



# POSTER SESSION

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## Poster #5

### Tracking Nongame Fish Movement in Their Natural Habitat (CSRF)

**Mentor:** Lauren Stoczynski, Biological Sciences

**Students:** Allison DeLoache, Forestry and Environmental Conservation

The movement of small, non-game stream fish is a largely understudied area in the field of fisheries research. We are interested in stream fish movement because of their potential to act as vectors, carrying contaminants within watersheds. We examined the dispersal patterns of bluehead chubs, creek chubs, roseyface chubs, yellowfin shiners, striped jumprock, and northern hogsuckers because they occupy different life-history strategies and functional niches in the environment. We worked at four sites on Clemson Experimental Forest land in the upstate of South Carolina. Initially, each stream was divided into 10 m sections. The total length of stream surveyed at each site averaged around 550 meters. At each site, we collect fish via backpack electrofishing. After collection, the fish were anesthetized, and a passive integrated transponder (PIT) tag with a unique ID was inserted into the fish. During this process, their length, weight, tag number, and species were recorded. The fish were then released at a predetermined point in the stream. During tri-weekly recapture visits, all fish were scanned for a PIT tag. We recorded the location of those with a tag and returned them to their location at the point of capture. Fish without a PIT tag were kept and a tag was inserted after sampling. We have deployed nearly 1500 tags. We sampled each site nine times during the summer and fall of 2021. From our preliminary results, we have seen fish moving both up and downstream of their release site after their initial tagging. We saw site differences in the movement of bluehead chubs and yellowfin shiners, and observed striped jumprock had the smallest overall dispersal distance when combining sites. This study will help inform how small-bodied nonmigratory fish are moving within their watersheds, which can strengthen metacommunity analysis and management/conservation efforts.

## Poster #11

### Effects of Trout Stocking on Aquatic Insect Abundance in Western North Carolina Streams (CSRF)

**Mentor:** Daniel Knapp, Forestry and Environmental Conservation

**Students:** Carter Balach, Conor Joye, Wildlife and Fisheries Biology; Allison DeLoache, Biological Sciences

Brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), and rainbow trout (*Oncorhynchus mykiss*) are stocked in North Carolina streams to enhance recreational fishing. These native and non-native trout are top consumers in streams. Aquatic insects, particularly from the EPT taxa (orders Ephemeroptera [mayflies], Plecoptera [stoneflies], and Trichoptera [caddisflies]), are an important food source for trout and other stream inhabitants, but the impact trout have on EPT populations is unclear. Our objective for this study is to compare the density of EPT taxa in a stream where trout are stocked (treatment) and a stream where trout are not stocked (control), before and after trout stocking events in spring 2022. We hypothesize that trout stocking leads to a statistically significant decline in EPT aquatic insect density. Specifically, we expect to see a decrease in aquatic insect density after a stocking event in the treatment stream, while the control stream density should remain stable. During each time period, we will use a systematic sampling design in which we measure densities within five 40 m reaches for each stream and sample aquatic insect densities a total of 10 times per reach ( $n = 50$  samples per stream) using a Surber sampler, a tool for determining benthic aquatic insect densities. We will collect, sort, identify to family, and enumerate insects in the lab and use an analysis of variance (ANOVA) to compare the abundance of each family in each stream at each time point. This project is in progress and sampling will be complete by April 2022, with data analysis complete during summer 2022. Our results could provide insight into the impact stocked trout have on stream communities. Quantifying how trout stocking alters the quantity and composition of aquatic insect communities could improve overall management decisions.

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## Poster #26

### mRNA Transcript Therapy for Treatment of SMA (CSRF)

**Mentor:** Congyue Peng, IIT Ctr Medical Devices/Sensor

**Students:** Anna Robinson, Microbiology; Brij Patel, Biochemistry; Kali Smolinski, Biological Sciences

Spinal muscular atrophy (SMA) is a neurodegenerative genetic disease caused by non-functional SMN protein due to mutations in the SMN1 gene. We hypothesize that we can make a cheaper alternative to current SMA treatments by delivering functional mRNA transcripts of the SMN1 gene intrathecally to subjects impacted by this disease. We have effectively generated our SMN1 transcripts from plasmids containing the gene and are happy with our high yield. Currently we are working on transfecting dental pulp stem cells with the transcript to test our idea in vitro. We have already grown our DPSCs and are working on encapsulating our SMN1 transcripts into lipid nanoparticles for delivery into the cells. If our cell model is successful we hope to move onto a mice model to transfect the transgenic SMA mice intrathecally with SMN1 mRNA. While there are treatment options available, their extremely high cost ranging in the millions, makes developing a more cost-efficient therapy very important.

## Poster #29

### Recognizing and Analyzing Misconceptions and Accessibility of Radiation Education (CSRF)

**Mentor:** Elliot Ennis, Chemistry

**Students:** Chlo Forenzo, Chemical Engineering

Only a small segment of most public school national curriculums are dedicated to the education of radiation and radioactivity. However, with more and more people getting their news and information from unmonitored websites and biased news networks, it has become more important than ever for the public to not only be able to recognize misconceptions and misunderstandings of these important topics, but also to seek out and improve discrepancies between these truths and the information being presented in schools. In this project, we investigated and established the gaps that exist in radiation education, specifically researching: is there a relationship between substantial gaps in education and shared characteristics of groups of people, have the substantial gaps always existed, when and how did they arise, and are the gaps a result of a lack of educational accessibility. Through survey research, we collected responses to various types of questions regarding both common misconceptions of radiation as well as demographic information, seeking to discover possible solutions and implementations to improve the discrepancies conveyed in our results.

## Poster #30

### Caught in the Net: Predicting Phishing Susceptibility Across the Lifespan (CSRF)

**Mentor:** Jeffrey Black, Human Factors Psychology, Dawn Sarno, Psychology

**Students:** Maggie Harris, Psychology

Previous research has demonstrated conflicting predictors of phishing susceptibility. For instance, impulsivity has been linked to both enhanced resiliency and susceptibility to phishing attacks. The present study clarifies past findings by exploring individual differences in phishing susceptibility with a diverse online sample. Participants completed a survey that included questions regarding demographics, personality (i.e., Big 5, impulsivity, curiosity), and phishing awareness (PAS) and then classified 50 legitimate and phishing emails. Results indicated that participants had better discrimination abilities when they were older, more agreeable, and more open to experience. Participants displayed poorer discrimination abilities when they were more impulsive and more extraverted. Overall, these results identified several vulnerable populations that would benefit from targeted intervention. This work was supported by the Clemson University Creative Inquiry program.

## Poster #32

### Examining the Support Women Athletes Receive from the Student Body (CSRF)

**Mentor:** Mariela Fernandez, Parks, Recreation & Tourism Management

**Students:** Marie Benedetti, Parks, Recreation & Tourism Management

Women continue to face challenges when participating in sport. Women athletes in collegiate settings, for example, continue to report receiving unequal funding, having a lack of women coaches, experiencing limited representation through social media and marketing strategies, and having a general lack of support. More information is needed to determine how universities, including the student body, can provide social support to women athletes. The purpose of this study was to examine the support the student body provides to collegiate women athletes. The research objectives were (1) to examine students' socialization into sport, (2) to examine students' behavior regarding sport attendance at women games, and (3) to examine best practices to support women athletes. To address the objectives, 14 interviews were conducted with currently-enrolled undergraduates in a university located in the southeast. Data analysis consisted of open, axial, and selective coding. Preliminary findings suggested that students were socialized early on to not value women sports as highly as men sports. Students' socialization may have translated into current-day behavior, which included a lack of appreciation for women athletes' skills, talent, games, matches, and events. For universities wanting to increase support for their women athletes, they could distribute additional information via physical advertising, social media posts, and word of mouth advertising, offering additional transportation to campus and more convenient parking for commuters and employees, and support and announcements released by university presidents and the governing body regarding female sporting events.

## Poster #33

### Dynamic Mechanical Behavior of Bio-inspired Graphene-Polymer Nanocomposites (CSRF)

**Mentor:** Zhaoxu Meng, Mechanical Engineering

**Students:** Zhangke Yang, Jane Breslin, Mechanical Engineering

Nacre is a design that has rigid material separated by a softer, more flexible matter that enhances toughness and improves nanocomposite mechanical properties. Coarse-grained molecular dynamics simulations is an alternate method to investigate mechanical behaviors that are difficult to observe in empirical studies. We created a model system with alternate layers of rigid multi-layer graphene (MLG) and soft polymethyl methacrylate (PMMA) and expose the system to ballistic impact. Decreased thickness and increased layers had a higher elastic modulus from the nanoconfinement effect of graphene on PMMA. The structure of MLG-PMMA films greatly influenced impact resistance and failure mechanisms. This study provides innovative insights to designing protective films with superb impact resistance. We acknowledge Clemson University for use of the Palmetto cluster and startup funds, SC TRIMH support, GRF from NASA SC Space Grant Consortium, and partial support by the NSF and SC EPSCoR Program.

## Poster #61

### The Public's Conceptions of Basic Skin Care (CSRF)

**Mentor:** Elliot Ennis, Chemistry

**Student:** Bella Chopra, Biological Sciences

The rising prevalence of social media in society has been an excellent platform for the sharing of ways of life, opinions, facts, and information. However, there is little filter for false or misleading information that can be found or shared on social media, and when it comes to information about medicine and health, it poses a danger. Since most forms of social media are centered around photos, there is a lot of misinformation about dermatological concepts as portraits are essentially photos of skin. A recent study found that only 35.5% of information about dermatology being shared on websites was precise. This leaves 65% that is either inaccurate or misleading. To test the effects of this misinformation on the public's knowledge of dermatological concepts, we have surveyed a large population using true or false questions to common misconceptions. Results of our Qualtrics survey will be presented.

## Poster #62

### Survey of Knowledge of Common Nutrition Misconceptions to Assess Knowledge Based on Age and Education Demographics (CSRF)

**Mentor:** Elliot Ennis, Chemistry

**Student:** Rachel Carter, Microbiology

Nutrition has impacts on our everyday lives and our health. Food can bring families and friends together and has cultural importance, but how knowledgeable are people on the nutrition behind their food? The aim of this survey was to gain knowledge on what misconceptions are common about nutrition and to provide an informational fact sheet at the end of the survey to help correct any misconceptions. Participants of the survey are Clemson University students and faculty, along with the local community. Qualtrics was used to disseminate the survey which included informed consent, demographic questions, nine nutrition statements that participants rated their level of agreement with and five true or false questions. Preliminary results highlighted differences seen between age and education level demographics. Participants aged 18-22 were more knowledgeable on the topic of GMOs than those participants aged 40 years or older, however the 40+ age group was more knowledgeable about protein content of food. When comparing the two extremes of household income, \$0-50,000 a year to \$200,000+ a year, those in the higher bracket of yearly income were more knowledgeable about added sugar and nutritional value compared to those of the lowest household income. The results of this survey can be used to see what misconceptions are common to a specific demographic due to age and education but along with other factors such as gender.

## Poster #63

### Highly Active Single-Atom Pt1/MoxC Catalysts for Mitigating CO<sub>2</sub> Emissions at Mild Temperatures (CSRF)

**Mentor:** Ming Yang, Chemical and Biomolecular Engineering

**Students:** Conner Rapp, Lindsay Molina, Chemical Engineering

CO<sub>2</sub> emissions has been identified as the largest contributor to global warming. Thermocatalytic conversion of CO<sub>2</sub> to CO, a versatile building block molecule for many value-added chemicals, is one of the leading strategies towards tackling global warming and ultimately, climate change. A search for low-cost but highly active catalyst that offers high CO yield while suppressing methane formation is key to scaling up this strategy. Catalysts based on traditional metal-based oxides do not meet these expectations. Herein, we report a new class of highly active, near 100 % CO-selective, low temperature catalysts (250 - 400 °C) for reverse water gas shift reaction based on atomically dispersed platinum species anchored on molybdenum carbide (Pt1/MoxC). This excellent performance is retained over 15 hours under reaction conditions, thereby confirming the durability of our catalysts. Moreso, our newly developed catalysts outperform literature benchmark catalysts by at least 2-3 magnitudes. The Pt loadings (0.1-1.0 wt%) on high-surface-area MoxC nanorods were tuned to develop a group of catalysts with similar coordination environments and electronic states but with varying surface density. Interestingly, the turnover frequency (TOF) of the Pt1/MoxC catalysts with similar active site, local and electronic properties varied inversely with the Pt atomic site density. These catalysts were characterized via detailed kinetic studies, microscopy and spectroscopy techniques. Through these studies, we provide evidence that the natural expectation that increasing the surface concentration of supported atomic species will enhance the overall performance of single atom catalysts is not always true, thus requiring careful evaluation. In summary, our new catalysts can serve as a potential candidate for cost-efficient CO<sub>2</sub> catalytic conversion technology.

## Poster #64

### MUSC Hollings Cancer Center HPV Campaign (CSRF)

**Student:** Jordyn Carroll, Campus Recreation

This study aims to broadly disseminate information about Human papilloma virus (HPV) vaccination through an HPV digital media campaign ad sponsored by the Medical University of South Carolina Hollings Cancer Center. Ad related facts/data are intended to positively influence social norms regarding vaccination, and directly drive parents to get their children vaccinated.

Visual ads are displayed through a partnership with WCSC in the form of “donut ads” (three, 30 second video ads, with the middle message raising awareness about HIV impact in South Carolina). A series of educational interview commercials have also been produced, depicting survivors or their parents. The target audience of the video ads are parents with children in the home (ages 11-18 years old) in Aiken, Charleston, Rock Hill, Columbia, Greenville, Hilton Head/Beaufort and a 50-mile radius around each city. Search targeting techniques, geofencing, and contextual targeting, among other methodologies, are utilized to gear vaccine messaging to the target population.

Overall findings indicate more than 990,000 impressions (views) made and a .13% engagement rate across all ads overall. Further, a .12% clickthrough has been generated, which is above the national benchmark of .10%. When compared to normal geofencing, which serves ads to users after they enter a target geo-fence and for up to 30-days afterward, Addressable geofencing targeting tactics yield the most impressions and clicks. These “addressable geofences” include ads served across websites and mobile apps within the homes of those in the target geography.

Results from the HPV campaign provide meaningful insight into effective targeting tactics, display forms, and messages seen. This research provides a unique framework for not only future HPV campaigns, but all vaccination efforts in our modern, technology-driven society.

## Poster #65

### Cuckoo Egg Morphology in the UV Range (CSRF)

**Mentor:** Virginia Abernathy, Biological Sciences

**Student:** Emily Bonds, Biological Sciences

In any coevolutionary interaction, the physiology of one or both species may influence the effectiveness of adaptations in the other species. For example, some brood parasitic cuckoos have evolved eggs that mimic the appearance of their hosts' eggs to avoid egg rejection by the host. Because egg rejection often requires visual cues, the visual system of the host may affect the evolution of the brood parasite's egg morphology. Bird species have two types of visual systems, with some being able to see farther into the UV range (300-400 nm) than others. Therefore, a host's visual system could determine whether there is selection pressure on the brood parasite to evolve mimicry in all or only a part of the UV range. We suggest that the visual system of parasitic cuckoo hosts is one mechanism that influences egg UV reflectance in certain parasitic cuckoo species. To find support for this hypothesis, we did an exhaustive search of the literature for graphs showing the spectral reflectance (color) of eggs of parasitic cuckoo species and their hosts across a bird's visual range (300-700 nm). Using Web Plot Digitizer v. 4.5, we traced each graph in order to extract the spectral reflectance values, which we then further processed using the pavo package in the R Statistical Package. This will allow us to use the data in a statistical analysis to determine if the host visual system might predict whether cuckoo eggs show mimetic reflectance in the UV range. Our research represents a previously unexplored aspect of the coevolutionary arms race between brood parasites and their hosts and demonstrates the importance of considering the visual perspective of the species being studied.

## Poster #66

### Mitochondrial Genomics: Resources for Endangered Species (CSRF)

**Mentor:** Virginia Abernathy, Biological Sciences

**Student:** Emily Bonds, Biological Sciences

A considerable number of vertebrate and invertebrate species in the Neotropics are subject to major environmental change and anthropocentric pressures, and thus, are considered 'endangered' by the IUCN Red List of Threatened Species. This CI generates genomic resources for endangered species. Specifically, we are testing if complete mitochondrial genomes can be assembled from non-enriched metagenomic libraries generated from eDNA (field scats) using Illumina reads. Using a direct

assembly strategy, mitogenome from the six species above were assembled and circularized using the pipeline GetOrganelle with a coverage above 10x. Different phylogenomic analyses based on all PCGs demonstrated that the mitochondrial genomes assembled from eDNA can distinguish the same samples from closely and distantly related co-familial species. This new genomic resources represent a new tool to improve our understanding about the conservation biology and evolutionary history of endemic and endangered

## Poster #67

### A First Genomic Resource for the Neotropical Otter *Lontra longicaudis* (Carnivora: Mustelidae): Assembly and Characterization of the Complete Mitochondrial Genome (CSRF)

**Mentor:** Juan Antonio Baeza Migueles, Biological Sciences

**Student:** Erin Griffin, Biological Sciences

The Neotropical river otter *Lontra longicaudis* is a top predator in aquatic ecosystems from North, Central, and South America and is subjected to substantial environmental distress due to historic and contemporary anthropogenic disturbance. Currently, *L. longicaudis* is considered 'near threatened' by the IUCN Red List of Threatened Species. This study renders the first genomic resource for *L. longicaudis*; its mitochondrial genome was assembled and characterized in detail. The AT-rich mitochondrial genome of *L. longicaudis* was 16,436 bp in length and encoded 13 protein coding genes (PCGs), 22 transfer RNA genes, 2 ribosomal RNA genes, and a 994 bp long putative Control Region (CR). The heavy use of CTA (Leu), ATA (Met), and ATC (Ile) codons in PCGs contribute to the AT-rich nature of this genome. Out of 22 tRNAs, tRNA-Ser (AGY) (trnS1) lacked a typical 'cloverleaf' secondary structure. In the CR, numerous microsatellites and two tandem repeats were detected as well as multiple 'hairpin' structures.  $Ka/Ks$  values estimated for all but one PCG were  $< 1$ , indicating purifying selection in most PCGs. *atp8* experienced neutral selection. A phylogenomic analysis based on PCGs confirms the monophyly of the family Mustelidae and also supports the monophyletic status of the subfamilies Guloinae, Helictidinae, Melinae, Mustelinae, and Lutrinae, except Ictonychinae, found to be polyphyletic. In the Lutrinae, *L. longicaudis* had a basal position. The characterization of a complete mitochondrial genome in the Neotropical river otter *L. longicaudis* constitutes the first step towards supporting conservation efforts using genomic tools in this and other mustelids inhabiting aquatic neotropical environments under considerable contemporary anthropogenic disturbance.

## Poster #68

### Developing a Method to Decellularize Bovine Intervertebral Discs Using Supercritical Carbon Dioxide (CSRF)

**Mentor:** Jeremy Mercuri, Bioengineering

**Co-Author:** Nathan Aufderheide, Bioengineering

**Students:** Heather Cosh, Microbiology, A'anna Kelly, Nick Morrison, Abigail Shaffer, Bioengineering; Audrey Wessinger, General Engineering

Intervertebral Disc Degeneration (IVDD) is the leading cause of back pain in the United States, and current treatments fail to fix the underlying problem. Tissue engineering of the Intervertebral 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<sub>2</sub> (ScCO<sub>2</sub>) decellularization and its effect on the biological tissue mechanical properties. Through a literature review, the CI students developed the hypothesis that ScCO<sub>2</sub>, 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<sub>2</sub> 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<sub>2</sub>

## Poster #95

### Short Chain Fatty Acid Modulation of *Clostridioides difficile* Toxin Production (CSRF)

**Mentor:** Anna Seekatz, Biological Sciences

**Co-Author:** Michelle Baldassare, Microbiology

**Students:** Julian Coles, Microbiology

*Clostridioides difficile* is a prevalent healthcare-associated pathogen that is known to be influenced by the human gut microbiome. Toxin production is considered to be one of the leading factors in the organism's pathogenicity; however, its regulation is not widely understood. Our previous data suggests that the bacterial fermentation products, short chain fatty acids (SCFAs), can modify growth of *C. difficile* strain 630. To investigate the effect of the SCFAs acetate, propionate, and butyrate on toxin production by *C. difficile*, we used an in vitro cell rounding assay. Cells were incubated with filtrates from bacterial growth with or without each SCFA at different doses and timepoints. We observed increased toxin production in the presence of butyrate and acetate, whereas propionate had a minimal impact. Compared to standard media, a timepoint analysis revealed that bacteria grown in the presence of each SCFA induced toxin production earlier. Additionally, we observed a dose-dependent increase in toxin production with butyrate. This data suggests toxin production is increased in the presence of higher concentrations of butyrate. Going forward, we aim to investigate the regulatory aspect of toxin production by butyrate using RT-qPCR of toxin regulators at different timepoints of *C. difficile* growth.

## Poster #96

### Effects of Tropical Storm Fred on Benthic Stream Communities (CSRF)

**Mentor:** Daniel Knapp, Wildlife and Fisheries Biology

**Co-Author:** Drew Kanen, Biological Sciences

Benthic, or bottom-dwelling, species can be highly diverse within riverine ecosystems and play important roles in food webs and many ecosystem functions. Benthic communities rely on the biotic and abiotic structural components of river bottoms such as rocks and plant matter for protection, but these components are not impervious to change. Catastrophic disturbance events such as earthquakes, tsunamis, and floods can significantly alter the structure of ecosystems and adversely affect local communities, and stream communities are especially prone to disturbance via flooding due to the dramatic increases in water discharge that result from flooding events. Streams in Pisgah National Forest in western North Carolina were subject to flooding in August 2021 after Tropical Storm Fred brought heavy rains to the area, and it appears that the flooding heavily altered the benthic substrate composition of many streams. Our objective is to determine how flooding from Tropical Storm Fred impacted the abundance and species composition of benthic stream communities. We performed visual density surveys using 1-m<sup>2</sup> quadrats in five reaches of the Davidson and South Toe rivers in Pisgah National Forest. We compared abundance and richness within these stream communities before and after flooding using non-metric multidimensional scaling (NMDS) and found noticeable dissimilarity within the communities of the two groups. Our data further suggests that this dissimilarity manifested as a decrease in abundance of many benthic species. As urbanization and climate change increase the frequency and severity of large flooding events, our results suggest that benthic vertebrate communities may be vulnerable if this trend continues.

## Poster #97

### Role of CAF1G in Meiotic Homologous Recombination in *Arabidopsis Thaliana* (CSRF)

**Mentors:** Garrett Buzzard, Biochemistry and Molecular Biology; Michael Sehorn, Genetics and Biochemistry

**Student:** Daniel Hiott, Genetics

Dmc1 is a meiotic recombinase composed of a ring of eight subunits which is integral to DNA double-strand break (DSB) repair using the homologous recombination pathway. The homologous recombination pathway uses a homologous sister chromatid as a template for repair DNA synthesis. After a DSB, DNA end resection occurs, leaving a 3'-overhang. Dmc1 polymerizes on this ssDNA to form a right-handed helical protein filament. Then, other protein factors are recruited to promote the search for a homologous DNA region so strand invasion can be conducted. There are protein factors that interact with Dmc1, such as CAF1G in *Arabidopsis thaliana*, that modulate the activity of Dmc1. CAF1G interacts with Dmc1 in order to properly repair these double strand breaks, and for crossing over during meiosis I to generate genetic diversity. The mechanism by which CAF1G functions with Dmc1 is unknown. This project is expected to show the importance of CAF1G interaction with atDmc1 during meiosis and DNA double-strand break repair. I first characterized the purified atDmc1 protein in various biochemical and recombination assays. Inclusion of CAF1G will allow me to determine the effect CAF1G has on atDmc1 recombination activities.

## Poster #98

### Labeling Discrete Motions Calculated from Inertial Measurements in a Suturing Simulator (CSRF)

**Mentor:** Ravikiran Singapogu, Bioengineering

**Student:** Frankie Reid, Electrical Engineering

Suturing is an integral part of surgery. One crucial part of suturing is wrist-roll wherein surgeons choose either forehand or backhand motions to drive each suture based on their position relative to the suturing site. The suturing platform is printed based on a clockface model with twelve suture areas in each trial. Two trakSTAR sensors are used to measure the positions of the two arms of the needle holder, and an ATI mini40 is used to measure the force and torque on the suturing platform. Python is used to process the data and determine whether the user is driving the needle. Combining these metrics show promise for labeling the driving motions. The torque data indicates when needle driving is occurring, and the distance between the arms indicates when the needle holder is open. Automated labeling of needle driving motions is a critical piece in forehand vs. backhand detection during suturing. Ultimately, this project could provide feedback for assessing and improving suturing skills, specifically by comparing the extracted metrics for performance done by forehanded vs. backhanded sutures. The suturing project team thanks the NIH for their financial support.

## Poster #99

### Biomarkers for GM1 Gangliosidosis (CSRF)

**Students:** Morgan Ethridge, Biochemistry; Alexandria Hood, Biological Sciences; Caroline Ross, Chemical Engineering

GM1 Gangliosidosis is a lysosomal storage disorder categorized by a deficiency of the enzyme, B-galactosidase. We aim to observe changes in mitochondrial membrane potential, then correlate these changes to enzyme upregulation. GM1SV3 (diseased) and NSV3 (healthy) cells were seeded for the JC-1 and Hoechst assay. A plate reader was used for fluorescence, and cells were observed using microscopy. For the enzyme assay, cells were seeded, scraped, centrifuged, and resuspended. The enzyme activities of B-gal, Hex-A, Hex-T, and Mann were measured. In the JC-1 assay, the GM1 cells were observed to be green, indicating further disease progression. The NSV3 cells glowed red, indicating they are healthy. The Hoechst assay was a nuclear stain used to normalize data and track the number of live cells. The enzyme assay data showed elevated levels of Hex-A, Hex-T, and Mann and low levels of B-gal in GM1 cells compared to NSV3 cells. We then starved the NSV3 cells in different time increments to mimic disease progression, and observed an increase in the amount of green cells observed. As time progressed, the cells became more diseased, thus more green. The results of the JC-1 and enzyme assay prove that there is a correlation between membrane potential and enzyme activity. Successfully identifying mitochondrial dysfunction as a biomarker will be a step for treating LSDs. We would like to acknowledge the CI program and Dr. Larsen's Laboratory.

## Poster #100

### Does a Good Doctor Ask a lot of Questions? A Quantitative Approach to Assessing Communication in Medical Training Simulations (CSRF)

**Student:** Corbin Goodwin, Bioengineering

Communication, along with other essential non-technical skills (NTS), is critical for surgical safety; over 40% of errors in surgery have been attributed to communication failures. Thus, teaching medical students, the future clinicians, these skills is critical. NTS assessments often rely on subjective evaluation by expert raters, which is time-consuming, training-intensive, and subject to bias. The objective of this study is to quantify NTS of surgical trainees during simulated care scenarios through content-coding communication. Communication skills of 10 fourth year medical students were quantified through content-coding. Participants were stratified into two groups by a baseline NTS score. Those in the intervention group received NTS training, while the other half of students received technical training. We expect that participants' communication skills, as quantified through content-coding and NTS assessment, will be higher for those in the intervention group. By incorporating objective assessments into medical training, better evaluation and feedback for trainees can be completed, which will ultimately enhance patient safety.

## Poster #101

### A Demonstration of Adversarial Emulation Through The Development of A Command-and-Control Server (CSRF)

**Students:** Nick Rabon, Taylor Le, Amanda Esposito, Ellie Swaim, Adeem Mawani, Kelly Weisbach, Melissa Haueter, Computer Science; Lauren Hollingsworth, Management

**Introduction:** Develop a simple C2 (Command and Control) framework that manages the communications between a compromised machine and the C2 server. Furthermore, this framework should be able to generate a simple implant to use on the compromised machine. The implant will be utilized to run different commands by the “attackers”. In order to issue these commands, a Raspberry Pi will be utilized with connection via SSH. This research was carried out to convey the potential

**Methods:** This demonstration is conducted by utilizing a Raspberry Pi 4 4G in correlation with a Windows Laptop with Window's Defender features turned off. A C2 server will be developed and implemented in Python and capable of generating custom virus payloads written in Nim. These payloads will then be delivered to the victim laptop, hence displaying the potentialities of bad actor capabilities.

**Expected Results:** Anticipated results include an increased knowledge of adversarial attack vectors and methodology, as well as a newfound understanding of Red Team tactics. With this perspective, the CSOC hopes to expand our skillset within offensive security to have the ability to actively participate in penetration testing in the future.

**Conclusion:** From an outward perspective, the results from this demonstration should display the capabilities of bad actors to everyday users and convey the attacker lifecycle of vulnerability exploitation in full.

## Poster #127

### This Is How We Move It: Physical Activity Distinctions Between Global Occupations (CSRF)

**Mentors:** Alec Gonzales, Jackie Cha, Industrial Engineering

**Undergraduate Student:** Hannah Stribling, Industrial Engineering

There are varying levels of physical activity between different occupations, and these levels for the same job can differ among global populations. The purpose of this review was to identify and compare physical activity among occupations and across countries, grouped as continents. A systematic review was conducted adhering to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Five databases were searched, and 10,923 articles were systematically reviewed. Twelve studies were included based on reported measurements of physical activity in metabolic equivalents (METs) using the International Physical Activity Questionnaire. Preliminary results show that healthcare practitioners report the highest levels of physical activity, whereas those in the education, training, and library sector report the lowest. It was found that occupations in North America reported the greatest median MET of all continents included in this study. These results can be used to build a database of physical activity levels of different work populations and regions for researchers to use for benchmarking.

## Poster #128

### Lanthanum-Doped Carbon Dots for Rapid Phosphorus Sensing in Environmental Samples (CSRF)

**Mentors:** Diana Vanegas Gamboa, Environmental Engineering and Earth Sciences; Eric McLamore, Agricultural Sciences

**Undergraduate Student:** Sam Holberg, Biosystems Engineering

Lanthanum-doped carbon dots (LaCD) were developed for rapid detection of orthophosphate in environmental water samples. D-glucose was used as the carbon source and combined with lanthanum carbonate, and a surfactant during one-pot carbonization in a sealed glass reactor (microwave pyrolysis). The native solution contained colloids (up to 5 $\mu$ m) and amorphous nanoparticles (as small as 2nm). LaCD solutions (various size ranges) were tested as fluorescent sensors toward orthophosphate in water samples. LaCD emits fluorescence when excited with UV light, with a Stokes shift of approximately 110 nm (IEX=390 nm; IEM=500 nm). In the presence of potassium diphosphate standard, fluorescence decreases in a linear fashion. The Stern-Volmer constant KSV for this reaction was 7.1 (R<sup>2</sup>=0.90), indicating a quenching mechanism may be the underlying mechanism for the noted decrease in fluorescence. Ongoing experiments aim to characterize the lifetime of the supposed quenching reaction and perform detailed analyses to rule out non-photo-chemical mechanisms. A portable detection

system was developed using a fiber optic (pocket) spectrometer and a 3D-printed measurement cell. Using this system, calibration curves were prepared for  $K_2HPO_4$ . Phosphate in soil and water systems can negatively affect human health, and the development of a low-cost sensor can benefit rural communities harmed by poor agricultural practices. Agricultural and urban runoff can lead to an increase in phosphate concentrations in natural systems, which causes harmful algal blooms (HABs).

## Poster #129

### The Public's Perception and Knowledge of Human Body Detoxification (CSRF)

**Mentor:** Elliot Ennis, Chemistry

**Undergraduate Students:** Stephanie Davis, Psychology; Katharine Coplin, Food Science and Human Nutrition

Body detoxification through sweating, juice cleanses, and supplementation has become a popular dieting strategy. Detox diets claim to facilitate weight loss and increase overall health by eliminating toxic materials from the body. Prior studies have found little clinical evidence to support these claims. Despite these studies, the detox product industry has grown. The purpose of this study is to compile and analyze the views of Clemson students and the general public of their knowledge and thoughts of common misconceptions related to detoxification of the body. A secondary aim is to compare reviews of juice cleanses to ideas of sweat cleanses. A Qualtrics survey was created and distributed digitally (social media) and a flier format was posted throughout the Clemson campus. Preliminary results of the survey revealed: 93% of respondents were familiar with detox products, with social media being the highest reported exposure to those products. Other misconceptions centered around body detoxification were found and will be presented.

## Poster #130

### An Evaluation of Beliefs regarding Companion Animal Nutrition (CSRF)

**Mentor:** Elliot Ennis, Chemistry

**Undergraduate Student:** Faith Shupard, Animal and Veterinary Science

Nutrition is an integral component of an animal's overall health and well being. Ensuring that an animal's nutritional requirements are met will prevent diseases of malnourishment, improve immunity, and support the growth, development, and daily maintenance of the animal. Nutrition is often overlooked as a critical aspect of veterinary medicine, however proper nutrition can serve as a foundation for preventative medicine. The purpose of this study is to investigate a potential correlation between the level of pet care provided and quality of pet food purchased by pet owners and their familiarity with the basics of companion animal nutrition. This study is designed to evaluate the pet owner's knowledge of basic companion animal nutrition and the common associated pathologies. It is hypothesized that if a pet owner indicates that they utilize reliable resources to obtain nutritional advice and have a strong relationship with their veterinarian through the pre-survey questions, then they will answer a higher percentage of the survey questions correctly. Pet owners and veterinary professionals alike should be concerned with the results of this study as an increasingly educated generation of pet owners may lead to a healthier and happier pet population. Veterinary professionals are encouraged to utilize the results of this study to understand the most prevalent nutritional misconceptions among pet owners and inform them on how to best emphasize nutrition in their practice.

## Poster #131

### Examining the Influence of Instagram on Collegiate Female Athletes' Perceived Athletic Performance (CSRF)

**Mentors:** Iryna Sharaievska, Mariela Fernandez, Parks, Recreation and Tourism Management

**Undergraduate Student:** Cayman Williams, Parks, Recreation & Tourism Management

Social media, particularly Instagram, is increasingly becoming a way in which athletes can interact with their followers. Athletes on this platform, for example, are known to highlight their athletic performance via their personal and team accounts. There is little research on female athletes' communication on social media and how this interaction with followers affects athletes. Therefore, the purpose of this study is to examine the influence of Instagram on collegiate female athletes' perceived athletic performance. The research objectives will specifically address: (a) how often athletes use social media, (b) the type of content that athletes post, (c) how often athletes are featured on their teams' social media page, and (d) how social media interactions with fans influence athletes. To address the research objectives, 20 female athletes from a southeastern D-1 university will be interviewed. Data analysis will include open, axial, and selective coding. By doing this study, athletic departments may be able to implement policies that discuss social media usage.

## Poster #132

### Increasing Pedestrian Safety for Individuals with Intellectual Disabilities (CSRF)

**Mentor:** Joseph Ryan, Education and Human Development

**Co-Authors:** Jordan Stierle, Joanne Cunningham, Special Education

There are 172,814 nonfatal pedestrian related accidents each year in the United States. Individuals with intellectual disabilities (ID) are at increased safety risk given they often experience a combination of both intellectual and adaptive functioning deficits that impact conceptual, social, and practical domains. This study investigated the efficacy of providing a combination of direct instruction and task analysis to teach four young adults with ID how to safely navigate street crossings at locations that lack traffic signals. Students were identified for training given they currently performed only half of the procedural safety steps (e.g., looking both ways) recommended by the National Transportation Safety Board. The study recently received university IRB approval and will be conducted by several special education doctoral students in March.

## Poster #133

### Dye Fading in Cotton Fabrics to Determine Time Since Death in Forensic Context (CSRF)

**Mentor:** Katherine Weisensee, Sociology, Anthropology and Criminal Justice

**Undergraduate Student:** Alexa Geist, Chemistry

The determination of time since death is an important variable in forensic casework. Current methods to determine time since death rely on the body, resulting in variable results based on characteristics such as age and sex. Cotton textiles are commonly found in these cases and can be considered less variable due to known manufacturing standards. This study aims to use dye fading in textiles as a measure of time independent of the body. In this study, red, white, and blue cotton t-shirts were placed outdoors for 10 weeks, and samples were taken weekly from the front and back of the shirt, where the back of the shirt was in direct contact with the soil. These samples were then analyzed for wavelength at maximum reflectance using UV-Visible Spectrometry. This wavelength signifies the true color of the fabric. The results of this project are in progress and more data will be available in the coming weeks. Presently, we have observed the front of the t-shirts fading more rapidly, allowing the creation of a ratio between front and back samples. With these results, we will determine a correlation of fading with respect to time to establish time since death when human remains are found.

## Poster #134

### Food availability in Oconee County (CSRF)

**Mentor:** Mariela Fernandez, Parks, Recreation and Tourism Management

**Undergraduate Students:** Ava Keating, Food Science and Human Nutrition; Shaye Gaskill, Industrial Engineering

The purpose of this study was to determine what food items are available in Oconee County SNAP vendor stores. We expected that food items would be limited in non-grocery stores. We also anticipated that the food prices would be higher in non-grocery stores. To address the research question, we identified staple foods within each category (Fruits or vegetables; Meat, poultry, or fish; Dairy products; Breads or cereals) from the USDA's SNAP Staple Foods information sheet. The foods of interest included: bread, lunch meat, tuna, cheese, eggs, spaghetti, milk, chicken noodle soup, fresh fruits and vegetables, rice, water, and baby formula. A food inventory was created in Qualtrics to mark as the team visited SNAP vendor stores. The team visited SNAP vendors located in Seneca, Walhalla, Fair Play, Mountain Rest, Salem, Westminster, and West Union. Findings indicated that convenience stores had less food items, and they rarely had fruits and vegetables. Convenience and pharmacy stores were more expensive than grocery stores. This study provides a better glimpse of food access in rural communities.

## Poster #160

### SARS-CoV-2 Neutralizing Antibody Dynamics in Saliva (CSRF)

**Mentor:** Congyue Peng, IIT Ctr Medical Devices/Sensor

**Undergraduate Students:** Paige Comerford, Biological Sciences, Alex Pratt, Biological Sciences

This project focuses on neutralizing antibody detection regarding the spike protein of SARS-CoV-2 and ACE2 on the host cell. Data is collected by surveying the amount of neutralizing antibody in individuals elicited from infection due to SARS-CoV-2 to create a simple, non-invasive, neutralizing antibody test using current sampling methods. It also looks to assess how the neutralizing antibody inhibits the binding interaction of the spike protein and ACE2 receptor. Total antibody levels depict an indication of immune response. Specifically, the neutralizing antibody is working against the SARS-CoV-2 infection. The method used to conduct research is a neutralizing antibody detection sVNT protocol. The sVNT test requires a biosafety level two lab and has a streamlined process of obtaining quick, accurate results. This method requires a maximum of three hours of experimentation and does not require live pathogens. We examined longitudinal neutralizing antibody dynamics against spike proteins.

## Poster #161

### Autism Language Use in Academic Articles (CSRF)

**Mentor:** Jennifer Bisson, Psychology

**Undergraduate Students:** Layla Wheelon, Allison Torres, Kelsey Gentile, Emily Rogers, Psychology

Three main structures of language are used to discuss disability, including person-first, identity-first, and no person language. The present study explored the language used in academic articles to discuss Autism Spectrum Disorder (ASD). We predicted that there would be more "person first" language used (compared to disability first language). We also predicted that publication year would affect type of language use. To examine these predictions, scholarly databases were used to generate a list of 16,290 articles related to ASD, and every 45th article was reviewed. In total, 353 articles were used for analysis. Within each article, ASD terms were identified (e.g., Autism, Autism Spectrum Disorder, ASD, Autistic, Asperger, etc.). The terms were then coded in the context of the sentence as "person first," "disability first," or "no person". Percentages of each language type were taken by dividing the word count for each language type by the total word count in the article.

## Poster #162

### Protection motivation theory unmasked: Applying the Protection Motivation Theory of health to skepticism toward COVID mask and vaccine mandates (CSRF)

**Mentor:** Robin Kowalski, Psychology

**Co-Authors:** Chelsea Robbins, Industrial and Organizational Psychology, Hailey Carroll, Industrial and Organizational Psychology, Kenzie Hurley, Industrial and Organizational Psychology

**Undergraduate Students:** Nick Deas, Computer Science; Sophie Finnell, Kelly Evans, Emily Radovic, Psychology; Lyndsey Brewer, Criminal Justice; Gabriela Mochizuki, Biological Sciences

Variants of COVID-19 have sparked controversy regarding mask and/or vaccine mandates in some sectors of the country. Many people hold polarized opinions about such mandates, and it is uncertain what predicts attitudes towards these protective behavior mandates. This study examined skepticism of 774 respondents toward these mandates as a function of the Protection Motivation Theory (PMT) of health. Hierarchical linear regressions examined Protection Motivation (PM) as a predictor of mask and vaccine mandate skepticism independently and with political party affiliation as a control. PM alone accounted for 76% of the variance in mask mandate skepticism and 65% in vaccine mandate skepticism. When political affiliation was entered (accounting for 28% of the variance in mask mandate skepticism and 26% in vaccine mandate skepticism), PM still accounted for significant percentages of variance in both mask (50%) and vaccine (43%) mandate skepticism. Across regressions only perceived vulnerability failed to account for unique variance.

## Poster #163

### Examining Delay Discounting in Individuals with Opioid use Disorder Participants and Healthy Controls (CSRF)

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

**Undergraduate Students:** Stephanie Davis, Ethan Hammond, Sarah Roth, Psychology

**Background:** Impulsivity is associated with substance use, both as a determinant and consequence (de Wit, 2009). Delay discounting is a behavioral measure of impulsivity that describes the rate at which a reward loses value as the delay to its receipt increases. Prior studies have found that people with substance use disorders show a higher rate of delayed discounting than matched, healthy controls (Yi et al., 2010). However, delay discounting has been virtually unexplored among people with opioid use disorder (OUD).

**Aim(s):** This study compared the delay discounting data in individuals with opioid use disorder and healthy controls. A secondary aim was to explore the association between delay discounting and craving, and both depressive and anxiety symptoms.

**Methods:** Participants (N=53) were 23 individuals diagnosed with OUD receiving buprenorphine and 30 healthy controls. All participants completed a computerized delay discounting task in which they chose between two monetary rewards: one smaller, available immediately and the other larger but after a delay. Participants also completed the Patient Health Questionnaire-9, General Anxiety Disorder-7, and a visual analog scale assessing craving. We assessed delay discounting with the logk (higher values indicate greater discounting and impulsivity) and AUClog (lower values indicate greater discounting and impulsivity).

**Results:** Greater logk values ( $p=.006$ ) and lower AUClog values ( $p=.001$ ) were observed among the OUD group compared to the control group. Logk and AUClog values were negatively correlated ( $p<0.001$ ). Logk and AUClog values were not significantly associated with depression, anxiety, or craving.

**Discussion:** Overall, our findings suggest that delay discounting may be a useful task to differentiate healthy controls from subgroups with substance use disorders.

## Poster #164

### Grief and Psychological Wellbeing Among Clemson University Students (CSRF)

**Mentor:** Michael Almond, Counselor Education

**Undergraduate Student:** Michele Scaglione, Health Science

Coping with the death of someone close to you can be especially difficult during the college years. While dealing with this loss, students are at the same time experiencing academic and social pressures, and many are away from home for the first time ever. This study will examine the relationship between grief, specifically experiencing the loss of a family member or close friend in the past 12 months, and psychological health among students at Clemson University. Data reported from The National College Health Assessment (NCHA) will be used to explore this topic. This survey, administered by the American College Health Association (ACHA), is given to college students nationwide as a means to measure their health behaviors and wellbeing. I will be using data of students at Clemson from Spring 2020 in order to analyze the correlation between grief and psychological wellbeing. I hope to provide evidence for the impact that a substantial loss can have on mental health and loneliness, and suggest programs that may be beneficial for students currently experiencing a loss.

## Poster #165

### Hurricane Evacuation Sheltering Demand and Logistics Analysis: Case Study in South Carolina (CSRF)

**Mentor:** Yongjia Song, Industrial Engineering

**Co-Author:** Camden Brady, Industrial Engineering

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

Hurricane evacuation is the rapid movement of a large population away from areas that may potentially be affected by a hurricane. Upon the evacuation order issued by the government, emergency managers will integrate various information from the hurricane forecast, the hazard analysis, the social vulnerabilities, and the population's compliance to evacuation orders, to estimate the demand for sheltering. Shelter operations and the associated disaster relief logistics operations must be adapted to the demand estimation. In this project, we analyze the hurricane evacuation sheltering demand and use Hurricane Florence in South Carolina as a case study. Mathematical optimization models are proposed to understand and potentially improve the disaster relief logistics operations such as relief item prepositions, shelter activation, demand allocation, etc.

## Poster #166

### A Historical Analysis of Clemson University Women's Soccer Team Match Performance Using Machine Learning Methods (CSRF)

**Mentors:** Richard Farthing, Olympic Sports, John D DesJardins, Bioengineering, Jason Avedesian, Sport Science

**Co-Authors:** Connor Moore, Biomedical Data Science and Informatics, Katie Wright, Biomedical Engineering

Soccer coaches use offensive, defensive, and possession match statistics to assess team performance. However, identifying metrics relevant to match success is difficult when coaches need to interpret high dimensional datasets. To help coaches identify key performance indicators of match success, Principal Component Analysis (PCA) is a machine learning method used when the number of features (statistics) approaches or exceeds the number of observations (matches). PCA enables matches to be represented in terms of all statistics at once, but it fails to select the most important match statistics. To overcome this limitation, we used a combination of PCA and Lasso regression (Elastic Net) to analyze the Clemson University Women's Soccer team's historical performance from the 2018 – 2021 seasons. PCA indicated shifts in match style of play since 2018, such as increased total passes and decreased dribbles per game, and Lasso regression selected statistics with the greatest changes in seasonal averages. These results indicate that machine learning methods may be able to select the most important statistics and identify historical shifts in a soccer match dataset.

## Poster #167

### Does climate change affect shorebird nesting phenology in the Eastern and Western United States? (CSRF)

**Mentors:** Melissa Fuentes, Biological Sciences, Virginia Abernathy, Biological Sciences

**Undergraduate Students:** Autum Blanchard, Environmental and Natural Resources; Abby Good, Wildlife and Fisheries Biology; Faith Huntley, Biochemistry; Emily Bonds, Marlisa Bongiovanni, Hampton Warner, Biological Sciences

Previous research suggests a frequent response of organisms to the ongoing Climate Crisis is the adjustment of their reproductive timing or breeding phenology. Shorebirds may be especially vulnerable to increasing temperatures, as many are long-distance migrants with short breeding periods. We investigated the effects of climate change on two shorebird species in the eastern United States, *Tringa semipalmata* and *Charadrius wilsonia*, and one shorebird species in the western United States (California), *Himantopus mexicanus*. We utilized nest observation card data from Cornell's NestWatch program, and information about collected clutches from various museum databases, including clutches from Clemson University's Bob and Betsy Campbell Natural History Museum, to estimate the clutch initiation date of 901 nests from 1852 to 1987. We estimated latitude and longitude for all nest locations and uploaded this data, along with weather station location data downloaded from NOAA (National Oceanic and Atmospheric Administration), into ArcGIS Pro in order to find the five closest weather stations to each clutch. From this list of 357 weather stations, we calculated the average monthly precipitation and temperature of the areas in which nests were found during the breeding season for the years where data was available. These averages will be used in a linear regression analysis to determine if clutch initiation dates of these shorebird species have changed over time in relation to changes in temperature and/or precipitation. As many other studies have found, we predict to see significantly earlier clutch initiation dates depicted over time as a result of the changing climate.

## Poster #195

### Hearing Results (CSRF)

**Mentor:** Jackie Cha, Industrial Engineering

**Co-Author:** Holden Duffie, Industrial Engineering

Vocal features, i.e., speech, play an important role in patient care. These features define the 'sound' of speech and are crucial for clear communication between care teams and patients. In addition to what is being said, prosodic features such as intensity and pitch can influence care practices. The purpose of this research was to study and analyze the different vocal sound waves and patterns during a simulated medical scenario. Audio was recorded of medical trainees and prosodic speech features were calculated. After removing environmental noise, speech features of pitch, intensity, speech duration, and articulation rate for each participant was obtained. Preliminary results provide insights into how prosody features may be related to clinical performance for patient care. By understanding these vocal patterns, communication among care teams and patients can be quantified for improved patient care.

## Poster #197

### Identification of Virulence Genes in the Fungal Pathogen *Cryptococcus neoformans* (CSRF)

**Mentor:** Kerry Smith, Genetics and Biochemistry

**Undergraduate Student:** Emily Bernabe, Biochemistry

*Cryptococcus neoformans* is an invasive fungal pathogen that causes nearly one million cases of cryptococcal meningitis and over 190,000 deaths each year. *C. neoformans* can be known as an opportunistic pathogen because it takes advantage of individuals with compromised immune systems, specifically ones with HIV. *C. neoformans* is inhaled through the lungs, which is a low-glucose environment, so it is likely that it must use alternative carbon sources such as acetate to survive. The goal of this research is to investigate the growth of different *C. neoformans* gene deletion mutants on various carbon sources. We investigated deletions of the genes CNAG\_02045, CNAG\_02165, CNAG\_04795, and CNAG\_00613. CNAG\_00613 was identified as one of 15 genes in a genetic screen to find genes required for acetate utilization. CNAG\_02045, CNAG\_02165, CNAG\_04795 are part of a different deletion library that has not yet been screened, but are expressed at a higher level when grown on acetate versus glucose. Spot assays were performed on YNB media with either 2% glucose, 0.2% glucose, 2% acetate, or 2% glycerol to determine the functions of these genes in the metabolism of these carbon sources. In addition, the mutants were analyzed for the ability to produce melanin, a prominent virulence factor. The next step in this research includes investigating stress conditions, virulence factors, and the DNA of these mutants. The overall goal of this project is to see the role these genes may play in the pathogenesis of *C. neoformans*.

## Poster #198

### Identification of Genes Required for Acetate Utilization in *Cryptococcus neoformans* (CSRF)

**Mentors:** Kerry Smith, Genetics and Biochemistry, Perry Kezh, Genetics

**Undergraduate Student:** Alanna Scoggins, Microbiology

*Cryptococcus neoformans* is an opportunistic fungal pathogen that causes cryptococcal meningitis, a potentially fatal infection that affects immunocompromised individuals. For infection by *C. neoformans*, the pathogen must survive in alveolar macrophages, the first defense mechanism in the lungs, which contain limited amounts of glucose, forcing *C. neoformans* to survive on nonpreferred carbon sources, such as acetate. Genes CNAG\_00236, CNAG\_05310, CNAG\_07403, and CNAG\_03697, which have all been previously identified as possible genes required for successful growth on acetate, were investigated. After performing spot assays of these strains on both glucose and acetate media, researchers determined that none of the identified genes were required for growth on acetate. As the current treatments for cryptococcal meningitis are not always effective, identifying genes in *C. neoformans* that are required for acetate growth may be an important step in the development of more effective treatments.

## Poster #199

### The Connection Between CDCA7 Mutations and ICF (CSRF)

**Mentor:** Michael Sehorn, Genetics and Biochemistry

**Co-Author:** Garrett Buzzard, Biochemistry and Molecular Biology

**Undergraduate Students:** Elizabeth Caldwell, Genetics, Ashley Fister, Biological Sciences, Emily Peak, Health Science

Immunodeficiency, Centromeric region instability, Facial anomalies syndrome (ICF), a rare disease that causes severe

infections, is associated with mutations in the proteins Helicase Lymphoid Specific (HELLS) and Cell Division Cycle Associated 7 (CDCA7). These proteins form a nucleosome remodeling complex whose activity, if mutated, causes a reduction in satellite DNA methylation. In order to determine the effect of CDCA7 mutations found in patients, we first generated bacterial expression constructs separately with four differently tagged CDCA7 gene variants (FLAG-CDCA7, GST-CDCA7-His, His-CDCA7, and MBP-CDCA7). The R274H, G294V, and R304H mutations found in ICF patients were introduced into these expression constructs of CDCA7 using PCR mutagenesis. The goal of this investigation is two-fold. First, we will determine which epitope facilitates the purification of CDCA7. The second goal is to determine the effect each ICF mutation has on the biochemical activities of CDCA7 and whether these mutations will alter the HELLS-CDCA7 complex nucleosome remodeling activity. These studies will provide insight into the relationship between these mutations and ICF.

## Poster #200

### Using Electrophoretic Mobility Shift Assays to Better Understand RAD51 DNA Binding Activity (CSRF)

**Mentors:** Michael Sehorn, Genetics and Biochemistry, Garrett Buzzard, Biochemistry and Molecular Biology

**Co-Authors:** Melody Hayman, Biochemistry and Molecular Biology, Briana Vollbeer, Genetics

**Undergraduate Students:** Rachel Anderson, Biochemistry

RAD51 is a recombinase protein that is vital in the homologous recombination pathway. Homologous recombination is one of the processes by which cells repair DNA double-stranded breaks in a genome by using a homologous sister chromatid to resynthesize the DNA lost due to the damage. In the HR process, the broken ends of DNA are resected to expose the 3' single strand DNA overhangs. RAD51 forms a helical nucleofilament, called the presynaptic filament, on the ssDNA overhangs in order to invade the homologous DNA. Once homology is located, a D-loop is formed followed by repair synthesis. In my project, I am using electrophoretic mobility shift assays, or EMSAs, to monitor the DNA binding activity of RAD51 and a RAD51 variant that harbors substitution from a conserved alanine to a valine. The results from the EMSAs will help create a better understanding of RAD51 binding activity.

## Poster #201

### ClemsonX: Exploring Lunar Lava Tubes (CSRF)

**Mentor:** Cameron Turner, Mechanical Engineering

**Undergraduate Student:** Erich Tobitsch, Civil Engineering

Lava tubes are underground passageways that form when the outermost surface layer of a channel of lava crusts over and hardens due to being cooler in temperature than the lava contained lower in the conduit. The lava then continues to flow beneath the now hardened surface crust, eventually draining to leave behind a lava tube which is essentially a hollow cavern or cave conduit. Both the Moon and Mars contain a multitude of lava tubes. NASA recently has begun creating designs and plans that will allow these lava tubes to be explored. The reason that the space industry is interested in lava tube exploration is that it will enable new insight into the subsurface structure, soil composition, detection of elements present below the surface, the possibility of new scientific discoveries such as simple organisms or signs of once-living microbial organisms, new scientific and ultimately to run tests to study the feasibility of creating a lunar or Martian base in the future. The theory of creating a base below the subsurface in a potential lava tube is due to the idea that it will provide a greater level of protection from solar radiation than above the surface. NASA's Peregrine mission is currently under development to achieve the first lava tube exploration on the moon. The mission is designed to launch a lander that will land on the lunar surface in close proximity to one of the major lava tubes and then deploy rovers that will explore, generate maps, and take soil samples of the lava tubes for further analysis. The project scope of ClemsonX is to design a viable rover system that will perform these tasks efficiently.



## COLLEGE OF AGRICULTURE, FORESTRY, AND LIFE SCIENCES

STUDENT	POSTER #	MAJOR
Shupard, Faith	130	Animal and Veterinary Science
Blanchard, Autum	167	Environmental and Natural Resources
Coplin, Katharine	129	Food Science and Human Nutrition
Keating, Ava	134	Food Science and Human Nutrition
Balach, Carter	11	Wildlife and Fisheries Biology
Good, Abby	167	Wildlife and Fisheries Biology
Joye, Conor	11	Wildlife and Fisheries Biology

## COLLEGE OF BEHAVIORAL, SOCIAL, AND HEALTH SCIENCES

STUDENT	POSTER #	MAJOR
Brewer, Lyndsey	162	Criminal Justice
Carroll, Jordyn	64	Health Science
Peak, Emily	199	Health Science
Scaglione, Michele	164	Health Science
Carroll, Hailey	162	Industrial & Organizational Psychology
Hurley, Kenzie	162	Industrial & Organizational Psychology
Robbins, Chelsea	162	Industrial & Organizational Psychology
Benedetti, Marie	32	Parks, Recreation & Tourism Management
Williams, Cayman	131	Parks, Recreation & Tourism Management
Davis, Stephanie	129, 163	Psychology
Evans, Kelly	162	Psychology
Finnell, Sophie	162	Psychology
Gentile, Kelsey	161	Psychology
Hammond, Ethan	163	Psychology
Harris, Maggie	30	Psychology
Radovic, Emily	162	Psychology
Rogers, Emily	161	Psychology
Roth, Sarah	163	Psychology
Torres, Allison	161	Psychology
Wheelon, Layla	161	Psychology

## COLLEGE OF BUSINESS

STUDENT	POSTER #	MAJOR
Murphy, Colin	165	Economics
Hollingsworth, Lauren	101	Management

## COLLEGE OF EDUCATION

STUDENT	POSTER #	MAJOR
Cunningham, Joanne	132	Special Education
Stierle, Jordan	132	Special Education

## COLLEGE OF ENGINEERING, COMPUTING, & APPLIED SCIENCES

STUDENT	POSTER #	MAJOR
Goodwin, Corbin	100	Bioengineering
Moore, Connor	166	Biomedical Data Science and Informatics
Wright, Katie	166	Biomedical Engineering
Holberg, Sam	128	Biosystems Engineering

STUDENT	POSTER #	MAJOR
Forenzo, Chlo	29	Chemical Engineering
Molina, Lindsay	63	Chemical Engineering
Rapp, Conner	63	Chemical Engineering
Ross, Caroline	99	Chemical Engineering
Tobitsch, Erich	201	Civil Engineering
Deas, Nick	162	Computer Science
Esposito, Amanda	101	Computer Science
Haueter, Melissa	101	Computer Science
Le, Taylor	101	Computer Science
Mawani, Adeem	101	Computer Science
Rabon, Nick	101	Computer Science
Swaim, Ellie	101	Computer Science
Weisbach, Kelly	101	Computer Science
Reid, Frankie	98	Electrical Engineering
Brady, Camden	165	Industrial Engineering
Decker, Samantha	165	Industrial Engineering
Duffie, Holden	195	Industrial Engineering
Gaskill, Shaye	134	Industrial Engineering
Huet, Bianca	165	Industrial Engineering
Novak, Dan	165	Industrial Engineering
Stribling, Hannah	127	Industrial Engineering
Breslin, Jane	33	Mechanical Engineering
Yang, Zhangke	33	Mechanical Engineering

## COLLEGE OF SCIENCE

STUDENT	POSTER #	MAJOR
Bonds, Emily	65, 167	Biological Sciences
Bongiovanni, Marlisa	167	Biological Sciences
Chopra, Bella	61	Biological Sciences
Comerford, Paige	160	Biological Sciences
D'Egidio, Grace	19	Biological Sciences
DeLoache, Allison	5, 11	Biological Sciences
Fister, Ashley	199	Biological Sciences
Griffin, Erin	66, 67	Biological Sciences
Hood, Alexandria	99	Biological Sciences
Kanes, Drew	96	Biological Sciences
Mochizuki, Gabriela	162	Biological Sciences
Pratt, Alex	160	Biological Sciences
Smolinski, Kali	26	Biological Sciences
Warner, Hampton	167	Biological Sciences
Geist, Alexa	133	Chemistry
Caldwell, Elizabeth	199	Genetics
Carroll, Dylan	196	Genetics
Hiott, Daniel	97	Genetics
Vollbeer, Briana	200	Genetics
Strinsky, Isabel	165	Mathematical Sciences
Baldassare, Michelle	95	Microbiology
Carter, Rachel	62	Microbiology
Coles, Julian	95	Microbiology
Robinson, Anna	26	Microbiology
Scoggins, Alanna	198	Microbiology

### COLLEGE OF AGRICULTURE, FORESTRY, AND LIFE SCIENCES

MENTOR	POSTER #	DEPARTMENT
Jachowski, Cathy	11, 96	Forestry & Environmental Conservation
McLamore, Eric	128	Agricultural Sciences
Knapp, Daniel	11, 96	Forestry & Environmental Conservation
Knapp, Daniel	11, 96	Wildlife and Fisheries Biology

### COLLEGE OF BEHAVIORAL, SOCIAL, AND HEALTH SCIENCES

Black, Jeffrey	30	Human Factors Psychology
Fernandez, Mariela	32, 131, 134	Parks, Recreation & Tourism Management
Sharaievska, Iryna	131	Parks, Recreation & Tourism Management
Bisson, Jennifer	161	Psychology
Byrne, Kaileigh	163	Psychology
Kowalski, Robin	162	Psychology
Sarno, Dawn	30	Psychology
Cartmell, Kathleen	64	Public Health Sciences
Pericot Valverde, Irene	163	School of Health Research
Weisensee, Katherine	133	Sociology, Anthropology & Criminal Justice

### COLLEGE OF EDUCATION

Almond, Michael	164	Counselor Education
Ryan, Joseph	132	Education and Human Development

### COLLEGE OF ENGINEERING, COMPUTING, & APPLIED SCIENCES

Larsen, Jessica	99	Chemical and Biomolecular Engineering
DesJardins, John D	166	Bioengineering
Singapogu, Ravikiran	98	Bioengineering
Yang, Ming	63	Chemical and Biomolecular Engineering
Vanegas Gamboa, Diana	128	Environmental Engineering and Earth Sciences
Cha, Jackie	100, 127, 195	Industrial Engineering
Gonzales, Alec	127	Industrial Engineering
Song, Yongjia	165	Industrial Engineering
Meng, Zhaoxu	33	Mechanical Engineering
Turner, Cameron	201	Mechanical Engineering

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Buzzard, Garrett	97, 200	Biochemistry and Molecular Biology
Abernathy, Virginia	65, 167	Biological Sciences
Baeza Migueles, Juan Antonio	66, 67	Biological Sciences
Fuentes, Melissa	167	Biological Sciences
Seekatz, Anna	95	Biological Sciences

MENTOR	POSTER #	DEPARTMENT
Stoczynski, Lauren	5	Biological Sciences
Ennis, Elliot	19, 29, 61, 62, 129, 130	Chemistry
Kezh, Perry	198	Genetics
Sehorn, Michael	97, 199, 200	Genetics and Biochemistry
Smith, Kerry	196, 197, 198	Genetics and Biochemistry

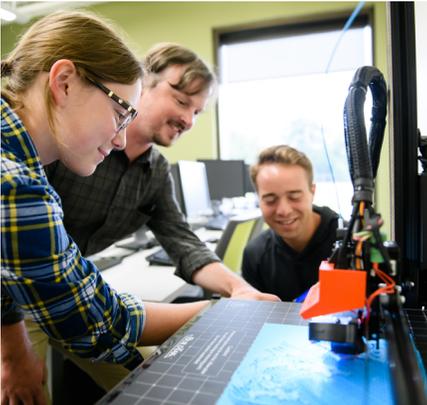
### OTHER

Peng, Congyue	26, 160	IIT Ctr Medical Devices/Sensor
Rathbone, Cody	101	Information Security & Privacy
Farthing, Richard	166	Olympic Sports
Avedesian, Jason	166	Sport Science



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