the context of substrate utilization, this can also inform the design of skincare products to promote a robust microbial community. For our experiments, we selected eight carbon sources and eight bacterial strains commonly present on the epidermis. After confirming the metabolic capacities of each microbe through microplate assays, they were categorized as specialists, utilizing 25% or less of the substrates, generalists, utilizing 75%, and intermediates that fell into neither category. Our next goal is to document the growth of microbes in combination with one another and multiple substrates using qPCR. This will allow us to determine potential niche cross-over through removal of specific microbes or substrates. Based on our current substrate utilization data, we hypothesize that the most phylogenetically related bacteria will have the highest instance of functional redundancy due to similar metabolic profiles, especially generalists. Additionally, we expect the combined microbial growth not to solely reflect individual substrate utilization data due to microbes competing over each substrate and feeding off the metabolites of the other microbes.

Poster #7

Urbanization Effects on 2nd-Order Resource Selection of the Eastern Kingsnake

Mentor: Bryan Hudson, Russell Kyle Barrett, Forestry & Environmental Conservation

Students: Katie Baucom, Forestry & Environmental Conservation; Martina Leake, Animal & Veterinary Science

Urbanization can rapidly alter the physical structure of an environment through the creation of impervious surfaces, conversion of forest cover to agriculture and urban open space, and by reducing connectivity among forest patches. Wildlife populations living within rapidly developing regions must pass through these environmental filters to maintain genetic diversity and overall fitness, which can be a direct reflection of movement potential across the landscape. As urban development intensifies, wildlife may be confined to corridors for both resource acquisition and dispersal, which may impose negative effects on fitness (e.g., loss of functional connectivity and gene flow; density dependence facilitating disease transmission). Understanding how wildlife populations respond to urban development is crucial for future urban planning if conservation and human values are to be merged. We investigated how the 2nd order resource selection (i.e., home range) of a generalist snake, the Eastern Kingsnake *Lampropeltis getula*, is configured within metro Atlanta, Georgia. By radio tracking 30 Kingsnakes, we tested the hypothesis that as urbanization increases, Kingsnake home ranges will become more linear as a direct reflection of undeveloped stream and wetland corridors. We plan to incorporate our results with those from concurrent studies evaluating the genetic structure, disease status, and dietary shift in these urban Kingsnake populations to provide a thorough view on urban impacts to this top level meso predator. Moreover, our results will help to link the human perception of yardscapes to wildlife resource needs in a region where human-wildlife conflict is exponentially increasing.

Poster #8

Comparative Vertebrate Musculoskeletal Biomechanics - Axes of Performance Variation for Escape from Predators

Mentors: Richard Blob, Amanda Palecek, Biological Sciences

Students: Shrika Ravichandran, Health Science; Olivia McNelly, Biological Sciences

The field of comparative biomechanics tests how differences in the ability of organisms to perform tasks can lead to differences in their survival. We have used two systems – frog tadpoles and goby fishes – to test which factors promote successful escape from predators. As tadpoles progress through metamorphosis, the tympanic membrane used for hearing and the pineal eye used for sensing light are only present in later stages, potentially leaving younger tadpoles more susceptible to predation. We exposed Xenopus tadpoles across different developmental stages to auditory, visual, physical, and vibrational stimuli. Post metamorphic stages (NF63 and NF64) responded to all stimuli, but pre-metamorphic stages (NF53 and NF56) only reacted to physical and vibrational stimuli, suggesting early tadpoles are more vulnerable to predators. In gobies, males and females differ in morphology and have different fitness strategies, which may correlate with their ability to escape predators. Males compete for territory and fight to mate with females, whereas females engage in fewer exposed activities. We measured escape response rates and kinematics in adult *Stiphodon maculidorsalis* gobies subjected to an underwater stimulus. Females had higher escape response rates than males, but males and females escaped at similar angles from the stimulus. This suggests males and females are capable of similar escape kinematics, but females are more likely to escape predation. Males may use escape behaviors less frequently due to their tendency to defend territory or fight with male conspecifics. Together, these studies show how variation in escape performance impacts predation risk for specific portions of animal populations, and point to vulnerabilities that should be recognized in conservation and management efforts.

Poster #9

Atelier InSite: Clemson Public Art

Mentor: Joey Manson, Art

Students: Devohn Goodwin, Sarah Gassman, Bryce Merrell, Christopher Burnette, Sidney Brusse, Visual Arts; Jordan Brideau, Architecture; Jordyn Carroll, Campus Recreation; Malik Sanders, Architecture; Stephanie DeMaio, Art

The goal of our CI is to explore ideas and methodologies related to implanting artwork for current and future public art projects. Our class specifically has identified three current areas of need in our community; through three mini-projects, we plan to more holistically represent and educate the public regarding Clemson's history. The aims of these three projects are as follows:

- Create a permanent and interactive memorial to honor the untold stories of underrepresented groups who have inhabited and built on the land we use today at Clemson University.

- Inform our community of the current state of Woodland Cemetery and its history while raising awareness to remedy the current unmarked grave indicators residing there.
- Creating before and after photo compositions of historical structures on Clemson's campus to bring awareness to their origins and how they've changed with their surroundings over time.

Poster #10

How the Aspire to Be Well Program Adapted to COVID-19

Mentor: Chloe Dixon, Student Health Center

Co-Author: Kayla Hood, Counselor Education

Students: Camryn Alexuis Brown, Elementary Education; Jada Crawford, Experiential Education

First implemented in 2013, the Aspire to Be Well Program has continuously evolved over the years to address the health, wellbeing and safety of Clemson University students. An integral part of welcoming students to campus, Aspire focuses on three main high risk topic areas of alcohol and other drug misuse, interpersonal violence prevention and mental health, as well as holistic wellness and bystander intervention. As part of CU1000, all first year students including freshman, transfer, and Bridge to Clemson students participate in Aspire. Our undergraduate student facilitators meet upwards of 6,000+ students each academic year to provide necessary campus resources to be successful. While the program has been updated each year, the COVID-19 pandemic in the year 2020 created the most significant change as our team had to transition to completely virtual sessions. We will discuss in detail what implementation and content changes were made to address student needs during COVID-19 as well as the implications of the data that was collected in the Fall of 2020.competing over each substrate and feeding off the metabolites of the other microbes.

Poster #12

Rounding the Corner: The Influence of Cornering Angle on Vitual Teleportation

Mentor: Christopher Pagano, Psychology; Hannah Solini, School of Computing

Students: Alyxandria Cicchinelli, Hannah Levin, Psychology; Connor Margraf, Health Science; Soline Mcgee, Animal & Veterinary Science

Teleoperated robots have proven useful across various domains, as they can more readily search for survivors, survey collapsed and structurally unsound buildings, map out safe routes for rescue workers, and monitor rescue environments. A significant drawback of these robots is that they require the operator to perceive the environment indirectly. As such, camera angles, uneven terrain, lighting, and other environmental conditions can result in robots colliding with obstacles, getting stuck in rubble, and falling over (Casper & Murphy, 2003). To better understand how operators remotely perceive and navigate unmanned ground vehicles, the present work investigated operators' abilities to negotiate corners of varying widths. In a desktop-based format, participants navigated a virtual vehicle around corners of varying angles (45°, 90°, and 135°) and varying path widths. In general, we found that both cornering time and the number of collisions increased as the index of difficulty of the corner increased. This effect, however, was most pronounced for the corners requiring a sharper turn. Ultimately, the findings from these experiments are applicable to contexts where an individual is tasked with remotely navigating around corners (e.g., video gaming, urban search and rescue, surveillance, military operations, training).

Poster #13

Contemporary Art & Practice

Mentor: Joey Manson, Denise C Woodward-Detrich, Art

Students: Sidney Brusse, Devohn Goodwin, Jennifer Ramirez, Rachael Yon, Bryce Merrell, Visual Arts; Stephanie DeMaio, Art; Aidan Rhoades, Physics & Astronomy; Caroline Harrison, Hannah Mathis, Experiential Education; Olivia Hueble, Student Services

Contemporary Art & Practice CI students explore historical and theoretical issues to gain critical perspectives on Art, visit and study current exhibitions in galleries in museums in New York City, gain professional experience, interning in the Lee Gallery, and share their studio research in an exhibition in the Lee Gallery.

Poster #14

Conspicuity in Human Factors Forensics and Safety

Mentor: Benjamin R Stephens, Psychology

Students: Michaela Cuoco, Robin Jervis, Grace Michel, Logan Osborne, Psychology; Michel Mcclure, Biological Sciences

Many accidents that require the analysis of hazards and safety measures that occur in everyday life involve the conspicuity of the area's features. Conspicuity is defined as the quality of being easily seen or noticed. In the past few years, the Creative Inquiry teams of Human Factors Forensics and Human Factors Safety have aimed to contribute to previous research by investigating conspicuity in actual incidents. The variables analyzed examine the conspicuity of features in the area where the incidents occurred. For example, the misstep study examines the conspicuity of texture, highlighting, and stereoscopic height perception and concluded these features were not sufficiently conspicuous to prevent a misstep. The skylight study assesses the effects of priming and alerts in a fatal fall suggesting that the skylight was neither conspicuous nor identifiable. The trip hazard study, conducted by the Safety team, concluded that both images and in-person viewings could be used to recognize the effect of light on the conspicuity of height changes. Lastly, the traffic sign study examines validity of magnitude estimation and effect of visual clutter in viewing traffic signs and concludes that the target signs, STOP and YIELD, were the most conspicuous in the scene. The studies conducted by the Human Factors Forensics and Human Factors Safety teams demonstrate the importance of feature conspicuity in instances of accident analysis and prevention.

Poster #15

Analysis of TikTok's Influence on COVID-19 Treatment Methods

Mentor: Elliot Ennis, Chemistry

Students: Angelina Harley, Genetics

Health misinformation continues to be spread over social media platforms. The rise of TikTok has given medical myths a new and large platform to expand across at an even faster rate. Homemade remedies and treatments for COVID-19 has been a particularly popular topic on TikTok. The top 20 liked videos under the hashtag #covidremedy were collected on 2/17/2022 and analyzed. At the time, the hashtag had a total of 29.4 million views. The top 20 liked videos had a total of 22,575,000 views and 17,323,333 likes. Many common threads were found in these 20 TikToks, but the most prevalent were the emphasis on ingesting Vitamin C and "boosting the immune system" and the use of natural remedies. The idea behind these videos that COVID-19 can easily be treated at home with these remedies, homemade remedies are safer because they are natural, the use of an audio that states that medications make people ill, and the lack of mention of the COVID-19 vaccine as a preventative measure work together to promote the idea that getting the COVID-19 vaccine is ineffective when there are readily-available and "safer" home remedies.

Poster #16

Effects of Tropical Storm Fred on Hellbender Abundance in a North Carolina Stream

Mentors: Cathy Jachowski, Daniel Knapp, Forestry & Environmental Conservation

Students: Tayci Sullivan, Rachel Myers, Wildlife & Fisheries Biology; Clifford Anders, Environmental & Natural Resources

Hellbenders (*Cryptobranchus alleganiensis)*, are large aquatic salamanders found in clear, cold, mountain streams in the eastern U.S.. Several hellbender streams in North Carolina were impacted by severe flooding in August 2021 due to Tropical Storm Fred (TS Fred), including one long-term hellbender study site. We hypothesized TS Fred caused hellbender declines in this site. Our objective was to compare abundance before and after Tropical Storm Fred in this stream. We conducted capture-mark-recapture surveys within a 600 m stream reach during pre-breeding (May-July) and breeding (September) seasons in 2020 and 2021. We used visual surveys while walking, snorkeling, and passive integrated transponder (PIT) scanning to locate and capture hellbenders. We used a robust design model in Program Mark to estimate abundance during each season while accounting for imperfect detection. We found that hellbender abundance was similar during pre-breeding seasons each year but, in contrast with our predictions, increased between pre-breeding and breeding seasons in both years; including immediately after TS Fred in 2021. Abundance estimates in 2020 were highly uncertain due to lower detectability that year. However, we observed some evidence that the increase between pre-breeding and breeding seasons in 2021 was less pronounced than in the previous year (240% increase in 2020 versus 40% increase in 2021), which could be indicative of flooding impacts. Trends in abundance did not support our hypothesis but are the foundation for future research. We will continue monitoring to find out if the increase could be due to breeding migration and whether future surveys provide any additional evidence regarding flooding impacts. Our future directions will lead us to learn more about hellbender environmental adaptability to flooding events.

Poster #17

Human Factors in Medical Device Reprocessing

Mentors: Melinda Harman, Delphine Dean, John D DesJardins, Manuel Gutierrez, Marketa Marcanikova, Simeon McKelvey, Bioengineering; David Neyens, Industrial Engineering

Students: Parker Athearn, Alli Baumgartner, Gabrielle Hertlein, Illana Jamison, Alexa Watchinski, Bioengineering; Mya Missouri, General Engineering; Logan Amick, Chris Gonzaga, Stephan Kasper, Industrial Engineering

Project 1: Human Factors Assessment of Reprocessing Electrosurgical Instruments This project tested strategies for mitigating contamination on electrosurgical instruments during simulated use and developed an experimental approach for assessing the usability of the mitigation strategies. This ongoing project is valuable because it supports the potential for safe reuse of electrosurgical instruments.

Project 2: Development and Validation of an Instrumented Ostomy Simulator This project developed an instrumented ostomy simulator coupled to existing high-fidelity mannequin simulators and integrated it into a broader point-of-care human factors assessment of nursing ostomy care. This ongoing project is valuable because the new ostomy simulator better represents excreta exiting through the stoma and enables comparison of different procedures used by nurses during ostomy care.

Project 3: Identifying Strategies for Home Management of Ostomy Care: An Analysis of YouTube Videos This project identified different procedures used by ostomates for changing an ostomy bag in home (non-hospital) settings using review of more than 150 YouTube videos shared online. This ongoing project is valuable because direct observation of healthcare procedures performed by individuals living with an ostomy supports development of strategies to improve ostomy care within a person-centered care framework.

Poster #18

Digital History: Computing in the Humanities and Social Sciences

Mentors: Vernon Burton, Alexander Bowen, History & Geography

Undergraduate Student: Lucas De Bernedetti, History

In Digital History, Clemson University students evaluate how historians use computer and database resources for research and presentation in history and the humanities before completing their own digital history project. As a part of this process, participating students work with a variety of simple digital platforms and methods, review history-focused websites, whether museum sites, digital archives, or mapping projects, and generally analyze new approaches to history made possible by digital technology. The course culminates in a digital history project of the students' undertaking that applies digital methodology to their own research and presentation. Participating students in Digital History are introduced to the concept of digital history as well as various digital methods ranging from text-mining, to data visualization, to geospatial technology for use in their projects. Additionally, students are expected to develop basic web design skills. Although students are free to determine the topic and research methods for their final project, they are expected to use some digital methods introduced in the course alongside traditional historical research and writing. In addition to the ongoing Civil War soldiers database, previous projects include a geospatial analysis of Cherokee villages and social media analysis of discourse on Southern identity and Civil War memory.

Poster #20

Research Using Museum Collections: Digitizing Egg Collections with Museum Database

Mentor: Virginia Abernathy, Biological Sciences, Melissa Fuentes, Biological Sciences

Students: Autum Blanchard, Environmental & Natural Resources; Marlisa Bongiovanni; Hampton Warner, Emily Bonds, Biological Sciences; Abby Good, Forestry & Environmental Conservation; Faith Huntley, Biochemistry

Museum collections are an essential, yet underutilized resource for scientific research. On the Clemson University main campus, the Bob and Betsey Campbell Natural History Museum has an expansive collection of vertebrate specimens, including 5,000 bird egg clutches from as early as 1870. However, the majority of the collections are not accessible through digital means; there is no way for someone to access the collections online to search for information about the specimens currently stored at the museum. Having an undigitized collection also leaves it vulnerable, as information could be lost forever if the clutches or information about the clutches are lost, damaged, or degrade over time. We began by digitizing the extensive egg collection in the museum by taking high-quality photographs of clutches using standard color cards and a lightbox and transcribing information from data cards about each clutch to an Excel spreadsheet. Data cards included information on species' identity, incubation stage at collection, date of collection, and locality of eggs. The photographs of each clutch and their corresponding information will be uploaded to the museum's database management software, Proficio, which will eventually become available to the public. The goal of digitizing the Clemson University egg collection is to make it more accessible to Clemson students, faculty, and researchers worldwide while also protecting this scientific data from damage and natural degradation over time, providing a lasting record for future research and the possibility to increase collaboration with other higher institutions on museum research.

Poster #21

Towards Modeling and Treatment for Parkinson's Disease in a Zebrafish Model

Mentor: Jessica Larsen, Chemical and Biomolecular Engineering

Students: Emme Bagwell, Biological Sciences; Minhyun Shin, Bioengineering; Nicole Henkel, Chemistry; Doris Migliaccio, Genetics

Tyrosine hydroxylase (TH) is the rate-limiting enzyme in the biosynthesis of dopamine. Dopamine is a neuroprotective catecholamine and neurotransmitter that works to regulate latent bodily functions such as movement, breathing, heart rate, as well as emotional and memory regulation. Patient's affected by Parkinson's Disease experience a loss of dopaminergic neurons, lower levels of dopamine, and low rate of dopamine production in the brain, leading to the neurological and physical decline in Parkinson's patients. Due to TH's role as a crucial component of dopamine development, it could potentially have effective properties for treating the disease. We hypothesize that SH-SY5Y neuroblastoma cell grafts combined with increased TH levels will show lessened neurodegenerative effects in an MPTP model of Parkinson's disease in zebrafish. SH-SY5Y neuroblastoma cells will be differentiated into dopaminergic neurons and their dopaminergic potential will be characterized using TH, and MAP2. Transport of TH into neurological tissue will be observed using the brainbow model of zebrafish, a fluorescent model of zebrafish that allows protein expression to be easily visualized. Sexually mature fish will be treated with MPTP through the water in order to induce Parkinsonian bradykinesia, demonstrated by decreased dopamine levels. As treatment, one group of fish will receive TH treatment. A second group will receive neuronal grafts and TH treatment. The effectiveness of the neuronal grafts and TH treatment will be quantified using techniques of Western Blot and tissue staining.

Poster #22

The Study of Healthy Aging and Applied Research Programs (SHAARP) Lab

Mentor: Lesley Ross, Christine Phillips, Psychology

Students: Gretchen Lobben, Animal and Veterinary Science; Madison Pollock, Biological Sciences

Background and objective: The U.S. is rapidly aging. For the first time in history, the number of older Americans will outnumber children under the age of 18 by 2034. This momentous population shift presents us with many opportunities to change the way we think about and experience aging. The SHAARP lab examines factors to keep older adults healthy, independent and mobile. We focus primarily on functional abilities that may be modified through cognitive, exercise, and lifestyle interventions. Methods used: We conduct randomized controlled trials, attain research grants, attend national and international academic conferences, and engage in community outreach - all focused on optimizing health and well-being across the lifespan. We are undergraduate and graduate students from diverse academic backgrounds working together with Drs. Christy Phillips and Lesley Ross at the Institute for Engaged Aging in Prisma Health Oconee Memorial Hospital. Results: Ongoing projects include multiple NIA-

funded studies investigating the effects of brain training and development of a mobile app to track real-world functioning. Our papers were recently published in Frontiers in Public Health, Journals of Gerontology, and Journal of Cognitive Enhancement. Upcoming conference presentations include the Cognitive Aging Conference, Atlanta GA and the International Society of Behavioral Nutrition and Physical Activity Annual Meeting, Phoenix AZ. Our undergraduate and graduate students place in top jobs and graduate programs throughout the country. Conclusions: The SHAARP Lab is very productive through our numerous national and international conferences, publications, funded grants, and success of our students. We are also proud of our community service activities and our high success rate in graduate school placement for our undergraduate members.

Poster #23

The Flow of Extremist Rhetoric: Tracing Violent Messaging From Top to Bottom

Mentor: Matthew Rhodes-Purdy, Political Science

Students: Lauren Hinkle, Alexis Marrero, Emily McCaul, Caroline O'Neal, Hannah Simmons, Political Science; Max Stukenberg, Marketing

This project seeks to analyze how extremist and violent messaging flows from political elites to base-level followers, with a special emphasis on social media. We analyze specific outbreaks of political violence, including the wave of hate crimes directed against Asian-Americans during the COVID-19 pandemic, the January 6th insurrection, and both sporadic violence and attacks by far right counterprotesters during the Black Lives Matter protests of 2020. We find a clear path, where violence begins with powerful figures and is gradually taken up by mid-level influencers, and from there to the base-level followers who actually perpetrate violent acts. This provides further evidence for a "top-down" model of political radicalization and extremism, where most episodes of political violence are driven by elites, rather than grassroots figures. This suggests that incentivizing elites to refrain from polarizing and extremist rhetoric would be the most effective means of reducing extremism.

Poster #24

Study of Surface Wettability on Fused Silica by Ultrafast Laser-induced Micro/Nano-Surface Structures

Mentor: Xin Zhao, Mechanical Engineering

Co-Author: Kewei LI, Mechanical Engineering

Students: Alex Curlee, Mechanical Engineering; Jaden Littleton, Grant Bishop, Mechanical Engineering

Glass materials integrated with advanced functions, such as anti-fogging and self-cleaning functions, are urgently demanded in applications such as vehicle windshields, eyeglasses, goggles, electronic device screens, and windows. Inspired by nature, researchers have found multiscale surface structures to be a crucial factor in determining a material's surface wettability. The ultrafast pulsed laser is a promising tool to induce such surface structures and subsequently control the surface functionalities on different materials. The behavior of surface wettability with different micro/nano-scale surface structures created by femtosecond laser irradiation on fused silica is investigated in this research. The effects of laser fluence, overlapping ratio, and repetition rate on the structure morphology are studied. Seven different sorts of structures can be created by manipulating these parameters: (S1) micro-dots array, (S2) micro-dots array covered with laser-induced periodic surface structures (LIPSSs), (S3) LIPSSs, (S4) microgrooves covered with LIPSSs, (S5) microgrooves covered with irregular nanostructures, (S6) micro-channels and (S7) micro-channels covered with LIPSSs. Investigations into the static contact angle show that hydrophilic and superhydrophilic surfaces can be generated through the introduction of these laser-induced hierarchical structures. The relationship between laser parameters, surface structures, surface roughness, and surface wettability is established. Each surface structure can be identified with a characteristic mean static contact angle value.

Poster #25

April 06

A Future Without Plastic: An Investigation Into How to Reduce the Amount of Plastic Waste by Fundamentally Rethinking how Disposable Utensil Work

Mentor: Latoya McDonald, Bioengineering

Students: Chase Armbruster, Civil Engineering; Victor Carson, Mechanical Engineering; Tim Feusse, Computer Engineering

Disposable dining utensils are a norm that has become a characteristic of all developing societies; however, the reliance on such goods has given rise to a global pollution crisis. Polyethylene-based single-use plastic is the number one cause of irreversible environmental damage, which has caused the collapse of ecosystems worldwide. This issue could easily be resolved if the societies causing this waste chose to switch to more environmentally friendly alternatives; however, there seems to be a social stigma towards such alternatives. In order to battle negative perception, the solution must appeal to user preference and be physically helpful. This study aims to examine people's perceptions of paper and other organic composite eating utensils and suggest materials that balance performance and user preference. Ultimately, this data is intended to facilitate the production of environmentally friendly utensils and reduce plastic waste. We plan to use surveys and utensil molds created by a 3-D printer to complete the objectives of our research. The survey will function as our means to gather information about people's general thoughts and opinions on utensils of varying materials and their characteristics. With the information derived from the survey, we hope to create a utensil with the help of a 3-D printed mold that will satisfy a large majority of the general populace's preferences. So, in conclusion, if utensils made from reprocessed material can possess qualities such as cheap to make/sell, efficient structure, minimal impact on the taste of food, and reusable, then these utensils include the potential to have preferred use over plastic utensils by the public.

Poster #27

Inclusive Excellence in Science and Technology

Mentor: Meredith Morris, Genetics & Biochemistry

Students: Evan Hulst, Genetics; John Moore, Biochemistry

CU Investors is a program that was created in 2014 by Dr. Meredith Morris to involve underrepresented middle school students in science. The goal of this project is to encourage minority and economically-disadvantaged students to pursue a future in STEM to increase diversity in the scientific community. This goal is accomplished by visiting local Title 1 schools and bringing engaging science projects that allow the students to apply the material they are learning. The effectiveness of the projects is determined by the feedback of teachers and the Investors' personal observations of student engagement and knowledge gain, as well as pre and post surveys that allow the Investors' to assess the impact the visits are having on the attitude of the students towards science. So far the results have been promising, with many teachers reporting an increase in average test grades after the visits, as well as increased interest in the material. Due to the difficulty of tracking students' continued interest in science a possible mentorship program may be developed so the students can stay in contact with the CU Investors in the future.

Poster #28

Collaborative for Communication and Culture Research Report

Mentor: James Gilmore, Communication

Students: Malaysia Barr, Sara Ciplickas, Maddy Grumet, Hillary Hardig, Madeline Makowski, Mary Moore, Olivia Provosty, Anna Transou, Communication

This semester, the Collaborative on Communication and Culture explored the following question: What is gained by raising awareness of policies that discriminate against or marginalize others in media and technology? We divided into two working groups. One studied issues in media representation using textual analysis of movies, television, and awards. The other studied the ethics of data collection policies using discourse analysis. In the media working group, we found recent efforts to raise awareness of ongoing marginalization in industry recognition groups have led to policy changes designed to accommodate diversity and inclusion. In the data collection group, we found awareness of privacy laws and terms of use documents continue to impede users from understanding the processes of data collection. These results indicate the continued importance of visibility—and processes of making inequities or concerns visible—as a key step for policy changes.

Poster #31

Orthopaedic Implant Retrieval Program (CU-REPRO)

Mentor: Melinda Harman, John D DesJardins, Bioengineering

Students: Jay Baek, Ben Black, Nicklaus Ipock, Alexander Kullman, Tara Rumsey, Gina Weingart, Zachary Worley, Bioengineering; Christine Encarnacion, Biological Sciences; Sam Gmitro, Biochemistry

Total joint replacements are widely successful, but a small percentage fail due to issues with the biomaterials and medical problems. The goal of the Implant Retrieval Program (CU-REPRO) is to assess trends in orthopaedic implant failures and critical variables in implant biomaterials and designs. This IRB approved program includes a repository of over 800 explanted joint replacements. We pursued three key projects in 2021-22. The Hip Project involved mechanical testing to compare two different surgical instruments used for hip replacement surgery, and we found that not all surgical impactors meet the clinical standard for proper assembly of modular implants.The Shoulder Project used visual assessments of shoulder implant damage, and we found that implant design is predictive of surgical difficulties during revision surgery of the shoulder joint. These two scientific studies were presented at the 2022 Orthopaedic Research Society annual meeting and two manuscripts are in preparation for submission to the Journal of Arthroplasty and the Journal of Shoulder and Elbow Surgery. The Implant Repository Project implemented modern database software to enhance the search capacity of implant design in our repository. All of these projects involve surgeons at Prisma Health in Greenville and Columbia, the Medical University of South Carolina, and the Florida Orthopaedic Institute in Tampa. In summary, CU-REPRO uses hypothesis driven research to understand implant performance and ultimately improve patient outcomes.

Poster #34*

Collaborative Escape Room Design

Mentor: Claire Dancz, Susan Reeves, Watt Family Innovation Center

Students: Anders Blom, Graphic Communications; Benjamin Salem, Maria Christenbury, Mechanical Engineering; Ryan Herron, Architecture, Jimmy Fillmore, Bioengineering; McKenzie Myers, Industrial Engineering

The Conation and Creativity in Engineering (CCE) Creative Inquiry course focuses on the identification and celebration of individuals' innate ways of problem solving (conation) and their process of engaging in creativity in engineering. In this presentation, students will share the Community Escape Room Collaboration (CERC) project, a multidisciplinary, community-service escape room project. CERC, and CCE as a whole, aims to provide an inclusive environment for all students to participate in conation and creativity topics. In advocating for Universal Design for Learning (UDL), students in this course have become UDL practioners while engaging in project design. During the fall 2021 semester, the student project team laid the foundation to establish a pathway for all students to participate in all aspects of an escape room. The student project team has built upon on this effort during the spring 2022 semester through emphasizing inclusion and diversity of users as a key design tenet for the CERC project, and is excited to share this project with the Clemson community.

Poster #35*

April 06

Woodland Cemetery Historic Preservation

Mentor: Sara Collini, History and Geography, Rhondda Thomas, English

Students: Aimey Jimm, Biological Sciences; Jermaine Johnson, Destiny Stewart, Nolly Swan, Alexis Thomas, Lucas De Benedetti, Bryanna Grayson, Maddie Hund, History; Matthew Sloop, JoNell Usher, Special Student; Gillian Barnard, Biochemistry; Robin Urban, Genetics; Hannah Sparks, English; Ollie Joye, Psychology; Rebecca White, Animal & Veterinary Science

In February 2020, two Clemson students visited what was then called the Fort Hill Slave and Convict Cemetery and found it in a state of disrepair. They worked with faculty and staff to clean up the site and install a memorial. Further research led the team to learn that there was a larger African American burial site on the west side of Woodland Cemetery. Using ground penetrating radar (GPR), 667 unmarked graves, believed to be those of African American enslaved persons, sharecroppers, tenant farmers, convicted laborers, and wage workers, were recovered throughout the cemetery. Clemson Trustees established a trustee task force and Legacy Council in late summer 2020 to develop a preservation and memorialization plan for the burial ground. In the Fall of 2021, a CI Project for the cemetery was created for students to help research and participate in community engagement activities that would assist with the development of the preservation plan and memorial. The students conducted historical and genealogical research on individuals and families who may be buried in the unmarked graves, investigated the history of health and sickness at the Fort Hill Plantation, contributed to biographies of important individuals in the cemetery's history, and explored historical maps and photographs to understand how the landscape of the cemetery and surrounding area has changed over time from the eighteenth century to the present day. This research tells a more comprehensive and multilayered history of the cemetery and will be incorporated into the memorial design that will honor the souls buried there.

Poster #36*

Antibiotic Resistance in Students' Exercise Environments

Mentor: Xiuping Jiang, Food, Nutrition & Packaging Sciences

Co-Author: Vishal Manjunatha, Food, Nutrition & Packaging Sciences

Students: Gabriella Lynne, Kelly Moyd, Christopher Wassynger, Zachary Gottschalk, Food Science & Human Nutrition

In the era of the COVID-19 pandemic crisis, there is an unwarranted use of disinfectants in all environments including recreational facilities. Excessive use of disinfectants leads to the development of antibiotic-resistant bacteria, which is one of the major threats to public health in today's world. In our study, we wanted to identify and characterize antibiotic-resistant bacteria present on equipment in the Fike Recreation Center at Clemson University.

Methods: Samples were collected aseptically from predetermined high contact surfaces from Fike Center with sterile wet Q-swabs. Swab samples were serially diluted and plated on Tryptic Soy Agar (TSA) plates to determine bacterial load and Mueller Hinton agar plates supplemented with tetracycline (16 µg/ml) and methicillin (4 µg/ml) antibiotics to identify bacterial isolates with resistance to tetracycline and methicillin, respectively. Further, the purified bacterial isolates were characterized by Gram-staining.

Results: The study found that equipment subjected to routine disinfection had lower bacterial load and higher numbers of antibiotic-resistant colonies, whereas less frequently disinfected surfaces had higher bacterial load but fewer antibiotic-resistant colonies. A total of 23 isolates were purified from swab samples of which 1 was Gram-negative cocci, 1 was Gram-positive bacilli, 2 were Gram-positive streptococci and 19 were Gram-positive cocci. Our results also showed that 12 of these isolates were methicillin resistant and 11 were tetracycline resistant.

Conclusion: The results show that excessive use of disinfectants may cause antibiotic resistance in the exercise environment. The high level of antibiotic resistant isolates may be a point of concern, but further research needs to be carried out to identify if the bacterial isolates are pathogenic.

Poster #37*

Statistical Analysis in Public Health

Mentor: Hamed Rahimian, Industrial Engineering

Students: Chase Harrison, Katherine Sessler, Kara Smith, Industrial Engineering

Over the past two years, our lives have changed drastically in response to the COVID-19 pandemic. Even two years after the start of the pandemic, we continue to see frequent changes in public policy with regards to COVID-19 mitigation strategies. Therefore, our Creative Inquiry team has decided to do a statistical analysis on the spread of the COVID-19 pandemic and the effect of various mitigation strategies on positive case numbers in the United States. By doing this study, we hope to make conclusions from our data on the effectiveness of different mitigation strategies on the infection rate of the pandemic. The results of this study are even more important now with the rise of the COVID-19 Delta and Omicron variants, as the findings could potentially impact what policies should be set in place moving forward.

Specifically, our team will be attempting to statistically model the populations of Pickens County, South Carolina, as well as the population of Cook County, Illinois. For now, we are choosing to look solely at the time before vaccines were made available (January 2020 - January 2021). To compare the COVID-19 infection rate in relation to public mitigation strategies, we incorporated the Public Health and Safety Measures (PHSM) index, a scale created by the World Health Organization. This scale transforms COVID-19 polices into a numeric value based off the severity of the mitigation strategy. This index was graphed alongside the positive case count for each experimental population. Moving forward, we plan to use Python software to code a program that will use a Gaussian process and predict future case counts in relation to changing public mitigation policies. With this prediction model governments may be able to understand how to implement policies, should spikes begin to happen again.

Poster #38*

Biodiversity in Pendleton Woodland Stream

Mentor: John R Wagner, Environmental Engineering & Earth Sciences

Students: Brooke Foard, Biological Sciences; Lacey Mitchum, Management

Biological research has been conducted over a five year period in a woodland area adjacent to Pendleton Elementary School in Pendleton, South Carolina. The stream that runs through the entirety of the study area is home to various macroinvertebrates, insects, and amphibians. Several Clemson undergraduate students have sampled the stream at different times of the year over the life of the project and recorded the number and types of organisms found. A healthy stream is an ecosystem that is both resilient and sustainable as it maintains its ecological structure and function over time. The study aimed to document any changes in biological indicators over the study period to indicate if the stream maintained its resilience, and to see if the same organisms appeared in both the Fall and Spring seasons. Six categories of biological indicators emerged from the comparative analysis, indicating that the woodland stream at Pendleton Elementary School remained both resilient and sustainable over the time of the study. The results of this research were presented to elementary school students and incorporated into lesson plans and field trips designed to meet several grade-level science curriculum standards.

Poster #39*

Deciphering the Role of MEILB2 in Meiotic Homologous Recombination

Mentor: Michael Sehorn, Genetics & Biochemistry

Co-Authors: Garrett Buzzard, Amara Onoh, Genetics & Biochemistry

Students: Ashley Polson, Microbiology; Ansley Davis, Biochemistry; Daniel Hiott, Genetics

Meiosis is a distinct type of cell division that results in the reduction of the number of chromosomes to ultimately produce haploid gametes. The intentional introduction of DNA double-strand breaks (DSBs) to the DNA initiates the meiotic program. These programmed DSBs are repaired by a DNA repair pathway called homologous recombination (HR). As a result of the HR-mediated repair, crossing over occurs between homologous chromosomes to ensure proper chromosomal segregation. Defective meiotic HR can result in the birth defects, infertility and aneuploidy observed in Down's Syndrome. Two essential recombinases, RAD51 and DMC1, are vital components of meiotic HR. RAD51 and DMC1 form nucleoprotein filaments on the ends of the DSB, following nucleolytic resection, that are responsible for catalyzing the search, pairing, and strand invasion of the homologous chromosome that serves as the template for repair. Another essential protein, BRCA2, is involved with the loading of DMC1 and RAD51 to the processed DSBs. In order to regulate the association of BRCA2 with both of these recombinases, an additional protein, MEILB2, is required. Previous work supporting this claim, demonstrated that dysfunctional MEILB2 inhibits DMC1 and RAD51 localization to DSBs suggesting that MEILB2 is an essential mediator of the RAD51-DMC1 interaction with BRCA2. Our research aims to investigate the manner in which MEILB2 accomplishes this. Using purified proteins, a series of affinity protein-protein interaction assays were performed to show how BRCA2, MEILB2, and RAD51 physically interact.Our results support previous claims that MEILB2 interacts physically with BRCA2. Analysis of these results will further elucidate the role of MEILB2 in mediating RAD51-DMC1interaction with BRCA2 in meiotic homologous recombination.

Poster #40*

Brain Tips: Making Scientific Research Accessible to Everyone

Mentor: June Pilcher, Psychology

Students: Caroline Michaelson, Food Science & Human Nutrition; Ashlyn Bloom, Morgan Gossett, Emma Kincaid, Piper Koontz, Sabina Laurino, Psychology

The Brain Tips team aims to improve students' daily lives by informing them about contemporary psychological research. Each day of the school week, a Brain Tips member researches and summarizes a relevant scientific article. Summaries focus on what students should take away from the research and how they can apply it in their daily life. Additionally, some of our topics aim to increase awareness and understanding of disorders. Recent topics include memorization techniques, eating habits in Autism Spectrum Disorder, and the effect of social media on body image. Summaries are posted on multiple social media platforms, including Facebook, Twitter, and Instagram. In addition, we have been working to extend our reach and increase interest in our page by advertising around campus and contacting high schools, tutoring centers, and on-campus groups. Brain Tips' social media pages provide valuable tips that give students a better understanding of their behavior, emotions, and the world around them. We hope to encourage readers to be more mindful of their learning process and how they can increase their academic success.

Poster #41*

8-Step Sequencer for Eurorack Modular Synthesizers

Mentor: Hassan Raza, Electrical & Computer Engineering

Student: Connor Cahill, Computer Engineering

A synthesizer is a musical instrument that uses electronics and electrical design concepts to produce audio signals. A modular synthesizer is a type of synthesizer system with a focus on combining individual modules, each with their own specific function, to create unique musical instruments and ideas. The most popular format for modular synthesizers is Eurorack, which is a standard that defines things such as panel dimensions and power specifications. The goal for this project was to design and build a working prototype for a sequencer module (circuit, printed circuit board and front panel all custom-designed). A sequencer is an electronic device that sequentially (or randomly, in some cases) steps through several pre-set voltage values. The main musical application of this function is arpeggiation (pitch/note sequencing), but many other use cases exist. This project is completed in the ECE Spark Space, using a combination of digital and analog circuit design techniques. The

electronics are designed and tested on breadboard using test equipment like oscilloscopes and function generators, then printed onto a PCB using EAGLE EDA software and the in-house PCB fabrication machine within the Spark Space. The panel is designed in Adobe Illustrator according to Eurorack standards and fabricated with laser-cut acrylic. The result is a simple, reliable, cheap, and easily reproducible design for a general-purpose sequencer that is fully compatible with other Eurorack systems. Several features included in the design of the sequencer include a maximum 8-step length, selectable sequence length, built-in slew limiter, and the ability to be clocked at a wide range of rates, from very low rhythmic frequencies up to around low audible frequencies (30 Hz).

Poster #42*

The Effect of Low Dose Ionizing X-Ray Radiation at Varying Dosing Rates on Smooth Muscle Cells in Vitro

Mentor: Delphine Dean, Bioengineering

Students: Arianna Csiszer, Haley Hilliard, Jackson Wells, Charles Winchester, Bioengineering; Almog Gur, General Engineering,

Although the effects of high-doses of radiation are known to cause DNA damage and negatively influence cell proliferation, the precise biological effects of low-dose ionizing x-ray irradiation are not well understood. These effects, however, are significant in the medical field due to their use in diagnostic imaging and therapeutic radiation sources. The aim of this study was to determine the effects of varying low dose x-ray irradiation on cells in vitro with vascular smooth muscle cells being the specific cell type studied due to their role in vascular pathophysiological processes.

A novel characteristic x-ray irradiation cabinet housed in a cell incubator that generates x-rays was used to study the effects of x-rays at varying dose rates on the proliferation of human smooth muscle cells (SMCs). Immunofluorescence imaging of SMC markers, cell live/dead assays, and proliferation assays were performed starting from Day 0 to Day 3.

The radiation (0.2mGy total) at 0.05 mGy/min appears to affect proliferation the first two days of exposure, then return to normal levels after Day 3. However, both the 0.16 mGy/min and 0.50 mGy/min rates resulted in affected levels of proliferation with no return to normal levels after Day 3 of exposure. The irradiated samples were statistically significant to their corresponding control, and every irradiated point yielded statistically significant results below a p-value of 0.05 at at least two time points.

We concluded changing the dose rate, while the total dose received was kept constant, has an impact on SMCs. Since these cells rapidly proliferate when shifting from a contractile to a more synthetic phenotype, increasing the dosing rate is believed to shift the SMC expressed phenotypes.

ACKNOWLEDGEMENTS: Clemson Creative Inquiry for funding. Donald Medlin and Leon Zheng for design of the irradiation cabinet.

Poster #43*

Invasive Species Survey Techniques

Mentor: Trisha Markus, Forestry & Environmental Conservation

Student: Blair Abernathy, Wildlife & Fisheries Biology

Invasive species are nonnative to their introduced range and cause ecological and economic impacts. They are likely to invade disturbed ecosystems, compete with native species for resources, and reduce overall plant and animal diversity. The project aims to test survey sampling techniques in the Clemson Experimental Forest (CEF); the methods will then be used to complete an invasive species survey for the Marine Corps Air Station (MCAS) Townsend Bombing Range. Survey methods for detecting invasive species will be conducted in the CEF Fant's Grove Area. Esri ArcPro software and ArcGIS Online were used to plan the surveying areas and analysis. The field survey was performed using the Esri Arc GIS Field Maps mobile app and Trimble Juno GPS units. These methods will be used to complete the invasive species survey at the MCAS Townsend Bombing Range and write management plans for the invasive species on the property.

Poster #44*

April 06

Förster Radius: The Importance of Choosing the Fluorophore Pairs to Study the Structure and Dynamics of Biomolecules

Mentor: Hugo Sanabria, Physics & Astronomy

Students: Hannah Levin, Psychology; Krushi Patel, Microbiology; Abigail Poropatich, Physics

When observing the movement of biomolecules through Förster Resonance Energy Transfer (FRET), it becomes essential to select a fluorophore pair that will be attached to the biomolecule of interest. FRET is a non-radiative form of energy transfer between two fluorophores. To optimize for FRET, it is crucial to consider the fluorophore's properties, such as the quantum yield and the Förster radius. Thus, the selection of a fluorophore pair is integral to the performance and accuracy of the FRET measurements. However, a comparison between fluorophores and fluorophore families is lacking. Here we show how to compute the Förster radius and a comparison of Förster Radii among the family of Alexa fluorophores. The aforementioned fluorophore pairs are typically used because they are well characterized and satisfy instrumental restrictions. Using this approach, we seek to compare Alexa fluorophores with other fluorophore families. We benchmark our results with reported values. Further, we wish to demystify the mathematics behind dye selection and optimize biomolecule and fluorophore pairing to create a more efficient protocol for selecting FRET pairs.

Poster #45*

Quantification of Plantar Pressure Profiles Resulting From Standard DFU Treatment/Prevention Devices

Mentors: Kyle Walker, General Engineering, John D DesJardins, Bioengineering

Students: Precious Fe Custodio, Eve Gilreath, Haley Hilliard, Abby Wagner, Bioengineering

There are half a billion people with diabetes worldwide and about one third of them will develop a diabetic foot ulcer (DFU) over the course of their lifetime[1] . Diabetic foot ulcers are disabling and frequently lead to amputation of the leg. Of the patients who do not receive an amputation and are able to heal the ulceration, approximately 40% will experience recurrence within the first year, 65% recurrence within five years, and 90% recurrence within 10 years[1]. Custom foot orthotics, rigid boots, and casts are the some of the common treatments for diabetic foot ulcers. These function through the reduction of peak plantar pressure around the area of ulceration. Despite current treatments, ulcerations of the foot easily become chronic wounds. The pathological processes are poorly understood and poorly taught, and communication between the many specialties involved is often disjointed and insensitive to the patient's needs[2].

While the listed treatments are known to be helpful in facilitating healing through plantar pressure offloading, their exact degree of effectiveness is poorly understood. Our group aims to quantify the effectiveness of different offloading systems through the use of real-time plantar pressure measurements (Tekscan, F-Scan System). The resulting pressure maps will be analyzed for outcome measures such as peak pressure, peak pressure location, average pressure, contact area, etc.

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Poster #46*

A More Welcoming Space: Makerspace CI

Mentors: Todd Schweisinger, Mechanical Engineering; Kelsey Sheaffer, University Libraries

Students: Margaret Dee, Emily Petty, Mechanical Engineering; Rylee Rollins, Materials Science & Engineering; Emily Nill, Industrial Engineering; Victor Cruz, General Engineering

The Clemson Makerspace is an organization that runs multiple locations on campus where the Clemson community can use high technology machines to create and develop projects. However, how intimidating is the Makerspace to users who are unfamiliar with the space and the machines? Is there a comprehensive understanding of how to use the machines in the Makerspace? The Makerspace Creative Inquiry works towards making the Makerspace more user-friendly and safe through student-developed standard operating procedures.

Members of our team tested the difficulty of machines using the available information. Using this direct experience with the machines, team members develop standard operating procedures (SOPs) for new users learning how to operate a machine. The team members were able to determine how efficient and comfortable students felt with the 3D scanning machine by comparing the amount of time it took a student who used a newly developed set of standard operating procedures against a student who used the original user manual. The student that was able to use the team-developed standard operating procedure felt comfortable and confident using the machine compared to the other student who felt confused when trying to use a long user manual book.

The team found that the standard operating procedures created were useful. These SOPs were put out for all makers to use while creating new things. Creations made by these SOPs can be seen through the life-size scale of Howard's Rock, a tapestry containing logos from different student organizations, and much more.

Poster #47*

Mind Control 3D Modeling: Using Electroencephalogram (EEG) Brain Wave Activity to Construct 3D Models of Mentally Visualized Objects

Mentor: Hugo Sanabria, Physics & Astronomy

Students: David Sanders, Physics, Thomas Delvaux, Mechanical Engineering

This project focuses on collecting data from the brain to be translated into 3D models. The brain naturally uses a similar process in which electrical signals provide a 3D representation of the world around us. This project seeks to understand if an image encoded in the visual cortex can be artificially retrieved and further translated into 3D models. It has been shown that the signals created in the brain can be successfully captured, filtered, and plotted. However, the usage of neural networks to translate this data into 3D models has yet to be demonstrated. Two 16-channel dry electrode EEG headsets have been built for data recording. In addition, a convolutional neural network (CNN) was trained to classify images. Specifically, the trained CNN successfully identified, with 80% accuracy, 2D images of cats and dogs. This will be used as a starting point for training an EEG data-based CNN. This research provides an avenue to link EEG recordings and the use of CNN to decode signals. Thus, paving a way to facilitate 3D object design taking a matter of minutes rather than hours or days. Hypothetically, using devices of sufficient sensitivity, subconscious thoughts could be extracted from the brain and represented. In a therapeutic context, this would be a powerful tool to assist with trauma recovery and help cope with other related mental illnesses.

Poster #48*

Ultrasound-Guided Cannulation for Hemodialysis Using Customized Reusable Echogenic Phantom

Mentor: Ravikiran Singapogu, Bioengineering

Student: Sydney Desimone, Bioengineering

Many patients with End Stage Kidney Disease need weekly dialysis treatments to survive. Hemodialysis utilizes a vascular access typically created by joining an artery and a vein either surgically or via a synthetic graft. Blood obtained from the vascular access is circulated between the patient and the dialysis machine. High rates of complications for this practice stems from unskilled cannulation at dialysis clinics. More recently, ultrasound imaging (UI) use has become a popular method to cannulate complex vascular accesses since UI provides real-time measurements including, depth, diameter, and shape of the fistula. Having this feedback could potentially improve many aspects of the hemodialysis cannulation procedure (e.g., reducing the number of cannulation attempts).

Methods and Materials: We created echogenic phantoms mimicking AV fistulas in two shapes, straight and curved, with two different diameters for each in order to add complexity to the simulator. A 15 G needle was fabricated with an IR detector and an IR emitter array was inserted into the echogenic phantom models. As a result, a flashback system was created to detect real-time insertion of the needle. Ultrasound imaging was used to collect images and measurements during the cannulation procedure.

Results: Observations show that using ultrasound during cannulation allows us to accurately measure both the depth of the vessel and the distance of the vessel from the skin surface. Real time images using a portable ultrasound device were captured to show the exact position of the needle inside the phantom.

Conclusion: Implementation of ultrasound imaging during hemodialysis cannulation will improve accuracy and precision, reducing risks of complications and could greatly improve patient outcomes.

Poster #49*

Identifying the Role of Meetings in Fostering Effective Social and Cognitive Processes in Teams

Mentors: Marissa Shuffler, Kyle Christenson, Psychology

Student: Marie Lynch, Psychology

Interest in creativity and innovation has grown tremendously in the last two decades. Previous team creativity research has largely focused on evaluating the role of the creative individual as part of the team. Recently, researchers have begun to attend to factors that influence team-level creativity. The purpose of this study is to assess the impact of a team debrief intervention on creative processes that occur during team meetings as well as the resulting creative outcomes of those meetings. Participants of this study consist of undergraduate students from Clemson University studying psychology and undergraduate students from the University of Nebraska Omaha. Ad Hoc teams of three were asked to engage in two problem-solving activities bisected by an intervention activity. Teams assigned to the control intervention watched a ~15-minute TEDtalk about how to write an email while the debrief teams watched a ~5 minute debrief intervention describing how to reflect upon, discuss, and try to learn from collaboration efforts. This ongoing research aims to utilize both quantitative and qualitative methods to uncover social and cognitive social processes that lend themselves to more creative processes and outcomes in teams.

Poster #50*

Are CT Measures of Poultry Keel Bone Volume and Density Reproducible Using Horos Open-Source Image Analysis Software?

Mentors: Jeryl Jones, Ahmed Ali, Cerano Harrison, Animal & Veterinary Sciences; William C Bridges Jr, School of Mathematical & Statistical Sciences

Student: Shayna Cohen, Animal & Veterinary Science

Sternal fractures and deviations (keel bone damage, KBD) are an important welfare concern in laying hens. The objectives of our study were to assess the repeatability for a protocol quantifying keel bone quality in laying hens using clinical CT and open-source image analysis software (Horos). In consultation with a veterinary radiologist (JJ), a protocol for quantifying keel bone volume and density was developed. Three observers with varying levels of image analysis experience followed this protocol to perform triplicate measures for 4, 1-week-old chickens. Birds were assessed in a random order using preset window level (WL) and window width (WW) settings (WL:325, WW:1500). Region of interest (ROI) tracings were placed within a water phantom for calibration, around the outer margins of the cortical bone for total keel bone density & volume and the outer margins of the medullary bone for medullary keel bone density & volume. Cortical bone density and volume were calculated from these measurements. In consultation with a statistician (WB), the repeatability of measurements for the 6 variables was determined using Coefficients of Variation (CVs) (JMP PRO 16.1.0, SAS Institute Inc.). The CVs were obtained for triplicate measures per observer, and an ANOVA (followed by Fisher's Least Significant Difference test) was used to compare the repeatability of these measures among observers. No statistically significant differences were found among the observers for any of the measurements (ß = 0.05). Findings from the current study can be used as background for future studies assessing novel interventions for improving bone quality in laying hens. Funding for this project was provided by the Clemson University Creative Inquiry and the SC TRIMH (NIH P20GM121342).

Poster #51*

St Francis OR Redesign Project

Mentor: Kevin Taaffe, Industrial Engineering

Students: William Bustle, Anna Lamontagne, Nick Taylor, Industrial Engineering; Gianna Cooper, Genetics

The objective of this Creative Inquiry (CI) team was to conduct an exploratory study with St. Francis Eastside (SFE) to (1) understand the space limitations within the operating rooms at St. Francis Eastside, and to (2) make recommendations for improvements to layout and flow within and around the operating rooms. An initial trip was taken to SFE to see firsthand where the issues lay. Interviews were conducted with several health professionals including an anesthesiology manager, circulating nurse, scrub tech, and the director of surgical services. These discussions highlighted the issues they face in the operating rooms daily, primarily dealing with overcrowding, poorly placed equipment, and underutilized storage areas. After observing the operating rooms, the concerns of the surgical staff were confirmed. Discussions are underway for another visit to SFE to better understand how the limitations affect the workflow within the operating rooms during a live surgery. This CI will serve to be the foundation for a Clemson Industrial Engineering Capstone Project in the fall of 2022. In return, it will allow students to use knowledge acquired from the Industrial Engineering Department and related disciplines to implement solutions and suggestions to real world scenarios.

Poster #52*

Optimizing CRISPR/Cas9 and RNAi Systems to Characterize Post-Translational Modifications in *T. brucei*

Mentors: Joshua Alper, Subash Godar, Physics & Astronomy; Katherine Wentworth, Biological Sciences

Students: Jerry Enverso, Microbiology; Lucy Fischer, Genetics

Trypanosoma brucei, the unicellular parasite responsible for African sleeping sickness, exhibits unique tip-to-base flagellar beating for motility. The axoneme is the central structure of the *T. brucei* flagellum, consisting of microtubule doublets, dynein arms, and an array of proteins. We are interested in characterizing how acetylation, deacetylation, tyrosination, and detyrosination post-translational modifications affect the flagellum of *T. brucei*. To characterize these post-translational modifications, we will use CRISPR/Cas9 to knock out, and RNAi to silence the genes responsible for these modifications in *T. brucei*: ATAT1 (acetylation), SIR2 (deacetylation), TTL (tyrosination), and VASH (detyrosination). With the success of gene knockout and silencing through gene editing technologies, we will be able to characterize these post-translational modifications of the *T. brucei* flagellum through a series of motility assays. We are also interested in using RNA interference to downregulate the expression of proteins of interest. However, introduction of RNAi machinery into the bloodstream-form *T. brucei* genome has resulted in unintended defects in cell motility. Because the RNAi machinery inserts into the *T. brucei* genome near to the tubulin locus, we hypothesize that insertion could have interfered with the expression of tubulin, which polymerize to form microtubules and thus underly motility mechanisms of trypanosome cells. We are monitoring tubulin expression via western blotting and RT-qPCR to determine whether uninduced RNAi machinery affects tubulin expression and ultimately explains the observed *T. brucei* motility defect. Reduction of tubulin expression in uninduced RNAi cells in comparison to wild-type cells would indicate the vector used to introduce RNAi machinery into *T. brucei* must be redesigned.

Poster #53*

Building and Probing Simple Neuronal Circuits with Combined Optical Tweezer and Microelectrode Array Experiment

Mentors: Joshua Alper, Physics & Astronomy; Katherine Wentworth, Biological Sciences

Students: Nathan Edwards, George Grow, Bioengineering; Campbell Elam, Microbiology; Yugantar Gera, Physics; Abigail Rowell, Psychology; Hetvi Thakkar, Genetics

Neuronal circuits are networks of neurons in the human brain, and they communicate by firing action potentials to each other. Related studies heavily emphasize either the molecular or large-network level. By studying neuroblastoma cells in a simple, custom, rationally built circuit we can learn more about the way these smaller circuits can bridge the gap between molecular and large-circuit analyses. One advancement in technology we make use of in our lab is the microelectrode arrays (MEA) which can simultaneously record and stimulate neurons. We combined an optical tweezer (OT) with the MEA to create an OT-MEA system for placing and guiding the neurite growth of these neuroblastoma cells within the culture solution residing on the MEA. To enable proper analysis of the voltage vs time data collected over multiple electrodes, we are continuing our development of a system of analog filters, amplifiers, and digital post-processing software. We will stimulate the neurons as well as understand the effect that spontaneous neuronal signaling has within these neuronal circuits. NEST, a neuron modeling software, was utilized to predict and compare computational models of neuronal circuits with what we read in the lab. The effect of current amplitude, frequency, and network shape on signal propagation in networks is not completely understood; we have focused on investigation of the role of current frequency on neuron firing rate. One conclusion we have made is that for a specific network shape, current frequencies differing by 0.5 [Hz] caused a target neuron's firing rate to be approximately 2.0 times higher than current frequencies that were in-phase. These results suggest that current frequency can be a modulator in signal propagation for in vitro networks of neurons.

Poster #54*

The Impact of a First Night Shift on Affect and Affective Personality

Mentor: June Pilcher, Psychology

Students: Ethan Hammond, Maggie Pontiakos, Abi Wilkinson, Psychology; Christopher Ply, Microbiology

Night shift work is becoming increasingly common in the modern workplace and is a source of stress that leads to decreased emotional well-being, emotional reactivity, and affect. The first night shift, which is the beginning shift in a series of night shifts, is particularly stressful as it forces workers to work during a time they are typically sleeping. The current study will address the question; how will a first night shift impact positive affect (PA), negative affect (NA), and affective personality among undergraduate students? Ninety healthy undergraduate students, 60 males and 30 females (22.1 ± 3.0 years), completed a simulated first night shift as they performed various cognitive tasks during the night. The PANAS test was administered four times throughout the night (6:30 p.m., 10:30 p.m., 3:00 a.m., and 7:30 a.m.) to measure PA and NA based on how participants felt 'lately'. A median split was performed using the first testing session PA and NA data, and participants were assigned to a high or low PA/NA group to place them into one of four affective personality types: Self-actualizing (high PA, low NA), High Affective (high PA, high NA), Self-destructive (low PA, high NA), and Low Affective (low PA, low NA). A 2 (affect) * 4 (testing sessions) repeated measures ANOVA indicated a significant decrease in mean PA while NA remained stable. A Friedman test indicated a significant change in affective personality with the low PA affective personalities (Self-destructive and Low Affective) increasing in frequency. A decrease in PA and trend towards low PA affective personalities can cause reduced stress coping ability and worker efficiency. Organizations with first night shift workers should anticipate potential burnout and performance errors, and increase workers' perceived control so they can better navigate the stressors of a first night shift.

Poster #55*

Constitutional Questions Raised by Mandatory Vaccination

Mentor: Cary Kaye, Philosophy & Religion

Student: Maelee Dudan, Accounting

Students examine U.S. constitutional law regarding two questions raised by the prospect of mandatory universal vaccination for severe and contagious disease. They explore whether Congress has authority under the interstate commerce clause to mandate vaccination and whether U.S. individuals have a substantive due process right to refuse mandatory vaccination.

Poster #56

NextGen Teams: Establishing a New Experimental Paradigm in Team Dynamics Research

Mentors: Marissa Shuffler, Allison Traylor, Psychology

Students: Roisin Cahill, Psychology; Shelby Dorth, Language & International Health

Given the complexity of challenges at home and abroad, the United States Army relies heavily on team-based assignment in order to meet the increased demands of environmental variability on team coordination. Past studies on team dynamics have been limited in complexity, sample size, and fidelity to military operational environments. In a collaborative effort with research teams from four other universities, we have designed and are implementing an experimental paradigm informed by the latest team science research that has the potential to foster advancements in team staffing and composition. Teams of five subjects are assigned roles and tasked with three, thirty-minute military-based missions that simulate an operational combat setting. Participants complete surveys, which are supplemented by video, audio, and spatial data to gauge team performance and other metrics of team effectiveness. Initial findings indicate that the experimental paradigm is valid, controlled, and produces sufficient variability in team outcomes to yield important insights about team performance. The completed experimental paradigm and our future work at Clemson will enable our research team to assist the Army in human capital optimization as teams of U.S. soldiers navigate modern warfare.

Poster #57*

Investigations of Multiple Faceted Cu-based Single-Atom Alloy Catalysts for Electrochemical CO2 Reduction

Mentor: Ming Yang, Chemical & Biomolecular Engineering

Students: Brian Torreon, Julia Wood, John Yeager, Chemical Engineering

In-situ resource utilization is essential for a sustainable energy future both on earth and in space. On Earth, CO2 accumulation from fossil fuel emissions has significantly contributed to global warming. In the space, CO2 is a resource of interest due to its abundance on other planets' atmospheres, such as Mars. Thus, the facile conversion of CO2 into value-added chemicals, such as ethylene as a critical chemical intermediate or methane as a high-energy-density fuel is of great research interest in a broad scope. As such, copper (Cu) based electrocatalysts have significant potential in harnessing the CO2 reduction reaction (CO2RR) to address both cases. Manipulating the catalyst's physical characteristics such as nanoparticle size, shape, and crystallinity can enhance product selectivity. Building upon previous CI work, which involved a study of CO2RR using single atom alloys (SAAs) of PGM on polycrystalline Cu nanoparticles (Pd1Cu SAA), we aim to steer reaction selectivity by investigating the Cu shapes consisting of both [100] and [111] facets. We will synthesize the final catalysts (Pd-Cu SAA) using a galvanic displacement reaction. Galvanic displacement favors surfaces with higher free energy. By using the different surface energies of these facets, we will investigate if we can control the SAA dispersion of PGM on specific sites of Cu substrates. Thus, this project will investigate a catalyst with specifically designed PGM SAA in a flow cell electrolyzer for CO2 reduction. Optimizing the Cu electrocatalyst in the CO2RR will enable scientists to reduce CO2 into beneficial hydrocarbons to mitigate greenhouse gas emissions on Earth or generate fuel sources for future space travel endeavors.

Poster #58*

A Novel Role of SYCP3 in Meiotic Homologous Recombination

Mentor: Michael Sehorn, Genetics & Biochemistry

Co-Author: Garrett Buzzard, Biochemistry & Molecular Biology

Students: Daniel Hiott, Genetics, Stuart Philp, Biochemistry; Ashley Polson, Microbiology

Synaptonemal complex protein 3 (SYCP3) in humans is a protein involved in prophase I of meiosis. During meiosis crossing over of homologous chromosomes occur. In this phase the synaptonemal complex joins the homologous chromosomes to ensure that the exchange of genetic information is completed accurately. Previous reports suggest defective synaptonemal complex formation leads to aneuploidy which is associated with infertility and embryonic death. SYCP3 was shown to have a significant role in the formation and stability of the synaptonemal complex. Meiosis is initiated by the carefully controlled introduction of DNA double-strand breaks (DSBs) into the genome. These DSBs are repaired by the homologous recombination DNA repair pathway that cells use to repair DNA double strand breaks in a way to physically connect homologous chromosomes to facilitate the successful segregation. Two essential proteins in homologous recombination are the RAD51 and DMC1 recombinases. These recombinases bind to the single-stranded DNA and form a nucleoprotein filament. The nucleoprotein filament is responsible for the search for homology the subsequent DNA pairing and strand exchange. SYCP3 was shown to suppress RAD51-mediated strand invasion but not DMC1-mediated strand invasion. Mutations designed to disrupt DNA binding and oligomerization, as well as patient sample mutations of SYCP3 will provide insight into the mechanism of SYCP3 regulating RAD51-mediated DNA repair. The results from the analysis of SYCP3 will provide more insight into the role of SYCP3 in the homologous recombination pathways.

Poster #59*

April 06

Detection of Antiretroviral Drugs in Urine: The Kugundua

Mentors: Delphine Dean, John D DesJardins, Melinda Harman, Bioengineering

Co-Authors: Maria Eduarda Barbosa de Camar, Azrin Jamison, Bioengineering

Students: Aaron Spearman, Bioengineering

With the use of antiretroviral drugs (ARVs) in HIV/AIDs patient testing has become an essential gateway to prevention, treatment and care.Our goal is to design a urinalysis device to detect ARVs in patients with HIV/AIDS in resource poor areas and in low and middle income countries (LMICs), to help doctors ensure patient adherence to prescriptions and to promote prolonged health. Metabolic byproducts consistent between a variety of ARVs, particularly those used in LMICs were identified and those present in lamivudine & creatine were selected. From these markers, qualitative assays were developed to determine their concentration in artificial urine samples treated with varying amounts of metabolites. Based on the by-products discovered, molecular imprinted polymers (MIPs) were specifically designed for this application. Detection of selective ARV markers in aqueous solution was conducted using 2 different MIP strategies to identify an optimal metabolite recognition procedure. Cyclic voltammetry was used to test the effectiveness of each biosensor to detect the metabolites. Figure 1: Through the cyclic voltammetry testing, calibration curves for both methods were obtained. Method A's calibration curve can be seen in figure 1. The graph shows a linear relationship between the current density and concentration of the metabolite in question. Method B showed that it would not didn't produce a good linear relationship and so would not be adequate. Method A showed that the metabolite was able to be detected within an aqueous solution.Furthermore the ability to detect metabolites suggests there is a potential use for monitoring patient adherence to ARV drugs. Further testing will require the use of artificial urine to observe the biosensor's selectivity in the presence of the other metabolites.

Poster #60*

Bark-Gnawing Beetles (Coleoptera: Trogossitidae, s. lat.) of South Carolina

Mentors: Michael Ferro, Michael Caterino, Plant & Environmental Sciences

Students: Nikolai Artley, Environmental & Natural Resources; Annabelle Matthews, Alexandra Ratay, Courtney Stuart, Plant & Environmental Sciences

The bark-gnawing beetles (Trogossitidae), in the old sense, have recently been split into several families, three of which are in South Carolina. Thymalidae are associated with polypore fungi. Lophocateridae are omnivores and include the stored-product pest *Lophocateres pusillus* (Klug). Trogossitidae, in the new sense, are predators of insects associated with dead wood, especially economically important bark beetles (Curculionidae: Scolytinae), and include the Cadelle (*Tenebroides mauritanicus* (L.)), a serious stored-product pest. No species list for Trogossitidae, in either sense, is available for South Carolina. Specimens from the Clemson University Arthropod Collection and by-catch from the South Carolina Pine Beetle Survey were sorted, identified, and databased. More than 600 specimens were identified. At least 19 species have been documented for South Carolina, representing eight new state records, including the first records of Thymalidae and Lophocateridae. Habitus photos and distribution maps are presented.

Poster #68

Developing a Method to Decellularize Bovine Intervertebral Discs Using Supercritical Carbon Dioxide

Mentor: Jeremy Mercuri, Bioengineering

Undergraduate Students: Nathan Aufderheide, A'nna Kelly, Nick Morrison, Abigail Shaffer, Bioengineering; Heather Cosh, Microbiology; Audrey Wessinger, General Engineering

Intervertebral Disc Degeneration (IVDD) is the leading cause of back pain in the UnitedStates, and current treatments fail to fix the underlying problem. Tissue engineering of theIntervertebral disc (IVD) aims to correct IVDD by restoring native IVD function while preserving mechanical properties. The Ortho-X Laboratory aims to find a solution to IVDD by using decellularized xenograft scaffolds as an IVD replacement. One of the largest limiting factors is maintaining mechanical properties throughout the decellularization process. In the fall of 2021, the CI focused on investigating the potential of Supercritical CO 2 (ScCO 2) decellularization and its effect on the biological tissue mechanical properties. Through a literature review, the CI students developed the hypothesis that ScCO 2, in combination with various detergents, may preserve the mechanical properties of the IVD during decellularization. The students also identified several compatible ionic, anionic, and zwitterionic detergents to be used with ScCO 2 and devised a decellularization protocol for the IVDs. The students also initiated a collaboration with Dr. Michael Matthews at the University of South Carolina who has published numerous articles concerning the use of ScCO 2 for tissue decellularization using a custom-made system. Through this collaboration, Ortho-X CI students will test their novel decellularization protocol. Initial studies will include processing extracted bovine IVDs and evaluating for changes in the histological microarchitecture and cellularity of the tissue following decellularization treatment compared to untreated controls. Ultimately, ScCO 2 has potential to effectively decellularize IVDs and pave the way for future research in effective treatments for IVDD. We would like to acknowledge Clemson Creative Inquiry for sponsoring this research.

Poster #69

Measuring Something Very Fishy: Assessment of Children's STEM Identity After Participation in a Marine Science Outreach Program

Mentors: Randi Sims, Michael Childress, Kea Payton, Biological Sciences

Students: James Cullers, Savannah Doughty, Lauren Hayes, Environmental & Natural Resources, Zachary Hemann, Mechanical Engineering; Ana Hernandez, Kelly Medina, Anna Marie Metzger, Sarah Rojugbokan, Isabella Balzola, Patricia Ryan, Biological Sciences; Neil Parikh, Biochemistry; Maddie Stephens, Isabel Tiller, Wildlife & Fisheries Biology; Nicholas Ryan, Environmental & Natural Resources; Mckenzie Vandenbrekel, Animal & Veterinary Science

Children are the scientists of tomorrow. For this next generation the most pressing issue they will face is our changing climate and its impacts on human health and planetary wellbeing. Therefore, it is essential that children today become interested and engaged in science. Our Something Very Fishy elementary outreach program uses ocean exploration as a theme for understanding how humans connect with our environment. Children in grades 3-5 participated in either an online or in person virtual marine science field trip and were asked to create drawings of what it looks like under the ocean or what a scientist looks like, and surveys of career interests before and after attending the program. Standardized scoring rubrics were created to measure STEM identity and the incorporation of ocean literacy themes presented in our programs. Interest in STEM careers increased with program participation and many ideas of ocean literacy were higher in frequency in post assessments. These results suggest that elementary school climate literacy programs can have positive benefits for increasing interest in STEM careers through gains in personal and community efficacy to help save our oceans and our planet.

Poster #70

Modeling Solid-Liquid Interface Properties in High-Entropy Alloys for Additive Manufacturing Processes

Mentor: Enrique Martinez Saez, Mechanical Engineering

Student: Xiaolong Tian, Computer Science

Advanced designs in many applications require the development of materials with improved properties to cope with the increasingly harsh environments that such applications pose. Advanced manufacturing processes, such as additive manufacturing (AM), can deliver parts with complex geometries, minimal waste material, and limited post-processing. However, AM microstructures can vary considerably from those produced by traditional metallurgy. It is essential to characterize and control the microstructure and properties of AM parts such that they may be qualified for use in critical applications. Furthermore, the combination of these advanced processing techniques with novel compositions, such as high-entropy alloys, can potentially generate invaluable knowledge to grow optimized materials. We have used atomistic modeling tools to analyze the solid-liquid interface properties that control the solidification process and dictate the morphology of the microstructure. We have computed the interphase stiffness relying on the capillary fluctuation method and the anisotropic parameters. We observe that depending on the solid-liquid interface orientation, extra phases can develop at the interface in concentrated systems at the liquidus temperature. The presence of such phases significantly affects the stiffness of the interface and might modify the solidified microstructure.

Poster #71

Characterization of Populus Promoters Involved in Stress Response

Mentor: Haiying Liang, Genetics & Biochemistry

Students: Allie Randazza, Bryce Deuty, Biochemistry

Promoters play critical roles in controlling the transcription of genes and are important as tools to drive heterologous expression for biotechnological applications. In addition to core transcription factor-binding motifs that assist in the binding of RNA polymerases, there are specific nucleotide sequences in a promoter region to allow regulation of gene expression. This project aims to characterize the Populus promoters that are responsive to stress. Populus (known as poplar) is an economically and ecologically important genus and model system for woody plant research. The genus comprises ~30 species, which are native to the Northern Hemisphere and are among the fastest-growing temperate trees. In addition to environmental benefits such as carbon sequestration, reduction in sediment run-off, and habitat for wildlife, poplars have important commercial uses in pulpwood, engineered lumber, and biofuels. Promoter sequences of allene oxide synthase (AOS1) gene and members of rapid alkalinization factor-like (RAFL) genes were retrieved from the available genome of *P. trichocarpa* and *P. deltoides* and mined for conserved motifs. Promoter sequences were cloned and used to drive the expression of a scorable maker gene (β-glucuronidase, GUS). Currently, we found that the poplar AOS1 promoter drives rapid and localized expression by wounding. When all the other promoters are fully characterized, our study will not only provide insight on the responsive elements in the poplar promoters, but also provide promoters for future applications. The project is funded by Clemson University Creative Inquiry.

Poster #72

Impact of Conserved Starch Utilization Systems in Bacteroides spp. on Biofilm Formation and Chronic Diseases

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

Students: Joshua Brueckner, Avery Conzelmann, Abby Simpson, Microbiology; Mia Koppari, Abigail Shealy, Biological Sciences

The Bacteroides genus of bacteria can be characterized as anaerobic and gram-negative with a distinct presence in the gastrointestinal tract of humans. Research has indicated potential links between Bacteroides and type 1 diabetes (T1D) and other chronic diseases. Previous work in our lab has demonstrated that the starch utilization system (SUS) of Bacteroides represents a well-conserved target for potential manipulation of this genus within the human microbiota. Specifically, we have shown that when exposed to acarbose, an α-amylase inhibitor, starch degradation and growth by Bacteroides species is inhibited. This specific inhibition could potentially delay or prevent the onset of certain chronic diseases. Our aim is to continue research on the variety of chronic diseases that can be affected by different species of Bacteroides. The different components of our study include exploring the role of host-associated *Bacteroides fragilis* in colon cancer and investigating the starch utilization systems in potentially host-independent *Bacteroides faecium*. For colon cancer formation, we are investigating both biofilm formation and bile acid modification. We are also interested in determining if Bacteroides starch utilization systems are conserved in *B. faecium*, and if the bacterium is also inhibited by acarbose. Understanding the potentially well-conserved

mechanisms of host-microbe interactions for various Bacteroides spp. could lead to potential therapeutics for a variety of chronic diseases.

Poster #73

Finding Your Voice Camp

Mentors: Denise Anderson, Dean of Health,Educ,HumanDev; Alexsandra Dubin, Parks, Recreation and Tourism Management

Co-Author: Shelly Black, Psychology

Students: Bella Baldree, Zayn DeAndrade, Amelie Gray, Elizabeth Gunter, Hannah Purvis, Psychology; Clara Dendtler, Mary Stephens Mcmillan, Morgan Smith, Nursing; Gillian Schwesinger, Biological Sciences

Individuals who are highly physically active are more likely to have greater self-esteem, better body image, and increased physical activity self-efficacy. Currently, the average PE program provides less than 12% of the recommended daily amount of physical activity, with adolescent girls being the least active. Additionally, 80% of adolescents ages 12-17 drop out of organized sports, with girls dropping out earlier than boys (Slater & Tiggeman, 2010). 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 in 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 from previous years suggests this camp positively impacts those who attend, however since the camp will be held April 8th-10th, there is no data from this year to analyze.

Poster #74

Deep Eutectic Solvents Based on Halogen Bonding

Mentors: Colin McMillen, William T Pennington Jr, Chemistry

Co-Authors: Andrew Peloquin, Madhushi Bandara, Chemistry

Students: Victoria Critchley, Audrey Gasque, Matthew Lowery, Connor Nee, Hampton Warner, Biological Sciences; Spencer Watts, Chemistry

Deep Eutectic Solvents (DESs) are a high impact field of study given their promise as novel solvents for electrochemical systems, materials/environmental processing, catalysis, biosensors, separations, and other chemical reactions. The vast majority of DESs are constructed of constituent molecules or ions that interact with one another through hydrogen bonding. Since the nature of the interactions between molecules influences the properties of the resulting DESs, there is great interest in identifying new chemical systems that form DESs. DESs that involve different intermolecular interactions may be particularly interesting since they may possess significantly different solvation properties based on their differing interactions. Halogen bonding has recently been developed as a complementary tool to hydrogen bonding in crystal engineering, where intermolecular interactions are studied to rationally design new materials with specific properties. We will utilize halogen bonding interactions to similarly design new DESs. Using an empirical, combinatorial approach via mechanochemistry new DESs will be identified and then characterized by spectral and thermal analysis. Systems that do not form DESs via mechanochemistry will be subject to crystallization and single crystal X-ray diffraction, providing additional understanding of the intermolecular interactions surrounding these systems, and supporting the design of subsequent reactions. We have identified several potentially productive chemical systems and will discuss our findings and future directions.

Poster #75

Development of Tools for the Study of Host-Pathogen Interaction in the Symbiotic Polydnaviruses

Mentors: Matthew Turnbull, Daniel Howard, Peng Zhang, Biological Sciences

Students: Kat Terwelp, Rachel Carter, Kelsey Miller, Microbiology; Alexis Yoh, Genetics

Polydnaviruses (PDVs) are symbiotic viruses carried asymptomatically by certain lineages of parasitoid wasps and transmitted to lepidopteran larvae (caterpillars) during oviposition. Host lepidopteran susceptibility to parasitization is determined by susceptibility to the PDV: susceptible lepidopterans exhibit reduced immune capacity, altered metabolism, and disrupted development, ultimately dying while permitting wasp offspring emergence, while unsusceptible larval hosts kill their parasitoid invader. PDV genomes encode numerous multi-gene families, raising the question of what role individual family members play in determining lepidopteran host range: are family members redundant, or do they perform complementary roles such as host-specific expression patterns or interaction with different physiological pathways? We report two resources developed to address this question. First, we have generated a recombinant baculovirus vector utilizing the AcMNPV backbone to express the fluorescent reporter mCherry under the Very Late Promoter p10, and to express the fluorescence timer Med-FT-N1 under the regulation of inserted putative PDV promoter elements. Expression of mCherry permits identification of AcMNPV-infected cells and tissues, while FT-N1 expression permits visualization and timing of putative promoter activity. Second, we have developed a plasmid-based approach to examine interactions of PDV proteins via labeling of proximate host proteins (BioID) in the PDV-susceptible cell line Sf9. Our results clearly indicate that these tools will be useful in examining contribution of individual gene family members to pathology and by extension to manipulation of individual hosts and host systems, that is, the relationship between virus evolution and host range.

Poster #76

Investigating the Interactions of Probiotic Microorganisms with the Host

Mentors: Kristi Whitehead, Krista R Rudolph, Biological Sciences

Students: Julia Morgan, Biological Sciences; Caroline Palmentiero, Ashley Polson, Laurel Taylor, Meg Templeton, Microbiology

Probiotics contain a variety of microorganisms that are marketed as dietary supplements to improve overall gut health. Probiotic organisms confer many benefits to their host and are subject to changes in activity based on stressors encountered in the host environment. The goal of this study is to further understand the interactions between probiotic microbes and the host through investigation of the impacts of host artificial sweetener consumption and microbial bile acid hydrolase activity. In order to understand these interactions, we have employed in vitro growth assays using different stressors to investigate impacts on growth in our model strains of *Lactobacillus reuteri*, SD2112, MM4-1A, and PRB241. Concerning artificial sweeteners, preliminary data has shown that strains SD2112 and MM4-1A are unable to grow on aspartame and stevia. Future experiments will include using other sweeteners such as trehalose, as well as using new model organisms from the gut microbiome. In regards to bile acid modification, baseline data has shown that both the wild type, MM4-1A, and bile salt hydrolase mutant, PRB24, are both capable of growing in similar patterns when placed in traditional MRS broth. Future research will look at how the strains may alter bile metabolism by placing them in broths containing different concentrations and types of bile acids. A better understanding of the gut microbiome and its effect on the human host has the potential to aid understanding of illness and pursue targeted therapies.

Poster #77

Sustainable Agriculture Through Enhanced Plant Resilience

Mentors: Juan Carlos Melgar Jimenez, Ksenija Gasic, Sruthi Kutty, Dara Park, Guido Schnabel, Vidya Suseela, Sarah White, Plant & Environmental Sciences

Students: Patrick Belk, Ally Brawner, Lexi Coulombe, Cady Kurz, Jake Seiter, Plant & Environmental Sciences; Bryce Deuty, Biochemistry, Heather Motro, Environmental & Natural Resources; Mary Mulligan, Biological Sciences

This project responds to the national and global needs of understanding biotic and abiotic stresses for improving plant resilience to climate variability and change, land and water degradation, and plant diseases, for sustainably increasing agricultural production in the next decades. Undergraduate students develop lab and field research studies in different disciplines and research groups at Clemson, working in topics such as plant responses to climate variability and change, fruit breeding, soil water dynamics, or water quality. At each lab, students are becoming familiar with lab and field research protocols used in identifying and tackling agricultural problems that impact the natural resources and economy of South Carolina. For instance, there are students working on the effect of soil amendments on root growth and development, the influence of soil

microorganisms on carbon and nitrogen cycles, the development of resistance to fungicides, or how transient changes in environmental conditions can affect sap nutrient content and their influence on fruit quality. Students attend lab meetings and synergy meetings where they discuss how their projects overreach their disciplines and impact other projects. During the summer, they will also collaborate with an international researcher working on a similar research project in Spain during an 8-week research abroad so that the students gain a global perspective and learn how to identify critical factors that impact the sustainability of our agricultural systems. This project is sponsored by USDA-NIFA Award number 2021-68018-34636.

Poster #78

Sustainable Agriculture Through Enhanced Plant Resilience

Mentor: Kara Powder, Biological Sciences

Co-Author: Allyson Brandon, Biological Sciences

Students: Kelsey Piatkowski, Biological Sciences

Cichlid fishes of Lake Malawi have developed diverse craniofacial shapes through evolution. One source of this variation are differences among species due to differences in feeding mechanisms and diet, but there are also differences within species due to sex. Unlike other fish species, trying to figure out the genetic sex of cichlid fish from Lake Malawi has proven difficult because most species lack a bona fide sex chromosome. Along with this issue, sex hormones and social dominance within communities also play a role in determining the sex of an individual. To examine whether we could track sex by genetics alone, DNA obtained from fin clips was examined in two cichlid species (*Pseudotropheus livingstonii* and *Aulonacara baenschi*) that phenotypically appeared male or female. PCR and gel electrophoresis were used to determine if males and females could be differentiated based on DNA differences on linkage group 7. For one of the target regions (Absc101), PCR products had different fragment sizes between the sexes for each species. *Pseudotropheus* males had fragment lengths of 320 and 500 bp, while females had one fragment length of 250 bp. *Aulonocara* males and females were found to have PCR product sizes of 200 bps and 280 bps, respectively. These preliminary results provide evidence that these species can have their sex identified genetically. This finding will enable us to further investigate the role of sex in facial shape, for instance by determining sex in animals too young for males and females to look different. Future work will help answer more questions about how male and female facial differences occur, for instance the influence of sex hormones. Understanding these effects is important for learning more about craniofacial shape within humans, where differences between male and female jaw shape can lead to medical issues such as joint pain or dental issues.

Poster #79

Understanding the Impact of Patient Boarding Time on Emergency Department Provider Productivity

Mentors: Kevin Taaffe, Vishnunarayan Girishan Prabhu, Industrial Engineering

Co-Authors: Ankita Bharat Ghadshi, Rahul Raviraj Shenoy, Industrial Engineering

Students: Matthew Elgin, Maggie Tyler, Industrial Engineering

The focus of the project is to study the link between patient boarding (or waiting time) and Relative Value Unit (RVU) generation. RVU's are a measure of value used in the United States Medicare reimbursement formula for physician services. Along with this, we study the impact of patient boarding against safety and productivity, respectively. Super boarding is a term that is used when a patient occupies an emergency department bed more than 120 minutes without services being provided and a disposition decision has already been made. During this period, there is no RVU generation. Many hospitals experience critical overcrowding and heavy emergency resource demand, hampering the delivery of high-quality medical care which compromises patient safety. It also affects the primary work of emergency department staff taking care of patients. Currently, we are conducting data analysis and trying to find a meaningful relationship that can show how the boarding of patients affects RVU generation. Analyzing this data will also help us to identify other factors affecting productivity and find techniques to reduce the boarding time of patients while increasing physician and departmental productivity.

Poster #80

Rings of Fire: Reconstructing the Fire History of the Southern Appalachian Mountains

Mentors: Donald Hagan, Brayden Williams, Forestry & Environmental Conservation

Students: Charles Baker, Harrison Bedenbaugh, Jon Carter, Conner Estes, Nate Wilson, Forest Resource Management; Andy Rabon, Environmental & Natural Resources,

Prior to the fire exclusion period of the early 1900s, fires burned frequently across eastern North America. Lightning ignitions were common in many areas, and Native Americans strategically used fire in various capacities to shape grassland and forested landscapes. Contrary to the early belief of the "pristine New World," evidence shows that fires, including those lit by humans, were a driving force of the landscape and plant communities of the Appalachian mountains prior to European settlement. Some researchers further suggest that fire frequency increased after the arrival of Europeans. Despite this growing body of knowledge, little is known about the historic fire regimes of the Blue Ridge Escarpment – the southeastern terminus of the Appalachians and one of the rainiest regions in North America. Through the analysis of old-growth forest stands, fire scars, and tree rings, it is possible to bring the fire history of the Blue Ridge Escarpment to light – both adding to the volume of knowledge regarding historic fire regimes of the United States and providing land managers with a stronger scientific basis to inform the use of prescribed fire as a restoration tool.

Poster #81

Testing of Genetically Encoded Voltage Indicators for Use in Insects

Mentor: Matthew Turnbull, Biological Sciences

Students: Caroline Ennis, Genetics; Sophia Sitsis, Microbiology

All animal cells produce gradients of charged molecules across their membrane, generating membrane potentials that are used for work and are indicative of cell state. Membrane potential (Vmem) is established by a range of ion channels and pumps, the expression of which is dependent on organism, cell type, and physiological state. Interestingly, alteration of Vmem has been demonstrated to drive cell physiology, thus membrane potential modifiers can have deleterious and beneficial consequences. Given this, better understanding of Vmem dynamics can yield significant insights into cell and organism state, as well as consequences of their disruption. Previously, we have utilized Vmem-sensitive fluorescence dyes to test Vmemdynamics, but such dyes require extensive manipulations increasing possibility of artifacts. We thus are testing suitability of two Genetically-Encoded Voltage Indicators (GEVI) for their use in insects. The green fluorophore Arclight was tested for use in Sf9 lepidopteran cell line, which is widely used for biomedical and biotechnological purposes. While we observed fluorescence, signal:noise ratios were low suggesting fluorophore and/or expression level must be changed to make the system useful. In parallel, Arclight and a red GEVI, VARNAM, are being examined for in vivo visualization of Vmem in the model fly, Drosophila melanogaster. Preliminary data indicates that both GEVIs have utility in fly, depending on specific question (tissue and physiological process) under examination. The development and use of GEVIs in insects will enhance our understanding of the pattern and function of membrane potential in a range of physiological processes in these important animals, including development and host-pathogen interactions.

Poster #82

Wetland and Prairie Restoration in South Carolina

Mentor: Althea Hagan, Forestry & Environmental Conservation

Students: Courtney Barrett, JB Rehrig, Environmental & Natural Resources; Katie Baucom, Forestry & Environmental Conservation

As human population numbers grow exponentially, more and more wilderness is being converted for urban and agricultural use. Historically, the South Carolina piedmont region was dominated by prairie landscapes characterized by plants maintained through fire and grazing. South Carolina's coastal plain was historically dominated by longleaf pine habitat. Agriculture and fire suppression have caused serious destruction and decline to both of these landscapes. We focus here on the restoration of two study locations: A wetland in Brosnan Forest in Dorchester County, SC and a portion of the Clemson Experimental Forest in Clemson, SC. The Brosnan Forest is a privately owned 14,400-acre longleaf pine reserve and a 200 acre wetland on the property is being restored to create a mitigation bank. In August, the wetland was inundated for the first time in several decades, and woody wetland species were planted. However, it is believed that this wetland was historically herbaceous by looking at 1930's aerial imagery and hydrology after inundation. A wetland vegetation survey will be conducted in the summer of 2022, with a smaller survey being conducted in the fall to account for grass and sedge bloom. The Clemson Experimental

Forest was a large acreage of land that succumbed to overcultivation. In the 1930's it was converted to forest. In 2020, a portion of the Experimental Forest was severely decimated by a tornado. We will be using multiple site preparation techniques to convert the area to an endemic Piedmont Prairie community in 2022.

Poster #83

Blood in Insects: from Circulation, to Hydraulics and Self-healing

Mentor: Konstantin Kornev, Materials Science & Engineering

Students: Miller Clement, Andrew Derasmo, Ahva Zadeh Bioengineering; Lauren Hogan, Materials Science & Engineering; Megan Williams, General Engineering

Insects have an open circulatory system and their blood is multifunctional. It circulates over the body and appendages to bring nutrients, oxygen and remove waste; it is also used for distributing the mechanical load on appendages such as antennae, proboscises and the like. And it creates a seal to the wound halting the blood loss or invasion of microorganisms. The formed blood clot is also used as a scaffold for formation of the new tissue. Using cockroaches (*Periplaneta Americana*), hawkmoths (*Manduca sexta*) and butterflies (*Vanessa cardui*) we study the blood flow and blood pressure in antennae. The viscosity of the insect blood is being evaluated through the study of oscillating magnetic nanorods within the fluid. Furthermore, the pressure gradient throughout the antenna is being analyzed by tracking hemolymph velocity across various flagellomeres and punching antennae with nanosharp Tungsten needle and then measuring the drop radii and surface tension and applying the Laplace law of capillarity. The drop clots fast and we study this process by filming the drop shape evolution and applying it to different substrates modeling different cuticles of insects. Finally, we investigate the role of blood pressure in forced uncoiling of proboscises in butterflies and moths. A new setup was developed to evaluate the contribution of blood pressure to proboscis uncoiling. Obtaining a detailed understanding of the blood properties of insects will prove to be instrumental in the future design of bioinspired self-healing fiber-based microfluidics.

Poster #84

Characterization of Commensal Clostridia in the Human Gut

Mentor: Anna Seekatz, Biological Sciences

Co-Authors: Disha Bhattacharjee, Biological Sciences; Christine Woelfel-Monsivais, Microbiology

Students: Natalie Markley, Microbiology; Lindsey Turner, Biochemistry

The gut microbiota is a collection of a diverse of microbes found in the gastrointestinal tract. Collectively, these microbes are known to play a crucial role in the host health by providing colonization resistance to exogenous microorganisms via nutrient competition and production of short chain fatty acids. Although the diversity and abundance of bacterial species found in the gut microbiome have greatly improved, there are microorganisms within the gut microbiota that have yet to be characterized, limiting our knowledge of the roles they play within this commensal system. This project aimed to characterize previously isolated strains of Clostridia, a group of commensal gut microbes that are crucial for human health. Bacterial isolates were obtained from human fecal matter and characterized through a combination of microbiological methods. Isolates were streaked on various rich media under anaerobic conditions to assess growth and morphology. Gram and spore stain were conducted to further assess bacterial features. Most isolates formed small, round, off-white colonies, and were gram-positive cocci and rods. Within the Clostridial isolates we characterized, approximately half the characterized isolates were spore formers, most belonging to the Lachnospiracaceae family. Our future directions include investigating carbohydrate utilization and butyrate production in Anaerostipes species which are anaerobic, gram-positive, butyrate producing bacterium belonging to the Lachnospiraceae family.

Poster #85

Producing, Packaging, and Marketing Sustainable Manure-Based Compost on a University Equine Facility

Mentors: Brittany Perron, Horse Farm, Kristine Vernon, Animal & Veterinary Sciences

Co-Author: Michaela Gibson, Packaging Science

Students: Raquel Jordan, Environmental Engineering; Brooklyn Stevenson, Horse Farm, Olivia Luk, Lindsay Woodall, Animal & Veterinary Science; Abigail Marcengill, Student Services; Haley Kolak, English; Weston Whitfield, Packaging Science

Animal waste has been converted to compost for several decades as a method of disposal and environmental resource. The goals of this project were to: 1) convert horse waste to compost, 2) sustainably package the end-product and 3) practice marketing techniques. Equine waste was collected and stored in four wooden-pallet bays from individually stalled mature horses at the Clemson University (CU) Equine Center in Pendleton, SC. Waste consisted of a manure-based mixture (MBM): feces, urine, long-stem forage and wood-shavings. Two treatment bays (TRT) were covered with corrugated sheet metal and three-one inch PVC pipes placed at the base of the MBM with 0.32cm holes for aeration while the control bays (CTRL) were left uncovered with no aeration. Temperature of all piles were taken biweekly; post-recording, TRT piles were manually turned. Three composite samples were taken from TRT and CTRL piles once weekly and submitted to CU Ag Service Lab for standard analysis including: percent moisture, total nitrogen, total carbon, C:N, pH, organic matter and soluble salts. Results determined TRT piles to reach completion sooner than the CTRL piles (8 and 12 weeks, respectively). However, end products of both piles were of adequate soil amendment quality as defined by the CU Ag Service Lab. Once compost reached a consistent 55ºC, it was packaged in to repurposed feed bags and sealed using an industrial sewer. The poly-weave bags maintained compost moisture content and simplified product distribution. The finished product was then advertised on the CU Equine Facebook page and CU marketplace where orders were taken and fulfilled. The marketing technique was deemed successful as all the compost was sold upon one month of initial advertisement. Thus, equine manure from a university facility can be converted to compost, packaged sustainably and used as a quality soil amendment.

Poster #86

Buoyant and Magnetic (BAM) Assays for Single Molecule Detection of SARS-CoV-2 Nucleocapsid Protein in Saliva

Mentor: Jeffrey Anker, Chemistry

Co-Author: Cassidy Bouknight, Bioengineering

Students: Hanna Campbell, Biochemistry; William Pons, Wilkins Taylor, Chemistry

We are developing a rapid saliva screening test to detect SARS-CoV-2 using interactions with buoyant and magnetic microbeads. These microbeads are functionalized with antibodies that bind to SARS-CoV-2 nucleocapsid protein, forming buoyant-and-magnetic (BAM) complexes, with almost one BAM complex per molecule. These BAM complexes are easily separated with a magnet; and removing the magnet frees the BAM complexes to rise; individual complexes intensely scatter light and are counted using a simple camera. Background from non-specific binding is typically 10-20 BAM complexes in spiked real saliva. High sensitivity is due to the high surface area, rapid capture due to buoyant bead travel, and high affinity antibodies, while specificity is due to good surface chemistry and buoyant forces which dissociate weak nonspecific bonds. The entire set up is less than $50 and once optimized, this test should be able to deliver on-site results within 15 minutes without any complex equipment.

Poster #87

A Social Network Approach to Assessing Collaborations in Agritourism

Mentors: Marissa Shuffler, Sydney Begerowski, Psychology

Co-Author: Lori Dickes, Political Science

Students: Caroline Ko, Madison Lenz, Psychology

Agritourism is a rapidly growing industry that broadly refers to the farm-community-tourism nexus, encompassing a wide range of activities (e.g., recreation, entertainment, hospitality, agricultural education, direct-to-consumer sales of local food). Given this wide range, there is often extensive collaboration across disciplinary and geographical boundaries. The interdisciplinary and international nature of the agriculture industry provides a rich source of data that allows researchers to better understand collaboration and the factors that drive it. This poster applies principles of social network analysis in the examination of authors and co-authors from the 2018 World Congress on Agritourism Conference (WAC) to investigate the emerging network of agritourism and characteristics within this network. Data was coded by a team of four undergraduate students, led by one graduate student researcher, and demonstrated high intercoder reliability. Findings from this poster create a baseline to assess

collaboration and will be part of a continued effort to examine the co-authorship network at future conferences and assess the evolution of collaborations over time.

Poster #88

Not all Gigs are the Same: Examining Differences in Gig Worker Experiences

Mentors: Robert Sinclair, Gwendolyn Watson, Psychology

Students: Claire Bardell, Financial Management; Ethan Hammond, Graylie Icard, Emily Mattison, Meredith Pool, Shreya Tellur, Psychology

Gig work is a growing nonstandard work arrangement that has received substantially less attention than traditional employment. Although all gig work is characterized by its flexibility, project-based, and temporary nature, Watson et al. (2021) outlined five gig worker profiles: Gig Service Providers (e.g., rideshare drivers), Gig Goods Providers (e.g., Etsy sellers), Gig Data Providers (e.g., MTurkers), Agency Gig Workers (e.g., actors), and Traditional Gig Workers (e.g., musicians, substitute teachers). This survey-based study examined differences in job satisfaction, work meaningfulness, and turnover intentions across gig worker profiles as well as reasons participants are in gig work. Participants were recruited via online communities (e.g., Reddit, Facebook groups). Our final sample consisted of 68 gig workers, representing four gig work profiles. We were unable to recruit enough Agency Gig Workers for this portion of the project. By performing one-way analyses of variance of profile differences, we compared gig workers' perceived job satisfaction, work meaningfulness, and turnover intentions. Our results indicated there were differences in turnover intentions and meaningfulness across profiles, but there was not a significant difference in satisfaction. Specifically, Gig Goods Providers reported higher levels of turnover intentions than Gig Service Providers, and Gig Data Providers reported lower levels of work meaningfulness than the other three profiles. Additionally, we found that Gig Goods Providers reported passion as a significantly greater reason for working in gig work than Gig Data Providers. These findings contribute to our understanding of gig workers' experiences and support that these experiences differ based on their gig work profile.

Poster #89

Small-Scale Lumber Drying Options

Mentor: Patrick Hiesl, Forestry & Environmental Conservation

Students: Parker Dukes, Forest Resource Management; Addison Foster, Grayson Seymore, Environmental & Natural Resources

During the COVID-19 pandemic, the use of portable sawmills (chainsaw and bandsaw mills) by private forest owners increased exponentially. This spike in popularity can be attributed to rising lumber prices and a desire to be more self-sufficient. A critical component, however, to using any lumber is to reduce the moisture content to an appropriate level for the desired application. Many methods, techniques and structures can be used to dry lumber, including air-drying, the use of solar and dehumidification kilns. In this Creative Inquiry project, we constructed a solar kiln for drying small amounts of lumber, including an off-grid power supply option. Additionally, we evaluated the drying of oak lumber in a dehumidification kiln, and found that the moisture content of the lumber can be reduced from 35% to 8% over a 2 week period. Through the construction of the solar kiln and use of the dehumidification kiln, several limitations were identified within the systems that could be improved upon. For example, not all of the oak lumber dried evenly, so further research should be done on smaller loads of lumber. As for the solar kiln, there is an opportunity to reduce its size to be more practical for the small-scale lumber producer.

Poster #90

Exploring Implicit Bias in Prelicensure Undergraduate Nursing Students

Mentors: Janice Lanham, Karyn Jones, Margaret Wetsel, School of Nursing

Students: Catherine Collins, Emily Eich, Kennedie Fee, Olivia Frendt, Emilee Green, Emma Harwell, Olivia Mahon, Kellie Moore, Lauren Nobles, Sophia Pomeroy, Talina Van Overeem, Sarah Whitelock, Nursing

The purpose of this CI is to explore the impact of implicit bias in a prelicensure, undergraduate nursing program. Participants completed The Best Intentions Questionnaire, The Race Implicit Association Test (IAT), and a 90-minute educational workshop. Preliminary study results: Educating participants on mitigation strategies (mindfulness and reflection) increased participant awareness/understanding of implicit bias. Conclusion(s): In order for participants to experience an increase in awareness of implicit bias within the scope of nursing education, mitigation strategies must be introduced early (first-year) in the undergraduate nursing curriculum in order to foster a framework to develop patient advocacy skills and enhance cultural competency.

Poster #91

April 07

Investigation into the Effect of Interlaminar Carbon Nanotubes in Aerospace-Grade Carbon Fiber Composites

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

Students: Jackson Wiley, Griffin Sisk, Mechanical Engineering

Carbon fiber composites are essential in high-performance applications ranging from material found in spacecraft to golf clubs as their excellent strength to weight ratio provides a great alternative to metals. These composites incorporate carbon fibers and epoxy resin matrix to create connected and set fibers which allow for more robust fiber-reinforced mechanical properties and a stronger response to axial loads. Composites exist in several layers, and common failure occurs in the delamination of these layers. In an attempt to increase interlaminar strength, carbon nanotubes are embedded between the layers to more readily keep the composite together. To understand the mechanical properties of commercial-grade carbon fiber for aerospace application, we conducted compressive testing using a load frame to compress samples with and without interlaminar carbon nanotubes and used digital image correlation to measure the displacement. This resulting displacement was analyzed and used to calculate strains in different deformation tensor components. Additionally, high-speed ping pong balls were fired at samples to test their response to supersonic speeds. The carbon fiber composites were brought to substantial deformation or fracture using load frames applying force to the sample to test the full range of mechanical properties, including calculations of work, toughness, stress, and flexural strength. These quantitative differences in calculations showed a difference in the mechanical properties of carbon fiber samples with and without interlaminar carbon nanotubes.

Poster #92

Modeling the Fentanyl Supply Chain for Effective Interdiction

Mentor: Thomas Sharkey, Industrial Engineering

Students: Bianca Huet, Allison Urove, Georgia Cervenka, Industrial Engineering

Our focus is on modeling the supply chain of fentanyl as it intersects with other illicit drug supply chains, as well as the economic impact that this has on the illicit drug market, specifically through the time of COVID-19. From thorough research of fentanyl, heroin, and prescription opioids, it has been found that fentanyl intersects the supply chains of heroin and prescription opioids. With this knowledge, the team was able to determine the supply, demand, and transshipment nodes of each illicit drug which then was used to build each supply chain model, including when fentanyl is cut into other supply chains to reduce costs and increase potency. The supply chains were modeled as linear programs that were then coded in Microsoft Excel using the Open Solver program addition. The supply chain models were tested using different capacity disruptions to simulate the impact of COVID-19 on illicit opioids. Ultimately, the team concluded that while COVID-19 initially had a dramatic effect on the availability of fentanyl, over time the interdependence between fentanyl, heroin, and prescription opioids slowly shifted back towards equilibrium. Additionally, when disrupting various nodes in the model, it was determined that altering supply variables had the greatest chain reaction affecting the supply chain and the relationships within it.

Poster #93

Machine Learning Approaches to Support Organizational Learning About Frontline Adaptations in Hospitals

Mentors: Sudeep Hegde, Industrial Engineering; Carl Ehrett, Watt Family Innovation Center

Students: Nick Rhodes, Industrial Engineering; Lindsay Einbinder, Academic Success Center; Jan De Voor, Computer Science

Hospital incident reporting systems have largely been ineffective in improving care quality and patient safety, in part because of a narrow focus on learning from negative outcomes. The Resilience Engineering Tool to Improve Patient Safety (RETIPS) has been designed with the aim of expanding the scope of learning from everyday work, to include how things go well in everyday work. RETIPS elicits free-text descriptions of adaptation from from frontline workers, including workarounds, improvised workflows, and preventive measures. RETIPS has been implemented at a major children's hospital in the United States, to elicit narratives on radiology workers' adaptations around the beginning of the COVID-19 pandemic. One challenge in terms of scaling the implementation of the tool relates to the aggregated analysis of text data generated through a large number of reports over the course of time. To that end, this research develops a machine learning methodology to identify patterns relevant to improving adaptive capacity in the organization. Our machine learning pipeline includes unsupervised topic modeling, sentiment analysis, named entity recognition, and similarity analysis using numerical text encodings obtained using pre-trained neural networks. The result of this methodology is to supplement the text data with metadata useful for researchers, including the topics discussed in the responses, how survey participants in each topic feel overall about the topic (via scores representing overall sentiment and emotional content), and how diverse discussion is within each topic.

Poster #94

Increasing Preservice Teachers' Knowledge of Collecting Student Data Using a Mixed Reality Simulator: A Preliminary Analysis

Mentors: Alex Carlson, Shanna Hirsch, Education & Human Development

Student: Kasey Griggs, Elementary Education

Mixed Reality Simulation (MRS) is a technology that allows teachers to interact with virtual classroom of avatar students who are controlled remotely by an actor. This environment provides an approximation of practice to allow preservice teachers opportunities to practice skills they will need upon entering the classroom. This presentation will discuss our study in which we used a pretest-posttest design to examine whether participants who received instruction on behavior data recording and practiced those skills in MRS demonstrated improvements in knowledge, confidence, and usage of that skill. Additionally, we examined how the participants viewed their experience in MRS. As this project is ongoing, our presentation will discuss the preliminary findings of this study and their potential implications.

Poster #102*

Immunosuppression Leads to Delayed Pygostyle Fusion in Avians

Mentor: Susan Chapman, Biological Sciences

Student: Jackson Sanders, Biological Sciences

Within the avian spine, cartilaginous intervertebral discs (IVDs) in the pygostyle degrade, as part of the mechanism of vertebral fusion. We discovered that caudal chicken IVDs retain the nucleus pulposus (NP) until IVD degradation. Our transcriptome profiling comparing fusing and non-fusing IVDs from the tail suggests that sterile inflammation plays a role in the degeneration of the nucleus pulposus. Our analysis suggests that the NP undergoes a type of programmed cell death, resulting in inflammation, which in turn attracts neutrophils to remove the degenerating disc tissue prior to boney fusion. To test whether the immune system is involved in IVD degeneration, we performed a loss of function experiment using prednisolone. Prednisolone is a widely prescribed anti-inflammatory corticosteroid in vertebrates. We hypothesized that if IVD degradation is driven by an immune reaction, suppressing the immune system would prevent or delay disc degradation. Prednisolone was orally administered every day to chickens from 2 weeks old for 6 weeks at a dosage of 1 mg/kg. Tails were then imaged using microCT and histologically stained to determine the effect of steroid exposure. At 8 weeks, control birds fused all pygostyle vertebrae. Conversely, prednisolone treated birds failed to fully degrade the most proximal intervertebral disc and prevented fusion of the opposing vertebrae. These results demonstrate that suppressing inflammation, detected in the degenerating NP, prevents pygostyle fusion.

Poster #103*

April 07

Evaluation of Genetic Profiles Involved in the Racial Disparity Incidence of Cancer Using Digital Resources

Mentor: Heather Dunn, Bioengineering

Co-Author: Amber Stone, Animal & Veterinary Science

Students: Emma Banks, Biochemistry, Mia Damiano, Marena Fleming, Megan Johnson, Soline Mcgee, Animal & Veterinary Science; Katherine Joiner, Health Science; Jayla Nelson, Emerald Withers, Biological Sciences; Lindsey M Williams, Health Science

The incidence of cancer is not distributed equally across all population groups. Racial and ethnic minority populations in the United States have experienced cancer health disparities, and African Americans have the highest overall cancer death rate compared to other ethnic groups. Research has identified many factors that contribute to these disparities, and new initiatives are providing insight into potential genetic and biological causes. This project utilized online data portals and open-source software programs to evaluate genetic expression across different cancers associated with racial disparity incidence. Our research team obtained patient data from The Cancer Genome Atlas (TCGA) by the National Cancer Institute. The gene PIK3CA has a common gain of function mutation which leads to increased cancer cell survival, proliferation, migration. This mutation is prominent in breast, lung, uterine and stomach cancers, and these diseases are implicated in racial disparities. Utilizing String database, genes associated with PIK3CA are demonstrated through an interaction network. The R2 genomics platform provided analysis and visualization of cancer locations with similar mutations. The open-access Human Protein Atlas illustrated expression profiles of human cancers and pathological expression across multiple tissue types. Finally, the Jackson Laboratory has created the Clinical Knowledgebase which is a dynamic digital resource for evaluation of genomic expression in cancers. The focus of this project was to utilize digital resources to evaluate cancer genomic profiles and mutations that are potentially associated with racial disparities in cancer incidence.

Poster #104*

Consistency Analysis in Top-Down and Bottom-Up Approaches to Fluctuating Hydrodynamics

Mentor: Zhen Li, Mechanical Engineering

Student: Jonathan Despeaux, Mechanical Engineering

Hydrodynamic fluctuation is the underlying mechanism for the well-known Brownian motion and all diffusion processes. There are many fluctuating hydrodynamics models derived either from top-down (starting from continuum-based models) or bottom-up (coarse-graining of molecular dynamics) methods. We hypothesize these top-down and bottom-up models are connected, and their consistency and accuracy can be quantified by theoretical analysis and numerical simulations.

We systematically compare the properties of hydrodynamic fluctuations in a top-down smoothed dissipative particle dynamics (SDPD) model derived from a Lagrangian discretization of the continuum-based Landau-Lifshitz Navier-Stokes equations, and a bottom-up dissipative particle dynamics (DPD) model derived from a coarse-graining projection of atomistic fluid dynamics. To extract the hydrodynamic behavior of SDPD and DPD fluids at different length scales, we consider the Fourier-transformed counterpart of the hydrodynamic variables in order to directly compare the variables' time-evolution by specifying wave numbers of interest. We then compute current correlation functions of the hydrodynamic variables in the Fourier space via SDPD and DPD particle trajectories and compare the correlation functions between the two methods to quantify their consistency and accuracy at varying length scales.

This research intends to quantitatively inform other researchers on the range of length scales in which both the top-down (SDPD) and bottom-up (DPD) fluid simulation approaches are consistent with one another and the point when the two methods diverge.

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Poster #105*

Potentially Morally Injurious Events: An Opportunity for Courage?

Mentor: Cynthia Pury, Psychology

Co-Author: CJ Swartzwelter, Psychology

Students: Rylee Bryant, Jessica Carroll, Elizabeth Crain, Averey Degennaro, Elsah Napier, Abigail Rowell, Mary Thompson, Psychology; Chloe O'Brien, Language & International Health

Potentially Morally Injurious Events (PMIEs) are events in which someone witnesses or is asked to participate in an event that violates their moral code. PMIEs have been commonly studied in military personnel and health care workers but can occur in any organization. PMIEs can result in strong negative emotions and a variety of other negative outcomes and have been found to be influenced by a variety of individual and organizational factors. As a negative event someone might be able to stop, or at least may attempt to stop, courage on the part of the individual might function as a mitigating factor in reducing the severity or the impact of PMIEs. We present an overview of the literature on PMIEs, including antecedent factors and outcomes, then suggest theoretical links between PMIEs and courage. Results of our literature review will be used to develop more explicit hypotheses and later research projects. The eventual goal of our study is to reduce the impact of PMIEs, both in terms of reducing their emotional impact and, more importantly, decreasing their incidence. This project is sponsored by Clemson Creative Inquiry.

Poster #106*

Potentially Morally Injurious Events: An Opportunity for Courage?

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

Students: Dena Albarghsh, Luke Mcintyre, Industrial Engineering; Alyssa Costello, Environmental Engineering; Aiden Tombuelt, Mechanical Engineering; Abbey Woods, Chemical Engineering

El Serrano, Nicaragua is a community of approximately 3,000 people. Two rainwater-fed sources from the mountains have served as the community's water supply, but they are insufficient during the dry season and have bacterial contamination. Thus, the Clemson EWB Nicaragua Water Team has been working on optimal solutions to improve El Serrano's water quantity and quality.

At the beginning of the project, two assessment trips were taken to determine community perceptions, water quality, flow rates, geography, and topography, as well to take photographs and discuss the project scope with the community's Water Committee. The Clemson team then conducted alternatives analyses and determined that a deep water supply well was the best option. In December 2017, the Clemson team traveled to El Serrano to oversee the drilling and installation of the well.

Since then, the water project team has investigated ways to improve the quality of the original water supply sources from the mountains. Alternative solutions have been proposed to the community, and documents are being prepared that describe the procedures needed to keep the water supply system working properly. Despite travel restrictions to Nicaragua since 2017, the team has been able to work towards providing documents for the community. These documents include an alternative analysis on researched methods for reducing turbidity, chlorination handling and procedures, and proper well maintenance as well as a plan for saving money to be used towards replacement and repair of the pumps. With the completion of this project the Clemson team will begin to look for a new project.

Poster #107*

Microfluidic Experiments on Model Biofluids Flowing Through a T-Junction

Mentor: Xiangchun Xuan, Mechanical Engineering

Co-Author: Mahmud Raihan, Mechanical Engineering

Students: Nayoung Kim, Mechanical Engineering; Savannah Till, Bioengineering

Manipulation of non-Newtonian fluids at the microscale has received considerable attention in recent years due to their relevance in biological and chemical applications. Thus, polymer solutions with different fluid rheological properties, as lab models for biofluids, petroleum, emulsions, and engineered fluids etc., are frequently studied through various channel shapes to understand the small-scale flow dynamics of viscoelastic non-Newtonian fluids. In this work, we present an experimental study of polymer solution flows in a T-shaped microchannel. Six different types of polymer solutions were tested including polyvinylpyrrolidone, hyaluronic acid, polyethylene oxide with two different molecular weights, xanthan gum, and polyacrylamide along with pure water. We observe some fundamental differences in flow behaviors between the polymer and water solutions as well as amongst the polymer solutions themselves. We try to relate these flow behaviors with the fundamental properties (e.g., shear thinning, elasticity, polymer chain entanglement) of those fluids to draw a general conclusion.

Poster #108*

Applying Geophysical Methods to Interpret Geologic Landforms

Mentor: Scott E Brame, Environmental Engineering & Earth Sciences

Students: Annalee Chiaviello, Jennifer Briglio, Drew Hiner, Kevin Keeney, Geology

Geologic landforms are the result of processes that occurred in the distant past (millions of years ago) and secondary processes such as weathering and erosion that produced the distinctive landscapes we recognize today. Determining the nature of these processes and their level of significance in forming these landscapes involves looking at more than just the surface features, we must look below the ground level. This unseen part is called the subsurface. Delineating the nature of the subsurface is challenging and has traditionally been done with drilling and boreholes. While this approach guarantees a definite knowledge of the subsurface at one specific point, it is limited by both expense and the constantly changing nature of the subsurface in both horizontal and vertical dimensions.

Of particular interest is the critical zone (CZ) which is the uppermost part of the subsurface where living organisms, rock, and water interact. Geologically, the CZ is comprised of soil, chemically weathered rock known as saprolite, and eventually by solid, unweathered fractured bedrock. Understanding CZ structures below a few meters is a difficult task without drilling an inordinate number of expensive boreholes. However, geophysical methods can reveal deeper CZ structure without drilling. The focus of this group is to utilize relatively inexpensive geophysical techniques to enhance our understanding of the critical zone and how these processes affect the nature of geologic landforms.

Poster #109*

Work Demands as Predictors of Fatigue and Stress among Emergency Physicians: A Multi-Method Approach

Mentor: Thomas W. Britt Jr, Psychology

Students: Caroline Barrows, Biochemistry; Kaustubha Reddy, Health Science

Our study examined work demands experienced by emergency medicine physicians (EP) across eight shifts per physician. Past research has focused on between-physician differences on burnout and well-being, whereas the present study examined fluctuations in stress and fatigue over the course of multiple shifts, and how meaningful work may serve as a buffer against demands and stressors faced by EP. In the present study, 16 EP were assessed at the beginning and end of 116 shifts. 60 of these shifts took place prior to the start of the COVID-19 pandemic, while 56 took place during the pandemic. At each assessment, physicians completed a self-report survey, provided a saliva sample to be assessed for cortisol, and completed a pupilometer test that assessed the pupils' response to bright light. The purpose of these measurements was to assess both perceived and physiological fatigue. The beginning-of-shift self-report measure assessed prior sleep and fatigue, and the end-of-shift self-report measure assessed fatigue, as well as work demands, meaningful work experiences, and overall shift evaluations. Over the course of 116 shifts, cortisol levels at the end of shift were related to the number of stressors encountered during the shift, $r = .26$, $p < .01$. This suggests that cortisol, a physiological indicator of stress, is sensitive to the number of demands experienced. Additionally, cortisol levels at the end of shift were negatively related to the diameter of the pupil

response at the end of shift, $r = -.29$, $p < .01$. This suggests that pupillary response, a physiological indicator of fatigue, was related to work demands. These results indicate that using multiple methods is needed to accurately understand the stress and fatigue experienced by emergency physicians over multiple shifts.

Poster #110*

Clemson University Engineers Without Borders: Nicaragua Bridge Project

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

Students: Waverly Kremer, General Engineering; Phillip Storie, Chemical Engineering

El Serrano (Nicaragua) is a rural community of about 3,000 people divided by a river that often floods during the rainy season (typically May to October). Community members had constructed a rudimentary pedestrian bridge over the river consisting of three tree logs with cement poured over them. Over the years, however, termite and water damage have deteriorated their bridge. Because the river separates the local school from most of the community, Clemson's EWB Bridge Team began investigating appropriate solutions for replacing the pedestrian bridge. During an assessment trip in 2016, pictures of the bridge and its surroundings were collected as well as information about the community. One of the original logs comprising the bridge had already fallen away, and we also learned that the bridge was dangerous for children because there were no hand- or guard-rails to prevent them from falling off.

To begin the design process, the bridge team analyzed stream cross-bed data, soil samples, and rainfall data. With this preliminary information, we were able to model the streambed around the existing bridge and an estimated flood level. Getting advice from different professional engineers has led us to begin designing a single span pedestrian bridge raised several feet above the bank of the river. Initial load calculations have been completed, and cable calculations are in progress. The team is focusing on making sure the bridge will be in a location and orientation where support cables will not cross into the road or encroach on nearby personal properties. To accomplish this under the current travel restrictions, the team's best option at the moment is to obtain satellite data from a third party. Today, the Clemson EWB Bridge Team is working to solidify our design, create a site plan, and collect possible contacts for materials and machinery for our implementation trip.

Poster #111*

Using Geologic Properties to Determine the Past and Future

Mentor: Scott E Brame, Environmental Engineering & Earth Sciences

Co-Author: Cole Bowman, Hydrogeology

Students: Nina Leitch, Jessica Knox, Sam O'Cain, Geology

Geology is a science that encompasses every aspect of the natural world on Earth as well as other celestial bodies in our solar system and beyond. Defining the exact nature of natural systems is challenging. To reduce the uncertainty involved in this process, geologists focus on specific properties that can be measured and used to determine changes in these systems over time. By quantifying these properties at a specific point in time, these values can used by other researchers as baseline levels in future studies or to determine what happened in the past by the application of scientific principles.

The scope of this research team is diverse and driven by the interest of its members. Geologic properties that are currently being measured by this group include microplastic deposition in coastal watersheds, foraminiferal and chemical analyses as proxies of environmental change in coastal marshes, microstructural anatomy of bird feathers using a Scanning Electron Microscope to determine metrics of feather microstructure and biomechanical functions, and detrital zircon ages for unconsolidated fluvial sediments loess-paleosol sequences in Argentina.

Poster #112*

Differentiating between Natural and Anthropogenic Carbon Dioxide Fluxes

Mentor: Scott E Brame, Environmental Engineering & Earth Sciences

Students: Marlow Thomas, Environmental Engineering; Riley McDonald, PRTM Outdoor Laboratory

Carbon dioxide is the most abundant greenhouse gas emitted by human activity and its long residence time in the atmosphere is causing a major threat to our environment. The significance of this phenomena on our environment is disagreed upon by different groups and one of the problems is the lack of specific local data about the magnitude of this problem. On a large scale it can be hard to conceptualize and find the source of the problems. By using local measurements, it is possible to pinpoint specific areas of high emissions which can allow the sources to be correctly identified and addressed.
We have been collecting data in and around the Clemson campus that allows us to calculate carbon dioxide fluxes at specific locations. This data is collected using an eddy covariance tower which measures both carbon dioxide concentrations and vertical wind speeds 30 times per second. The focus of this group is to differentiate between the natural background fluxes of carbon dioxide from the excess CO2 being emitted from anthropogenic sources such as vehicles.

Poster #113*

Developing Geologic Skills through Experiential Learning

Mentor: Scott E Brame, Environmental Engineering and Earth Sciences

Students: Christopher Amell, Jordan Rajcok, Karinna Thompson, Kevin Keeney, Geology; William Cooley, Christopher Parks, Computer Science; Denise Diaz, Mathematical Sciences; Jess Mack, Psychology; Lakyn Tippett, History

To understand the nature of the physical world, you must experience it. This is especially true of geology and even more so in the southeastern US where most rock formations are covered by extensive vegetation that severely limits the interpretation of relevant geologic structures. Thus, to learn geology and form meaningful interpretations, you must travel to locations where rocks are not covered by vegetation. In the United States, this implies you need to travel to the western regions of this country where yearly rainfall is sparse, and the rocks are well exposed for examination.

Given that understanding, the guiding philosophy of this research group is to experience firsthand the nature of geologic structures, formations, and landforms by going to where rocks formations can be readily observed. Given that our experience in these far-flung locations is limited by expense and time constraints, we spend most of our time planning the logistics of these trips and researching specific sites of interest before we go. The research involves determining the geologic setting, significance, and history of these sites. This approach ensures that we maximize our experiential knowledge while on the trip. We hold to the belief that the best geologist is the one who has seen the most rocks.

Poster #114*

Regional American cooking for 4-H South Carolinians

Mentor: Margaret Condrasky, Food, Nutrition & Packaging Sciences

Students: Zachary Gottschalk, Carly Jones, Meghan McClanahan, Olivia Towey, Jeidon Wilkins, Food Science & Human Nutrition

Throughout the year culinology TM (culinary, food and nutrition science students) surveyed the nation from the Northeast, Midwest, West coast, Southwest to the Southeast in search of agricultural products to showcase in a summer cooking with a chef program in SC. Thirty high school students are primed to participate in a summit with this Clemson University Creative Inquiry team to practice the five recipe sets in preparation to be ready for the summer Cooking Like a Chef Camps throughout the state. The CI team researched the recipes, tested the products and designed educational materials for the program. Using a rubric for sensory appropriateness of the recipes the CI team identified (n=25) recipes that met their culinology TM criteria.

Poster #115*

Fabrication and Characterization of Composite Membranes for use in Applications at the Water–Energy Nexus

Mentor: Eric Davis, Chemical & Biomolecular Engineering

Co-Author: Missoury Lytle, Chemical Engineering

Students: Alana Lesuer, Chemical Engineering

In this project, thermo-responsive soft composites were fabricated using lignin, a byproduct of the paper-making process. The objective was to incorporate Lignin in hydrogels to evaluate its properties and use for biomedical applications. Lignin is an ideal candidate due to its antimicrobial properties as well as its natural biodegradation. By varying the concentration of lignin and the amount of crosslinker, we were able to fabricate stimuli-responsive polymers with a range of mechanical and transport properties. PNIPam was the thermoresponsive polymer selected and three types of lignin were used varying in molecular weight. Free radical polymerization was completed using an initiator and accelerator, the gels were then annealed until dry and then characterized. Various characterizations were conducted on each membrane such as young's modulus, water uptake, and permeation. It was found that the higher mass lignin and PNIPam hydrogels exhibited higher water uptake however they exhibited lower permeation of Methylene Blue. Finally, the Young's Moduli were higher for heated membranes showing a volume phase transition. Drug delivery was also explored with these membranes using caffeine and assessing the compatibility with the human body. These materials are potential candidates for biomedical applications such as implantable, drug-eluding materials. Although further exploration needs to be done on drug delivery it can be seen that the addition of lignin in hydrogels increases various characteristics of the hydrogels and could be used in the microbiological implementation.

Poster #116*

Genomic Editing Using Prime Editors

Mentor: Renee Cottle, Bioengineering

Students: Angeline Chen, Sarah Minich, Bioengineering

Tyrosinemia is a disease caused by loss-of-function mutations in the fumarylacetoacetate hydrolase (FAH) gene. This illness leads to the buildup of succinylacetone in the liver and can lead to serious health issues and even death. While the CRISPR/Cas9 method has shown increasing promise as a gene therapy treatment, it has its limitations. CRISPR/Cas9 systems produce double stranded breaks, which often lead to the production of indels and off target editing. This process also requires either homology directed repair (HDR) which can result in low efficiencies in nonreplicating cells or non-homologous end joining (NHEJ) which can lead to unintended edits as well. The goals of our experiments are simple. First, we are attempting to prove that we understand how to create a prime editing system by creating a previously published prime editor. This involves designing and implementing a prime editing system that can effectively introduce the sickle cell mutation (HBB mutation into EV6 gene) into human cells, particularly human hepatocytes. This involves designing machinery that will locate the EV6 gene sequence, and damage it in a way that will allow it to be repaired with a base that causes the sickle cell mutation. We plan to have this system introduced to cells this semester so that during the summer we can start creating our own prime editing system that targets and mutates the gene causing tyrosinemia type 1 with a base that will make it nonfunctional; essentially curing the cell of that disease. The value of this project is indescribable. The success of the creation of this prime editing system could lead to the permanent treatment of tyrosinemia type 1. Successful disablement of the mutation that causes this disease could lead to the development of more permanent treatments to replace our currently ineffective solutions

Poster #117*

April 07

The Mary Bruce Project: Shining a Light on Hidden Contributions to Science, Medicine, and Healthcare

Mentor: Kimberly Paul, Genetics & Biochemistry

Students: Aimey Jimm, Nancy Wolf, Emma Chapman, Biological Sciences; Abbigayle Merck, Biochemistry, Hunter Gentry, Genetics

The Mary Bruce Project is named for the wife and life-long research partner of microbiologist Sir David Bruce. Dr. Bruce is credited with major discoveries in tropical medicine around the turn of the last century, but Mary's contributions had been largely over-looked and their extent unknown. Our driving question is this: What other "hidden figures" - namely women, subjugated peoples, and other marginalized populations - play in advancing science, medicine, and health over the last 200+ years of scientific discovery? Here, we will present a series of vignettes spanning the globe and exploring the story of Dr. Rebecca Crumpler, the first Black woman to get a medical degree in the US; the legacy of Henrietta Lacks and HeLa cells, and recent efforts at reparations to the Lacks Family; the toll of medical research on sub-Saharan Africa; the alleged medical abuses of women detainees in immigration facilties; the story of Dr. Charlotte Auerbach, a geneticist who discovered how mustard gas causes gene mutations, and stories of three women scientists (Dr. Lise Meitner, Dr. Leona Woods Marshall Libby, and Dr. Maria Goeppert Mayer) who helped develop and build the atomic bomb.

Poster #118*

Disposable Point-Of-Care Home Testing Platform for Metabolic Diseases

Mentor: Renee Cottle, Bioengineering

Students: Thomas Dempster, Campbell Yates, Biochemistry; Erin O'Neill, Bioengineering

The motivation of the Creative Inquiry BIOE 4510-049 is to develop a low-cost, disposable, stand-alone, point-of-care diagnostic and monitoring system to help caregivers of patients with glycine encephalopathy. Glycine encephalopathy is a rare metabolic disorder in which glycine builds up in the body due to a mutation that results in the malfunctioning of glycine breakdown pathways. This disease causes patients to live a very limited life consisting of seizures and delayed intellectual development. Currently, glycine levels for those suffering from this disease must be measured weekly using blood samples that are sent off to labs, which can take days to return results and result in incorrect treatment. The Dakin-West reaction used in our research will allow caregivers to monitor urine glycine concentration at home using the varying color changes, so they can adjust the patient's drug treatment schedule and improve the patient's quality of life as well as clinical outcomes. We formulated a design idea for the assay based on research; we utilized a colorimetric assay that measures the amount of glycine in a patient's urine through a multi-step chemical reaction, and gives a qualitative color change and quantitative absorbance range with increasing glycine concentrations. We developed the procedure for measuring glycine concentration in the lab and were able to get promising colorimetric results, so now we are working towards modifying our reaction to be more applicable to in-home testing. We are currently finalizing our prototype design and modifying the reaction to work with synthetic urine, which will allow us to imitate patient urine samples and confirm the usability of our device. We will then take pictures of the reaction and, using RGB values, associate a concentration of glycine with different color values to finalize a color chart for the device.

Poster #119*

Micro-Heart Pumps & Pipes

Mentors: William Richardson, Michael Potter, Jonathan Heywood, Bioengineering

Students: Calvin Chernyatinskiy, Karen De Guzman, Jack DeWaele, Caroline Peak, Sebastian Saenz, Collin Vogel, Bioengineering; Samantha McNabb, General Engineering; Omika Merchant, Microbiology

Heart disease is the #1 cause of death in the world every year and finding new therapies is slow and expensive. Researchers can grow heart tissue in the lab to test new therapies, but these heart cells do not behave the same as heart cells in the body due to being outside their native environment. This CI is developing culture chambers for growing heart cells in mechanically-realistic conditions to improve future therapy screens. The multifaceted project involves three teams:

The Imaging Team's goal is to automate the cell imaging process to improve efficiency and reduce camera and human-related errors. To do this, camera movement is automated over a stationary cell plate using a modified 3D printer. This results in a high-resolution image capture system for accurate, high-volume analysis of tissue properties via image processing software.
The E-Stim Team's goal is to determine the relationship between electrical stimulation pulses and tissue contraction. Two videos

are filmed to determine percent strain of the contraction and are run through a MATLAB script which measures the movement of a point frame by frame in the video. The pixel displacements are used to measure percent strain of the pistons due to gel contraction.

The E-Mag Team's goal is to measure the force subjected on the tissues from a computer-controlled electromagnet. The deformation caused by the magnet is compared to deformation caused by a known force in custom stress-strain tests. Through this, the force of the magnets interacting with the magnetic field at specific voltages, amperages, and distances is determined.

Once completed, the Creative Inquiry will have contributed to the development of a novel culture chamber that subjects heart tissue to mechanically realistic conditions for cardiac therapy screens. NIH grants GM121342 and HL144927 are acknowledged as sponsors.

Poster #120

PLM Processes and CAD/CAE Tools with Application to Vehicle Component Design

Mentors: John R Wagner, Gregory Mocko, Mechanical Engineering

Co-Author: John Morris, Mechanical Engineering

Students: Clark Beuckman, Sam Gossett, Noah Wanthal, Mechanical Engineering; Michael Calamari, General Engineering; Brendan Schumm, Industrial Engineering

Manufacturing and service industries are adopting digital tools and processes to compete in the global marketplace. Entry-level engineers should have a working knowledge of computer technology that enables digital creation, collaborative design spaces, and data preservation. This Creative Inquiry course provides students primarily from the College of Engineering, Computing and Applied Science (CECAS) with relevant experiences in applying Product Lifecycle Management (PLM) concepts and associated tools. Students begin the course by learning the Siemens NX software toolset, a package offering computer-aided-design, computer-aided-engineering, and computer-aided-manufacturing features. A series of lectures on PLM fundamentals and digital product development complement the students' technical skills by providing insight into the digital thread. Practical experience is delivered through reverse-engineering a robotic, tracked vehicle, which is investigated to produce geometric part models that are virtually assembled into a mobile platform. Students practice collaborative design and learn additive manufacturing practices when fabricating a tachometer for the vehicle. Finally, students will form the foundation of a digital twin by integrating sensors for the vehicle with the virtual model through internet-of-things. Overall, these efforts in producing a robust physical-cyber system offer students first-hand experience with digital tools within the PLM framework in preparation for future roles in industry.

Poster #121

AI Security and Privacy

Mentors: Yingjie Lao, Electrical and Computer Engineering, Joseph Clements, Computer Engineering

Students: Julia Boone, Aspen Evans, Anthony Giocondi, Samantha Johnson, Teja Guruvelli, Daniel Stackhouse, Alexandra Sturgis, Sydney Shillinglaw, Rajat Sethi, Computer Science; Landon Hill, Nish Patel, Alexandra Sturgis, Computer Engineering; Charles Kowalski, General Engineering; Danny Zhang, Computer Engineering; Victor Ruan, Electrical Engineering

Manufacturing and service industries are adopting digital tools and processes to compete in the global marketplace. Entry-level engineers should have a working knowledge of computer technology that enables digital creation, collaborative design spaces, and data preservation. This Creative Inquiry course provides students primarily from the College of Engineering, Computing and Applied Science (CECAS) with relevant experiences in applying Product Lifecycle Management (PLM) concepts and associated tools. Students begin the course by learning the Siemens NX software toolset, a package offering computer-aided-design, computer-aided-engineering, and computer-aided-manufacturing features. A series of lectures on PLM fundamentals and digital product development complement the students' technical skills by providing insight into the digital thread. Practical experience is delivered through reverse-engineering a robotic, tracked vehicle, which is investigated to produce geometric part models that are virtually assembled into a mobile platform. Students practice collaborative design and learn additive manufacturing practices when fabricating a tachometer for the vehicle. Finally, students will form the foundation of a digital twin by integrating sensors for the vehicle with the virtual model through internet-of-things. Overall, these efforts in producing a robust physical-cyber system offer students first-hand experience with digital tools within the PLM framework in preparation for future roles in industry.

Poster #122*

Fool's Gold: Digital Literacy and Impulsivity Predict Susceptibility to Multiple Forms of Online Deception

Mentor: Dawn Sarno, Psychology

Co-Author: Jeffrey Black, Human Factors Psychology

Students: Maggie Harris, Kelsey Harris, Piper Koontz, Psychology; Elizabeth Paradise, Criminal Justice

Previous research has primarily explored deception detection in online tasks (e.g., phishing, fake news) independently. Thus, research has failed to identify if the same users who fall for one form of online deception are more likely to fall for others. The present study remedied this gap in the literature by examining how the same users identify deception in three different online tasks. All participants classified 90 emails, text messages, and news headlines (50% legitimate, 50% deceptive). Additionally, participants completed a survey that included questions about their digital literacy, cognitive reflectiveness (i.e., impulsivity), and demographics. Results indicated that a participant's ability to discriminate between deceptive and legitimate stimuli in one task was related to their ability to detect deception in other two online tasks. Furthermore, individuals who reported higher levels of cognitive reflectiveness and digital literacy were better at discriminating between deceptive and legitimate stimuli across all three tasks. Overall, the present findings suggest that individuals who fall for one form of online deception are more likely to fall for other forms of deception, and that cognitive reflectiveness and digital literacy can be used as predictors of general susceptibility to online deception. This project was supported by the Clemson University Creative Inquiry program.

Poster #123*

H19: A Potential Biomarker For Triple Negative Breast Cancer

Mentor: Kylie King, Bioengineering

Students: Mya Beasley, Microbiology; Sydney Jarecki, Rohita Nerella, Zoe Perry, Biological Sciences

Among breast cancers, triple negative breast cancer (TNBC) is considered the most aggressive. It has the highest rates of metastasis and recurrence, and patients with metastatic spread have a 5-year survival rate of only 12%. Disease monitoring is typically in the form of serological panels to identify two common antigens; however, these are only effective in late stage cancers. Here, we develop and validate an assay to measure plasma levels of H19, a long-noncoding RNA (lncRNA) that is involved in every step of tumorigenesis and metastasis. First, we optimized the RNA extraction protocol to prevent DNA and protein contamination. Using RT-qPCR, we quantified the levels of H19 within plasma samples from TNBC patients at the Hollings Cancer Center. When normalized to GAPDH, there was an observable correlation between cancer stage and levels of H19. Due to our low sample size we could not conduct statistical analysis, though the next step for the project includes a much larger sampling. This biomarker test has the potential to foster earlier diagnosis, easier disease monitoring, and improved patient outcomes. This project also has potential for translational clinical studies in the future, as further knowledge of the interactions of H19 within TNBC patients could open the door for therapeutic options. This project was supported in part by the Clemson University Creative Inquiry Program.

Poster #124*

Enhancing Small Ruminant Production

Mentor: Susan Duckett, Animal & Veterinary Sciences

Students: Drew Alexander, Megan Dennis, Abby Garrett, Sierra Green, Tiarra Green, Logan Griggs, Kathryn Hart, Caroline Mccorkle, Taylor Pappas, Jocelyn Phillips, Margaret Russell, Animal & Veterinary Science

Small ruminants such as sheep and goats are found throughout the world where they are used to produce meat, milk and wool. Feed costs are the single largest expense for livestock producers and accounts for up to 70% of total production costs. Nutrition of the ewe during late gestation is very important and undernutrition can result in fetal growth restriction that impacts subsequent lamb growth and development. Our project evaluated different feeding levels of pregnant ewes during the last trimester of gestation and how it altered lamb birth weights and ewe milk production. At d 86 of gestation, pregnant ewes with twins were divided into two groups with one group being fed at 100% of nutrient requirements (Control, CON) and the other group was fed at 60% of nutrient requirements (Nutrient restricted, NR) until parturition. Ewe body weight gain was measured during late gestation. Lamb weights were obtained at birth and at weekly intervals during the first 21 d of postnatal growth. Ewe milk production was measured at weekly intervals during the first 21 d of lactation by separating the ewe and lambs for 3 h, and then milking the ewe to obtain milk amount. Body weight was maintained in the NR ewes; whereas, CON ewes gained weight during late pregnancy. Lamb birth weight was greater for NR than CON but ewe body condition score was lower for NR at lambing. Milk production was not altered at d 1 or d 7 of lactation between the treatments. Our research demonstrates that

current nutrient requirements for ewes carrying twins during late gestation may exceed actual requirements for our sheep flock and lowering feeding levels to 60% of requirements did not impact birth weight or early milk production but reduced feeding costs.

Poster #125*

Real-Time Building and Comfort Data Collection Using Mobile Indoor Robots

Mentor: Da Li, Civil Engineering

Co-Author: Yijin Zhao, Civil Engineering

Students: Tim Koehler, Madeline Woehrman, Computer Science; Johnson Vo, Electrical Engineering

To address critical building data sensing and analysis challenges facing facility operations and management, this project is developing new mobile robotic platforms with multiple sensors attached (e.g., temperature sensor, lighting sensor, CO2 sensor) to achieve real-time and high granularity indoor environmental quality monitoring for benchmarking and control of large built environments. To enhance occupants' interaction with robots, evidence-based persuasive human-machine interfaces were designed on the top of robots to collect occupants' indoor environmental quality perceptions (e.g., thermal comfort, visual comfort, indoor air quality comfort) by questionnaire, and analysis of occupant data can support building operators making managerial plans to boost occupants' indoor satisfaction.

Poster #126*

Flu or COVID-19? Development of a RT-qPCR Saliva Diagnostic for Respiratory Illnesses

Mentors: Kylie King, Rachel Ham, Congyue Peng, Bioengineering

Students: Sam Gmitro, Isaac Lee, Biochemistry

SARS-CoV-2, Influenza A, and Influenza B, bind to ACE2 receptors throughout the human body, specifically within the salivary glands. ACE2 receptor binding causes an inflammatory response leading to symptoms such as body aches, fever, difficulty breathing, cough, and fatigue. These symptoms are common to COVID-19 and seasonal flu, so laboratory diagnosis is necessary. Standard clinical diagnostics for SARS-CoV-2, Influenza A, and Influenza B use nasopharyngeal swabs, which can be expensive and may cause discomfort. Saliva testing for SARS-CoV-2 reduces cost per test and is more convenient for patients. Therefore, we are developing a comprehensive saliva test that can differentiate between these two infections that often present with similar symptoms. We have determined that Influenza A can be detected in patient saliva samples. This project has the potential to streamline testing for people with symptoms common to multiple respiratory illnesses, streamlining diagnosis and treatment. This project was supported in part by the Clemson University Creative Inquiry Program.

Poster #135

Stories of Refuge, Detention, and Hospitality

Mentor: Angela Naimou, English

Students: Emily Alverson, English; Mary Ann Fahmy, Language & International Health; Ana Luisa Licon Lopez, Architecture; Abi Lonon, Psychology

Our CI began in Fall 2019 with the question: How has immigration detention in the US affected people's lives in the US and internationally, and what are the stories of the lived experiences of people in detention as well as those who are working to advocate for immigrant rights? We read literature of migration and detention and combined it with experiential trips, workshops, and discussions with people involved in migrant rights in the US South. We visited with detained immigrants, legal advocates, and humanitarian workers in Lumpkin, Georgia, and the nearby Stewart Detention Center and El Refugio hospitality house. Visitation has been suspended since the start of the COVID-19 pandemic, when the CI shifted course by meeting online with various area non-profit organizations and conducting individual and small group projects, including podcast and written interviews with lawyers, immigrants, and community organizers. Reading literature on refuge and incarceration, we find a close and complex relationship between the histories and experiences of immigration and the longer interconnected struggles for freedom, equity, and justice in the United States. We also found the need for practical mutual aid and immigration support infrastructure, and are exploring how universities have played key roles elsewhere in refugee support infrastructure while transforming the learning opportunities for students and faculty at those institutions.

We are gathering more finding this semester by: 1. conducting a day-long research trip to Clarkston, GA, as a hub of refugee-led infrastructure and welcome. We plan to meet with various community leaders, organizations, and advocacy groups in Clarkston; 2. holding a workshop with Dr. Diya Abdo, founder and director of the Every Campus a Refuge program headquartered in Guilford College, NC; and 3. hosting a campus event to share what we've learned with the campus community and ideas for future projects, in light of Afghan refugees being resettled in the city of Clemson.

Poster #136

Prospective Predictors of COVID-19 Risk Behaviors, Vaccination Intent, and Infection in Young Adults

Mentor: James A McCubbin, Psychology

Co-Author: Anna Kadau, PRTM Outdoor Laboratory

Students: Virginia Gembala, Sophie Finnell, Psychology; Kate Tolleson, Chemical Engineering; Lindsay Warren, Biological Sciences; Jose Rodriguez, Language & International Health

Widespread community transmission of the SARS-CoV-2 virus provide a unique opportunity to examine prospective predictors of pandemic risk behavior. Public health recommendations to limit the spread of COVID-19 include social distancing, mask wearing, hand washing, travel restrictions, and vaccination. Models of health behavior suggest that perceptions of health threat, efficacy of risk-reducing behaviors, norms, and control may be important predictors for adherence to these recommendations. The present study utilized a prospective, cross-lagged, longitudinal design to examine the relationship between these predictors of health behavior and subsequent adherence to recommendations for risk-reducing behavior.

We sent two email-based surveys of health behavior predictors and personal risk-taking behaviors for SARS-CoV-2 exposure and COVID-19 risk to 289 former laboratory participants, one during the summer of 2020 and one during the winter of 2021. Eighty-five participants responded, yielding a response rate of 29.4%, with 45 responding to both surveys.

Results indicate that perceptions of health threat and perceived efficacy of risk-reducing behaviors significantly predicted subsequent social distancing, mask wearing and handwashing during both essential and nonessential travel ($ps<.05$). Moreover, receipt or intention to receive a vaccination was significantly predicted by perceived efficacy of risk-reducing behaviors ($r=.583$, $p<.001$) and by normative perceptions of family and friends ($r=.310$, $p= .039$).

These findings suggest that public health strategies to change perceptions of threat, perceptions of efficacy of risk-reducing behaviors, and attitudes of family and friends may have measurable effects on pandemic risk-related behaviors including participation in vaccination campaigns.

Poster #137

I Just Want to Matter!

Mentor: Robin Kowalski, Psychology

Students: Hailey Carroll, Sophie Finnell, Emily Radovic, Natalie Cote, Kelly Kiser, Isabella Lorenzo, Meredith Mock, Psychology; Nick Deas, Computer Science

Previous research on the mattering construct has demonstrated the importance of feeling valued and significant to one's mental health and well-being. Conversely, feeling that one does not matter to others (i.e., anti-mattering) has been identified as a risk factor for depression and suicidal ideation (Flett et al., 2019). The present study used Natural Language Processing to investigate the extent to which posts found on the subreddit "r/SuicideWatch" contain indices of anti-mattering. For example, one original poster said, "even if you don't really mean it, could someone tell me that I matter. That I'm not worthless and that I don't need to die." Additionally, we examined the degree to which constructs such as loneliness and hopelessness relate to anti-mattering. After collecting and hand-coding a sample of the posts for these constructs, a machine learning model was trained to generate labels for the full set of posts. Additional labels, such as "COVID-19" and "LGBTQ," were produced based on the presence of related words in post content and also investigated for their relation to anti-mattering.

Poster #138

Exploration of Weight Management Strategies for College Students

Mentor: Vivian J Haley-Zitlin, Food, Nutrition & Packaging Sciences

Students: Camryn Bendik, Grace Donnelly, Tyler Friedrich, Joseph Jenrette, Abigail Kassab, Maddie King, Bailey Klaes, Aleksander Michailovs, Makayla Neely, Samantha Smith, Food Science & Human Nutrition

How can a Creative Inquiry (CI) Team Assess Overweight and Obesity on a College Campus? How can a CI Team Help Combat Unwanted Weigh Gain on a College Campus? These are the research questions our CI Team is investigating.
Methods: Research of overweight and obesity trends include knowledge of the topic as well as one's location. In SC, the obesity rate is high with SC having the 12th highest rate of adult obesity in the US. Overweight and obesity often begin in childhood and continue throughout adulthood. Even though excess weight gain occurs disproportionately in individuals with less education, weight gain and weight fluctuations often occur during college years. Our CI Team's goal is to increase knowledge of prevention and treatment strategies for obtaining and maintaining a healthy weight. The members' ability to assess body mass index (BMI) which is used to determine if an individual's weight is within normal, overweight, or obese limits; accurately perform waist/hip measurements; and conduct and interpret bioelectrical impedance (BIA) assessments allow team members to more accurately access an individual's weight status as it relates to their health. Investigation of local foods readily available to students, physical activity possibilities and strategies to motivate others are important and practical aspects of helping others reach their healthy weight goals. Results and conclusions: Our team is learning new skills and collecting data which will be presented at FoCI. This research is valuable as each person who has increased knowledge to manage their weight and health goals is better able to assist in ending the current obesity epidemic. We wish to thank Clemson University Creative Inquiry for their invaluable support.

Poster #139

Type 2 Diabetes Treatments Under Investigation

Mentor: Vivian J Haley-Zitlin, Food, Nutrition & Packaging Sciences

Students: Timothy Barend, Reese Kauffman, Elicia McMillan, Caroline Michaelson, Angela Morkos, Bryce Morris, Hailey Rodgers, Sayler Schuster, Food Science & Human Nutrition

Are there new and innovative methods to control blood glucose levels that can be added to lifestyle and/or hypoglycemic medications interventions? Thirty-four million individuals 18 years and older in the US have type 2 diabetes and eighty-eight million have prediabetes. These numbers continue to rise despite increased efforts to slow the growth of this disease. In addition to the lifestyle interventions of diet, physical activity, and behavior modification which our Creative Inquiry (CI) Team promotes and has taught repeatedly, we pilot tested a new agent that may be an appropriate addition to a diabetes intervention - a potential glucose lowering beverage. Sensory evaluation, a new research method and skill for our CI team members, was introduced and learned in order to accurately evaluate the new product to be assessed. Knowledge of the in-development product was obtained, established product development protocols were determined and practiced by team members, and a new beverage was prepared 'in-house' and compared with a commercially available product using a questionnaire designed for this study. Based on the results from a blinded taste test, adjustments were made to the questionnaire as well as the new beverage product. Innovative alternatives to traditional treatments for type 2 diabetes are worthy of exploration. Attainment of new skills for student researchers is a valuable venture and encourages independent thought and critical thinking. This research is valuable as a new coadjutant for the treatment or prevention of type 2 diabetes is needed due to the increasing prevalence of this disease. Further, this research is expanding the hands-on research skills of students. We want to thank Clemson University Creative Inquiry for their invaluable support.

Poster #140

Plant Biotechnology for use in Crop Genetic Improvement

Mentor: Hong Luo, Genetics & Biochemistry

Students: Andrew Fiorentino, Biological Sciences; Annalise Enger, Chemical Engineering; Charles Henry, Microbiology; Jason Yeung, Morgan Kuess, Biochemistry

Abiotic stresses, such as salinity, drought, heat, cold and nutritional deficiency, are the major limiting factors for plant growth and development, significantly impacting crop production. It is therefore critical to develop effective strategies to genetically modify plants for improved performance under environmental stresses. Novel biotechnology approaches to genetically engineer stress resistance in crop species play an increasingly important role in sustainable modern agriculture. Currently, many genes encoding functional proteins, transcription factors, signaling molecules and small RNAs have been identified to regulate plant responses to abiotic stresses. Manipulation of these genes in transgenic plants has led to enhanced stress tolerance in different crops. In this project, we have adopted similar strategies in an agriculturally and environmentally important perennial crop plant, creeping bentgrass, evaluating candidate genes for their use in genetically engineering turfgrass for improved abiotic stress resistance. Specifically, we have cloned a high affinity potassium transporter gene PvHAK5 and an AP2-domain transcription factor gene PvABR1 from a highly salt-tolerant plant, seashore paspalum (Paspalum vaginatum). Chimeric gene constructs were prepared to introduce PvHAK5 and PvABR1 into creeping bentgrass to study their roles in plant stress responses. We hypothesized that transgenic plants overexpressing PvHAK5 or PvABR1 will exhibit efficient growth and be able to withstand salinity and other abiotic stresses compared to the non-transgenic wild type controls. Currently, several rounds of plant transformation have been conducted and transgenic plants are being generated for further analysis.

Poster #141

Experimental Green Roof Instrumentation and Initial Data Validation

Mentor: William Martin, General Engineering

Students: Patrick Fuller, Industrial Engineering; Gabe Milio, General Engineering; Donovan Rice, Computer Engineering

This project is exploring the possible synergy between utilizing green roofs, rainwater cisterns, and roof top agriculture. Green roofs have many benefits, but their impact on reducing stormwater runoff quantity from larger design storms is limited. Including a cistern can be a way to improve this, but a cistern by itself is not a reasonable approach if there is no use for the stored water. Urban agriculture is the link that will be used to couple these two best management practices as the stored water can be used to irrigate the plants in the green roof. In turn, this expands the types of plants that can be grown to crops which can be harvested and produce a source of revenue as well as a source of locally produced food. To establish the feasibility of

this concept, this project has focused on setting up a small-scale green roof system to monitor the weather, green roof, cistern, and irrigation system. The initial instrumentation includes a Davis Pro 2 weather station and Phidget load cells and bridge which monitor the weight of the green roof system. Both systems communicate with a Raspberry Pi single board computer which acts as the core of our remote instrumentation system, and the Pi also controls the irrigation pump. So far, the system has successfully been able to record and store the weather and weight data, as well as status indicators for the remote system including pump and connectivity status. Initial validation of the data shows the correlation between the different systems (weight, rainfall, and irrigation). With the addition of a water level sensor, the full water balance can be quantified which will allow for the assessment of the long-term viability of this concept.

Poster #142

What Can You Use? Perception of Object Use in Individuals With and Without Autism Spectrum Disorder

Mentor: Jennifer Bisson, Psychology

Students: Nishi Patel, Ishika Sharma, Psychology

Differences in social communication and preoccupation with objects are well recognized symptoms of individuals on the autism spectrum disorder (ASD) and are often times used in the diagnostic criteria for evaluation. While these behaviors are considered common for individuals with ASD, very little is known about how individuals on the spectrum perceive the uses of objects. There may be many different ways objects can be used, yet through social context there is a distinction in the acceptable way in which an object should be used. In this study, we asked adults, both with and without ASD, to list all of the possible uses of 6 items shown to them as a picture. Additionally, they were asked to identify which of the uses are considered "socially acceptable." The results from this study show that the number of total object uses were positively associated with ASD severity. Furthermore, a positive association between ASD symptoms and uses for the object as a whole (i.e., global uses) were identified. However, the study revealed no relation between ASD severity when individuals with ASD listed socially acceptable object uses. These results support that individuals with ASD are better able to creatively perceive hypothetical object uses and process objects globally more than in parts (i.e., local uses). Additionally, the study indicates that adults with ASD do not have a deficiency in identifying the socially acceptable object uses as is frequently seen in children with ASD.

Poster #143

Tweeting or Tears: How Sounds Affect Stress and Mood

Mentors: Sarah Sanborn, Jennifer Bisson, Psychology

Students: Georgia Massey, Mallory Mccormick, Isabella Powell, Psychology; Nella Stringer, Biological Sciences

Infant cries are powerful signals aimed to attract their caregivers' attention, however, they can evoke negative emotions such as distress or anxiety (Bruning & McMahon, 2009). The caregiver's perception and interpretation of an infant's negative affect determines how the caregiver responds to the infant's distress (Gustafson et al., 2019). This study was created to examine the effects of infant sounds on perceiver affect, stress, and executive control. In a mixed subjects design, undergraduate student participants were randomly assigned to one of three sound conditions: bird song, infant crying, or silence, during which they completed a Sustained Attention task (Lee et al., 2015) and the Wisconsin Card Sorting Task (Miyake, 2000); task order was counterbalanced. After the tasks, participants completed a subjective stress rating, the Positive and Negative Affect Schedule (Watson et al., 1988), questions on child-care experience, and demographics. Data collection is currently ongoing; preliminary data will be presented in time for FOCI. A series of between-subjects one-way ANOVAs will be used to examine the impacts of sound type (cry, bird, silence) on positive mood, negative mood, and perceived stress. We predict that participants will show an increase in both negative mood and stress when listening to infant crying compared to birdsong or silence. Many previous studies examining perception of cries have relied on brief cry clips. In this study, individuals were exposed to longer bouts of crying, and emotional responses were noted. Results from this study will provide us with information about how individuals' stress and mood might be impacted when listening to prolonged infant crying while engaging in complex cognitive tasks.

Poster #144

Longitudinal Study Assessing the Influence of Mental Health App Features on Depressive Symptoms

Mentor: Kaileigh Byrne, Psychology

Students: Caroline Graydon, Maggie Harris, Abi Wilkinson, Emma Winterlind, Psychology

Research findings have shown mental health apps to be a promising tool for improving mental health and wellbeing in areas of depression, anxiety, and stress; however, studies focused on understanding which app features and designs are optimal for improving the therapeutic benefit of mental health apps remains vastly unexplored, specifically the realm of avatar customization and identification. We predict that, when given the option, individuals who may customize their avatar will experience reduced depressive symptoms and report higher adherence and motivation levels as compared to those who do not have this option. A total of 46 participants (M = 20.958, SD = 3.052) completed the pre-assessment questionnaire including the Patient Health Questionnaire- 8 (PHQ-8) (M = 8.854, SD = 4.472) and began to use the AirHeart Cognitive Behavioral Therapy (CBT) app. The participants were instructed to complete all seven CBT modules over the course of two weeks and complete a post-assessment at the end. A mixed effects ANOVA, which will be conducted to identify the effect of customization on depressive symptoms over time, and it is expected that the ability to customize a personal avatar will further reduce depressive symptoms. The findings from this study will provide app developers with insight into the effectiveness of specific components of mental health apps. Similarly, studying the influence of avatar customization on users' intrinsic motivation, and identity will aid in the development of potential tools targeted at reducing depressive symptoms between therapy appointments.

Poster #145

Medical Devices in the Developing World

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

Students: Joshua Brady, Mabry Godbold, Aaron Spearman, Isabelle Museck, Kaitlyn Cimney, Joshua Londhe, Azrin Jamison, Allison Jacob, Bioengineering; Katherine Summers, Mechanical Engineering,

This Creative Inquiry focuses on developing medical devices to address needs for the developing world. Our goal is to design medical devices and equipment that are more applicable to today's developing countries. We aim to minimize costs, however making a cheap device is not our purpose. We look to develop devices and equipment that are more sustainable, able to be manufactured within the developing country, easily repairable, and very affordable. We design, test, and implement novel medical ideas to help improve the lives of those in need within our global community. We currently have three projects focused on different areas of medical innovation. One of our projects focuses on developing a dynamic and assistive ankle prosthetic for transtibial amputees using muscle wire and pressure sensors. The prosthetic is to be implemented in rural areas of India where current prosthetic solutions are non assistive and are associated with other long term health issues. Another project is focused on developing a Kugundua, a device for detecting antiretroviral drugs in urine for the treatment of HIV and Aids. It'll be used for measuring patient adherence in low resource settings where patients can use it at home and send results directly to clinicians. Lastly our third project team is working on developing a prototype mask filter, to purify polluted air using an activated charcoal filter. The mask is being designed with inexpensive materials to make it available to developing countries where pollution and air quality are of concern.

Poster #146

Influence of Shoal Scale Habitat Characteristics on *H. coronaria* density in Stevens Creek, South Carolina

Mentors: Andrew Grunwald, Althea Hagan, Forestry & Environmental Conservation

Students: Tucker Cribb, Emory Moser, Wildlife & Fisheries Biology; Luis Garcia, Environmental & Natural Resources

Hymenocallis coronaria, commonly known as the rocky shoals spider lily, is a rare and imperiled aquatic macrophyte that is endemic to shoals of fall line streams in Alabama, Georgia, and South Carolina. *H. coronaria* populations have been declining throughout their range due to hydroelectric flow modification and anthropogenic water quality degradation, leading to increased interest in the conservation and restoration of this charismatic species. While the habitat characteristics of *H. coronaria* have been qualitatively described at the shoal scale, there is a need to quantitatively examine how these habitat characteristics and other biotic interactions influence *H. coronaria* colonization. This research monitored water quality, water quantity, and herbivory pressure in three shoals that support varying densities of *H. coronaria* in Stevens Creek near Plum Branch, South Carolina. Water depth and flow velocity was sampled in one meter increments along a permanent transect using a Global Water flow probe and a YSI ProDSS multiparameter water quality meter was used to measure water temperature, dissolved oxygen, conductivity, pH, ORP (oxidation reduction potential), and turbidity. Herbivory pressure was monitored using game cameras at

each shoal. Initial results suggest that water quality has little effect on the growth and health of *H. coronaria* in Stevens Creek and that density may be more influenced by water quantity and herbivory pressure. Specifically, shallow water depths and high deer herbivory appear to be limiting the density in Shoal 3 and deep water depths are limiting in Shoal 2. Conversely, the moderate water depths and low deer herbivory in Shoal 1 seem to be ideal for *H. coronaria* colonization. Future research will explore the importance of substrate characteristics on *H. coronaria* density and methods for reducing deer herbivory.

Poster #147

Evaluating Otoliths and Scales as Aging Structures for American Shad

Mentor: Troy Farmer, Forestry & Environmental Conservation

Students: Piper Monk, Kacey Nicosia, Environmental & Natural Resources; Noah Wilson, Cameron Wright, Agribusiness

American Shad (*Alosa sapidissima*) are a diadromous fish that inhabit coastal rivers along the Atlantic coast from Florida to New Brunswick, Canada. Historically, American shad supported some of the largest fisheries on the Atlantic coast, but in recent decades populations have declined to ~10% of their historical levels, resulting in the closure of many recreational and commercial fisheries along the Atlantic Coast. American Shad populations in coastal South Carolina support one of the few remaining commercial and recreational fisheries in the U.S. making sustainable management of these populations imperative. Accurate age data is critical for sound fisheries management. Historically, many agencies aged American Shad using scales, but recent studies from the northeastern U.S. suggest that scales may overestimate age of young Shad while underestimating age of older Shad. These studies suggest otoliths may be more accurate than scales. However, northeastern populations of American Shad differ from southern populations in being long-lived and iteroparous. Southern populations are short-lived and semelparous. The objective of this study was to compare scale versus otolith ages from American Shad from the Santee River, SC. We collected 170 American Shad from the SCDNR Jack D. Bayless Hatchery. Otoliths and scales were removed, cleaned, and examined in whole view under a dissecting microscope. Three independent readers aged each scale and otolith. Of 170 fish, 128 had otoliths that judged readable and 97 of these (76%) had a majority of readers agree on an age. Scale ages were determined as well and final relationships between scale and otolith ages will be determined by quantifying percent agreement and bias.

Poster #148

Outbreak of an Invasive Fish Pathogen, *Aphanomyces invadans*, in a Forested Stream in the Santee Experimental Forest, South Carolina

Mentor: Troy Farmer, Forestry & Environmental Conservation

Students: Madalynn Binkerd, Lexi Thomason, Environmental & Natural Resources; Emily Davidson, Biological Sciences

Aphanomyces invadans is an oomycete (fungus-like eukaryotic microorganism), introduced into North America in the 1970's, which causes epizootic ulcerative syndrome (EUS) in many species of freshwater and brackish water fish. EUS is a significant aquatic disease affecting valued ecosystem constituents and functions. A recent episode of EUS in fish was detected in a first-order, freshwater stream that drains a watershed (WS-77) in the Santee Experimental Forest, South Carolina, being harvested as part of an ongoing study testing clear-cutting versus thinning as tools to prepare coastal watersheds for longleaf pine restoration. The presence of *A. invadans* in symptomatic fish was confirmed with DNA sequencing during November 2021, and it was not found in the nearby first-order reference watershed (WS-80) that has not been harvested. This unplanned observation presents a unique opportunity to investigate the environmental factors that trigger *A. invadans*-related pathologies for fish in natural waters, thereby enhancing understanding of how stressors associated with land management and climate change influence aquatic ecosystem processes and impact fish health. The objectives of this project were to compare timeseries of water quality parameters between the paired watersheds to understand if changes in water quality triggered the outbreak of *A. invadans* Specifically, we will investigate if temperature, dissolved organic carbon, turbidity, dissolved oxygen, and other water quality parameters differed between watersheds leading up to the observed outbreak. Results should fill knowledge gaps concerning environmental conditions that facilitate outbreaks of *A. invadans* and allow for connections to be drawn between land use changes, forest management, and fish health.

Poster #149

Hurricane Relief and Evacuation Timing Decision Analysis for South Carolina

Mentor: Yongjia Song, Industrial Engineering

Students: Camden Brady, Samantha Decker, Bianca Huet, Dan Novak, Industrial Engineering; Colin Murphy, Economics; Isabel Strinsky, Mathematical Sciences

Weather related disasters are becoming increasingly costly and dangerous to the United States. Year 2020 marked the tenth consecutive year with eight or more-billion-dollar disasters. In this project, we focus on hurricane disasters, for which a large number of forecasting and hazard analysis tools are valuable for emergency managers to estimate demands for disaster relief resources and mobilize these resources accordingly. This project was designed to analyze South Carolina's evacuation and sheltering logistics planning procedure using the forecasted and actual trajectories of hurricanes. The analysis was based on HURREVAC, which is a program that stores the forecasted and actual data of previous and ongoing hurricanes, as well as the South Carolina evacuation decision timeline, which describes when certain steps will be taken for the preparation leading up to and during the evacuation. We find that an increased forecasting accuracy will allow for supplies and their distribution centers to be optimally disseminated to evacuation shelters and affected areas, which will pose as a tremendous financial benefit at a state level.

Poster #150

The Relationship Between Anxiety and Uncertainty Tolerance Among Heavy Alcohol Users

Mentors: Kaileigh Byrne, Psychology, Irene Pericot Valverde, School of Health Research

Students: Megha Gupta, Biological Sciences; Caroline Kelley, Caroline McDaniel, Sarah Roth, Psychology

Alcohol Use Disorder (AUD) is the most prevalent substance use disorder in the US and has shown to be highly comorbid with anxiety disorders. The tendency to react negatively to uncertainty on an emotional, cognitive, and behavioral level, a cognitive phenomenon known as Intolerance of Uncertainty (IU), may be linked to both AUD and anxiety. This study explores the relationship between anxiety sensitivity (AS), IU, and decision-making under uncertainty in individuals with AUD compared to healthy controls. Upon completion of an eligibility screening, participants are sorted into a control or patient (AUD) group. Eligible participants (N = 34) then complete a single-session lab study in which they perform a decision-making task and answer surveys related to anxiety, intolerance of uncertainty, and drinking behaviors. We first predicted that individuals with AUD would present higher levels of both AS and IU. Secondly, we expected the relationship between AS and IU to be stronger in the AUD group. Preliminary results fail to show differences in AS or IU between groups. However, results suggest that there is indeed a relationship between anxiety and lower tolerance of uncertainty on an uncertainty-based decision-making task among those with AUD but not in the control group.

Poster #151

Investigating Genomic Assemblies and Identification of Human AluY Subfamilies

Mentor: Miriam Konkel, Genetics & Biochemistry

Students: Michaela Moore, Genetics; Zari O'Connor, Biochemistry

Transposable Elements (TEs) are repetitive mobile genetic elements accounting for ~50% of the human genome that can replicate and move throughout genomes. With about one million copies in humans, primate-specific Alu elements are currently the most active in propagation, with AluY, AluYb8/9 and AluYa5 subfamilies being major drivers of TE-driven genome expansion. Due to their repetitive nature and high abundance, TE annotation has proven to be challenging. To determine the impact of genome quality on TE annotation, we retrieved close-to-full length Long Interspersed Element 1 (L1) and Alu TEs across primate genomes and genome assemblies using the UCSC Table Browser function and performed comparative genomics analyses. Our results show that genome assembly quality is generally correlated with more accurate TE annotation. Furthermore, we identified 12 Alu subfamilies with elements pristine to their respective consensus sequence (totaling to 287 elements). Building upon this and to better understand ongoing Alu mobilization patterns, we investigated two subfamilies with evidence for ongoing mobilization, AluYb8/9 and AluYg6, for the presence of additional subfamily structure. Our results support a more refined subfamily structure with evidence for a considerably greater subfamily diversity within humans. Some of these subfamilies show evidence for recent expansion and may represent emerging subfamilies that might become major drivers of TE expansion and genetic diversity. Furthermore, we reconstructed the evolution of these subfamilies through phylogenetic and network analyses. Overall, our fine-scale approach offers a recent perspective of divergence patterns and continued evolution and may allow an improved characterization of disease-causing insertions and polymorphisms.

Poster #152

Transgene Containment and Removal in Important Perennial Grasses

Mentor: Hong Luo, Genetics & Biochemistry

Students: Andrew Fiorentino, Biological Sciences; Annalise Enger, Chemical Engineering; Jason Yeung, Morgan Kuess, Biochemistry; Charles Henry, Microbiology

Turfgrass and switchgrass are among the most important perennial grasses significantly impacting agriculture production, agriculture economy, sustainable energy and environment. Like in many row crops, genetic engineering of both switchgrass and turfgrasses using transgenic technologies offers the opportunity to incorporate many economic and agronomic benefits that are difficult or impossible to achieve through traditional breeding techniques. However, the risk of transgene escape and the unforeseen environmental consequence by the use of transgenic technology in perennial grasses require development of strategies for transgene containment. We have developed and are evaluating an integrated approach that combines a dual site-specific recombination system and total sterility induction mechanisms for transgene containment and removal in switchgrass and turfgrass, producing transgenic products self-contained for desirable transgene, but free of undesirable foreign DNAs. Two transgenic lines of switchgrass and creeping bentgrass are being produced to express two different chimeric gene constructs. When the two transgenic lines are cross-pollinated, the hybrids would be total-sterile and free of unnecessary DNA, but expressing gene of interest. Currently, transgenic plants of the two different lines are being generated in both creeping bentgrass and switchgrass for cross-pollination to produce hybrids for use in evaluating the efficacy of the dual site-specific recombination system for controlled total sterility and gene containment. The system is universal and can be applied in different crop species to address transgene escape issue facilitating commercialization of transgenic perennial grasses.

Poster #153

Clinician Burnout and Well-Being During COVID-19

Mentor: Janice Lanham, School of Nursing

Student: Abigail Wildi, Nursing

Clinician burnout and well-being are important issues impacting healthcare providers. The COVID-19 pandemic has increased susceptibility to nurse burnout (Howell, 2021). To address this issue, this research study will evaluate the effectiveness of implementing a well-being protocol in a prelicensure undergraduate baccalaureate nursing program. Burnout will be assessed by using the Maslach Burnout Inventory using a pretest-posttest design.

Poster #154

Do Boat Electrofishing Catch Rates of Alabama Bass and Largemouth Bass Differ Between Day and Night?

Mentor: Troy Farmer, Forestry & Environmental Conservation

Students: Madison Byars, Brittany Darrington, Isabel Tiller, Wildlife & Fisheries Biology; Andrew Peel, Environmental & Natural Resources

Illegal introductions of Alabama Bass *(Micropterus henshalli)* into reservoir systems along Gulf Coast and Atlantic Slope drainages has increased in recent years increasing concern for competition and hybridization with native black bass. Monitoring approaches are needed to detect Alabama Bass in recently invaded reservoirs and continued monitoring in reservoirs with established populations. However, recent observations by SCDNR biologists suggest that daytime boat electrofishing failed to detect Alabama Bass for several years after initial detection in Lake Wylie by anglers. Our study aimed to determine if boat electrofishing catches of Alabama Bass and native Largemouth Bass (*Micropterus salmoides*) differed between daytime and nighttime periods on Lake Hartwell, South Carolina. We randomly selected 8 coves along the Seneca River arm of Lake Hartwell, stratified by habitat type (coves with and without installed habitats), and randomly assigned each cove to be sampled during day or night. In each cove, we conducted four 15-minute boat electrofishing transects during October - November 2021. We used a mixed effect generalized linear model to test for species, time of day (day or night), and habitat (natural or installed) effects on catches. We found that Alabama Bass catches per 15-minute transect were four times higher at nighttime (4.4 ± 4.2; mean ± sd) than daytime (0.8 ± 0.9). Alabama Bass catches were also higher in coves with installed habitats (3.8 ± 4.3) compared to coves with only natural habitats (1.4 ± 1.9). Largemouth Bass catches were also higher at nighttime (4.9 ± 2.4) compared to daytime (2.8 ± 1.4) but did not differ by habitat. Results suggest that nighttime boat electrofishing will be more effective at sampling Alabama Bass in large, oligotrophic reservoirs.

Poster #155

The Effects of Information Overload on Student Burnout

Mentor: Marguerite Albro, University Libraries

Students: Maria E. Adonay, Special Student, Joshua Mazaiwana, Biological Sciences; Trenton Prothow, Middle Level Education

Scientists use an adapted version of the Maslach Burnout inventory survey to measure student burnout. Demographic questions -such as major and year of study- were asked in order for scientists to properly measure information overload. Student surveys were administered online after students came back from winter break since they could gauge their experience of the previous semester including management of academics and extracurriculars.

Poster #156

Searching for Novel Antibiotics in Soil Microbes

Mentor: Min Cao, Biological Sciences

Students: Benjamin Blouin, Food Science & Human Nutrition; Stephanie Randar, Biological Sciences; Marshall Epps, Microbiology

In recent decades, antibiotic resistance has become a threatening issue due to over-reliance on antibiotics. Therefore, novel antibiotics are needed. This project focused on finding antibiotic-producing bacteria in soil because the majority of antibiotics are produced by fungi or soil bacteria. This is a research opportunity because identified bacteria may be used to collect novel antibiotics that may complement currently overused antibiotics. By partnering with Small World Initiative (SWI) – crowdsourcing antibiotic discovery and through the support of Clemson University Creative Inquiry and Undergraduate Research, this research opportunity has been made available to us. Soil samples were collected from various locations around Clemson University and its surrounding areas in January and February of 2022. The samples were suspended in sterile distilled water and plated on tryptic soy agar (TSA) plates to isolate single bacterial colonies. Based on the colony morphology, we identified 27 different bacterial types from eight soil samples. Among these, 19 were Gram-positive, and eight were Gram-negative; all isolates produced the catalase, an enzyme that breaks down hydrogen peroxide into water and oxygen. A top agar antibiotic production test was performed with eight bacterial test strains. These plates were observed to see if the isolates made a zone of inhibition (ZOI) around the colonies. Of the 27 isolates, twelve showed promise for antibiotic production. Further experiments will be conducted to characterize the isolates using 16S ribosomal RNA sequencing and extract the potential active compounds from the candidate bacteria.

Poster #157

Reimagining Transportation Infrastructures in Clemson

Mentor: Jiayun Shen, Civil Engineering

Students: Bradly Balterocruz, Marco Blanco, Brian Cruz-Castro, Mechanical Engineering; Daylon Boone, Adam Marzec, Computer Engineering; Elena Le, Max Marzec, Computer Science; Johnathan Niebles, Industrial Engineering

The Creative Inquiry (CI) titled 'Reimagining Transportation Infrastructures in Clemson' aims to look at the road network of Clemson during football gamedays and parking lots of Clemson during normal operations. The objective of the CI is to: 1. Investigate both infrastructures' adequacies to meet the current demands using engineering measures, 2. Identify alternatives to account for future growths of the university.

Clemson football gameday attracts more than 100,000 visitors on any given gameday. The university's operations have been highlighted multiple times by local news. Having conversations with planners and practitioners with the university and reviewing previous studies allowed the identification of critical intersections during gameday. Utilize mobility data from Safegraph and field observations. We construct traffic simulations to see the differences between game day and typical day operation.

Sentiments towards Clemson parking have been mixed. Users do not enjoy it, and the parking services claim that selling two permits per parking spot is working fine. The research team uses GIS Field Data Collection for campus parking lots and calculates performance measures to investigate whether parking is a problem in Clemson.

Poster #158

Do the Elusive Flowers of Hexastylis thermoregulate to Increase Pollination Success?

Mentors: Matthew H Koski, Jacob Heiling, Biological Sciences

Students: Grant Gaskins, Microbiology; Taylor Sherer, Wyatt Witman, Biological Sciences

Many organisms experience temperatures that are not ideal for physiological function, and thus employ mechanisms to thermoregulate. Flowers can thermoregulate through capturing solar radiation or undergoing thermogenesis. Floral thermoregulation allows plants to maintain optimal temperatures for survival, reproduction, and pollinator attraction. Hexastylis spp. are native plants to Eastern North America that present flowers on the forest floor, concealed by leaf litter. Hexastylis spp. flower in late February to early April in when temperatures are generally cool. The genus is in a plant family, Aristolochiaceae, known to have thermogenic species. Flowers are reddish and often produce a fetid odor, which are features of fly or beetle pollination. In other plants with such pollination systems, heat increases volatile emission and pollinator visitation. Terhmoergulation in Hexastylis spp. has not been explored and documentation of pollinators is scarce. We are using native Hexastylis in the South Carolina Botanical Gardens to ask 1) Does Hexastylis thermoregulate?, 2) Is floral size associated with the degree of thermoregulation? 3) What are the primary pollinators of Hexastylis?, and 4) Does thermoregulation impact pollination success? We will evaluate the potential for thermogenesis by measuring internal flower temperatures and ambient temperatures immediately adjacent to flowers. We will score pollinator visitation using time lapse cameras and capture flower visitors for identification using sticky traps. We predict that the flowers will upregulate temperatures under colder ambient temperatures, and that warmer flowers will experience higher pollination success. While conducting research we will work with 4-H Junior Naturalists to engage young students in plant science and field research through hands-on experiences.

Poster #159

Controlled Environment Agriculture: Innovation of Distributing Food to Urban Environments and Food Deserts

Mentor: Lance Beecher, Cooperative Extension Services

Students: Abbie Campbell, Kayla Escobar, Environmental & Natural Resources

The students used the information from previous semesters to finalize a model system that would operate efficiently. This system would be contained within a controlled environment chamber and provide ample food. This would offer an economic system that would be efficient enough to be environmentally feasible. Lighting continued to be a significant portion of the budget, affecting capital cost, so students began to investigate alternative methods further to provide ample light to the plants. The students evaluated different designs to determine plans for unlimited space usage and ample space to inspect plants by production managers. Creating space for effective production and adequate operating areas was necessary for the system to be practical. The system will provide an evaluation model and disseminate vital information through the Clemson Extension Program.

Poster #168*

Queer issues in STEM: An Exploration of Three Student-driven LGBTQIA+ STEM Education Projects

Mentors: Matthew Voigt, Engineering & Science Education, Eliza Gallagher, Engineering & Science Education

Students: Clara Holloman, Biochemistry; Abigail Smith, Genetics; Allie Popovchak, Secondary Education

There has been a growing effort within STEM education to broaden participation, address equitable outcomes, and promote inclusive learning environments. At the same time, educational research, institutional programs, and policies to support students with a Queer identity in STEM environments remain largely underdeveloped and undertheorized. By Queer, we mean students who identify as Lesbian, Gay, Bisexual, Transgender, Queer, Intersex, Pansexual, Asexual, or in other ways Queer because of their queer sexual identity or non-cisgender identity (LGBTQIA+).

As part of a Creative Inquiry course, we initiated three student-driven research projects to better understand the experiences of Queer students in STEM. The first project gained insight into making medical care a more positive experience for LGBTQIA+ patients through the development and implementation of a patient survey. Results from the survey identified similar negative experiences for the majority of respondents and solutions that may help alleviate discomforts LGBTQ+ patients face in healthcare facilities. The second application-focused project developed Queer math curriculum and lesson plans for high school contexts. The third project explored the experiences of Queer undergraduates pursuing STEM degrees through individual interviews. Results from the interviews highlight the ways in which students describe how their identity is positioned as relevant or included in STEM environments. Overall, this research brings awareness to marginalizing practice in STEM and helps promote the design of inclusive spaces.

Poster #169*

April 08

SARS-COV-2: Salivary Immune Response Profiling Through Antibody Detection by Enzyme-Linked ImmunoSorbent Assay (ELISA)

Mentors: Sujata Srikanth, Congyue Peng, IIT Ctr Medical Devices/Sensor; Delphine Dean, Bioengineering

Students: Elysia Andrews, Microbiology; Amanda Brewer, Caroline Mitchum, Biological Sciences

The recent SARS-CoV-2 pandemic has generated a need for assessing antibody levels within the mucosal secretions of both infected and uninfected individuals. Additionally, there is much interest in how the available vaccines for protection against this virus affect the antibody titer. This study uses an Enzyme-Linked ImmunoSorbent Assay (ELISA) to analyze antibody response in saliva towards the SARS-CoV-2 virus: Both the Trimeric and receptor-binding domains (RBD) were assessed for immunogenicity. Following data analysis, the study indicated differences in antibody titers correlating with vaccination status, vaccine type, length of time since vaccination, and presence or absence of prior infection. The results of this assay provide insight into the duration of naturally-acquired immunity with infection by this virus and the possible efficacy of different vaccines in offering protection. Furthermore, the implications of the study could be valuable in assessing the protection offered by vaccines against different variants of SARS-CoV-2, as well as if infection by a novel variant offers an altered response.

Poster #170*

Biohydrogen: The Microbial Future of Renewable Energy

Mentor: Caye Drapcho, Environmental Engineering & Earth Sciences

Students: Anna Mcclendon, Teague Mccracken, Biosystems Engineering

The production of hydrogen gas via the fermentation of Thermotoga neapolitana is one of the newer forms of renewable energy being researched as the need for alternative fuels becomes more pressing. It is seen as a desirable alternative because it has a renewable source, can be performed biologically, and combusts to only form water. While the carbon/nitrogen sources and optimal environments have been investigated for this process, one of the main issues is figuring out what to do with the spent medium once the process is completed. The goal of renewable energy is to reduce the amount of waste produced as much as possible, so finding an alternative use for the spent medium would ensure the process is ecologically and economically sound. The objective of this research is to investigate various uses for the spent medium while simultaneously optimizing the production of hydrogen gas.

Poster #171*

Marketing Survey of Clemson Students – Understanding Student Perceptions of Clemson's '55 Exchange Retail Ice Cream Operation

Mentor: John U. McGregor, Food, Nutrition & Packaging Sciences

Students: Lara Burke, Dina Graves, Reese Kauffman, Elle Mckemy, Emma Patterson, Ian Smith, Drew Willey, Natalie Williford, Food Science & Human Nutrition

This research examines consumer preferences and feedback for Clemson's '55 Exchange Ice Cream student business enterprise. Clemson students completed a marketing survey in exchange for a poker chip that could be redeemed on Valentine's Day for a free scoop of Clemson ice cream at the '55 Exchange. 33% of all coupons given out were redeemed at the '55 Exchange on Valentine's Day. An online questionnaire was developed to gauge consumer preference in product offerings, buying locations, meal moments, special events, reward programs, and customer satisfaction. The survey was completed by 21% freshmen, 35% sophomores, 18% juniors, 35% seniors, and living status 33% on campus, 66% off campus. The survey results were analyzed using Excel and SPSS software to summarize the findings and create a roadmap of how to elevate the brand. Cold brew coffee, a newer product, may have room for growth as results show that 48% of consumers are slightly unlikely to extremely unlikely to purchase. However, 65% of consumers were slightly likely or greater to attend cold brew coffee sampling. 35% of consumers are likely to purchase from the store, and 23% are likely to purchase a prepackaged pint. Most on-campus students who completed the survey live in Bryan Mall (32%), or Douthit Hills (23%). Most off-campus students park in commuter lots C-1 (48%) or C-11 (24%). Students were asked what time they normally leave campus. The largest group (27%) said they leave from 3:00 pm - 5:00 pm. Advertising in areas other than these will target students who aren't typically near the Hendrix Student Center to go to the 55' Exchange. Students were also asked how likely they were to attend various events if '55 Exchange were to hold them, with answer choices ranging from "Extremely Unlikely" to "Extremely Likely". The Ice Cream Sampling event received the highest percentage of "Extremely Likely" responses at 52%.

Poster #172*

Self Heating in Materials with High Dissipation

Mentor: Irina Viktorova, School of Mathematical & Statistical Sciences

Co-Author: Abdullah Kose, Automotive Engineering

Students: Kevin Ferguson, Eddie Lewis, Civil Engineering; Tori Luongo, Mathematical Sciences; Jordan Mcdowell, Industrial Engineering; Emma North, Bioengineering; Shelton Stevenson, Architecture; Andrew Zix, General Engineering

Self heating in materials with high energy dissipation such as polymers and polymer composites under vibrational cyclic loading can lead to catastrophic failure known as “heat explosion”. Predicting safe temperature increases is essential for critical structural applications. The properties of many polymer materials are strongly temperature dependent, thus emphasizing the importance of heat generation from mechanical vibrations.

The analysis is based on the model predicting stress induced heat increase for viscoelastic materials under cyclic loading conditions. A set of stress-strain and creep experiments on PMMA at ambient and elevated temperatures was performed together with the mechanical engineering department. The data was used to determine the model parameters for viscoelastic mechanical stresses. Additional data from experimental testing of PMMA under vibrational loading has been analyzed and used to verify the developed model.

Poster #173*

The Molecular Determination of Fatty Acid Uptake and Metabolism in *Trypanosoma brucei*

Mentor: Kimberly Paul, Genetics & Biochemistry

Students: Sunny Ennis, Biochemistry, Adela Veytsman, Biological Sciences; Gracie Dellinger, Genetics, Bailey Holder, Microbiology

Trypanosoma brucei, a parasite endemic to Sub-Saharan Africa, is the causative agent of African Sleeping sickness in humans and wasting disease in cattle. As an extracellular parasite, *T. brucei* chooses either to scavenge nutrients from the host or to synthesize those nutrients de novo. One of those nutrients is fatty acids. Research on *T. brucei* has shown that the parasite requires the saturated fatty acid myristate (C14:0) as the membrane anchor domain for its variant surface glycoprotein (VSG), which is critical to immune evasion by the parasite. However, the mechanism of fatty acid uptake in *T. brucei* has hardly been explored. In this project, our group seeks to elucidate the mechanisms of fatty acid metabolism and its role in VSG anchoring in *T. brucei*. We are developing gene knockouts of several putative genes predicted to be involved in fatty acid uptake: fatty acyl-CoA synthetases (ACS) 1-7, long-chain acyl-CoA synthetase (LACS) 5, fatty acid transport protein (FATP), and plasma membrane fatty acid-binding protein (FABPpm) 1 and 2. We are also making a gene knockdown of a putative gene (sn1-006) we predict to be important for assembling the VSG membrane anchor. In the future, we plan to examine these cells morphologically and perform a biochemical assay to assess the effect of these gene knockouts and knockdowns.

Poster #174*

April 08

The Effect of Humidity on Electrospun PLGA Nanofiber Wrapped Sutures

Mentors: Jorge Rodriguez, Delphine Dean, Bioengineering

Students: Marissa Beighley, Eve Gilreath, Ellie Hatcher, Calvin Paulsen, Molly Turk, Halli Wall, Bioengineering; Abbey Woods, Chemical Engineering

The goal of this research is to create a localized drug delivering suture with the necessary properties to provide effective treatment. In this research, the effects of humidity on electrospun PLGA nanofiber wrapped sutures are studied. First, a 15 wt/v% of PLGA 50:50 is dissolved completely in DMAc at 60°C. A 1 wt/v% of PEO is then added and heated until fully dissolved. The solution is loaded into a 1mL syringe and extruded at 0.50 mL/hr. At the desired humidity, a +7.5 kV and -2.5 kV are applied to the syringe needle and the collector. The collector is set at 100 rpm for 30 minutes clockwise and 30 minutes counterclockwise.The fibers are collected and wrapped around Vicryl Suture with a custom device. Tensile tests confirmed an increase in ultimate tensile strength and elastic modulus after wrapping nanofibers around Vicryl Sutures. The humidity tests showed how humidity can affect pore size, lead to bead formation, and impact crystallinity. A humidity of 65% led to the most desirable suture characteristics for wrapping. This humidity decreased beading formation, increased fiber output, and led to an average diameter of 134.2 nm. An increase in humidity leads to a larger diameter, while extremely low and high humidities increase bead formation. Bead formation is unwanted due to its ability to release high concentrations of drugs during degradation. At humidity of 65%, these sutures show the proper mechanical strength and drug delivering capabilities to be used in the body. PLGA's ability to alter pore size and degrade into non-toxic products make it a fitting biomaterial for targeted drug delivering suture. Localized drug delivering sutures provide patients with the needed drugs while lowering chances of addiction and organ damage.

Poster #175*

Origami for Carbon-based Multifunctional Materials

Mentor: Rodrigo Martinez-Duarte, Mechanical Engineering

Students: Grayson Cliff, Maddy Counts, Mechanical Engineering

In this abstract we will present our research exploring the following question: What novel methods for carbon/carbide material manufacturing present promising mechanical properties such as low density and high specific strength? In previous semesters, the Multiscale Manufacturing Laboratory (M2L) has found carbonized miura-ori samples from cellulose films feature density as low as 0.014 ± 0.005 g/cm3. Additionally, the specific stiffness of this carbon origami and its ability to transfer load compare advantageously to other lightweight cellular materials. In addition, the M2L has explored spiking printer ink with metal precursors, the rationale is this metal react with the carbon from cellulose to create metal carbides. Our research focuses on the intersection of these two topics: We intend to explore the properties and applications of miura-ori metal carbide samples to create the materials of the future! These samples are created by first using a printer with spiked ink to print colored domains on filter paper that match the miura-ori pattern. Next, the miura-ori crease pattern is scored on the paper before being manually collapsed. In a furnace, samples are pyrolyzed at up to 1400˚C in a nitrogen gas atmosphere for approximately 8 hours, resulting in metal carbides. Once these carbon-based origami samples have been created, we test their mechanical properties, which indicate their potential for manufacturing. These results are used to further explore which origami patterns and metal carbides will yield the best mechanical properties for particular applications. Though we have yet to manufacture miura-ori carbon/carbide samples, we are continually refining our processes and techniques and intend to have a small set of samples fabricated and mechanically tested by the end of this semester. Through pyrolysis of origami patterns, we manufacture a high strength, low density material with potential applications in automotive and aerospace design, lightweight materials, and more!

Poster #176*

Effects of Kratom/Gabapentin Prenatal Exposure on Rat Offspring

Mentor: Mary Ellen Wright, School of Nursing

Students: Madelyn Carr, Health Science; Maggie Crowe, Hannah Lee, Sarah Marsden, Abby Parkison, Nursing; Megan Ralfe, Language & International Health

Kratom, as a legal substance sold for multiple purposes, has gained increased use with a paucity of evidence on the effects of prenatal exposure, except a few case reports of infant withdrawal (Wright, et al. 2021). Gabapentin is prescribed, and available for non-prescribed off label use in street drug sales for similar purposes of opioid withdrawal symptoms and pain relief. Similarly, Gabapentin has one published case report of infant withdrawal with little known as to infant withdrawal effects with prenatal exposure. The proposed study involved the prenatal exposure of female pregnant rats to Kratom and/or Gabapentin for the purpose of measuring the symptoms of withdrawal, growth, and development of rat offspring using a 2-by-2 factorial design. The study consisted of four cohorts of rat offspring without exposure, exposure to Kratom alone, exposure to Gabapentin alone, and exposure to both Kratom and Gabapentin combined. Measures using an observation tool developed to measure rat offspring withdrawal were employed on the rat offspring in all four cohort groups. In this presentation, the Creative Inquiry students will describe their involvement in data collection and data scoring of the rat offspring. Preliminary analysis revealed that Kratom and Gabapentin were absorbed by the rat offspring during the perinatal and lactation period. Lactation toxicology revealed the presence of both Kratom substrates and Gabapentin. Observations of the rat offspring revealed signs of withdrawal. Further research is recommended to confirm the initial findings of this pilot study.

Poster #177*

Development of a Platform for the Use of Microbial Factories in Bionanomanufacturing

Mentor: Rodrigo Martinez-Duarte, Mechanical Engineering

Students: Logan Cripe, Mechanical Engineering; Danny Lazega, Bioengineering

Optoelectronic tweezers, or OET, are used to manipulate cells without damaging them. This cell manipulation includes attracting individual or groups of cells that range in size from micrometers to nanometers. The manipulation of cells itself is done so by using a photosensitive substrate layer of amorphous Silicon (a-Si) and a layer of Indium Tin Oxide (ITO). The photosensitive properties of the a-Si allow for the creation of non-uniform electric fields, where a force is placed on the particles and cells through dipole moment. This method, commonly known as dielectrophoresis, allows for attraction or repulsion of the cells, depending on the polarization of the cell itself. Our main goal is to move microbial factories of cellulose in a desirable way to create complex patterns of cellulose and promote the use of an OET in creating those patterns. Application of this concept allows for insights into creating objects and complex geometries on a microscopic scale. In this presentation, we will detail the development of an improved OET platform and its initial validation with large particles.

Poster #178*

On Alert: The Impact Environmental and Biological Factors on White-Tailed Deer *(Odocoileus virginianus)* Vigilance

Mentors: David Jachowski, Michael Muthersbaugh, Forestry & Environmental Conservation

Students: Sarah Geisler, Biological Sciences; Austin Owen, Dylan Palumbo, Kelsi Sullivan, Wildlife & Fisheries Biology; Katerina Whitman, Environmental & Natural Resources

White-tailed deer *(Odocoileus virginianus)* are ecologically, culturally, and economically important in South Carolina. To best manage deer populations, it is critical wildlife managers understand drivers of deer population dynamics. Predation, or consumptive effects directly impact deer populations, but non-consumptive effects can also impact deer populations. Vigilance is a specific perceptive behavior which prey species use to detect stimuli (e.g. predators) and has been hypothesized to lead to non-consumptive effects on deer populations, through reduced individual fitness. Accordingly, our objective was to quantify what environmental and biological factors white-tailed deer vigilance. We hypothesized that deer vigilance would be related to biological and environmental factors. Specifically, we predicted that deer vigilance would be positively related to juvenile presence, daytime hours, and coyote activity, but negatively related to herd size and nighttime hours. To better understand these relationships, we deployed ~90 motion-activated wildlife cameras along dirt roads and paths on private lands in McCormick and Greenwood Counties, South Carolina, during May-June in both 2019 and 2020. For all collected photographs we recorded wildlife species, number of individuals present, time of photograph, and quantified vigilance behavior for individual adult male, adult female, and juvenile deer. We fit generalized linear mixed effects models (GLMM) to test our hypothesis and quantify which variables best explained deer vigilance. Our results will provide insight into which factors impact vigilance behavior in deer and could ultimately aid in population monitoring and management.

Poster #179*

Cyst Formation in the Human Parasite *Entamoeba histolytica*

Mentor: Cheryl Ingram-Smith, Genetics & Biochemistry

Students: Catherine Manke, Genetics; Louise Franke, Alex Turkopuls, Adira Nair, Biochemistry; Annabelle Harris, Microbiology

Entamoeba histolytica is responsible for ~90 million cases of diarrheal illness and up to 100,000 deaths each year. Amoebic dysentery is characterized by severe bloody diarrhea with other symptoms and typically lasts two weeks or more. In some cases, *E. histolytica* can invade the intestinal wall, escape to the blood stream, and travel to the liver where it causes amoebic liver abscess which is deadly if left untreated. *E. histolytica* infects humans through ingestion of food and water contaminated with environmentally resistant cysts. These cysts convert to the growing amoeba form, called a trophozoite, in the small intestine and then travel to the large intestine to colonize. As the trophozoites grow, a portion convert back to the cyst form and are shed into the environment daily in feces to continue the cycle of infection. Our lab is interested in understanding what governs whether cells continue their growth or convert back to cysts. We will present several ongoing projects addressing different aspects of this process.

Poster #180*

Optical Tweezer-Based Microrheology Using Large Trapped Beads Exhibit Multiple Unique Challenges Not Present in Experiments Conducted with Smaller Beads

Mentor: Joshua Alper, Physics & Astronomy

Student: Megan Keech, Bioengineering

Materials scientists and engineers use optical tweezer-based microrheology measurements to probe the viscoelastic properties of complex microstructured materials such as gels and filament networks with various structural feature sizes at multiple length scales by trapping and tracking beads of various sizes suspended within the materials. Current procedures for analyzing these data inherently rely on an approximation that the bead diameter is similar to the beam width at the diffraction-limited focal point of the trapping laser, but less dense materials have larger structural features and require larger diameter beads. We discovered significant deviations from the linear assumption in the detection of beads that are 5-10-fold larger than the laser focal point. Additionally, data collected across a spectrum of bead sizes and material viscosities suggest that the trap's effective spring constant for large beads is difficult to properly determine using traditional stokes drag methods due to ambiguity in the characterization of the traps ability to hold the bead when a force is applied. Lastly, we discovered the sensitivity of experiments to perceived bead center locations, sampled incrementally across a cubic region in the center of the bead. By quantifying these observations with the analysis of large bead optical tweezer experiments, we better understand their interaction with the trap and how to account for these nonlinearities properly. Ultimately, our results will allow researchers to analyze sparse material matrices, use larger beads, and accurately perform calculations with optical tweezer-based microrheology.

Poster #181*

Analysis and Characterization of Additively-Manufactured Carbide Matrices

Mentor: Rodrigo Martinez-Duarte, Mechanical Engineering

Student: Bentley Bevis, Mechanical Engineering

The research focuses on the validation of robocasting (paste 3D printing) as a suitable manufacturing method for complex shapes and components made from porous tungsten carbide. The technique utilizes a modified 3D printer to extrude a biopolymer precursor paste containing tungsten oxide nanoparticles. Then, the deposited paste is dried and baked at high temperatures, which induces the formation of tungsten carbide. In terms of broader impacts, the goal is to further the technological development of manufacturing structural energy components (SECs), which can be applicable in electric vehicles or batteries for example. Porous tungsten carbide poses as an extremely useful material for this field for its high strength to weight ratio and electrical properties. However, current manufacturing methods can be both expensive and complex, so the intent is to provide a method that is more simplistic and sustainable through additive manufacturing. The methods and results include X-ray diffraction (XRD) and scanning electron microscopy (SEM) to characterize the microscopic structure and gain an understanding of how it affects the physical properties. The significance of this analysis is toward enabling control over the microscopic structure based on 3D printing parameters, precursor composition, and heat treatment. Eventually, the goal is to tailor the fabrication process, optimizing the tungsten carbide component for its intended use.

Poster #182

Litter Collection Creative Inquiry

Mentors: Todd Schweisinger, Mechanical Engineering; Cecil Huey, Emeritus College

Students: Arlo Newton, General Engineering; Meaghan Cahill, Civil Engineering

The overall purpose of this Creative Inquiry is to come up with a solution to plastic waste in Developing Countries, with a focus on India. Many of these countries do not have well-established trash-collecting systems. The goal is to figure out a way to repurpose plastic into something useful for communities, with the manufacturing process as accessible and replicable as possible. The first few semesters of this project were mostly devoted to research - research on existing solutions and the properties of plastics. In the Fall of 2021 semester, we acquired an oven to begin testing on the plastics. So far we have only run a few tests, focusing on brick-making methods using shredded #2 plastic, also known as High-Density Polyethylene. We chose to use HDPE plastic because it is bountiful, shreds easily, and has a lower melting and softening point, making it easier to test on. We are currently working towards making plastic bricks by melting and compressing the plastic in a mold. From these tests we have created flat samples of differing thicknesses to test the shear and compressive strength of the HDPE block.

Poster #183*

Polymersomes as Aid in Nerve Regeneration: A Customizable Approach to Neurological Repair

Mentor: Jessica Larsen, Chemical & Biomolecular Engineering

Students: Conner Lumb, Kayleigh Trumbull, Chemical Engineering

How can the optimization of polymersomes improve the efficacy of treatments for nerve injuries? Polymersomes were synthesized using poly(ethylene glycol)-b-poly(lactic acid) (PEG-b-PLA), poly(ethylene glycol)-b-poly(lactic-co-glycolic acid) (PEG-b-PLGA), and poly(ethylene glycol)-b-poly(ε–caprolactone) (PEG-b-PCL) via the solvent injection method. Different sized polymersomes were synthesized using various concentrations of copolymer and syringe pump speeds while maintaining a constant 1mL syringe and 20G needle for all syntheses. The polymersomes' Z-average diameter and zeta potential were measured using DLS. After lyophilization, polymersomes were loaded with fluorescein isothiocyanate-bovine serum albumin (FITC-BSA) as a model therapeutic to compare the loading behavior of each copolymer. Loading was confirmed using dialysis. The polymersomes were also loaded with a preliminary peptide and introduced to rat dorsal root ganglia (DRG) neurons to assess their effect on neuron growth.

Polymersome synthesis was optimized to produce vesicles that were the appropriate size (~200nm), variability (polydispersity index <0.20), and stability (zeta potential ~ ±20mV). The average loading efficiencies for all three polymersome types were >90%. This is encouraging as FITC-BSA is larger than the target drug for future applications which would show more success. DRG neurons treated with highly concentrated polymersomes showed an increased rate of growth compared to neurons treated with the peptide alone. Polymersomes can be customized to protect and deliver a drug through the blood-brain barrier, enhancing the pharmacokinetic profile and improving nerve regeneration. These capabilities seem promising in the frontier for improved neurological therapeutics. Acknowledgments: NSF, SC EPSCoR, Clemson Creative Inquiry

Poster #184*

April 08

A Method to Produce and Identify Placental Specific Extracellular Vesicles Containing miRNA in Maternal Circulation

Mentor: Scott Pratt, Animal & Veterinary Sciences

Students: Helene Bell, Biological Sciences; Lily Mauro, Genetics, Julia Norman, Kalis Johnson, Animal & Veterinary Science

Placental insufficiency in humans and livestock is a primary cause in fetal growth restriction within the uterus leading to increased fetal and neonatal morbidity and mortality. Ethically, experimentation to assess placental function cannot be conducted in humans and establishes a need for relevant animal models. Ruminants are used extensively to evaluate fetal-maternal interactions during gestation. Small RNA called microRNA (miRNA), maybe effective markers of placental insufficiency associated with assisted reproductive technologies. Within the cell, microRNA (miRNA) regulate gene expression by binding to mRNA suppressing mRNA translation in to proteins. In contrast, miRNA can be packaged in bodies called extracellular vesicles (EVs) within the cell, and released into biological fluids. While extracellular miRNA associated with EVs have been identified in maternal blood during gestation in ruminants, the ability to identify and isolate EVs specifically produced by the placenta is nonexistent. The lab's goal is to be able to identify placental EVs in maternal circulation during gestation in ruminants and determine if the circulating miRNA within the EVs can be used as markers of placental function. To achieve this goal, genes of proteins known to be associated with EVs will be genetically modified. Four cDNA of proteins associated with ruminant EVs were isolated using RT-PCR and subcloned into a plasmid vector. Currently products have been verified by restriction enzyme digestion of cDNA clones and size as determined by slab gel electrophoresis. These cDNA will then be utilized to generate vectors that will express each cDNA as a fusion protein encoding the protein of interest and a unique protein sequence allowing for detection and isolation of placental produced EVs and their miRNA content both in vitro and in vivo.

Poster #185*

The New Top Dog: The Influence of Coyote Activity on Bobcat and Gray Fox Behavior

Mentors: David Jachowski, Elizabeth Reghi Saldo, Alex Jensen, Michael Muthersbaugh, Forestry & Environmental Conservation

Students: Sean Kiernan, Bridget Shupe, Nicholas Sparano, Wildlife & Fisheries Biology

After the removal of a majority of the natural wolf populations, coyotes *(Canis latrans)* first began to appear in South Carolina in the late 1970's, largely due to natural eastward expansion resulting from decline in wolf populations. By the 1990's, coyotes had established themselves across much of the southeast and have become infamous amongst farmers and hunters for the threat they pose to white-tailed deer and livestock. While their impact on deer and livestock has been studied, not much is known about their impact on smaller carnivores. Our aim was to assess occupancy of bobcats and gray foxes across ~15,000 acres near McCormick, South Carolina in relation to coyote activity. However, coyote activity is not the only potential factor driving bobcat and gray fox occupancy; other factors such as habitat quality, human activity, and competition with other species also have potential to play a role. To accomplish this, we processed photos from around 90 cameras across winter, summer, and fall 2020. We expected to find lower bobcat and gray fox occupancy at sites where coyote activity was higher. Furthermore, we expected greater bobcat occupancy relative to gray foxes possibly due to a bias in detection favoring bobcats. Based on our results, we can expect to observe similar trends in occupancy of other mesocarnivore populations where coyotes are present. From this, a greater understanding of coyote impact on native mesocarnivores can be gained and used in future studies.

Poster #186*

Carnitine Biosynthetic Pathway in *Cryptococcus neoformans*

Mentor: Kerry Smith, Genetics & Biochemistry

Student: Dylan Carroll, Genetics

Fungal infections cause over one and a half million deaths annually, while the most common invasive species *Cryptococcus neoformans* kills more people each year than tuberculosis. In immunocompromised individuals, namely HIV/AIDS patients, *Cryptococcus* is extremely virulent and can spread to the brain causing meningitis. Furthermore, the cellular processes of fungal cells are so similar to human cells that the production of antifungal drugs is very challenging. Due to increases in immunosuppressive drugs and a large population of humans living with some form of autoimmune disorders, cryptococcal meningitis cases have become prevalent and require innovative research.

As the site of *Cryptococcus* infection in the lung provides a glucose- and amino acid-poor environment, the Smith lab hypothesizes utilization of acetate is likely important early in establishment of a pulmonary infection. One of fifteen initial

gene deletion mutants identified in a screen to find genes crucial for acetate utilization was CNAG_00403, a gene encoding a mitochondrial protein that we hypothesize may function in the production of L-carnitine. This amino acid assists in the transport of acyl-CoA into the mitochondria to be broken down as part of the Krebs Cycle to produce energy for the fungi. This mutant can grow on 2% glucose + YNB but not 2% acetate + YNB growth medium. The CNAG_00403 mutant also has decreased melanin production, a known virulence factor of *Cryptococcus*, on melanin-induced growth plates. Research is being conducted with growth assays to help understand the carnitine biosynthesis pathway to see if it could be a drug target to prevent virulence of *Cryptococcus*.

Poster #187*

A Replication Study to Understand the Relationship Between Sleeping Position and Autism Spectrum Disorder

Mentor: Jennifer Bisson, Psychology

Students: Alex Hannegan, Sabina Laurino, Psychology; Lucy Jennings, Genetics

Since 1985, the prevalence of Autism Spectrum Disorder (ASD) has been increasing, and there is reason to believe that there might be an actual increase in prevalence rates (Nevison, 2014). Elevated cerebrospinal fluid (CSF) in the extra-axial region of the brain is an early biomarker of ASD (Shen et al., 2017); because CSF is mainly circulated at night, sleeping positions may affect filtration rates (Lee et al., 2015).

A previously conducted pilot study measured the relationship between sleeping position and ASD severity (Bisson et al., 2022). Results showed that infants diagnosed with ASD demonstrated more severe symptoms when back sleep was the primary sleeping position. Subsequently, children that primarily slept on their side demonstrated less severe ASD symptoms. To replicate these findings, we have substituted the Brief Infant Sleep Questionnaire-Revised with the Childhood Autism Rating Scale 2 (CARS 2). The CARS 2 is a more widely used measure that is used to indicate ASD symptom severity in children between two and four years old.

After receiving IRB approval, we will recruit participants from therapy clinics, pediatrician offices, and daycares. Preliminary results will be reported at the time of the conference. We predict that increased side sleeping in infancy will be related to decreased ASD symptom severity. We also predict that increased back sleeping in infancy will be related to increased ASD symptom severity. If our predictions are correct, this will provide more evidence of a relationship between increased time in side-sleeping positions and lower ASD severity in children with ASD. Further research is needed to determine the exact mechanism that explains the relation between sleeping position and ASD symptom severity.

Poster #188*

REFil – Recycling Excess Filament

Mentor: William Martin, General Engineering

Students: Brandi Baldus, Materials Science & Engineering; Connor Fuller, Kayleigh Robinson, General Engineering; Sarah Maxwell, Computer Engineering; Brianna Morillo, Electrical Engineering; Sarah Paguaga, Mechanical Engineering;

3D printing has grown in popularity, with fused deposition modeling (FDM) being one of the most common methods. For all the benefits 3D printing can provide, it can generate a lot of waste. This waste comes from support material (printed material there only for support which is removed after printing), failed prints, and intermediate prints that are generated as part of an iterative design process. The most common filament used with 3D printers is PLA and while it can be composted industrially, there is the potential for it to be recycled into new filament. This project is investigating the process of recycling waste PLA filament using a 3Devo shredder and Precision 350 filament maker. Initial runs using virgin PLA pellets were successful, resulting in a consistent filament that was able to be used in the on-campus 3D printers. Waste filament from on-campus makerspaces was collected, shredded, dried, and blended with the virgin PLA to create a partially recycled 3D filament. Currently, recycled content between 10 – 20% have been tested with varying success. As the recycled content has been increased, more consistency issues with the new filament have been observed. As this variability has the potential to result in more failed prints it is critical that these issues are resolved. Therefore, the source of this variability is being explored and a number of potential solutions have been proposed and are currently being tested. This project was sponsored by the Clemson University Create Inquiry program and the 3Devo equipment was funded by a grant from the IT Student Advisory Board.

Poster #189*

April 08

Taking Care of You: Evaluating Heart Rate Variability and Skin Conductance of Children and Parents Throughout a Surgical Procedure

Mentors: Jackie Cha, Industrial Engineering; Anjali Joseph, School of Architecture

Co-Authors: Alec Gonzales, Industrial Engineering; Swati Goel, Architecture

Students: Keegan Mazur, Industrial Engineering

With the rise of pediatric outpatient surgical procedures, children and their caregivers often experience stress and anxiety leading up to a procedure. Children can be afraid of not knowing exactly what will happen in the surgery and how the doctor's office or surgery room will look. Because of this, the caregivers of these children also experience high levels of stress. In this study, stress and anxiety levels associated with care spaces were observed from the children and their caregivers while undergoing an outpatient surgical procedure. Seven children and their care providers were assigned to a control or intervention group. Those in the intervention group watched a customized virtual reality (VR) program which presented the child with how each care space during the perioperative process would look. Participants wore a wrist-wearable that tracked various metrics of heart rate variability and skin conductance, which have been previously associated with stress and anxiety. Preliminary data show little differences between the control and intervention groups; however, future work includes increasing sample size to understand stress and anxiety of children and their caregivers during the surgical care process.

Poster #190*

The Dangers of Near Perfect Spam Filters: Understanding User Complacency in Phishing Detection

Mentors: William Volante, Dawn Sarno, Psychology

Students: Spencer Sewell, Claire Gendron, Psychology

Cybersecurity ideally aims to prevent digital attacks from occurring altogether, however it is often necessary to employ further strategies to deter more pervasive threats. It is therefore important to adequately prepare human users to act as the last line of cyber-defense. The present study investigated the effect of an automated email filter on users' classifications of legitimate and phishing emails. Filter decision and perceived reliability were manipulated along with email type (i.e., legitimate/phishing). Participants' email classification accuracy and confidence were assessed along with their trust in the automated email filter. Individual differences in personality and propensity to trust machines were also measured. Accuracy results indicated that participants were more accurate for email types (i.e., legitimate/phishing) that matched the automated filter's decision. Confidence results suggest that participants were more confident when identifying phishing emails, and confidence was further strengthened when the automation also classified the email as phishing. Participants' trust in the automated filter did not vary by condition, indicating that neither filter decision nor reliability influenced users' trust. Alternative trust hypotheses such as perceived task difficulty (Madhayan & Wiegmann, 2007) or perceived riskiness of the task (Master, et al., 2005) are discussed. Propensity to trust machines was shown to be positively correlated with the post-interaction measure of trust. Overall, this work informs on email filter design and implementation. Importantly, findings suggests that users may be more vulnerable to phishing emails that specifically appear in their inbox.

Poster #191*

The Modern Peach Consumer

Mentor: Rupert Hurley, Food, Nutrition & Packaging Sciences

Co-Authors: Deb Hutchins, Brennan Lytle, Food, Nutrition & Packaging Sciences

Students: Thomas Breslin, Caroline Joseph, Hayden Kelley, Ashley Kirk, Carolyn Ridlehuber, Luke Summer, Marshall Abell, Nate Stephens, Packaging Science

Peach sales have declined more than 6% over the past decade and the average peach consumer is greater than 55 years old. This CI team set out to explore how Gen Z makes decisions about purchasing, storing, and consuming peaches through a survey to more than 100 screened respondents. Much information was obtained about how Gen Z consumers handle peaches, including that ~1/3 of respondents did not know how to ripen a peach and many store their peaches incorrectly at home, leading to a less than desirable consumption experience.

Poster #192*

** Indicates PM Session*

Investigating Attention Modeling Differences between Older and Younger Drivers

Mentors: Dustin Souders, Kathryn Baringer, Alan Mintz, Psychology

Students: Anthony Alvarado, Audrey Biggers, Allie Combos, Lydia Hird, Adam Razavi, Psychology

As in-vehicle technologies (IVTs) grow in both popularity and complexity, the question of whether these IVTs improve or hinder driver performance has gained more attention. The ability to predict when a driver will be looking at the road or a display on the car's dashboard or center console is crucial to understanding the impact of the recent tech-heavy trend in car designs on safety and the extent to which IVTs compete with the primary driving task for visual resources. The SEEV model of visual attention has been shown to be able to predict the probability of attending an area of interest while driving based on the salience of visual stimuli (S), the effort required to shift attention between locations (Ef), the expectancy that information will be found at a location within the visual field (Ex), and the value of the information found at that location relative to the task being performed (V). Much of the current research with this model has been done with younger drivers. Since how we process information changes as we age due to experience coupled with physical and cognitive changes, it is important to evaluate the fit of the SEEV model with older drivers as well. This study proposes to compare older and younger adult SEEV models calculated using eye tracking during a series of simulated driving scenarios with differing levels of effort, expectancy, and value placed on the primary driving task and a secondary typing task to be done on the center console while maintaining lane position and speed. Given that older adults have been shown to have an increased reliance on top-down processing for task completion, we anticipate seeing that the SEEV model can accurately predict visual attention allocation for both sets of drivers, but with greater predictive weighting on the top-down processes (Expectancy & Value) as well as the bottom-up process Effort, and a lesser weighting on the bottom-up process Salience for older adults than for their younger counterparts.

Poster #193*

Pollen-Pistil Dynamics Across an Elevational Gradient in *Argentina anserina*

Mentors: Matthew H Koski, Anita Cisternas Fuentes, Biological Sciences

Students: Cameron Forehand, Environmental & Natural Resources; Kate Morris, Biological Sciences

Successful pollination is the first step to seed production and is essential to the reproductive success of a plant. The quality and quantity of pollen deposited on plant stigmas may differ among populations due to pollinator composition or overall pollinator visitation rates. These differences in pollen quality and quantity may lead to disparities in reproductive success. Here, we assessed pollen-pistil dynamics in thirteen populations of *Argentina anserina* that span an elevation gradient in Southwestern Colorado to answer the following questions: 1) How do pollinator composition and pollination rate vary across populations that span the elevation gradient? 2) How do pollen quantity and quality vary across populations? 3) Does variation in elevation or pollinator visitation predict variation in pollen quantity and quality? During three consecutive summers pollinator visitation was observed, and styles were collected in natural populations from senesced flowers that experienced potential pollinator visitation. We used fluorescence microscopy to assess the: number of pollen grains deposited on stigmas; the number of grains that germinated; and the number and length of pollen tubes growing down each style. In total, we have examined over 4,400 styles across 928 flowers. On average, 38% of pollen deposited germinated and only 0.3% of pollen germinated created a pollen tube that reached the bottom of the style. We found that pollen quantity and germination rate vary widely across populations while quality did not. Pollen quantity and quality were not correlated with pollination rate, pollinator composition, or the elevational gradient. We predict that other factors like genetic diversity and population-specific attributes such as density and population size could be driving variation across populations.

Poster #194*

April 08

Want to Boost Your GPA? Consider Viewing Your Environment Differently: The Relationships Among Exam Performance, Reappraisal, and Situational Barriers

Mentor: Eric McKibben, Psychology

Students: Kate Cox, Matt Eckert, LeAndra Hairston, Psychology

Exam performance is a common indicator of success for students. Oftentimes, there are perceived barriers to achieving good grades. One's capacity to view such barriers differently could aid in better performance. The purpose of this study is to determine the relationships among performance, reappraisal, and perceived situational barriers.

Using a nonexperimental design, 61 participants completed brief measures of reappraisal and perceived situational barriers (i.e. COVID-19) before taking an exam in a psychology course at Clemson University. Exam scores were subsequently collected and correlated with reappraisal and situational barriers ratings. Results from a regression analysis indicated that reappraisal significantly predicted test scores ($F(1,56) = 9.68$, $p = .003$, $r2 = .147$). Situational barriers were also a significant predictor of exam performance ($F(1,56) = 6.04$, $p = .017$, $r2 = .097$). We also tested a mediational model in which higher reappraisal ratings predicted reduced perceived barriers ($F(1,538) = 13.923$, $p < .001$, $r2 = .025$) which then predicted higher exam scores ($F(2,55) = 6.849$, $p = .002$, $R2 = .199$), indicating some support for partial mediation.

Based on the data collected, reappraisal may be an effective means for reducing the impact of perceived situational barriers on exam performance. Future research may experimentally test the efficacy of reappraisal techniques on reducing perceived situational demands. Nevertheless, our research suggests a need for students to receive training on reappraisal techniques so that they are less hindered by situational barriers when preparing for and taking exams.

Poster #196*

Veteran's History Project

Mentors: Vernon Burton, Alexander Bowen, History & Geography

Students: Lucas De Bernedetti, History

The Veteran's History Project at Clemson University, in cooperation with the Library of Congress, interviews American war veterans and U.S. citizens involved in supporting war efforts to ensure future generations may hear accounts directly from veterans about the realities of war. Students facilitate the digitization of completed interviews and other collected materials for Clemson University's records before forwarding the original materials to the Veterans History Project of the American Folklife Center. The Veteran's History Project at Clemson began with the goal of assisting the Library of Congress with its own efforts to preserve valuable accounts of American history. With the Library's limited resources, it is only able to digitize a small number of interviews. By conducting interviews, participating students gain experience in how to appropriately conduct oral history interviews based on approved policies, sharpen their interpersonal skills for application in the professional world, and understand how to adhere to the rigorous professional format required by the Library of Congress. Students moreover hone their digital history skills by digitally replicating veteran interviews and materials for dissemination to the Library of Congress, the interviewed veteran, Clemson Special Collections, and the website and/or YouTube page.

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Bowen, Alexander	18, 196	History & Geography
Burton, Vernon	18, 196	History & Geography
Collini, Sara	35	History & Geography
Kaye, Cary	55	Philosophy and Religion
Joseph, Anjali	189	School of Architecture

COLLEGE OF BEHAVIORAL, SOCIAL, AND HEALTH SCIENCES

Gilmore, James	28	Communication
Anderson, Denise	73	Dean of Health, Education, Human Dev.
Dubin, Alexsandra	73	Parks, Recreation & Tourism Management
Dickes, Lori		Political Science
Rhodes-Purdy, Matthew	23	Political Science
Begerowski, Sydney	87	Psychology
Watson, Gwendolyn	88	Psychology

MENTOR	POSTER #	DEPARTMENT
Baringer, Kathryn	192	Psychology
Bisson, Jennifer	142, 143, 187	Psychology
Britt Jr, Thomas W.	109	Psychology
Byrne, Kaileigh	144, 150	Psychology
Christenson, Kyle	49	Psychology
Kowalski, Robin	137	Psychology
McCubbin, James A	136	Psychology
McKibben, Eric	194	Psychology
Mintz, Alan	192	Psychology
Pagano, Christopher	12	Psychology
Phillips, Christine	22	Psychology
Pilcher, June	40, 54	Psychology
Pury, Cynthia	105	Psychology
Ross, Lesley	22	Psychology
Sanborn, Sarah	143	Psychology
Sarno, Dawn	122	Psychology
Shuffler, Marissa	49, 56, 87	Psychology
Sinclair, Robert	88	Psychology
Solini, Hannah	12	Psychology
Souders, Dustin	192	Psychology
Stephens, Benjamin R	14	Psychology
Traylor, Allison	56	Psychology
Volante, William	190	Psychology
Pericot Valverde, Irene	150	School of Health Research
Jones, Karyn	90	School of Nursing
Lanham, Janice	90, 153	School of Nursing
Wetsel, Margaret	90	School of Nursing
Wright, Mary Ellen	176	School of Nursing

COLLEGE OF EDUCATION

Carlson, Alex	94	Education & Human Development
Hirsch, Shanna	94	Education & Human Development
Hood, Kayla	10	Counselor Education

COLLEGE OF ENGINEERING, COMPUTING, & APPLIED SCIENCES

Cottle, Renee	116, 118	Bioengineering
Dean, Delphine	17, 42, 59, 145, 169, 174	Bioengineering
DesJardins, John D	17, 31, 45, 59, 145	Bioengineering
Dunn, Heather	103	Bioengineering
Gutierrez, Manuel	17	Bioengineering
Ham, Rachel	126	Bioengineering
Harman, Melinda	17, 31, 59	Bioengineering
Heywood, Jonathan	119	Bioengineering
King, Kylie	123, 126	Bioengineering
Marcanikova, Marketa	17	Bioengineering
McDonald, Latoya	25	Bioengineering
McKelvey, Simeon	17	Bioengineering
Mercuri, Jeremy	68	Bioengineering
Peng, Congyue	126, 169	Bioengineering
Potter, Michael	119	Bioengineering
Richardson, William	119, 145	Bioengineering
Srikanth, Sujata	169	Bioengineering
Singapogu, Ravikiran	48	Bioengineering
Walker, Kyle	45	Bioengineering
Cannon, Andrew	91	Chemical & Biomolecular Engineering

MENTOR	POSTER #	DEPARTMENT
Davis, Eric	115	Chemical & Biomolecular Engineering
Larsen, Jessica	21,183	Chemical & Biomolecular Engineering
Yang, Ming	57	Chemical & Biomolecular Engineering
Li, Da	125	Civil Engineering
Shen, Jiayun	157	Civil Engineering
Clements, Joseph	121	Civil Engineering
Rodriguez, Jorge	174	Dean of Engineering, Computing & Applied Sciences
Lao, Yingjie	121	Dean of Engineering & Science Electrical & Computer Engineering
Raza, Hassan	41	Electrical & Computer Engineering
Gallagher, Eliza	168	Engineering & Science Education
Voigt, Matthew	168	Engineering & Science Education
Brame, Scott E	108, 111, 112, 113	Environmental Engineering & Earth Sciences
Drapcho, Caye	170	Environmental Engineering & Earth Sciences
Ladner, David	4	Environmental Engineering & Earth Sciences
Schlautman, Mark A.	106, 110	Environmental Engineering & Earth Sciences
Wagner, John R.	38	Environmental Engineering & Earth Sciences
Wylie, Jerry	106, 110	Environmental Engineering & Earth Sciences
Martin, William	141, 188	General Engineering
Cha, Jackie	189	Industrial Engineering
Girishan Prabhu, Vishnunarayan	79	Industrial Engineering
Hegde, Sudeep	93	Industrial Engineering
Neyens, David	17	Industrial Engineering
Rahimian, Hamed	37	Industrial Engineering
Sharkey, Thomas	92	Industrial Engineering
Song, Yongjia	149	Industrial Engineering
Taaffe, Kevin	51, 79	Industrial Engineering
Kornev, Konstantin	83	Materials Science & Engineering
Li, Zhen	104	Mechanical Engineering
Martinez Saez, Enrique	70	Mechanical Engineering
Martinez-Duarte, Rodrigo	175, 177, 181	Mechanical Engineering
Mocko, Gregory	120	Mechanical Engineering
Pataky, Garrett	91	Mechanical Engineering
Raihan, Mahmud	107	Mechanical Engineering
Schweisinger, Todd	46, 182	Mechanical Engineering
Wagner, John R	120	Mechanical Engineering
Xuan, Xiangchun	107	Mechanical Engineering
Zhao, Xin	24	Mechanical Engineering

COLLEGE OF SCIENCE

MENTOR	POSTER #	DEPARTMENT
Abernathy, Virginia	20	Biological Sciences
Blob, Richard	8	Biological Sciences
Brandon, Allyson	78	Biological Sciences
Campbell, Barbara	6	Biological Sciences
Cao, Min	156	Biological Sciences
Chapman, Susan	102	Biological Sciences
Childress, Michael	1, 2, 69	Biological Sciences
Cisternas Fuentes, Anita	193	Biological Sciences
Fuentes, Melissa	20	Biological Sciences
Heiling, Jacob	158	Biological Sciences
Howard, Daniel	75	Biological Sciences
Koski, Matthew H	158, 193	Biological Sciences
Palecek, Amanda	8	Biological Sciences
Payton, Kea	1, 2, 69	Biological Sciences
Powder, Kara	78	Biological Sciences
Rudolph, Krista R	76	Biological Sciences
Seekatz, Anna	84	Biological Sciences
Sims, Randi	1, 2, 69	Biological Sciences
Stoczynski, Lauren	3	Biological Sciences
Turnbull, Matthew	75, 81	Biological Sciences
Van den Hurk, Peter	3	Biological Sciences
Whitehead, Kristi	72, 76	Biological Sciences
Zhang, Peng	75	Biological Sciences
Anker, Jeffrey	86	Chemistry
Ennis, Elliot	15	Chemistry
McMillen, Colin	74	Chemistry
Pennington Jr, William T	74	Chemistry
Whitehead, Daniel	72	Chemistry
Ingram-Smith, Cheryl	179	Genetics & Biochemistry
Konkel, Miriam	151	Genetics & Biochemistry
Liang, Haiying	71	Genetics & Biochemistry
Luo, Hong	140, 152	Genetics & Biochemistry
Morris, Meredith	27	Genetics & Biochemistry
Paul, Kimberly	117, 173	Genetics & Biochemistry
Sehorn, Michael	39, 58	Genetics & Biochemistry
Smith, Kerry	186	Genetics & Biochemistry
Wentworth, Katherine	52, 53	Microbiology
Alper, Joshua	52, 53, 180	Physics & Astronomy
Godar, Subash	52	Physics & Astronomy
Sanabria, Hugo	44, 47	Physics & Astronomy
Bridges Jr, William C	50	School of Mathematical & Statistical Sciences
Viktorova, Irina	172	School of Mathematical & Statistical Sciences

OTHER

MENTOR	POSTER #	DEPARTMENT
Beecher, Lance	159	Cooperative Extension Services
Huey, Cecil	182	Emeritus College
Dixon, Chloe	10	Student Health Center
Albro, Marguerite	155	University Libraries
Sheaffer, Kelsey	46	University Libraries
Dancz, Claire	34	Watt Family Innovation Center
Ehrett, Carl	93	Watt Family Innovation Center
Reeves, Susan	34	Watt Family Innovation Center

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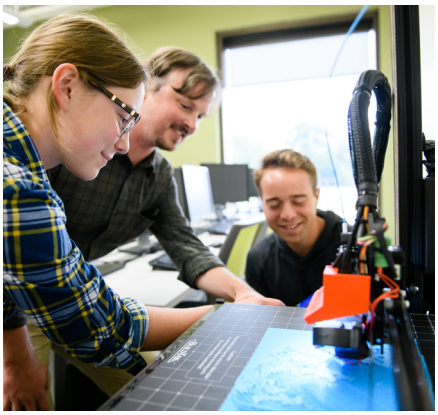

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