27th ANNUAL
UNDERGRADUATE RESEARCH SYMPOSIUM

OCTOBER 23, 2025
1:00PM
USA STUDENT CENTER BALLROOM

UNIVERSITY OF SOUTH ALABAMA
OFFICE OF
UNDERGRADUATE RESEARCH

27th Annual Undergraduate Symposium
Thursday, October 23, 2025

Welcome
Dr. Padmamalini Thulasiraman
Director of the Office of Undergraduate Research

Invited Student Presentations:
Jacob Barron
Angelina Ladner
Ethan Myers
Anya Powell
Jack Spedale
Nakeria Woods

Outstanding Mentor Award
Phi Kappa Phi Poster Award
TriBeta Poster Award

Poster Sessions – Student Center 2nd floor lobby
1:00 Odd-number posters
3:00 Even-numbered posters

Sponsored by:
Alabama Space Grant Consortium, University of South Alabama Academic Affairs, University of South Alabama Graduate School, College of Arts and Sciences, Mitchell College of Business, College of Medicine, School of Computing, College of Education, College of Engineering, and Pat Capps Covey College of Allied Health Professions

Welcome to the Undergraduate Research Symposium

The Office of Undergraduate Research is pleased to host the 27th Annual Undergraduate Research Symposium at the University of South Alabama. This symposium is a wonderful way to celebrate and support the achievements of more than ninety undergraduate students as they highlight their scholarly activities.

We extend a warm welcome to everyone joining us today. Whether you are a proud mentor or parent, a curious student or faculty member, a university administrator, or other guest, I know you will be impressed by the exceptional research these students have accomplished so far. We hope you learn about the many ongoing research endeavors at the University of South Alabama.

The Office of Undergraduate Research (OUR) seeks to promote scholarly and creative activity and enhance critical thinking, problem-solving skills, and communication. We take pride in our foundational role in developing the scholars and scientists of tomorrow. Success of this event would not be possible without the time, effort and dedication that each of our faculty mentors provide guiding the undergraduate students in their research and creative discovery.

Special thanks to the Alabama Space Grant Consortium, the Academic Affairs Office, and individual colleges and departments for their sponsorship. We also express our appreciation to the members of the University Committee on Undergraduate Research for their time and valuable insights to promote the Summer Undergraduate Research Fellowship (SURF) program.

Dr. Padmamalini Thulasiraman
Director, Office of Undergraduate Research

Dear Colleagues and Students,

Welcome! We are thrilled to have you join us for the 27th Annual Undergraduate Research Symposium. This event shines a spotlight on the dedication and creativity of our undergraduate scholars as they share their research with the University community.

The University of South Alabama is deeply committed to supporting undergraduate research, recognizing the powerful impact of students working alongside faculty research mentors. These experiences nurture creativity, critical thinking, problem-solving, and independence, preparing our students for success in their future careers, graduate studies, or both.

The influence of undergraduate research extends far beyond campus. Working together, faculty and students explore important questions and share their findings, strengthening our university community and adding to conversations that shape the world.

We are incredibly proud of the students and faculty who make this work possible through the Office of Undergraduate Research. We hope today's symposium leaves you inspired and energized by the creativity and dedication on display.

Andrea (Andi) M. Kent, Ph.D.

Executive Vice President and Provost

Oral Presentations

Jacob Barron
Major: Computer Science
Faculty Mentor: Dr. J. Todd McDonald
Department: Computer Science
College: School of Computing
Advancing SBHA: Expanding Program Translation to MBA

Angelina Ladner
Major: Marketing - Marketing Management Concentration
Faculty Mentor: Dr. Marianne Loes
Department: Marketing, Supply Chain Management, and Analytics
College: Mitchell College of Business
A Study on the Behavior of Generation Z Buyers

Ethan Myers
Major: Biomedical Science
Faculty Mentor: Dr. Allyson Shea
Department: Microbiology and Immunology
College: Frederick P. Whiddon College of Medicine
UroDetect a water quality field test kits turned diagnostic tool for Urinary Tract Infections

Anya Powell
Major: Biology
Faculty Mentor: Dr. Jeremiah Henning
Department: Biology
College: College of Arts and Sciences
Ghost Crabs Take the Spotlight : Artificial Ambient Light Pollutions' effect on Ghost Crabs (*Ocypode quadrata*)

Jack Spedale
Major: Biomedical Science
Faculty Mentor: Dr. Terrence Ravine | Dr. Ronald Balczon
Department: Biomedical Sciences | Biochemistry and Molecular Biology, Center for Lung Biology
College: Pat Covey College of Allied Health Professions | Frederick P. Whiddon College of Medicine

Evaluating protein ubiquitination in pulmonary microvascular endothelial cells during *pseudomonas aeuruginosa* exoenzyme y intoxication

Nakeria Woods
Major: History
Faculty Mentor: Dr. Timothy Lombardo
Department: History
College: College of Arts and Sciences

Furthering the Dream: An Examination of the Early Formation of the Collective Memory of Martin Luther King Jr. in the United States

Mentor Honor Roll

Mentor, Department	Nominated By
Dr. Glen Borchert Pharmacology	Rani Badve
Dr. Thiago Bruder Physiology & Cell Biology	Laith Alqudah
Dr. James Davis Chemistry	Grace Kingrey
Dr. Meghan Hermance Microbiology & Immunology	Mackenzie Kyles
Dr. Silas Leavesley Chemical & Biomolecular Engineering	Natalie Hadad
Dr. Benjamin Linzmeier Geology	Emily Morgan
Dr. Marianne Loes Marketing, Supply Chain Management & Analytics	Angelina Ladner
Dr. J. Todd McDonald Computer Science	Jacob Barron
Dr. Jason Strickland Biology	Alayna Tagert
Dr. Dhananjay Tambe Mechanical Engineering	Cambridge Cooper
Dr. Padmamalini Thulasiraman Biomedical Sciences	Priscilla Foster
Dr. Moustafa Zagho Chemistry	Jonathan Mason

University Committee on Undergraduate Research
Program Director: Dr. Padmamalini Thulasiraman

College	Member, Department
Pat Capps Covey College of Allied Health	**Robin Mockett**, Biomedical Sciences
College of Arts and Sciences	**Jason Coym**, Chemistry **Lesley Gregoricka**, Anthropology **Zoya Khan**, Modern & Classical Languages and Literature **Christina Lindeman,** Visual Arts **Steven Schultze,** Earth Sciences **Jack Shelley-Tremblay**, Psychology **Jason Strickland**, Biology
Mitchell College of Business	**Al Chow**, Marketing, Supply Chain Management and Analytics
School of Computing	**Tom Johnsten**, Computer Science
College of Education and Professional Studies	**Ryon McDermott**, Professional Studies
College of Engineering	**Daniela Wolter Ferreira Touma**, Electrical and Computer Engineering **Silas Leavesley**, Chemical and Biomolecular Engineering
Honors College	**Doug Marshall**, Sociology
College of Medicine	**Thomas Rich,** Pharmacology **Glen Borchert,** Pharmacology
College of Nursing	**Rebecca Graves**, Research, Development and Evaluation **Rebecca Thomas,** Maternal-Child Nursing

Office of Undergraduate Research
Located in the Honors College
Seamen's Bethel Theatre
(251) 460-6243

Research Area	Posters
Allied Health and Nursing	16, 56,61, 64, 73, 79, 92
Arts and Humanities	5, 15, 23, 98
Biology	13, 24, 26, 36, 39, 41, 42, 46, 47, 53, 76, 78, 80, 81, 82, 84, 85, 90, 91
Biomedical Science/Engineering	1, 2, 3, 4, 11, 12, 14, 19, 20, 28, 29, 31, 33, 35, 37, 40, 44, 49, 52, 55, 57, 58, 67, 70, 72, 74, 88, 96, 97
Business	18, 48
Chemical Science/Engineering	7, 8, 21, 45, 50, 54, 60, 63, 68, 69
Earth Science/Engineering	9, 25, 30, 34, 43, 51, 62, 66, 75
Mathematics and Computing	6, 27, 32, 59, 65, 93, 99
Physical Science/Engineering	17, 22, 77, 83, 87, 94
Social and Behavioral Science	10, 38, 71, 86, 89, 95

Poster: 1

Laith Alqudah

Major: Biomedical Science

Faculty Mentor:
Dr. Thiago Bruder

Department: Physiology and Cell Biology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): NIH-R01 HL69202, startup funds from University of South Alabama

Can a Mouse Model of Kawasaki Disease Be Used to Study Pulmonary Hypertension?

Kawasaki Disease (KD) is a severe multisystem inflammatory condition characterized by vasculitis and is the leading cause of acquired cardiovascular disease in children. If left undiagnosed or untreated, KD can cause lasting cardiovascular damage, including pulmonary hypertension (PH), a progressive condition in which elevated blood pressure in the lung arteries places strain on the heart and can lead to heart failure. Despite evidence suggesting that KD may contribute to PH in children, there is currently no established animal model to investigate this link, which limits our understanding of the underlying mechanisms and potential treatments. To address this gap, we propose to evaluate whether a KD mouse model effectively replicates the development of PH. Using 57BL6/J mice, KD was induced via administration of a water-soluble fraction of Candida albicans (CAWS), while control mice received vehicle treatment. After 23 days, hearts, aortae, and lungs were collected for histological analysis, with a focus on detecting vasculitis, cardiac hypertrophy, and pulmonary vascular remodeling, the hallmark signs of PH. By determining whether KD-induced mice develop pulmonary changes consistent with PH, this study aims to establish a novel model for studying how KD drives pulmonary complications. This work has the potential to enhance our understanding of KD-related cardiovascular disease, guide early detection strategies, and provide a foundation for the development of targeted therapies to improve outcomes in children affected by this devastating illness.

Poster: 2

Rhea Arya

Major: Philosophy

Faculty Mentor:
Dr. Daniella Schwartz

Department: Rheumataology and Clinical Immunology

College: University of Pittsburgh Department of Medicine

Funding Source(s): NIH (Hillman Cancer Center Academy, UPMC)

Th9-arterial endothelial cell crosstalk promotes autoimmunity-associated cardiovascular disease

"Th9-high" immune endotype, marked by expansion of IL-9–producing Th9 cells and increased cardiovascular risk. Recent evidence suggests that inflammatory mediators within atherosclerotic plaques—such as nitric oxide (NO) and key cytokines—can modulate Th9 differentiation, potentially amplifying vascular inflammation and endothelial dysfunction in autoimmunity. Splenocytes were isolated from C57BL/6 mice and cultured under Th9-polarizing conditions (IL-4 and TGF-β). Experimental groups were treated with 200 μM NOC-18 (a nitric oxide donor), anti–IL-2 blocking antibodies, recombinant IL-1β, or a combination of anti–IL-2 and IL-1β. After three days, intracellular flow cytometry quantified the percentage of IL-9–producing CD4+ T cells. Isotype antibody and solvent controls were included. Experiments were optimized in a single mouse, then performed using splenocytes from two additional mice to provide three biological replicates. Treatment with 200 μM NOC-18 increased the frequency of IL-9–producing Th9 cells compared to controls. Blockade of IL-2 reduced Th9 polarization and IL-9 production, while IL-1β produced a variable effect. Co-treatment with anti–IL-2 and IL-1β further modulated Th9 differentiation, highlighting a complex interplay between nitric oxide and cytokine signaling pathways in regulating Th9 responses relevant to inflammatory cardiovascular disease.

Poster: 3

Sarah Atterberry

Major: Biomedical Science

Faculty Mentor:
Dr. Chandrani Sarkar

Department: Pathology, Mitchell Cancer Institute

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF

Exploring the Role of Obesity on Triple-Negative Breast Cancer Progression

Breast cancer (BC) is one of the most commonly diagnosed cancers and the second leading cause of cancer-related deaths among women in the U.S. Triple-negative breast cancer (TNBC) is the most aggressive BC molecular subtype and is associated with poor overall survival. Obesity, a modifiable risk factor, is highly prevalent in TNBC patients and has been linked to worse clinical outcomes. However, its role in TNBC progression is poorly understood. This study investigated the impact of diet-induced obesity on TNBC tumor growth and metastasis using an orthotopic mouse model. We hypothesized that obesity accelerates TNBC proliferation and enhances its metastatic potential. Mice were fed either a normal or high-fat diet, and TNBC tumors were established. Obese mice experienced accelerated tumor growth and progression compared to lean controls. Tumor tissues were analyzed via immunohistochemistry for Ki-67 (proliferation marker) and CD31 (angiogenesis marker). Oil Red O staining of frozen tissue sections was performed to quantify lipid content in tumor tissues from both groups. Tumors from obese mice showed significantly higher Ki-67 levels and increased microvessel density. Additionally, lower lipid content in obese tumors suggested an altered lipid profile. Overall, our findings contribute to a better understanding of how obesity may influence TNBC progression through metabolic and vascular mechanisms, with potential implications for therapeutic targeting in obese patients.

Poster: 4

Rani Badve

Major: Biology

Faculty Mentor:
Dr. Glen Borchert

Department: Pharmacology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF

Quantifying the Regulatory Output of the Chr5 LG4 Enhancer Between EXOC3 and CEP72 via a G-Based Mechanism

G4 structures are four-stranded DNA conformations that arise from guanine-rich sequences capable of Hoogsteen hydrogen bonding. These structures are highly enriched in regulatory genomic regions, such as promoters and enhancers, and have been implicated in transcriptional regulation, replication, and genome stability. A recent study by DeMeis et al. (2024) described a novel class of long G4-rich loci (LG4s) that overlap with known enhancers and directly interact with promoters via G4:G4 base pairing, independent of protein-mediated looping. One such locus is located on human chromosome 5p15.33 and spans approximately 5 kb (Chr5:551935–556936). This LG4 overlaps several enhancers and is predicted to regulate nearby genes, including EXOC3 and CEP72, both of which have G4-enriched promoter regions. Biochemical evidence, including enhancer quadruplex immunoprecipitation (EQuIP) and electrophoretic mobility shift assays (EMSA), confirmed direct physical interactions between the Chr5 LG4 and these promoters under G4-permissive conditions. However, while this study established structural proximity and molecular binding, the functional consequences of this interaction on gene expression remain unknown. This project aims to measure the transcriptional output of the EXOC3 and CEP72 genes in response to the Chr5 LG4 enhancer. Specifically, we seek to determine whether G4-mediated enhancer-promoter interactions result in measurable changes in gene expression. Using luciferase reporter assays, this study will provide functional validation of the proposed G4-based mechanism and help define the extent to which LG4 elements drive transcriptional activation.

Poster: 5

Shamarion Barnes

Major: Social Work

Faculty Mentor:
Dr. Nancy Kelley

Department: Sociology, Anthropology, and Social Work.

College: College of Arts and Sciences

The impact of social isolation on the mental health of older adults

This rapid review explores how social isolation impacts the mental well-being of older adults. It examines studies linking isolation to mental health issues like depression, anxiety, and cognitive decline in this age group. Using a quick search of major databases, the review focuses on studies that clearly show this connection.

Initial results suggest that being socially isolated significantly increases the risk of mental health problems for older adults. This highlights the urgent need for solutions. Programs and policies that reduce isolation could greatly improve their mental health. By addressing social isolation, we can support healthier, more connected lives for our aging population.

The findings emphasize the importance of community and social connections in maintaining mental health as people age. Future research should explore effective ways to combat isolation and promote well-being. This review serves as a call to action for creating supportive environments for older adults, ensuring they remain engaged and mentally healthy.

Poster: 6

Jacob Barron

Major: Computer Science

Faculty Mentor:
Dr. J. Todd McDonald

Department: Computer Science

College: School of Computing

Funding Source(s): SURF

Advancing SBHA: Expanding Program Translation to MBA

Intellectual Property (IP) is a primary target of cyberattacks, specifically through reverse engineering and software piracy, which are responsible for significant financial damage. Code obfuscation techniques have been developed as a means of protecting sensitive information in code, but existing methods have limitations. We explore a hybrid approach that combines two existing forms of obfuscation: Mixed Boolean-Arithmetic (MBA) and Software-Based Hardware Abstraction (SBHA). MBA transforms simple equations into complex equivalents, while SBHA represents logic through circuit-like structures represented in software. By parsing MBA-obfuscated expressions and converting them into bench-format circuits, we demonstrate how we can extend SBHA's capabilities into arithmetic domains. The hybrid MBA-SBHA model enhances reverse engineering resistance by combining algebraic complexity with structural obfuscation, while maintaining compatibility with SAT solvers. Our findings demonstrate successful construction and verification of obfuscated circuits, suggesting practical applications in the protection of intellectual property. Future work includes creating a program to automate MBA-to-SBHA translation, and expanding toward full-program obfuscation.

Poster: 7

Mayte Bastida

Major: Criminal Justice

Faculty Mentor:
Dr. Alexandra Stenson

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): NOAA National Sea Grant

Quantification of microplastics in public water and groundwater samples

Microplastics contaminate local water sources and raise concerns on health risks towards living organisms. Microplastics are polymers that are hard to break down and pose a threat to human body systems and aquatic environments. This research focuses on the identification of microplastics found within public water and roadway samples. Local samples from the Gulf Coast were obtained, separated from sedimentation, processed through vacuum filtration and analyzed using Micro-Fourier Transform Infrared spectroscopy (FTIR). Through this research, we are able to break down what plastics are prominent within specific areas to highlight the importance of microplastic pollution. The most commonly found microplastics involved in this research include polyethylene terephthalate (PET), Polyethylene (PE), Polypropylene (PP), Polyurethane (PU), Polystyrene (PS), Polyvinyl Chloride (PVC), Acrylic, Nylon, Teflon, and Low-density Polyethylene (LDPE). This research aims to identify microplastics to facilitate an easy approach on combating certain plastics from entering local water sources.

Poster: 8

Bailey Baxter

Major: Biomedical Science

Faculty Mentor:
Dr. David Forbes

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): Forbes Lab

Small Particles, Big Impact: Reengineering Lipid-Like Nanoparticle Synthesis

Lipid-like nanoparticles (LLNPs) are innovative drug delivery systems that encapsulate mRNA, protecting it from physiological degradation. Despite their clinical success, current LLNP assembly methods involve multiple synthetic steps, presenting opportunities for optimization. A streamlined synthetic approach for LLNP assembly was explored by diversifying carboxylic acid derivatives through the Curtius rearrangement. Model systems were utilized to synthesize ureas, amides, and carbamates, which serve as key components in LLNP structures. Notably, an unexpected byproduct from an attempted rearrangement involving benzylamine was isolated and characterized, underscoring the reaction's complexity. Successful synthesis of a carbamate derivative using cyclohexane carboxylic acid demonstrated a reduction in synthetic steps by half. This research was conducted within a course-based undergraduate research experience (CURE) CH 490-H, fostering hands-on engagement in medicinal chemistry. These findings highlight the utility of Curtius rearrangement for developing LLNP components while advancing efficient synthetic protocols in drug delivery systems.

Poster: 9

Zachary Beneke

Major: Mechanical Engineering

Faculty Mentor:
Dr. Shenghua Wu

Department: Civil, Coastal, and Environmental Engineering

College: College of Engineering

Funding Source(s): SURF, NSF REU

Characterizing Microplastics in Public Water Bodies of the Gulf Coast Region

Microplastic pollution in marine environments presents a growing concern to both human and animal health within affected ecosystems. This study examines the concentration and distribution of microplastic types across the coastal regions of Alabama, Mississippi, and Florida, focusing on both beach and river locations. Ten environmental samples were collected from diverse sites along the Gulf Coast and processed using a combination of established techniques, including density separation and Fourier-transform infrared (FTIR) spectroscopy. Analysis revealed an average of approximately 37 distinct microplastic particles per 28-liter sample or about 1.31 plastics per liter of water. The five most prevalent polymer types identified were polyethylene terephthalate (PET), polyethylene (PE), low-density polyethylene (LDPE), polypropylene (PP), and polytetrafluoroethylene (Teflon). Overall, the widespread presence of microplastics in public water bodies emphasizes the urgent need to address plastic pollution through improved filtration methods, policy implementation, and environmental sustainability awareness. Contributions of this work include expanding the regional database of microplastic contamination, supporting the development of standardized monitoring frameworks, and identifying opportunities for innovation in filtration and remediation technologies.

Poster: 10

Peyton Benson

Major: Exercise Science - Pre-Professional Concentration

Faculty Mentor:
Dr. Caitlyn Hauff

Department: Health, Kinesiology, and Sport

College: College of Arts and Sciences

Funding Source(s): SURF

Exploring the Blue Zone Effect: The Role of Environment in Shaping Wellness

Blue Zones are areas with a large concentration of people experiencing high levels of longevity and happiness due to their unique lifestyle behaviors and environment . College students' health and wellness behaviors are influenced by their own environment. How study abroad influences health and wellness behaviors is understudied. The purpose of this research study was to identify any lifestyle or behavior changes in American college students after returning from a study abroad experience in Greece. Greece is home to one of five Blue Zones in the world and while visiting, these college students learned about the four major Blue Zone Pillars: connection, nutrition, movement, and outlook/perspective. Participants (n=8) were college students who went on a study abroad experience in Athens, Greece, focused on learning about Blue Zone lifestyles. Upon returning from the program, individual interviews were conducted with each student discussing their study abroad experience, as well as their current and past lifestyle behaviors. Along with the interviews, students were asked to provide photos that best represent their responses to specific photo elicitation prompts illustrating Blue Zone pillar concepts. For example, students were asked to pick an image that represents what ‘active living’ looks like in their environment. The example prompt represents the Blue Zone pillar of movement. Currently, a four-person coding team is working on analyzing data to find emerging themes between the interviews and photographs.

Poster: 11

Kira Bruno

Major: Electrical Engineering

Faculty Mentor:
Dr. Mohamed Shaban

Department: Electrical and Computer Engineering

College: College of Engineering

Funding Source(s): SURF

AI Analysis of Histopathology Images of Cancer

Colorectal cancer (CRC) poses a significant global health burden. In the United States alone, an estimated over 2 million new diagnosed cases and 0.6 million new deaths are projected in 2024. The primary risk factors contributing to this cancer include unhealthy food consumption, behaviors, advanced age, and a family history of CRC. Given the substantial burden and associated risks, there is an urgent need for highly accurate diagnostic systems capable of detecting CRC at an early stage. This will facilitate timely intervention, and potentially improve disease prognosis. Histopathological image analysis plays a crucial role in the diagnosis and staging of CRC. However, manual examination of these images by pathologists is time-consuming, subjective, and prone to errors due to the complexity and variability of cancerous tissue patterns. With rapid advancements of deep learning (DL) techniques, there arose a growing interest in developing automated computer-aided diagnosis systems for CRC detection based on histopathology images. The DL-based systems have the potential to assist pathologists by providing accurate and reliable screening of CRC, reducing workload, and minimizing the risk of missed diagnosis. Several DL models have been recently proposed demonstrating promising results in diagnosing CRC. However, most of these models are computationally intensive, hindering their deployment on resource-constrained platforms including edge or mobile devices that can be used in remote healthcare facilities. In this project, we will introduce several resource efficient DL structures that will achieve a significantly high accuracy at a reduced memory and computational overhead. Node pruning, filter pruning, resource efficient architectures and post training quantization will be considered to reduce the complexity, and minimize the inference time of the models. The performance of the proposed models will be evaluated using the five-fold cross validation where the accuracy, sensitivity, specificity, precision, and f1-score will be estimated.

Poster: 12

Luis Calderon

Major: Mechanical Engineering

Faculty Mentor:
Dr. Dhananjay Tambe

Department: William B. Burnsed Jr. Mechanical, Aerospace, and Biomedical Engineering

College: College of Engineering

Sciatica and Low Back Pain: Development of a Novel Mathematical Framework

Low back pain is one of the most prevalent musculoskeletal disorders, affecting nearly 80% of adults and resulting in more than $100 billion annually in medical costs, rehabilitation, and lost productivity in the United States. The L4–L5 motion segment, consisting of two vertebrae and the intervertebral disc, is a major contributor to this pain due to its role in carrying a significant portion of the upper-body load while allowing frequent flexion, extension, and rotation, which subjects it to high mechanical stress. Mechanical changes in this region can alter nerve pathways, particularly through variations in the foraminal area — the bony opening through which spinal nerve roots exit — which changes size with posture and loading. Excessive narrowing, known as foraminal stenosis, can compress nerves and cause pain or sciatica that radiates down the leg. Disc bulging or herniation can also contribute to compression but is less predictable mathematically. The objective of this research is to develop a mathematical model of the L4–L5 segment that accounts for posture-dependent loading and its effect on foraminal area, enabling the prediction of conditions that lead to pain and guiding strategies for prevention and treatment.

Poster: 13

Vinsent Cenko

Major: Biology

Faculty Mentor:
Dr. Sinéad Ní Chadhain

Department: Biology

College: College of Arts and Sciences

Funding Source(s): SURF

Isolation of CO_2-Capture Compound Degrading Bacteria

Monoethanolamine (MEA) is commonly used in CO_2 capture, but less common compounds like sodium taurinate (NaT) and sodium methyltaurinate (NaMeT) are being explored as alternatives. Since CO_2 emissions are a major cause of climate change and environmental damage, it is important to study naturally occurring carbon capture compounds (CCC's) and how bacteria interacts with them in the environment (Hanson et al., 2024). The focus of this project is on the isolation of bacteria from Dauphin Island seawater that can degrade NaMeT. Previous research has shown that there is marine bacteria that are capable of metabolizing NaMeT, such as *Paracoccus versutus* (Weinitsche et al., 2006). This project aims to determine whether such bacteria are present in Dauphin Island seawater and to identify them.

Poster: 14

Sanjana Chada

Major: Biomedical Science

Faculty Mentor:
Dr. Thiago Bruder

Department: Physiology and Cell Biology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): National Institute of Health (NIH) - R01

Artesunate, an Anti-Malarial Drug, Improves Vascular Function and Reduces Vasculitis in a Mouse Model of Kawasaki Disease

Kawasaki disease (KD) is an acute vasculitis that primarily affects medium-sized arteries, especially the coronary arteries, in children. It is the leading cause of acquired heart disease in children in developed countries. It was previously demonstrated, in our lab, that a mouse model of KD induced by Candida albicans water-soluble fraction (CAWS) exhibits vascular dysfunction mediated by Toll-like receptor 4 (TLR4) activation.

Artesunate (ART), an anti-malarial agent, was recently identified as an inhibitor of the MD2/TLR4 signaling pathway. We tested the hypothesis that ART attenuates vascular dysfunction and vasculitis in the CAWS-induced KD mouse model. Male C57BL/6J mice (5–6 weeks old) were treated with CAWS (4 mg/day, intraperitoneally for 5 days) or vehicle (control). ART treatment (25 mg/kg/day, i.p.) was initiated on day 7 and continued for 3 weeks (KD+ART group). On day 28, hearts and abdominal aorta (AA) were collected for histological and vascular function analysis.

CAWS induced vasculitis in 75% of the mice (9/12). Functionally, KD mice exhibited hypercontractility to U46619 in the AA, which was reversed by ART treatment. KD also induced endothelial dysfunction, shown by reduced acetylcholine (ACh)-mediated vasodilation, which was restored by ART. No changes were observed in KCl-induced contractility or sodium nitroprusside-induced vasodilation.

In conclusion, ART effectively mitigates vascular dysfunction and reduces vasculitis in a KD mouse model. These findings highlight ART's potential as a therapeutic strategy for reducing cardiovascular complications in patients with KD.

Poster: 41

Blaine Chaperon

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle, Dr. Ronald Baker

Department: Stokes School of Marine and Environmental Sciences

College: College of Arts and Sciences

Driving Factors of Lionfish Diet in Calabash Caye, Belize

Lionfish (*Pterois spp.*) are invasive predators in the Caribbean that have rapidly colonized reef ecosystems such as Turneffe Atoll, Belize, posing a serious threat to native biodiversity. In this study, we examined the stomach contents of 88 lionfish collected from eight sites to assess prey composition and feeding patterns by time of day. Stomachs were dissected and prey items identified to the lowest possible taxonomic level, then categorized as fish, crustaceans, or gastropods. Results revealed that fish were the most frequently consumed prey, particularly in lionfish measuring 150–275 mm, while crustaceans were consistently present across all size classes. Time-of-day analysis indicated peak feeding activity in the morning, with fish and crustaceans comprising the majority of prey. These findings highlight the role of lionfish as dominant reef predators and provide critical insights to inform management and mitigation strategies.

Poster: 15

Ananya Chari

Major: Philosophy

Faculty Mentor:
Dr. Corina Schulze

Department: Political Science and Criminal Justice

College: College of Arts and Sciences

Gender, Race, and the Death Penalty: Native American Women's Executions in the United States

The salience of gender in capital punishment has received limited scholarly attention, with Indigenous women's experiences remaining especially undertheorized. Drawing on the Women's Executions Database (Schulze, 2025), the only dataset correcting for women's underrepresentation in official statistics, this study examines the cases of fewer than a dozen Native American women "lawfully" executed in the United States. Through a qualitative, intersectional analysis, it identifies thematic patterns within and beyond their experiences, situating them in the broader history of U.S. colonialism. Findings reveal how state-sanctioned executions reproduce intersecting hierarchies of race, gender, and political power, underscoring the gendered and colonial dimensions of capital punishment.

Poster: 16

Madison Clarke

Major: Speech and Hearing Sciences

Faculty Mentor:
Dr. Kimberly Smith

Department: Speech Pathology and Audiology

College: Pat Covey College of Allied Health Professions

Understanding the Project: Hearing Loss and Aphasia

Hearing loss can make communication even harder for people with aphasia (PWA), which is why we need to find easy and effective ways to screen for it. In this study, we compared two different hearing screening methods: one done by a clinician and one using an automated, tablet-based system. We wanted to see if they gave similar results and also learn about how hearing loss affects the daily lives of people with aphasia. We tested seven adults with aphasia using both screening methods. Our results showed the automated screening had a slightly lower pass rate (60.9%) than the clinician-led one (66.7%). This suggests the automated method might be more sensitive at picking up on hearing problems that the traditional method might miss. Related to the technology aspect, the automated method is promising but is not perfect as a couple of participants could not finish the test because of technical issues with the equipment. Lastly, using the Speech Spatial and Qualities of Hearing Scale 12 (SSQ12), we asked about their self-reported hearing abilities. The results indicate they have the most trouble understanding speech, but they were better at locating where sounds were coming from. Our results show that automated hearing tests could be a great tool for people with aphasia because they are sensitive to hearing loss. However, we also learned that it is important to ask people about their own experiences. A good hearing assessment for someone with aphasia should include both an objective test (like an automated screening) and questions about their personal challenges with hearing, especially when it comes to understanding speech.

Poster: 18

Jeremy Cliett

Major: Supply Chain Management

Faculty Mentor:
Dr. Jennifer Zoghby

Department: Marketing, Supply Chain Management, and Analytics

College: Mitchell College of Business

Formation of leadership

This research analyses whether pledge class sizes are correlated with leadership roles in a chapter of a national fraternity. The Epsilon Alpha chapter of the University of South Alabama conducts rushes for its fraternity at the start of the fall and spring semester. The fall pledge class is typically larger than the spring class, however anecdotal data suggests a correlation between spring pledge class and future leaders. One hypothesis is that these smaller pledge classes encourage an earlier development of leadership skills. Each pledge class has a leadership group of three mini officers a president, vice president and a number three. Data would be gathered from the South Alabama chapter records and potentially the national sources for the fraternity. Future research may include more in-depth studies on the correlation between pledge class size and leadership roles among other Greek organizations beyond this one chapter. Smaller pledge classes demand for accountability and responsibility from each member.

Poster: 17

Hannah Cline

Major: Civil Engineering

Faculty Mentor:
Dr. Shenghua Wu

Department: Civil, Coastal, and Environmental Engineering

College: College of Engineering

Funding Source(s): SURF

Sustainability of Dredged Materials for Construction Use

Dredging is a process used to maintain navigation, control flooding, and support environmental balance, producing large volumes of sediments that are often stored or discarded despite containing sand, silt, and mineral components with properties similar to natural aggregates. Despite this underutilization, the construction industry continues to rely heavily on virgin sand and gravel, thereore accelerating the depletion of natural resources. This research project addresses this imbalance through a two-part study. First, two dredged sands will be evaluated through standard laboratory procedures, including sand and mortar testing, to assess their suitability for construction use. Second, a literature review will examine the role of aggregates in concrete, focusing on how sand influences strength, durability, and performance in mortar and cement-based systems. The results will be compared against ASTM specifications, specifically ASTM C270 for mortar and ASTM C33 for aggregates, to determine whether dredged sands can meet established construction requirements. A comparison of two dredged sands will provide insight into their potential as sustainable alternatives to virgin aggregates. Contributing to the conservation of resources and promoting sustainable construction practices is the broader significance of this work. Demonstrating that dredged materials can perform adequately in mortar applications offers a pathway to reducing waste disposal, lowering environmental impacts, and supporting a more responsible approach to material sourcing in the construction industry.

Poster: 19

Grayson Cole

Major: Chemical Engineering

Faculty Mentor:
Dr. Glen Borchert

Department: Pharmacology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF

snoRNAs as Emerging Biomarkers in Pancreatic Ductal Adenocarcinoma (PDAC)

Pancreatic ductal adenocarcinoma (PDAC) is one of the most lethal forms of cancer, due to late diagnosis and aggressive progression. Despite advances in genomic profiling, the rate of survival of stage four pancreatic cancer is just 3%. The aim of this project is to design a specific type of blood screening for individuals with a family history of PDAC. This blood screening would be able to detect PDAC at significantly lower stages, increasing the chances of survival by allowing for a viable treatment before the tumor tissue has progressed to untreatable limits. Using FragmentFinder, a program to detect the elevation of any given snoRNA in cancerous tissue, and scratch assays, an experiment to quantify the metastasis level of tumor cells, we can evaluate any RNAs behavior in PDAC. Thus far, six snoRNAs that are expressed exponentially higher in this cancer, compared to normal tissue, have been identified, and observations on their behavior with these cancerous cells have been studied. Soon, similar steps will be taken but instead of on pancreatic tissue samples, blood samples will be ran, allowing for potential biomarkers to be detected. Overall, this project aims to increase the survival rate of pancreatic ductal adenocarcinoma by earlier detecting cancer tissue at earlier stages.

Poster: 20

Cambridge Cooper

Major: Biomedical Science

Faculty Mentor:
Dr. Dhananjay Tambe

Department: William B. Burnsed Jr. Mechanical, Aerospace, and Biomedical Engineering

College: College of Engineering

Funding Source(s): SURF

The Fall-acy of Falling Prevention

Identifying the most effective physical techniques that elderly individuals can utilize may significantly reduce the risk of injury or death resulting from falls. Adults aged 65 and older are disproportionately affected by fall-related injuries and fatalities, with the number of deaths in this age group continuing to rise. This suggests contemporary interventions that focus on fall prevention are inefficient. Our approach emphasizes the use of techniques to fall safely.

Drawing from martial arts, military, and parkour disciplines, we investigate controlled falling strategies such as break-falls (ukemi) and diagonal rolls that can be adapted to the unique needs of older adults. To support the effectiveness of these methods, we are examining the role of dietary factors—including protein, calcium, and vitamin D intake—in promoting musculoskeletal health and reactivity. Furthermore, we are assessing the reliance on specific muscle groups, such as the quadriceps and core stabilizers, that are essential for absorbing impact and executing controlled falls safely.

By integrating physical technique training with nutritional considerations and targeted muscle strengthening, this project aims to establish a holistic, evidence-based framework for reducing the severity of injuries among elderly populations. Ultimately, this research seeks to advance fall management from a solely preventive approach toward one that equips older adults with the physiological resources needed to fall safely.

Poster: 21

Riley Cork

Major: Chemistry

Faculty Mentor:
Dr. Hans-Jörg Schanz

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): NASA

Aerogels from Polydicyclopentadiene and its Copolymers

Low-density, silica-based aerogels are excellent insulators; however, freeze drying is needed for their production, making them expensive to produce. Poly-dicyclopentadiene (PDCPD) based aerogels are an attractive alternative based on price and potential processing via Chemically Induced Phase Separation (CIPS). We have produced a series of aerogels via the ring opening metathesis polymerization (ROMP) of dicyclopentadiene (DCPD). A synthetic protocol using second generation Grubbs catalyst based on the H2ITap ligand was established isolating the aerogel via CIPS. This route eliminated the need for freeze drying and provided a lightweight aerogel material with little to no change to the initial volume and shape of the gel. The issues these initial aerogels face is a 35% weight increase after a week under open air circumstances. This likely is due to surface oxidation as this mass gain is not observed in samples stored under vacuum. In an attempt to mitigate this issue, an oxanorbornene comonomer was added to the synthesis of the aerogel with the expectation that it would limit further conjugation of the aerogel and slow down the surface oxidation. Weight tracking as well as thermal testing of the aerogels using the differential scanning calorimetry (DSC) are being run to determine the oxidative effects of the addition of the comonomer with the same age and exposure to air as the initial aerogels.

Poster: 21

Julia Cravey

Major: Chemistry

Faculty Mentor:
Dr. Hans-Jörg Schanz

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): NASA

Aerogels from Polydicyclopentadiene and its Copolymers

Low-density, silica-based aerogels are excellent insulators; however, freeze drying is needed for their production, making them expensive to produce. Poly-dicyclopentadiene (PDCPD) based aerogels are an attractive alternative based on price and potential processing via Chemically Induced Phase Separation (CIPS). We have produced a series of aerogels via the ring opening metathesis polymerization (ROMP) of dicyclopentadiene (DCPD). A synthetic protocol using second generation Grubbs catalyst based on the H2ITap ligand was established isolating the aerogel via CIPS. This route eliminated the need for freeze drying and provided a lightweight aerogel material with little to no change to the initial volume and shape of the gel. The issues these initial aerogels face is a 35% weight increase after a week under open air circumstances. This likely is due to surface oxidation as this mass gain is not observed in samples stored under vacuum. In an attempt to mitigate this issue, an oxanorbornene comonomer was added to the synthesis of the aerogel with the expectation that it would limit further conjugation of the aerogel and slow down the surface oxidation. Weight tracking as well as thermal testing of the aerogels using the differential scanning calorimetry (DSC) are being run to determine the oxidative effects of the addition of the comonomer with the same age and exposure to air as the initial aerogels.

Poster: 22

Spencer Dalgety

Major: Computer Engineering

Faculty Mentor:
Dr. Jinhui Wang

Department: Electrical and Computer Engineering

College: College of Engineering

Funding Source(s): SURF, Dr. Jinhui Wang

Designing a IoT Network to Monitor Microplastic Concentration in Real-Time

Microplastic pollution is a growing global concern, yet current monitoring methods remain limited; scale, cost, and sample collection time continue to inhibit accurate, timely measurements. This project presents the design and implementation of an Internet of Things (IoT) network for monitoring environmental conditions relevant to microplastic detection. The system integrates off-the-shelf sensors with a Raspberry Pi to collect temperature, humidity, pressure, and particulate matter (PM) data. Using Google Cloud's BigQuery, data from multiple sensor nodes are stored in a centralized table and visualized through Looker Studio as an interactive map. The final prototype successfully displays real-time PM concentration trends across multiple nodes, with map visualization adjusting pin opacity based on measured values. The solution demonstrates scalability for future deployment and offers an adaptable framework for integrating advanced sensors and AI modules to enable direct microplastic detection in air and water. This work establishes a foundation for cost-sensitive, real-time environmental monitoring networks that can be expanded to address the urgent challenge of microplastic pollution.

Poster: 23

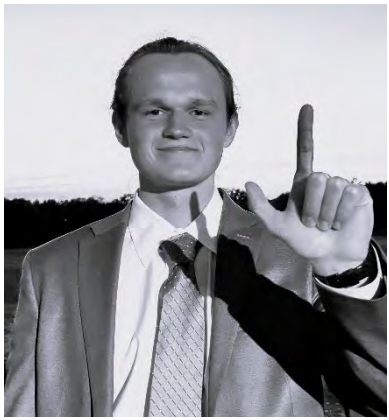
Thomas Dean

Major: Communication

Faculty Mentor:
Dr. April Taylor

Department: Communications

College: College of Arts and Sciences



Beyond Greenwashing: How Companies Can Effectively Advertise Their Sustainability Messages

The purpose of this research is to define effective and efficient methods to advertise the growing trend of large scale companies committing to green and CO_2 reduction methods. Analyzing existing data and determining cultural trends is crucial to properly represent the popular green initiative adopted by large corporations. Not only representing what eco-friendly marking techniques work, but by also investigating which green initiatives have failed and why. The intent of this research is to demonstrate how companies ought to adopt the generational zeitgeist of conservationary practices.

Poster: 24

Natalie Dickinson

Major: Mechanical Engineering

Faculty Mentor:
Dr. Tuan Tran

Department: Biology

College: College of Arts and Sciences

Discovering the Relationship Between Preemptive Drought Stress and *Ralstonia solanacearum* Bacterial Wilt Resistance

Ralstonia solanacearum is a soilborne pathogen that causes bacterial wilt disease in agricultural settings, decimating crops such as bananas, eggplants, potatoes, and tomatoes. In order to stop this crop decimation, it is important to understand how *Ralstonia solanacearum* works and the preemptive measures we can take to help the plants it affects have a fighting chance. This disease cuts off the water supply to the plant by clogging up its xylem (water transport "tube") with bacterial ooze/biofilm. Without a way to stop this from happening the disease progresses quickly and spreads fast, easily ruining entire fields of crops, impacting both farmers and consumers. The goal of my research project is to explore the potential use of abiotic stress priming (drought) to boost plant resistance against bacterial wilt. This study focused on the tomato cultivar Bonny Best. Our results showed that plants exposed to longer drought periods consistently survived longer than those watered daily. This means that preemptive droughting of a plant allows it to gain a resistance to bacterial wilt disease, leading to the belief that it could be an effective method of preventing widespread crop destruction. However, it remains to be explored how this preemptive drought primed plant resistance.

Poster: 25

Haleigh Dyer

Major: Meteorology -- Professional Track

Faculty Mentor:
Dr. Jake Wiley, Dr. John Lanicci

Department: Earth Sciences

College: College of Arts and Sciences

Funding Source(s): ASGC, SURF, University of South Alabama - Research and Scholarly Development Grant

A Pilot Study of Objective Classification of Elevated Mixed Layer Environments

Elevated mixed layers (EMLs) and lids are created when warm, dry air is advected over a layer of cooler, moist air. Identifying this layer is important to weather forecasting because severe thunderstorms can form along the edge of the lid where buoyant instability can be released. This study sought to determine if a machine learning based classification model could objectively distinguish between EML, lid, and non-EML/lid soundings. Using archived sounding data from the University of Wyoming's database, soundings of 24 locations in the central US from spring 2024 were sorted into the three categories. Human classification for these three categories was done by first visually examining each Skew-T Log-P diagram and determining if an inversion signature was present. If not, then the sounding was sorted into the non-EML/lid category. If the signature was present and a sufficient lapse rate was visible, the sounding was classified as an EML. To determine if the EML sounding was sufficiently unstable to be classified as a lid sounding, the lifted index was divided by two to calculate the buoyancy term. Buoyancy terms of 0.5 or greater were classified as EML soundings, and buoyancy terms of less than 0.5 were classified as lid soundings. A total of 50 soundings from each category were saved for the study. The data was then divided into two subcategories, 80% to train the classification model and 20% to test it. Next, the sounding data was run and tested using the classification model incorporating various predictors such as a 0.87% per mb relative humidity break, a lid strength of 2°C or greater, and a static stability greater than 4.5°C per 100 mb. Finally, the classification model results were assessed to determine their accuracy.

Poster: 26

Emma Edmondson

Major: Biology

Faculty Mentor:
Dr. Jeremiah Henning

Department: Biology

College: College of Arts and Sciences

Funding Source(s): ReCoast

Throwing Seeds at Glass Houses: A Project on Coastal Restoration and Community Ecology

Coastal dune restoration efforts present many unique challenges including sustainably sourcing enough substrate and recreating stable ecological communities in short time frames. Community assembly experiments can improve restoration project outcomes by predicting species success and the time frame for establishing ecosystem stability (Kraft & Ackerly 2014). Substrate made from recycled glass bottles has been proposed as an alternative to dredging of offshore substrate, and the high ecological and economic impacts associated with this process (Morrow 2023). Plant survival and growth is supported by glass sand substrate (Hammer et al. 2025); however, plant community assembly and stability in glass sand substrate have not been tested. To address this knowledge gap we established a field experiment with 47 pots in natural field conditions (23 filled with natural beach sand and 24 with recycled glass sand) with nine dune species planted in each. We began monitoring plant height, percent senescence, and leaf count monthly. To understand changes in community composition through time we conducted permanova and visualized using a Principal Components Analysis.

Preliminary results have shown that the community composition shifts over time from grass dominance (*Spartina patens* and *Uniola paniculata*) to forb dominance like *Coreopsis lanceolata* and *Solidago mexicana*. Substrate type did not significantly predict success, indicating glass sand can be used successfully for reviving ecosystem function in restored dunes. Our results show that long term monitoring is crucial to success, as communities that begin as evenly distributed ecosystems often shift towards dominance of a few aggressive species. With these results in mind it can be concluded that glass sand is a valid substrate for restoration in coastal dunes. Additionally, targeted management practices like control of dominant taxa and nutrient addition could ensure strong and diverse plant communities in coastal restoration.

Poster: 27

Christian Ellington

Major: Computer Science

Faculty Mentor:
Dr. Jeffrey Mudrock, Dr. Sarah Allred

Department: Mathematics and Statistics

College: College of Arts and Sciences

Funding Source(s): Faculty Development Council Grant Program

An Ohba-like Result for Flexible List Coloring

Graph coloring can be traced back to the 1850s with the famous Four Color Problem. This problem involves coloring a map in such a way that two regions sharing a border have different colors. Since its introduction, applications of graph coloring have been found in computational complexity, computer science, and scheduling problems. In this project, we study a variant of graph coloring called flexible list coloring, which was introduced by Zdenek Dvor´ak, Sergey Norin, and Luke Postle in 2019. In flexible list coloring, each vertex of a graph is assigned a list of available colors, and each vertex may have a preferred color. The goal is to assign each vertex a color from its list such that adjacent vertices receive different colors, while maximizing the number of satisfied color preferences.

One notion in graph coloring that has received significant attention in the literature is chromatic-choosability. In this project, we generalize a famous result of Ohba from 2002 on chromatic-choosability to the context of flexible list coloring. This is joint work with Michael C. Bowdoin, Yanghong Chi, Bella Ives, Seoju Lee, Fennec Morrissette, and Jeffrey A. Mudrock.

Poster: 28

Edgar Escalante

Major: Biomedical Science

Faculty Mentor:
Dr. Terrence Ravine | Dr. James Davis

Department: Biomedical Sciences | Chemistry

College: Pat Covey College of Allied Health Professions | College of Arts & Sciences

Funding Source(s): ASGC, SURF

Synthesis and antimicrobial testing of novel boronium-based salts as replacements for quaternary ammonium compounds in disinfectants.

Quaternary ammonium compounds (QACs) are in widespread use as disinfectants. The search for a QAC replacement with less toxicity and comparable antimicrobial activity has been unproductive. This study aims to measure the antimicrobial activity of novel boronium salts against several antibiotic-resistant bacteria when compared to the QAC standard, Pestanal® (C_{12}-C_{14}-Alkyl(ethylbenzyl)dimethylammonium chloride). Tested antibiotic resistant bacteria included gram-positive methicillin-resistant *Staphylococcus aureus* (MRSA) and vancomycin-resistant *Enterococcus faecalis* (VRE), as well as gram-negative extended-spectrum beta-lactamase (ESBL) *Escherichia coli* and *Pseudomonas aeruginosa*. Minimum inhibitory concentration (MIC) values were determined using the microbroth dilution method. Investigated compounds included boronium salts with and without heterocyclic headgroups of either imidazole or pyridine with associated alkyl tail lengths containing either 12, 14, or 16 carbons (C-12, C-14, C-16). Also evaluated was an innovative diboronium (Gemini) salt, with two boronium centers separated by a six-carbon spacer and flanked on either end by C-12 alkyl tails. The boronium salts with C-16 alkyl chain lengths showed the strongest antimicrobial activity, with and without attached headgroups. The general trend in antimicrobial effectiveness based on alkyl chain length was determined to be C-16 > C-14 > C-12. The C-16 imidazole-boronium salt demonstrated highest effectiveness against gram-positives, like VRE and MRSA, at a lower required concentration than the QAC. Collectively, the data shows that boronium-based salts with C-16 alkyl tail lengths exhibit noticeable antimicrobial activity against tested gram-positive and gram-negative bacterial strains. Specifically, the C-16 imidazole-boronium salt demonstrated the best broad-spectrum activity making it a promising candidate to replace QACs in disinfectants.

Poster: 29

Jackson Fitch

Major: Biomedical Science

Faculty Mentor:
Dr. Marie Migaud

Department: Pharmacology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): Mitchell Cancer Institute

Promotion of ROS by Diclofenac and Its Effect on NAD+ Metabolism

Diclofenac, a non-steroidal anti-inflammatory drug (NSAID), is commonly used to treat symptoms such as inflammation, joint pain, and arthritis. Diclofenac has been shown to increase levels of reactive oxygen species (ROS) in numerous cell types, especially at higher concentrations. ROS ultimately causes oxidative damage to cells and tissues, and this can lead to inflammation and acute liver failure. Diclofenac shares biochemical similarities with acetaminophen: an analgesic and antipyretic drug commonly used to help treat fevers and pain that also causes serious side effects. When administered, each drug is converted to a respective quinone during 1st phase of drug metabolism via ROS-generating processes. We observed that an increase in ROS in cells leads to the formation of NAD derivatives called ox-NAD, and the corresponding nucleosides, the 3-carboxamide pyridone ribosides (PYR). These later species are major components of the nucleoside pool detected in human waste and their abundance has been shown to increase with age. Importantly, the PYRs have been shown to affect cellular functions negatively and the extent of the induced dysfunction occurs in a cell-dependent manner. When tested against multiple cell lines at a concentration of 0.2 – 2 mM, diclofenac was shown to promote ROS and to be toxic. Furthermore, its co-exposure with PYRs increased its toxicity towards cells. Notably, this differs from APAP, since APAP and PYR co-administration did not show this synergy. To understand the observed synergistic effects of diclofenac and PYR, we tested whether co-exposure induces an increase in ROS and ox-NAD and a reduction in ATP production more than diclofenac or PYR alone. We used isotopically labeled PYR and LC-MS/MS analyses to differentiate exposure-PYR from de novo PYR from NAD over-oxidation. We wish to present this work as it reveals possible novel mechanisms by which diclofenac might be harmful.

Poster: 30

Haley Floden

Major: Meteorology -- Professional Track

Faculty Mentor:
Dr. Jake Wiley

Department: Meteorology

College: College of Arts and Sciences

Funding Source(s): ASGC, SURF

Investigating the Impacts of Various Cyclone Tracks on Lake Michigan Lake-Effect Snow

Lake-effect snow (LES) is a significant winter weather phenomenon that impacts regions surrounding the Great Lakes, with variability in intensity and location influenced by both local and synoptic-scale conditions. This project analyzes how five different cyclone tracks vary from each other in their set up and impact of LES events over Lake Michigan, an area frequented by multiband LES events. Synoptic composite maps made of LES cases from 1997 to 2024 and their storm tracks have been developed and used to evaluate whether different storm paths contribute to variations in LES characteristics. For this study, we look at 15 Michigan counties along the eastern Lake Michigan coast, as well as two in northeast Illinois and three in northwest Indiana. The results from this research can improve LES forecasting by identifying characteristic synoptic environments that lead to significant LES events. Additionally, this study contributes to a broader understanding of how synoptic scale forcing modulates LES variability, potentially aiding in future climate assessments of LES trends in a changing atmospheric environment.

Poster: 31

Priscilla Foster

Major: Biomedical Science

Faculty Mentor:
Dr. Padmamalini Thulasiraman

Department: Biomedical Sciences

College: Pat Covey College of Allied Health Professions

Funding Source(s): SURF, ASBMB Student Chapter Award (ASCA)

Evaluating the Interaction Between Neu1-HER2 on the expression of Fatty Acid Binding Protein 5 in MDA-MB-453 cells

Breast cancer is at the forefront of cancer deaths among women. Understanding the underlying mechanisms that drive its progression is the key to creating targeted therapies. A specific receptor tyrosine kinase, HER2, activated by heregulin (HRG), promotes breast cancer cell growth and development. This growth factor receptor is sialylated, and desialylation of HER2 causes autophosphorylation, which leads to activation of cellular signaling events. One of the oncogenes regulated by HER2 is FABP5, which is well known to increase resistance to retinoic acid-mediated growth suppression. Preliminary studies have demonstrated that blocking the activity of sialidase Neuraminidase 1 (Neu1) with oseltamivir phosphate (OP) in breast cancer cell line MDA-MB-453 suppresses HRG-mediated activation of HER2 and its downstream targeted oncogene, FABP5. To corroborate these findings, ongoing studies include silencing of the Neu1 protein to examine p-HER2 and FABP5. From these findings, we will explore whether silencing Neu1 alters the sensitivity of RA in HRG-stimulated MDA-MB-453 cells. Knowledge of the interaction between Neu1 and HER2 could reveal novel medical therapies against these types of aggressive breast cancer, potentially improving the effectiveness of treatment and patient health overall.

Poster: 33

Manisha Gangasani

Major: Chemistry

Faculty Mentor:
Dr. Anthony Filiano

Department: Neurosurgery

College: Duke University School of Medicine

Funding Source(s): National Multiple Sclerosis Society

Localization of Type-I and Type-II Interferon Receptors in CNS Border Tissue

Multiple sclerosis (MS) is a chronic autoimmune disease marked by demyelination and axonal loss in the central nervous system (CNS). A hallmark of MS is the infiltration of peripheral immune cells, including T cells and monocytes. Emerging research highlights CNS border regions, such as the meninges and choroid plexus, as regulators of immune cell trafficking and cytokine signaling. Interferons (IFNs) play critical roles in immune regulation: type I IFN-β is used clinically to reduce relapses, while type II IFN-γ is linked to pro-inflammatory activity but may also act as a CNS regulator. Although interferon effects on immune cells are well studied in the periphery, their localization and signaling at CNS borders remain unclear. These interfaces may serve as entry points for immune cells, with IFN responses shaping disease progression. To examine receptor distribution, fluorophore-conjugated antibodies to type I (IFNAR1) and type II (IFNGR1) receptors were injected into the CSF or blood of adult C57BL/6 mice. After 10 minutes and perfusion, brains, spleens, and lymph nodes were harvested and cryosectioned for fluorescence microscopy. Results showed distinct patterns: IFNAR1 was enriched near the choroid plexus, while IFNGR1 labeling was more diffuse, appearing in meningeal regions and scattered cells at CNS interfaces. Ongoing work aims to define the specific cell types in dura and other border regions that express IFN receptors.

Poster: 32

Reeshi Ghosal

Major: Computer Science

Faculty Mentor:
Dr. Martin Frank

Department: Physics

College: College of Arts and Sciences

Funding Source(s): NSF

Improving the Reconstruction Algorithm in the Search for Magnetic Monopoles

Fermilab's NOvA (NuMI Off-axis v_e Appearance) experiment focuses on understanding the behavior of neutrinos and how they affect the cosmos. A sub-focus of the NOvA experiment is the search for magnetic monopoles. These elusive particles have not yet been observed in nature, leaving their behavior to be mysterious. The Far Detector, located in Ash River, MN, is integral in the search for these particles. The focus of this project is on simulated magnetic monopoles with speeds thousandths the speed of light and determining how to differentiate between a monopole event and a high energy event using the NOvA experiment's reconstruction algorithm. Using sample data, analysis will occur using ROOT, a data analysis framework created by CERN.

Poster: 35

Grayson Glenn

Major: Biomedical Science

Faculty Mentor:
Dr. Ryan Colquhoun

Department: Health, Kinesiology, and Sport

College: College of Education and Professional Studies

Funding Source(s): SURF

Dose-Response Impact of Glucosyl-Hesperidin (CITRAPEAK®) on Exercise Performance, Blood Flow, Stress, Cognition, and Other Perceptual Indicators

Hesperidin is a naturally occurring flavonoid found in citrus fruits. It is known to carry many health benefits. For instance, hesperidin has antioxidant effects, antiinflammatory effects, and various other metabolic effects. While data related to the basic health effects of hesperidin are widely available, the relationship between hesperidin and exercise performance is largely unexplored. However, there have been preliminary studies that suggest possible benefits of hesperidin supplementation on exercise performance. Glucosyl-hesperidin is a glycosylated hesperidin molecule that carries greater bioavailability. This suggests that glucosyl-hesperidin may be utilized by the body more efficiently potentially leading to increased exercise performance. We propose to investigate these possibilities. Participants will complete a peak oxygen consumption test (VO_2 Peak) using indirect calorimetry on a metabolic cart interfaced to a motorized cycle ergometer after 0 and 8 weeks of supplementation. Ventilatory threshold will be determined. We will then measure brachial artery blood flow by examining artery diameter and blood velocity using ultrasound technology. Finally, we will use the Stroop Color Matching Test and the Trail Making Test to investigate cognitive performance. These data will be used to determine the effects of glucosyl-hesperidin supplementation.

Poster: 34

Edy Gonzalez Fernandez

Major: Electrical Engineering

Faculty Mentor:
Dr. Daniela Wolter Ferreira Touma

Department: Electrical and Computer Engineering

College: College of Engineering

Funding Source(s): ASGC, SURF

Potential Optimized Location for Charging Access in Mobile Alabama (POLCA MAP) Project

The Potential Optimized Location for Charging Access in Mobile Alabama Project (POLCA MAP) is a research initiative focused on identifying strategic, sustainable, and cost-effective sites for electric vehicle (EV) charging infrastructure in Mobile, Alabama. The project integrates three complementary layers of analysis to provide a holistic framework for charger placement. First, grid impact was approximated through publicly available infrastructure data, using lighting density as a proxy for urban development and electricity demand. This identified low-stress areas where chargers could be installed without significantly burdening the grid. Second, economic activity was assessed by combining population density with consumer hotspots such as shopping centers and apartment complexes, ensuring that high-traffic areas were considered alongside underserved zones. Third, real driver route data collected through surveys formed the social layer, highlighting convergence points where charger placement would align with actual travel behavior. These three datasets were combined into a composite visualization—the POLCA MAP—where candidate zones were represented by 300-meter circles, allowing flexibility for real-world construction around barriers like parking lots or existing infrastructure. The POLCA MAP balances utility planning, infrastructure development, and cost efficiency, making it a scalable model that can be adapted to both urban and rural regions. By synthesizing technical, economic, and social perspectives, the project provides a data-driven methodology to support the growing EV ecosystem and contributes to the broader transition toward sustainable and accessible clean transportation.

Poster: 36

Kathy Hacker

Major: Environmental and Sustainability Sciences, Marine Sciences

Faculty Mentor:
Dr. Sinéad Ní Chadhain

Department: Biology

College: College of Arts and Sciences

Genome Analysis of Chitin Degraders Isolated from Dauphin Island, Alabama

Chitin, a polymer of n-acetylglucosamine, is the second most abundant polysaccharide found in nature, second only to cellulose. Chitin is common in the marine environment and composes the shells of many invertebrates and is also found in the cell wall of fungi. It is a source of bio-available nitrogen and carbon. We collected sea water at Dauphin Island, Alabama and used it to establish chitin enrichment cultures. Chitin degrading bacteria were identified by the formation of clear zones in chitin-agar plates. Once pure cultures were obtained, we identified the bacteria by sequencing the 16S rRNA gene. The chitin degraders belonged to the following genera: *Rheinheimera, Enterobacter, Achromobacter, Flavobacterium, Pseudomonas, Acinetobacter,* and *Stenotrophomonas*. Two isolates were chosen for genome sequencing based on their vigorous chitin degradation. The genomes were sequenced using Oxford Nanopore Technology. The genomes were assembled and annotated using both the BV-BRC platform. Isolate JM1 assembled into one contig of 4,115,693 bp and contained 3966 open reading frames including 73 tRNA genes, and 15 rRNA genes. JM1 was most closely related to *Rheinheimera baltica* DSM 14885. Isolate C6B assembled into two contigs totaling 3,857,220 bp and was composed of 2 contigs containing 3565 open reading frames, 74 tRNA genes, and 15 rRNA genes. C6B was also most closely related to *Rheinheimera baltica* DSM 14885. Each isolate contained one chitinase and one chitodextrinase gene. Future plans for these isolates are to clone and express the chitinase genes in *E. coli* to better understand the effectiveness of their chitinase degrading ability.

Poster: 37

Natalie Hadad

Major: Chemical Engineering

Faculty Mentor:
Dr. Silas Leavesley

Department: Chemical and Biomolecular Engineering

College: College of Engineering

Funding Source(s): SURF

Spectral Signatures of Disease: Autofluorescence Imaging for Early Cancer Detection

Colorectal cancer is a leading cause of cancer-related death worldwide, with a lifetime risk of one in twenty-three for men and one in twenty-five for women. Early detection improves outcomes, yet current diagnostic methods, such as tissue biopsy with pathological evaluation, are invasive, subjective, and may miss flat or depressed lesions. To address these limitations, this study explored excitation-scanning hyperspectral imaging (Ex-HSI) to analyze endogenous fluorophores in a mouse model of colorectal cancer. Ex-HSI excites tissue at a series of multiple wavelengths and captures fluorescence emission for each, generating detailed spectral profiles that reveal subtle differences undetectable by traditional imaging. Visualization approaches and spectral unmixing were used to separate signals of naturally occurring autofluorescent molecules, providing insights into molecular composition related to cell metabolism and tissue structure. During cancer progression, structural changes in the extracellular matrix and basement membrane, along with metabolic shifts, alter the molecular composition of tissue. Because many of these molecules (e.g., collagen, elastin, NADH, FAD) are autofluorescent, cancer-associated changes may be detected as shifts in spectral signatures, enabling comparison between healthy and diseased regions. In initial results using tissues obtained from a mouse colorectal cancer model, we found that spectral unmixing allowed clear separation of autofluorescent signals, revealing measurable differences between diseased and healthy tissue. These findings will guide the development of next-generation fluorescence-based endoscopy techniques aimed at improving early detection of colorectal cancer and enabling less invasive diagnostics.

Poster: 38

Lindsey Hall

Major: Social Work

Faculty Mentor:
Dr. Nancy Kelley

Department: Sociology, Anthropology, and Social Work.

College: College of Arts and Sciences

Funding Source(s): SURF

Evaluating Peer-Led Art Interventions At a Crisis Diversion Unit

Crisis Diversion Units (CDUs) provide immediate support and stabilization for individuals experiencing acute mental health crises. Historically, CDU care has emphasized psychological treatment, but integrative approaches such as creative expression have drawn increasing attention for their potential to support recovery. This study examines how peer-led art interventions affect participants' self-reported stress, anxiety, and depressive symptoms during their stay at the CDU, as well as any observed changes in emotional regulation or coping strategies following engagement in peer-led art sessions. It also explores whether participants report variations in hope, empowerment, or self-worth after participating in art-based peer support activities. A pre-post survey design was used to evaluate the intervention's impact on emotional well-being, stress levels, and satisfaction with care. The sample consisted of adults aged 18 and older in acute crisis from a crisis diversion unit over two weeks. Participants attended peer-led group art sessions three times per week for two weeks (six sessions total), which included four acrylic painting groups and two collaging groups. Of the anticipated one hundred participants, thirty-six took part in the study. Results indicate that these creative practices are associated with improvements in emotional well-being, reductions in stress, and higher patient satisfaction during acute mental health crises. Participants reported increased connection and empowerment, and some noted improved ability to process emotions. Quantitative data showed decreases in self-reported stress, anxiety, and sadness, along with modest gains in clarity of thought. These interventions may provide a comprehensive holistic approach to crisis care by supporting connection, empowerment, and emotional processing. Further research is recommended to examine and validate these integrative methods for holistically aiding recovery.

Keywords: Crisis Diversion Units (CDUs), acute mental health crisis, peer-led art interventions, creative expression, holistic mental healthcare

Poster: 39

Marissa Hall

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle, Dr. Ronald Baker

Department: Stokes School or Marine and Environmental Sciences

College: College of Arts and Sciences

Comparative Analysis of Fish Species Composition within Mangrove and Reef Communities in The Turneffe Atoll, Belize

This study aims to compare the species composition and age distribution of fish in mangrove and coral reef habitats in Belize. Based on Bradley et al. 2019, we expect community changes from the outer reef to the fringing mangrove. Using underwater video cameras, we recorded fish presence and behavior in both environments to better understand how these ecosystems influence the structure and dynamics of local fish communities. We found that the reefs observed had higher biodiversity, while mangrove sites were dominated by one or two species.

Poster: 40

Anthony Hantouche

Major: Biomedical Science

Faculty Mentor:
Dr. Dhananjay Tambe

Department: William B. Burnsed Jr. Mechanical, Aerospace, and Biomedical Engineering

College: College of Engineering

A Novel Microgravity Simulator

As humanity continues to push the boundaries of space exploration, with aspirations ranging from tourism to Zero-G manufacturing, and faster intercontinental travel to asteroid mining, understanding the impact of the space environment on human health is becoming increasingly crucial. Unlike astronauts, who undergo rigorous health screenings, future space travelers may not be in peak physical condition. This necessitates an urgent need to re-examine how various diseases progress in space, a critical area of research currently limited by the impracticality of conducting extensive studies in actual space labs.

To bridge this gap, simulated space environments offer a viable alternative. One key aspect of the space environment is microgravity, which can be replicated on Earth using specialized devices known as microgravity simulators. These simulators have been developed to expose humans, animal models, plants, and cells to low-gravity conditions.

At South, we are developing a novel microgravity simulator specifically designed to observe cellular behavior and processes under low-gravity conditions. Our initiative addresses a critical technological gap in existing simulators. The aim is to create a system that is freely available for non-commercial use, low-cost, easy to set up, and ensures reproducible results. By providing such a system, we aim to significantly enhance research capabilities and attract new external funding at South, ultimately contributing to a better understanding of biological processes in the unique environment of space.

Poster: 41

Aaliyah Harris

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle, Dr. Ronald Baker

Department: Stokes School of Marine and Environmental Sciences

College: College of Arts and Sciences

Driving Factors of Lionfish Diet in Calabash Caye, Belize

Lionfish (*Pterois spp.*) are invasive predators in the Caribbean that have rapidly colonized reef ecosystems such as Turneffe Atoll, Belize, posing a serious threat to native biodiversity. In this study, we examined the stomach contents of 88 lionfish collected from eight sites to assess prey composition and feeding patterns by time of day. Stomachs were dissected and prey items identified to the lowest possible taxonomic level, then categorized as fish, crustaceans, or gastropods. Results revealed that fish were the most frequently consumed prey, particularly in lionfish measuring 150–275 mm, while crustaceans were consistently present across all size classes. Time-of-day analysis indicated peak feeding activity in the morning, with fish and crustaceans comprising the majority of prey. These findings highlight the role of lionfish as dominant reef predators and provide critical insights to inform management and mitigation strategies.

Poster: 42

Harper Higdon

Major: Biology

Faculty Mentor:
Dr. Sinéad Ní Chadhain

Department: Biology

College: College of Arts and Sciences

Funding Source(s): SURF

Isolation of Carbon-Capture-Compound Degrading Bacteria for Sodium Taurinate (NaT)

The level of CO_2 in the atmosphere is increasing and needs to be managed in order to prevent or at least slow the crisis that is global warming. Carbon Capture Compounds (CCCs) can significantly decrease the levels of CO_2 through CO_2 sequestration. (Kumar et al., 2018). This summer, the three CCCs of focus included MEA, Sodium Taurinate (NaT), and Sodium Methyltaurinate (NaMeT); this poster focuses solely on the data found regarding NaT. Previous studies have shown that aerobic bacteria can use said compounds as sources of carbon or nitrogen. (Ikeda et al., 2025). Therefore, CCCs can be removed from the environment by means of biodegradation from naturally-occurring bacteria. With this in mind, this summer's research consisted first of growing bacteria under the presence of NaT to prove that it could actually grow. Next, determining the certain types of bacteria that grew under its presence. Finally, using a spectrometer to measure the optical density of particular bacteria to determine how well they grew. While there is still much more work to be done in the future, the bacteria growth under the presence of NaT was a success and provides reason to believe that CCCs can be degraded by means of nearby bacteria in the environment.

Poster: 80

Park Hobbs

Major: Marine Sciences

Faculty Mentor:
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Department: Stokes School or Marine and Environmental Sciences

College: College of Arts and Sciences

Baseline Data for *Cardisoma guanhumi* in Calabash Caye, Belize

This project establishes baseline data for the blue land crab (*Cardisoma guanhumi*) along the first segment of the nature trail at Calabash Caye Field Station in Belize. We recorded carapace width measurements and examined their relationship to sex, while also assessing the species' ecological role within the surrounding coastal ecosystem. Additionally, we analyzed lunar phases in relation to nightly crab abundance to identify potential patterns in activity. Although we marked captured individuals for a mark-recapture study, no recaptures were recorded, preventing the use of the Lincoln-Petersen method to estimate population size. However, we maintained a nightly count of crabs observed along the study area to provide insight into population trends. We noticed a decrease in observed population size and a distinct difference in carapace width.

Poster: 43

Jessica Ivory

Major: Mechanical Engineering

Faculty Mentor:
Dr. Kaushik Venkiteshwaran

Department: Civil, Coastal, and Environmental Engineering

College: College of Engineering

Funding Source(s): SURF

Utilizing Fe & Activated Carbon Hybrid Geotextile Pouches for PO4 Absorption and Fe Reusability

Phosphorus (P) is a fundamental component of almost every biological process. However, an excess accumulation of P in waterways due to stormwater runoff can cause eutrophication and dead zones; threatening aquatic ecosystems and human health. Therefore, the importance of developing effective ways for P removal from stormwater runoff. There are many green infrastructure types available such as bioswales and rain gardens, but these only focus on stormwater management instead of P removal. This research works to develop an effective P removal and Fe reusability method via the combination of non-woven geotextile pouches, iron (Fe), and activated carbon (AC). As such, these geotextile hybrid pouches would be an effective method to increase the capabilities of already existing green infrastructure types. In the study, non-woven geotextile fabrics were cut and sewn together to create pouches. Subsequently, the pouches were then filled with various types of Fe and various weights of both Fe and AC to test various variables. The results demonstrated that a) absorption is unaffected by the particulate size of Fe used and b) physically combined Fe + AC absorb phosphate more effectively than chemically combined Fe and AC. Overall, it can be concluded from this research that Fe is an effective tool for P removal, but that combining it with AC alone is not sufficient to prevent it from leaching from the pouches.

Poster: 80

Mileah Joy

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle, Dr. Ronald Baker

Department: Stokes School or Marine and Environmental Sciences

College: College of Arts and Sciences

Baseline Data for *Cardisoma guanhumi* in Calabash Caye, Belize

This project establishes baseline data for the blue land crab (*Cardisoma guanhumi*) along the first segment of the nature trail at Calabash Caye Field Station in Belize. We recorded carapace width measurements and examined their relationship to sex, while also assessing the species' ecological role within the surrounding coastal ecosystem. Additionally, we analyzed lunar phases in relation to nightly crab abundance to identify potential patterns in activity. Although we marked captured individuals for a mark-recapture study, no recaptures were recorded, preventing the use of the Lincoln-Petersen method to estimate population size. However, we maintained a nightly count of crabs observed along the study area to provide insight into population trends. We noticed a decrease in observed population size and a distinct difference in carapace width.

Poster: 44

Taylor Kiker

Major: Computer Science

Faculty Mentor:
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Department: Computer Science | Biochemistry and Molecular Biology

College: School of Computing | Frederick P. Whiddon College of Medicine

Funding Source(s): NSF

Mitochondrial Artificial Targeting of DNA Glycosylases to Augment mtDNA Repair

Mitochondria are the cell's primary energy producers and a significant source of harmful reactive oxygen species (ROS), which can damage mtDNA. Unchecked oxidative damage causes cellular dysfunction, which leads to a range of human maladies from neurodegenerative disorders to cancers. MtDNA damage from ROS is repaired by the base excision repair (BER) pathway, initiated by DNA glycosylases that recognize and remove damaged bases. Among the eleven mammalian DNA glycosylases, five (OGG1, NTHL1, NEIL1, NEIL2, and NEIL3) specifically repair oxidized DNA lesions. These enzymes function in both nuclear and mitochondrial BER guided to mitochondria by targeting signals. This project aims to "supercharge" mtDNA repair by modifying the five DNA glycosylases (OGG1, NTHL1, NEIL1, NEIL2, and NEIL3) while also allowing them to retain their critical function during BER within the nucleus. To this end, we have developed a pipeline referred to as Mitochondrial ARtificial Targeting (MART). A part of this pipeline includes a computational framework that is performed in four main steps: (i) construction of a training set of MTSs, (ii) discovery of candidate building blocks (BBs), (iii) selection of candidate BBs satisfying a threshold requirement (i.e., qualified BBs), and (iv) assembly of qualified BBs to create an engineered mitochondrial targeting signal. The DNA glycosylases are computationally re-engineered by identifying and replacing those BBs that likely impede the desired localization target with BBs that are likely to increase localization to the desired target (in this case the mitochondrion). Positive results of this MART pipeline are seen with NEIL1 where we were able to successfully re-engineer NEIL1 to increase its mitochondrial localization. Similar experiments are underway for the remaining DNA glycosylases.

Poster: 45

Grace Kingrey

Major: Biomedical Science

Faculty Mentor:
Dr. James Davis Jr.

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): NSF

Synthesis of Asymmetrical Boronium Ionic Liquids from Urea Ligands and N-methyl Pyrrolidine Heterocyclic Borane for Potential Use in Extraction of Bioactive Compounds

Boronium cations have shown promising results for potential use in the biomedical industry as broad spectrum antimicrobial agents. The results have generated new interest in the use of boronium ionic liquids in other biomedical applications. Recently a new group of boronium ionic liquids, using urea-containing ligands to form oxygen donor bonds to the central boron have been studied for their unique characteristics and ability to form room temperature ionic liquids as the bistriflimide salts. The hydrogen bonding capacity of the urea ligands containing N-H bonds performs an important role by influencing the solvent properties of these compounds. New +1 boronium cations were synthesized using various urea-containing ligands. A novel borane reagent, the BH3 complex, of N-methyl pyrrolidine was used to form the additional ligand bond for an O-B-N coordination. Ion exchanges with potassium bistriflimide were conducted with the iodine salt to form the room temperature ionic liquids. After purification, proton, carbon, and boron NMR spectroscopy was utilized to verify the structure.To obtain x-ray crystal structures, successful ion exchanges with tetraphenylboron were conducted and further recrystallised from various solvents. Future work with these compounds includes testing and comparing the solvation and hydrogen bonding between the series of asymmetrical urea-containing boronium cations. These unique compounds open a new avenue for exploring extraction of bioactive compounds.

Poster: 46

Mackenzie Kyles

Major: Biology

Faculty Mentor:
Dr. Meghan Hermance

Department: Microbiology and Immunology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF, CDC

Screening field collected Ticks from Coastal Alabama for *Rickettsia* Species

Ticks, which are ectoparasitic arachnids that feed on the blood of animals and humans, are important subjects of study in biomedical fields because of their capabilities as vectors of disease-causing microbes. Ticks can receive bacteria from their blood feedings and this bacterium can persist inside the tick's cells to be passed to a new host during the next blood meal. A particular bacterium that can parasitize ticks is *Rickettsia*. *Rickettsia* is a parasitic bacterium that can persist in the cells of animals and humans. Being bitten by a tick that is carrying *Rickettsia* bacteria can cause a variety of illnesses in humans, ranging from mild spotted fevers to the potentially deadly Rocky Mountain Spotted Fever. Therefore, it is important we have an estimation of how likely it is that a tick is carrying *Rickettsia* in coastal Alabama.

Summer 2025 research involved a 4-step process. First, a graduate student collected the ticks in field sites around Coastal Alabama. Next the ticks were identified by species, sex, life stage, and collection site and stored at -80°Cin individually labeled microtubes. Then, the DNA was extracted from the ticks. This was done by first submerging the tick in liquid nitrogen, finely crushing the bodies, adding lysis buffers, and incubating them overnight at 56°C. Then the next day, the tick lysate is bound to a spin column and washed until the pure DNA is yielded. Lastly, PCR and gel electrophoresis were used to determine if the tick was carrying *Rickettsia*. Research is currently ongoing but the conclusions of this project will give an estimate of how prevalent certain species of *Rickettsia* are within the species of tick they parasitize and which areas in coastal Alabama they were found in.

Poster: 48

Angelina Ladner

Major: Marketing - Marketing Management Concentration

Faculty Mentor: Dr. Marianne Loes

Department: Marketing, Supply Chain Management, and Analytics

College: Mitchell College of Business

Funding Source(s): SURF, Mitchell College of Business

A Study on the Behavior of Generation Z Buyers

Generation Z (those born between 1996-2010) consumers embark on a perplexing consumer decision journey. This study aims to unfold the antecedents to Generation Z's commitment to a brand by analyzing related marketing literature to examine the in-depth consumer decision-making process of this unique generation. Generation Z is beginning to form strong relationships with brands that will foster trust and loyalty, impacting future brand commitment. Moreover, with the fast-paced world of technology, this generational group is easier than ever to reach with marketing tactics; With channels such as loyalty programs and social media influencers, brands can develop trust and loyalty with consumers and cultivate consumer commitment and retention more than ever before. To unravel the cohort's typical characteristics and motivations when influenced to commit to a brand's products or services, a method consisting of two phases is proposed: in-depth literature reviews of supporting research followed by a structured survey to analyze concrete, quantitative data. This investigation contributes to academic literature by deepening the knowledge of the antecedents of Generation Z brand commitment and proposing a research model for this cohort to examine their purchase behavior. The research process revealed how social media influencers, brand trust, brand loyalty, and loyalty programs all help to foster brand commitment among generation z consumers. The significant path coefficients support that social media influencers reinforce the trust consumers have with a brand while this trust increases their loyalty. This brand loyalty then fuels the use of loyalty programs and increased brand commitment. The findings suggest that businesses seeking to engage generation z must integrate reward based loyalty systems with authentic influencer marketing which will help to cultivate long term brand commitment. Marketing professionals can utilize these findings and gain insight into the relevant touchpoints that influence Generation Z commitment while understanding the benefits utilizing these mediums can foster.

Poster: 47

Dermot Larson

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle

Department: Stokes School of Marine and Environmental Sciences

College: College of Arts and Sciences

Distribution of Snapper Life Stages at Fringing Mangroves vs. Coral Reefs

Several different snapper species are known to live throughout the Turneffe Atoll within Belize. Snapper species use multiple different types of habitats throughout their life cycle. Snapper are an important fisheries species as well as being important in the natural ecosystem. Understanding how habitats affect snapper lifecycle distribution is important for effective conservation.

The atoll is home to primarily three different habitats, all of which snapper species reside in. The three major habitats are mangroves, seagrasses and coral reefs. When snapper species are young, they tend to inhabit mangroves and seagrasses more so than the rocky coral habitats, moving to those coral habitats as they sexually mature. This is due to better protection for juvenile fish in mangroves, while the corals offer adult snapper a better food source, while still providing hard cover.

Our project aims to see how close proximity between the coral and mangrove habitats within the Turneffe Atoll affect the presence of juvenile and adult snapper within their preferred habitats. Students were taken out to mangrove and coral habitats and dropped cameras to record the snapper life stages present. Those videos were then analyzed for snapper species and lifecycle distribution. There was lack of evidence to support the claim that juvenile snappers will choose the mangroves over the reefs. This may be due to the relatively close proximity of all the habitats to each other compared to most other natural habitats.

Poster: 49

Brooke Latimer

Major: Biomedical Science

Faculty Mentor:
Dr. Allyson Shea, Sicily Hardy

Department: Microbiology and Immunology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF

Optimizing a Synthetic Urine Medium to Test PYRs as Nutrients Supporting UPEC Growth

A urinary tract infection (UTI) occurs when bacteria enter the urethra and colonize the bladder causing cystitis. In severe cases, UTIs can progress to pyelonephritis or urosepsis. UTIs are the second most frequent infectious disease worldwide, disproportionately affecting women and older adults. *Uropathogenic E. coli* (UPEC) is the predominant etiological agent, accounting for 60-80% of UTIs. While much is known about bacterial virulence and host immune responses, we lack insight into how the chemical makeup of urine modulates bacterial metabolism. Recently, a novel class of riboside pyridones (PYRs) were identified, specifically 2, 4, and 6PYR, that are enriched in postmenopausal women's urine. These PYRs are cytotoxic to epithelial cells and enhance UPEC growth. To determine which bacterial transporter(s) are responsible for PYR uptake, we will need to screen 466 UPEC transporter mutants grown in urine supplemented with PYRs. However, to achieve this, we need an extensive amount of pooled urine from the same group of individuals and costly spectrometric analysis to account for variable PYR concentrations. To address this issue, our objective was to develop a synthetic urine recipe suitable for UPEC growth curves that accurately mimics growth observed in human urine. We initially tested a published synthetic urine recipe, but it yielded inconsistent results when applied over time. Next, we performed a series of casamino acid (CAA) titrations in MOPS medium with UPEC and determined that 0.1% CAA in MOPS most closely reproduced growth observed in pooled human urine. Based on these findings, this medium presents a potential approach for screening UPEC mutants with consistent results.

Poster: 50

Hannah Lawley

Major: Biomedical Science

Faculty Mentor:
Dr. David Forbes

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): SURF

Potent and Precise: Next Generation Norcantharidin Derivatives

Both cell culture and animal models of tumor development indicate that Protein Phosphatase 5 (PP5) plays an important role in the progression of breast cancer cells. PP5 expression is regulated by both estrogen and HIF1 (hypoxia inducible transcription factor 1), and it suppresses stress-induced signaling cascades that trigger apoptosis. Cantharidin, a naturally occurring toxin from the blister beetle, and its derivative norcantharidin are known inhibitors of PP5; however, they also strongly inhibit PP1 and PP2A, which leads to toxicity in eukaryotic cells. Building on this challenge, our project explores the design of new norcantharidin derivatives aimed at improving selectivity and potency toward PP5. To this end, we synthesized and characterized multiple derivatives bearing either chloromethyl or chloroethyl substitutions, optimizing reaction conditions to maximize yield and purity. These compounds were tested for inhibitory activity against PP5 and selectivity relative to PP1. The chloroethyl-substituted derivative emerged as the most promising candidate, demonstrating strong PP5 inhibition with minimal off-target activity, closely resembling the profile of norcantharidin. These findings support the strategy of structural modification to tune potency and selectivity, with the chloroethyl substitution offering particular promise. This work not only advances the development of targeted PP5 inhibitors with reduced toxicity, but also provides new insights into the structure–activity relationships of norcantharidin derivatives and PP5 biology.

Poster: 52

Mariah Ledbetter

Major: Biomedical Science

Faculty Mentor:
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Department: Biomedical Sciences | Microbiology and Immunology

College: Pat Covey College of Allied Health Professions | Frederick P. Whiddon College of Medicine

Funding Source(s): SURF, ASBMB Undergraduate Research Award

Exoenzyme Y catalytic activity decreases Exoenzyme S-induced cytotoxicity in PMVECs.

Pulmonary microvascular endothelial cells (PMVECs) line the capillaries of the lung. *Pseudomonas aeruginosa* (*P. aer*) infection causes PMVECs to die, creating gaps between these cells. These gaps allow fluid to leak out of the capillaries, causing pneumonia. *P. aer* is the number one cause of ventilator associated pneumonia in intensive care unit patients. *P. aer* utilizes a Type III Secretion System to inject exoenzymes S, T, U, and/or Y into the host cell cytosol. S, T, and U lead to cytotoxicity. Y does not induce cytotoxicity. In epithelial cells, Y decreases S-induced cytotoxicity. In endothelial cells, Y does not decrease S-induced cytotoxicity. However, these data were generated using a series of isogenic *P. aer* mutants. Herein, we used recombinant *P. aer* mutants expressing S in combination with either enzymatically active or inactive Y to determine whether Y activity modulates S-induced cytotoxicity. To generate recombinant *P. aer* mutants, we transformed isogenic *P. aer* S and *P. aer* null with plasmids expressing either active exoenzyme Y (ExoY+), or inactive exoenzyme Y (K81M), or empty vector (ev). PMVECs were infected with recombinant *P. aer* mutants at a multiplicity of infection of 20:1 for 5 ½ hours. Cytotoxicity was assessed using a Cytotoxicity Detection KitPLUS LDH assay using a modified version of the manufacturer instructions. Intoxication with recombinant S/ev and S/K81M led to significant LDH release compared to uninfected control. S/ExoY+ led to significantly less LDH release compared to S/ev and S/K81M. Null/ev, Null/K81M, and Null/ExoY+ did not lead to significant LDH release compared to uninfected control. These data indicate that catalytically active exoenzyme Y decreases exoenzyme S-induced cytotoxicity.

Poster: 56

Aiden Lilley

Major: Exercise Science - Pre-Professional Concentration

Faculty Mentor:
Dr. Kevin Strehler

Department: Physical Therapy

College: Pat Covey College of Allied Health Professions

Funding Source(s): SURF

Cued Exercises for Shoulder Stability in Adolescent Swimmers

Shoulder stability and mobility is a crucial part of training for swimmers of all ages. The purpose of this study is to determine if externally cued exercises improve shoulder stability in competitive swimmers. A randomized controlled trial was conducted with 36 adolescent swimmers. Participants were randomly assigned to either a control group or an experimental group. The experimental group used an external cuing device during their exercises. All participants completed a 6 week exercise program consisting of 8 exercises. Before the program, baseline data was collected on demographics, active range of motion, isometric strength, and performance on the modified athletic shoulder test and the Closed Kinetic Chain Upper Extremity Test (CKUEST). The data collection for the modified athletic shoulder test and the CKUEST was performed again at the end of the training program. The results showed no significant improvement in shoulder stability in the experimental group using the external cuing device. Both the CKUEST and isometric strength test yielded similar results for both the experimental and control groups, suggesting the external cues provided no additional benefit. These findings were influenced by several limiting factors, most notably a significant drop in participant numbers from 36 to 21. Furthermore, participant compliance was a significant issue as most swimmers reported not consistently participating in the exercise program. In conclusion, our study was unable to demonstrate the effectiveness of external cuing during exercise due to low participation and a low sample size. The study will be done again under strict supervision to ensure the participants are actively engaged in the exercise program.

Poster: 54

Carolyn Lippold

Major: Chemical Engineering

Faculty Mentor:
Dr. David Forbes

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): ASGC, SURF

Next Generation Lipid-like Nanoparticles: Application of Traceless Solid-Phase Chemistry

Lipid-like nanoparticles (LLNPs) are a promising class of delivery vehicles for mRNA therapy, gene editing, and targeted drug delivery, with recent applications ranging from COVID-19 vaccines to CRISPR-Cas9 delivery. However, traditional LLNP synthesis can be time-consuming, waste-intensive, and difficult to purify. To overcome these challenges, we propose a traceless solid-phase synthetic strategy that enables efficient, modular assembly of LLNPs using a polymer support. Our method begins with the esterification of terephthalic acid to generate dimethyl terephthalate, followed by selective mono-esterification to produce mono-methyl terephthalate (MMT), a key reactant that allows for further functionalization. Functional groups supporting LLNP formation are introduced using diphenylphosphoryl azide and triethylamine. These intermediates are then anchored onto a 4-hydroxybenzyloxy alcohol polymer-bound resin. Cleavage of the LLNPs from the solid support is achieved via hydrogenation and analyzed through nuclear magnetic resonance (NMR). To validate our approach, we monitored the progress of MMT concentration in the reaction flask using NMR kinetics and confirmed successful polymer attachment and transformation using ATR-FTIR spectroscopy. The process significantly reduces the burden of post-synthetic purification, lowers material waste generation, and increases structural precision while also enhancing the project's scalability in future applications. We are currently developing a transesterification step to append long alkyl chains for lipid tail formation, enabling more biologically relevant LLNPs, with subsequent hydrogenation-based release and testing of their delivery potential. Ultimately, it offers a versatile and efficient route to LLNP synthesis, with potential for broader application in the development of next-generation therapeutics.

Poster: 53

Alexandria Mabien

Major: Health Informatics

Faculty Mentor:
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Department: Pharmacology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF, Funding was provided in part by NSF 231178 (GMB) awarded by the Division of Molecular and Cellular Biosciences and also by NSF grant 2243532 (GMB) awarded by the Division of Integrative Organismal Systems.

Y RNA and Y RNA-derived ysRNAs associations with, and potential roles during, viral infection

Y RNAs are a poorly-studied class of small non-coding RNAs (sncRNAs) which have previously been implicated in the pathogenesis of different human diseases, including cardiac and autoimmune conditions, as well as certain cancers. In recent years, however, multiple studies have reported correlations between Y RNA expressions and disease outcomes in viral infections (e.g., IAV, HIV, HPV, and SARS-CoV-2) as well as potential mechanistic roles that Y RNAs may play in host anti-viral defense. These studies suggest that Y RNAs may be associated with upregulation of viral defense proteins as well as altered cell-cell communication during viral infections. In this review, current literature detailing Y RNA effects on human viral infection will be summarized and future directions in the study of these relationships discussed.

Poster: 55

Mary Helene Marmande

Major: Chemistry

Faculty Mentor: Dr. Amy Arnold

Department: Neuroscience and Experimental Therapeutics

College: Penn State College of Medicine

Funding Source(s): American Heart Association Undergraduate Student Fellowship

Differential expression of cardiac renin-angiotensin system components in obesity and potential implications for blood pressure control

Obesity is a global epidemic strongly associated with cardiovascular complications, including hypertension. Dysregulation of the renin-angiotensin system (RAS) contributes to obesity-related hypertension by enhancing vasoconstrictive angiotensin (Ang) II pathways and reducing vasodilatory Ang-(1-7) pathways. However, the impact of obesity on tissue-specific RAS expression remains unclear. This study aimed to profile cardiac RAS components in high-fat diet (HFD)-induced obese versus control mice and assess associations with blood pressure. We hypothesized that obese mice would exhibit increased expression of Ang II components and decreased Ang-(1-7) components, correlating with elevated blood pressure. Male C57BL/6J mice were fed a 60% HFD or control diet for 12 weeks (n=10–12/group). Physiological analyses quantified blood pressure, body composition, and glycemic control. Whole hearts were collected for RT-qPCR analysis of angiotensin converting enzyme (ACE), ACE2, Mas receptor (MasR), AT1R variants (AT1Ra, AT1Rb), and AT2R. HFD males displayed cardiometabolic abnormalities including increased adiposity, hyperglycemia, insulin resistance, glucose intolerance, and mild blood pressure elevations. Cardiac ACE2 expression was reduced in HFD males, while ACE was unchanged. HFD males also showed reduced AT1R expression and increased MasR expression. ACE2 expression negatively correlated with body mass and trended with blood pressure. HFD-induced obesity downregulates cardiac ACE2, potentially shifting the RAS toward Ang II dominance and contributing to elevated blood pressure. Compensatory AT1R downregulation and MasR upregulation align with ligand-receptor feedback. Future studies should examine other tissues and sex differences in RAS regulation.

Poster: 51

Nathan Martin

Major: Civil Engineering

Faculty Mentor:
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Department: Civil, Coastal, and Environmental Engineering

College: College of Engineering

Funding Source(s): SURF, Dr. K. Venkiteshwaran

Phosphate Removal in Woody Biocarbon: Creating an Ideal Alternative for Industrial Fuel

The steel industry accounts for some 10% of the world's current carbon dioxide production, largely stemming from its reliance on carbon coke as a fuel source. Previous research has shown potential for partial substitution of carbon coke by various biocarbons, ideally saving 5% of the industry's net emissions. Problems arise when considering the chemical composition of pyrolyzed biochars—often being high in phosphates and sulphur, both compounds negatively affecting the properties of produced steel. This study sought to determine the effectiveness of acid washing on the removal of phosphate groups from unprocessed woody biocarbons, testing variability in biochar/wash liquid ratio, acid wash molarity, and removal rates in regards to exposure time. Hydrochloric acid was utilized in 3M solution, 1M solution, and 0.1M solution; these acid washes were compared to water washes. Results showed a near total ineffectiveness of water washing, demonstrating acid's high relative effectiveness, even in solutions with low molarity. Meaningful amounts of phosphate was collected, leading not only to a potentially carbon-negative fuel source, but also a potentially simple method for phosphate collection and utilization.

Poster: 63

Jonathan Mason

Major: Chemistry

Faculty Mentor:
Dr. Moustafa Zagho

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): SURF,
Department of Chemistry

Environmentally Resistant Two-Step Polydopamine/Glucosamine Antifouling Surface Modification of Poly(vinylidene fluoride) Microfiltration Membranes

Freshwater shortages from climate change and population growth highlight the need for efficient wastewater recycling, with polymer membrane filtration offering high purity and low energy use compared to other separation methods such as distillation, gravity separation, and centrifugation. However, fouling limits the performance of polymeric membranes. To address this, we propose bioinspired hydrophilic polydopamine (PDA) coatings on PVDF membranes, further enhanced with glucosamine to enhance hydrophilicity. Membrane properties will be characterized by FT-IR and AFM, and performance evaluated through pure water and bovine serum albumin (BSA) flux and BSA adsorption tests to assess antifouling improvements.

Poster: 57

Kathryn Mayeaux

Major: Biomedical Science

Faculty Mentor:
Dr. David Forbes

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): Department of Biomedical Sciences, Department of Chemistry

Protein Phosphatase 5 Inhibition: Synthesis of Next-Generation Derivatives to Explore Therapeutic Potential

Protein Phosphatase 5 (PP5) is a serine/threonine phosphatase that plays a pivotal role in regulating key cellular processes such as stress response, DNA damage repair, and cell cycle progression. Its overexpression has been closely associated with increased proliferation in human breast cancer and mouse leukemia models, highlighting PP5 as a compelling target for therapeutic intervention. This project centers on the development of a novel bioactive scaffold designed to selectively inhibit PP5 activity, thereby disrupting oncogenic signaling pathways. The proposed strategy involves the covalent conjugation of norcantharidin, a known phosphatase inhibitor, to a hydroxymethyl aniline derivative, which has demonstrated promising binding interactions within the PP5 active site. The synthesized compound will undergo computational modeling, molecular docking simulations, and enzymatic assays to assess its binding affinity, inhibitory strength, and selectivity toward PP5 in comparison to related phosphatases. Additionally, the conjugate's biological activity, cellular uptake efficiency, and capacity to inhibit PP5-mediated cell proliferation will be systematically investigated. By characterizing both its biochemical and functional properties, this project seeks to establish a foundation for the next generation of PP5-targeting small molecules with therapeutic potential in cancer treatment.

Poster: 59

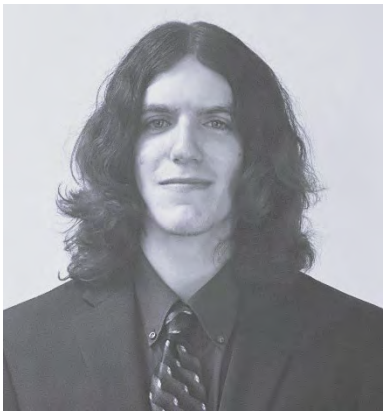
Aiden McCain

Major: Mathematics/Statistics

Faculty Mentor:
Dr. Sarah Allred, Dr. Jeffery Mudrock

Department: Mathematics and Statistics

College: College of Arts and Sciences



Funding Source(s): Faculty Development Counsel Grant Program

Enumerative Chromatic-Choosability of Multipartite Graphs

Graph coloring was introduced in the 1850s with the famous Four Color Problem about coloring maps in such a way that any two regions sharing a border receive different colors. Over the past 170 years, the study of graph coloring has led to the discovery and development of beautiful mathematics with many applications including in computer science, scheduling, problems on social networks, and register allocation.

In this project, we study a variant of graph coloring called list coloring which was introduced in the 1970s. One famous notion in list coloring that has received significant attention in the literature is chromatic-choosability. We examine an enumerative analog called enumerative chromatic-choosability; furthermore, we prove that certain complete multipartite graphs are weakly enumerative chromatic-choosable. This is joint work with Sarah Allred, Andy Fritz, Aiden McCain, Jeffrey A. Mudrock, and Morgan Taylor.

Poster: 39

Jana McLemore

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle

Department: Stokes School of Marine and Environmental Sciences

College: College of Arts and Sciences

Comparative Analysis of Fish Species Composition within Mangrove and Reef Communities in The Turneffe Atoll, Belize

This study aims to compare the species composition and age distribution of fish in mangrove and coral reef habitats in Belize. Based on Bradley et al. 2019, we expect community changes from the outer reef to the fringing mangrove. Using underwater video cameras, we recorded fish presence and behavior in both environments to better understand how these ecosystems influence the structure and dynamics of local fish communities. We found that the reefs observed had higher biodiversity, while mangrove sites were dominated by one or two species.

Poster: 60

Gabe Merchant

Major: Chemistry

Faculty Mentor:
Dr. James Davis Jr., Dr. Richard O'Brien | Dr. Terrance Ravine

Department: Chemistry | Biomedical Sciences

College: College of Arts and Sciences | Pat Covey College of Allied Health Professions

Funding Source(s): SURF, NSF (CHE-2102978)

Urea-Based Boronium Salts as Antimicrobial Agents

Quaternary ammonium compounds (QACs) have been widely used as disinfectants due to their ability to reduce or eliminate unwanted bacteria on surfaces. QACs antimicrobial properties are attributed to their ability to disrupt the cellular membrane of bacteria. In recent years, QACs have presented many health and safety concerns, primarily related to their overuse and accumulation. The increased use of QACs has led to a rise in resistant bacteria so the synthesis of novel antibacterial compounds is vital to combat the growing threat. Recent advances in boronium salts offer a unique opportunity to combat these adverse effects. Boronium salts containing alkyl chains of C-12, 14, 16 have shown comparable effectiveness to QACs. While effective, these salts were sparingly soluble in aqueous solutions. One possible solution is to utilize recently discovered boronium salts bonded to an O-donor such as urea. Boroniums coordinated in this manner contain two nitrogen sites from which hydrogen bonding can occur, allowing for increased water solubility. This further offers a unique head group that could yield favorable interaction with the hydrophilic portion of the phospholipid bilayer and increase microbial inhibition. To study these possibilities, boronium salts with 1,1-dimethylurea and a long alkyl chain were synthesized and characterized via NMR. Following this, minimum inhibitory concentration (MIC) testing was performed to determine the antimicrobial effectiveness of each compound.

Poster: 62

Ajah Moore

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle, Dr. Ronald Baker

Department: Stokes School or Marine and Environmental Sciences

College: College of Arts and Sciences

Funding Source(s): Study Abroad scholorships

Time of Day Effects Observed Hunting Behaviors of Lionfish in Turneffe Atoll, Belize

The Indo-Pacific lionfish (*Pterois volitans*), an invasive apex predator, is rapidly spreading throughout the Caribbean and Western Atlantic Ocean. This species exhibits distinct behaviors depending on activity state: active. Inactive, or hunting. We observed lionfish on Reef 3 near Calabash Caye, within the Turneffe Atoll of the Mesoamerican Reef system (Fig.1). Hunting behaviors were classified as striking and blowing, inactive behaviors as hiding and floating, and active behaviors as swimming and fanning. Results show that lionfish most frequently engage in hunting behaviors during the morning, while overall activity levels remain relatively consistent throughout the day.

Poster: 61

Kelson Moorer

Major: Biomedical Science

Faculty Mentor:
Dr. John Soltys

Department: Neurology and Immunology

College: Pat Covey College of Allied Health Professions

Funding Source(s): SURF

MS & the OR : Unraveling Perioperative Outcomes

Multiple sclerosis is an auto inflammatory disease that affects the nervous system causing patients to have relapsing symptoms.
There is currently no direct cause of MS but it is said to be caused by the immune system attacking the protective coating called myelin around nerve fibers in the brain and spinal cord. This attack on the myelin can cause a disruption in the communication between the brain and spinal cord leading to a number of different symptoms.

Poster: 66

Emily Morgan

Major: Geology

Faculty Mentor:
Dr. Benjamin Linzmeier

Department: Geology

College: College of Arts and Sciences

Funding Source(s): ASGC, SURF

PFAS Sampling Distribution in Mobile Watersheds

In this SURF 2025 project, Dr. Linzmeier and Ms. Morgan attempted to determine the distribution of sampling sites for the pollutant PFAS (Per- and PolyFluoroAlkyl Substances) in watersheds surrounding the Greater Mobile Area. In this, they consider the demographics of those living in tested areas, as well as their distribution in specific watersheds. They are also working with Bowden Labs to add to the literature and extend the sampling range.

Poster: 64

MacKenzie Morrison

Major: Speech and Hearing Sciences

Faculty Mentor:
Dr. Nicholas Stanley

Department: Speech Pathology and Audiology

College: Pat Covey College of Allied Health Professions

Funding Source(s): SURF

Self Perceived Hearing Ability and Listening-Related Fatigue in Patients with and without Aphasia

A gap in research examining the effects of hearing loss in the aphasia population may contribute to patients missing treatment that could significantly improve their quality of life. The purpose of this study was to determine whether persons with aphasia (PWA) will report a greater self-perceived hearing ability and listening-related fatigue compared to the two control groups with hearing loss (C-HL) and with normal hearing (C-NH).

Study participants were organized into three groups: PWA, C-HL, and C-NH. We hypothesized that the PWA would report a greater listening-related fatigue and perceive themselves as having greater hearing impairment than C-HL and C-NH groups. All participants completed the Cognitive Linguistic Quick Test-Plus (CLQT+), the Vanderbilt Fatigue Scale for Adults-40 items (VSF-A), the Speech, Spatial, and Qualities of Hearing Scale-12 items (SSQ-12). The CLQT+ assessed cognitive and linguistic abilities. The SSQ12 measured self-perceived hearing abilities across three domains: speech, spatial, and qualities. The VSF-A evaluated listening-related fatigue across four domains: emotional, social, cognitive, and physical. Statistical Analysis was performed using a Kruskal-Wallis test with an alpha level of .05. Results revealed significant differences in the SSQ12 speech subscale, VFS overall scores, and the VFS physical subscale. Although these findings did not fully align with the original hypothesis, they suggest that persons with aphasia experience greater listening-related fatigue overall and more difficulty in hearing speech.

Poster: 65

Fennec Morrissette

Major: Computer Science

Faculty Mentor:
Dr. Jeffrey Mudrock

Department: Mathematics and Statistics

College: College of Arts and Sciences

Maximizing Satisfied Requests in List Coloring

Graph coloring was first introduced in the 1850s with the Four Color Problem, which involves coloring regions of a map in such a way that any two regions that share a border receive different colors. In the 170 years since, the study of graph coloring has led to the development of beautiful and useful mathematics.
In this project, we study a variant of graph coloring called flexible list coloring, introduced by Dvorák, Norin, and Postle in 2019. In flexible list coloring, each vertex of a graph is assigned a list of available colors, and each vertex may have a preferred color. We seek to color each vertex with a color from its list such that adjacent vertices receive different colors while satisfying as many color preferences as possible. In particular, we study the list flexiblity of the join of an arbitrary graph with a complete graph.
This is joint work with Michael C. Bowdoin, Yanghong Chi, Bella Ives, Seoju Lee, Christian B. Ellington, and Jeffrey A. Mudrock.

Poster: 58

Ethan Myers

Major: Biomedical Science

Faculty Mentor:
Dr. Allyson Shea

Department: Microbiology and Immunology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF

UroDetect a water quality field test kits turned diagnostic tool for Urinary Tract Infections

Worldwide there are approximately 150 million Urinary Tract Infections (UTIs) annually, defined as >103 colony forming units (CFU) per mL of urine. UTIs are a major women's health concern with 40%-60% of woman expected to contract a UTI in their lifetime. >99% of UTIs are caused by bacteria, with Gram-negative species making up 84% of cases and Gram-positive accounting for 15% for cases. Currently urine culture is the only method to identify the causative agent of a UTI. While urine culture is relatively available in high resource areas, there is a lack of availability in rural and low resource areas. This problem leads to the overuse of broad-spectrum antibiotics to treat UTIs which contributes to the global anti-microbial resistance epidemic. UroDetect aims to provide a diagnostic method where standard urine culture is not available. The UroDetect system uses an existing water quality test kit Aquagenx© with a modified protocol to diagnose Gram-negative species, and a developed protocol and media for Gram-positive species. Using the Aquagenx© technology we diagnosed mock UTI- samples (102 CFU/mL) with a false positive (FP) rate of 32% and UTI+ (103 CFU/mL) with a false negative (FN) rate of 0%. For are developed Gram-positive test kit, we diagnosed mock UTI- samples (102 CFU/mL) with a false positive (FP) rate of 44% and UTI+ (103 CFU/mL) with a false negative (FN) rate of 11%. By using these two kits in combination UroDetect can diagnose 97% of UTI causative agents.

Poster: 70

Paul Nguyen

Major: Chemical Engineering

Faculty Mentor:
Dr. Eng Kuan Moo

Department: Mechanical and Aerospace Engineering

College: Carleton University

Funding Source(s): Fulbright Canada, Mitacs

High-Throughput Finite Element Analysis of Material Properties of Articular Cartilage

Osteoarthritis (OA) is a painful joint condition caused by the degradation of articular cartilage. Engineering suitable tissue replacements requires quantitatively accurate measures of material properties. To do so, Moo and colleagues previously obtained experimental data on proteoglycan and collagen content and curve-fitted the data. Using this data, realistic finite element cartilage models were developed with the multiphasic mixture theory. By using a numerical optimization procedure (genetic algorithm), Moo and colleagues determined material properties of tibia samples at different stages in OA. Their findings revealed that the intrinsic fiber modulus of cartilage does not significantly change at different stages in OA, suggesting that collagen softening is not a major driver of cartilage degradation.

This project further optimized the prior workflow by parallelizing the framework and expanding the analysis to a new set of femur cartilage samples. My work focuses on optimizing the setup for high-performance computing clusters and local virtual machines, while adding functionality to the genetic algorithm.

Poster: 68

Lucy Orr

Major: Chemistry

Faculty Mentor:
Dr. David Forbes

Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): SURF

Molecular Mosaic: Assembling Subunits for a PP5 Targeted Blockade

Protein phosphatase 5 (PP5) is a serine/threonine phosphatase whose overexpression has been linked to tumor progression, making it an attractive target for anticancer drug discovery. Norcantharidin, a demethylated analog of cantharidin, has shown PP5 inhibitory activity, motivating the design of new derivatives with improved potency and selectivity. This project explores norcantharidin-based compounds as potential PP5 inhibitors through organic synthesis, structural characterization, and docking studies. Due to solubility challenges with initial constructs, efforts were redirected toward the assembly of Subunit "L." This compound was synthesized from (2-methylquinolin-4-yl)methanol and pyridine in dichloromethane and acetonitrile. After two hours of stirring, precipitation occurred, and the solid was collected by vacuum filtration. Product formation was confirmed by thin layer chromatography (TLC), purified by column chromatography, and characterized by nuclear magnetic resonance (NMR) spectroscopy. Further structural analysis of Subunit L is underway to confirm identity and purity. In parallel, Subunit "O" is being synthesized using 6-quinolinemethanol under similar conditions and will undergo TLC verification, chromatographic purification, and NMR characterization. Additional derivatives are planned to expand the compound library and enable comparative structure–activity studies. Future work will evaluate these derivatives through dose–response assays and IC_{50} testing against PP5. By advancing the design and synthesis of novel norcantharidin-based inhibitors, this project aims to clarify structure–activity relationships and contribute to the development of targeted therapeutic strategies for cancer treatment.

Poster: 74

Shaivi Pandey

Major: Biomedical Science

Faculty Mentor:
Dr. Allyson Shea

Department: Microbiology and Immunology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF

Iron Limitation Facilitates a Conserves Response in Uropathogens

Urinary tract infections (UTIs) are one of the most common infections worldwide, with about 50% of women experiencing one in their lifetime. Uncomplicated cases typically result in cystitis, a bladder infection. Complications arise when UTIs ascend from the bladder to the kidneys, leading to pyelonephritis and potentially urosepsis. *Uropathogenic Escherichia coli* (UPEC) causes 70–80% of UTIs, and *Proteus mirabilis* causes up to 10% of cases and has been increasingly recognized as a contributor to complicated UTIs. A characteristic of uropathogens is their ability to adapt to host-imposed iron restriction, a critical nutrient for their survival. Unlike commensal *E. coli*, uropathogens possess conserved virulence mechanisms that enable persistence in the urinary tract. A previous study revealed that a metabolic gene lpdA partially regulated motility in UPEC strain CFT073. This current study broadens the scope by attempting to uncover a conserved response to iron limitation in UPEC strain CFT073 and P. mirabilis strain HI4320. To investigate these mechanisms, RNA sequencing was performed on strains CFT073, HI4320, and commensal *E. coli* strain K12 under iron-rich, iron-depleted, and iron-replete conditions. Comparative analysis revealed that genes exbB, oppA, alsA, alsB, tsr, tar, and treB were significantly regulated in both uropathogens but not in the commensal strain. These findings suggest the presence of an iron-responsive regulon that facilitates virulence traits in uropathogens. Identifying conserved responses to iron limitation highlights potential broadly applicable therapeutic targets across diverse uropathogens.

Poster: 67

Madison Peters

Major: Biomedical Science

Faculty Mentor:
Dr. Padmamalini Thulasiraman

Department: Biomedical Sciences

College: Pat Covey College of Allied Health Professions

Funding Source(s): SURF

Differential regulation of Proteinase 9 and Granzyme B by hydroxytyrosol in breast cancer subtypes

Hydroxytyrosol (HT), a simple phenol abundant in olive oil, is recognized for its antioxidant, anti-nflammatory, and anti-cancer properties. Due to it's potential to promote apoptosis, HT has become a focus in cancer research. Our previous findings have shown that HT reduces Proteinase Inhibitor 9 (PI-9) in Estrogen Receptor Positive (ER+) MCF-7 and T47D cells, while inducing Granzyme B (GrB) in only T47D cells. The purpose of this project was two-fold: (1) to examine whether the effects of HT on the PI-9-GrB complex enhances Fas-mediated apoptosis in T47D cells and (2) to determine the effects of HT on PI-9 and GrB expression in ER- MDA-MB-453 cells. Our preliminary results have demonstrated that HT activates Caspase 3, but is not enhanced with the Fas ligand. Similar to findings in ER+ breast cancer cells, HT suppresses PI-9 in ER- MDA-MB-453 cells, but does not alter GrB expression in these cells. Future studies will include quantifying the basal expression levels of PI-9 and GrB in the ER+ and ER- breast cancer cells. Furthermore, we will examine the role of Fas in HT-mediated apoptosis in the three breast cancer cells.

Poster: 76

Athena Pettway

Major: Biology

Faculty Mentor:
Dr. Jason Strickland

Department: Biology

College: College of Arts and Sciences

Funding Source(s): SURF

From Strike to Sequence: Comparative Genomics of Venom Evolution in Black-Tailed Rattlesnakes

Venom serves a prominent ecological and evolutionary role in snakes, serving functions in both predation and defense. However, the genetic mechanisms that dictate venom variation, particularly gene-level changes, and contribute to variance in venom composition, are not fully understood. Our project takes a closer look into mechanisms of gene turnover within the Black-tailed Rattlesnake species complex (BTRC), which includes *Crotalus basiliscus*, *Crotalus molossus*, *Crotalus molossus nigrescens*, *Crotalus molossus oaxacus*, *Crotalus ornatus*, and *Crotalus totonacus*. These species exhibit striking differences in venom composition, most notably in the presence or absence of the potent myotoxin (MYO), crotamine, which induces rapid paralysis in mammalian prey. To uncover the genetic basis for these differences, we employed comparative genomics and bioinformatics to identify patterns of gene gains, losses, and duplications across venom-related gene families, such as phospholipases (PLA2s), snake venom metalloproteinases (SVMP), snake venom serine proteases (SVSP), and MYO. Through genomic comparison, we found regions where genes had been deleted between closely related species, allelic variation, and some genes that only existed in a single species. For some gene families, copy number variation is likely important for venom variation. Our study represents the most venomous organism genomes compared within a closely related group and highlights how quickly genomic changes can occur during the speciation process

Poster: 72

Richard Pham

Major: Biomedical Science

Faculty Mentor:
Dr. Glen Borchert

Department: Pharmacology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF

Technique for Isolating Persister Cells in *S. Enterica*

Persister cells are a small subset of bacterial cells that enter dormancy when under environmental stressors such as antibiotics. These types of cells can survive antibiotic treatment without being genetically resistant through a temporary shutdown of their own metabolism. Once an antibiotic treatment is completed, the persister cells become metabolic active again and repopulate. This process is relevant in chronic and recurrent infections such as tuberculosis and urinary tract infections. Persister cells in bacteria such as *Salmonella enterica* can cause a relapse in infection after antibiotic therapy. Therefore, studying persister cells would allow for the development of therapeutics to combat these persistent infections. To be studied, persister cells need to be isolated. Due to their scarcity (≈ 1 in 10^6 cells), readiness to return to a metabolically active cell, and absence of reliable biomarkers, isolating persister cells is difficult. To address these problems, an outline for a three-stage workflow for persister isolation followed by gene characterization is presented.

First, a minimum inhibitory concentration (MIC) of ciprofloxacin for *S. Enterica* (SL1344) was determined to be 0.06 µg mL−1, providing the minimum for antibiotic concentration. Second, a time-kill assay was performed to find the biphasic-killing curve (BPKC) performed at 10xMIC revealed a “persister plateau” after one hour of exposure, presenting the optimal antibiotic exposure length to enrich for persisters. Third, cultures obtained at this plateau were dual stained with Redox Sensor Green (low fluorescence in persister/dormant cells) and propidium iodide (stains dead cells), then subjected to fluorescence-activated cell storing (FACS). This step effectively separates live, low-metabolism (RSG^low/ PI^{-1}) persisters from dead and actively growing sub-populations.

By combining precise antibiotic concentration and exposure time with metabolically based flow cytometry, this study establishes a reproducible platform for isolating a highly enriched population of *S. enterica* persisters.

Poster: 73

Alexa Posey

Major: Nursing

Faculty Mentor:
Dr. Joyce Pittman

Department: Nursing

College: College of Nursing

Skin Assessment in Nursing, Medical and Physical Therapy Student Education: Skin Tone Variation

BACKGROUND: Pressure injuries (PIs) involve skin integrity becoming impaired due to unrelieved pressure on a bony prominence. PIs have four stages, and the most common way the first stage is described is a nonblanchable erythema. This description cannot be observed in darker skin tones. This description is taught first in textbooks and reinforced during clinicals. It is essential for nurses, physical therapy (PT) and physicians to know what PIs look like in all skin tones as they are all heavily involved in direct patient care. If a student is not taught what a pressure injury looks like in darker skin tones from the beginning of their professional education, then it will not be taught later on in the classroom.

PURPOSE: This study's purpose is to examine the representation of skin color tones in nursing, PT, and medical education in its textbooks regarding images and the narrative content around them. This study's first aim involves analyzing the narrative content of these textbooks relevant to skin tone variety. The second aim of the study is to analyze the representation of the images and graphics in a convenience sampling of nursing, PT, and medical textbooks.

METHODS: A descriptive and content analysis study design will be used to achieve both aims. Textbooks were obtained from the University of South Alabama's biomedical library, bookstore, school faculty, and textbook publishers. A modified DOTT scale will be used to analyze textbook content since the original DOTT scale is meant for noting the content of lectures. The Monk Scale will be dichotomized similarly to Pusey-Reid's (2023) Fitzpatrick scale and used to analyze textbook images.

RESULTS: Results are in progress at this time.

CONCLUSION: Pending

Poster: 78

Anya Powell

Major: Biology

Faculty Mentor:
Dr. Jeremiah Henning

Department: Biology

College: College of Arts and Sciences

Funding Source(s): ASGC, SURF

Ghost Crabs Take the Spotlight : Artificial Ambient Light Pollutions' effect on Ghost Crabs (*Ocypode quadrata*)

Artificial Light pollution, the effects of artificial light to natural spaces, is an emerging problem in urbanized coastal ecosystems. Light pollution has well-documented impacts on the navigation, feeding behavior, and nesting activity of nocturnal organisms among coastal communities. For instance, Atlantic Ghost Crabs (*Ocypode quadrata*) are nocturnal mesopredators that visually seek prey items, evade predators, and act as a common bioindicator species of human activity in beach ecosystems. Escape response behaviors are essential for ghost crab survival, and light pollution may impact their ability visually detect predators and disrupt the production of Crustacean Hyperglycemic Hormone (CHH), a stress hormone synthesized in their eye stalks. To determine the impact of background light pollution on ghost crab escape response behavior, we collected approximately 30 crabs from a high light pollution area and an undeveloped area of the beach with no light pollution on the West End of Dauphin Island, Alabama. Of the crabs collected, we reared 15 crabs from each differing original light condition in a common light environment prior to conducting recorded trials with a stimulus of being pursued by a flashlight. Next, we changed common lab environment of our crabs, going from no-night light present to ambient night light present to determine if population differences were genetic-based or a plasticity response. Behaviors were scored into one of six pre-determined categories and compared between crabs' background light pollution, sex, and lab night light condition. Our results will shed light on predator response of a critical, widespread bioindicator mesopredator with implications for a favorite gulf coast activity, ghost crabbing.

Poster: 62

Emma Pritchett

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle, Dr. Ronald Baker

Department: Stokes School or Marine and Environmental Sciences

College: College of Arts and Sciences

Funding Source(s): Study Abroad scholorships

Time of Day Effects Observed Hunting Behaviors of Lionfish in Turneffe Atoll, Belize

The Indo-Pacific lionfish (*Pterois volitans*), an invasive apex predator, is rapidly spreading throughout the Caribbean and Western Atlantic Ocean. This species exhibits distinct behaviors depending on activity state: active. Inactive, or hunting. We observed lionfish on Reef 3 near Calabash Caye, within the Turneffe Atoll of the Mesoamerican Reef system (Fig.1). Hunting behaviors were classified as striking and blowing, inactive behaviors as hiding and floating, and active behaviors as swimming and fanning. Results show that lionfish most frequently engage in hunting behaviors during the morning, while overall activity levels remain relatively consistent throughout the day.

Poster: 75

Jackson Quinn

Major: Meteorology - Graduate School Track

Faculty Mentor:
Dr. Steven Schultze

Department: Earth Sciences

College: College of Arts and Sciences

Funding Source(s): SURF

The 2026 FIFA World Cup Will be Impacted by Extreme Heat.

The biggest sporting event in the world is coming to Canada, Mexico, and the United States next summer! With the 2026 FIFA World Cup, each of the 16 host cities will experience a cultural experience unlike any other. Extreme heat, however, threatens to derail the joy this tournament will bring to 48 nations across the world. Player and fan safety is said to be paramount to football's governing body FIFA, which is why they moved the 2022 edition hosted in Qatar to the winter. Though actions taken by FIFA at the 2025 Club World Cup, a warmup tournament hosted in the United States, such as kickoffs in the peak heat of the day and improper implementation of cooling breaks and other player safety procedures leaves a lot to be desired. This study found how many host cities are likely to experience extreme heat indices above FIFA's threshold of greater than a wet bulb global temperature of 32º C. To do this Heat Index was used as a measure of thermal comfort due to data coverage. This means the data presented is the thermal comfort level for players and fans in the shade and would not account for wind. Ultimately the threat extreme heat poses to the 2026 World Cup should be unacceptably high for FIFA. Thus, FIFA should take steps to ensure the 2026 World Cup is remembered for the great plays on the field, and not for putting player and fan safety at risk in favor of revenue.

Poster: 71

Brock Renicks

Major: Psychology

Faculty Mentor: Dr. Benjamin Hill

Department: Psychology

College: College of Arts and Sciences

Associations Between White Matter Pathways and Verbal Learning in an Aging Hispanic Population

In this study the Spanish English Verbal Language Test was used in conjunction with correlational tractography to determine white matter integrity of Hispanic adults. The Spanish English Verbal Language Test (SEVLT) is a normative word-list verbal learning test for an older Hispanic and latino population. Within this test we looked at the learning variables and also the delay variables associated with this test. In addition to this SELVT test we also used correlation tractography to map out portions of the brain where there was a correlation in the SEVLT test and white matter tracts. Many prior studies used techniques such as diffusion tensor imaging (DTI) which used voxel-wise imaging over a region of interest, however this limits anatomical specificity. In our study we used correlation tractography, which is a more tract-centric approach. The correlational tractography utilizes the variable of quantitative anisotropy (QA). This variable represents the amount of water that is being diffused along the primary fiber orientation within a voxel or frame of the brain. This means that a higher QA means that there is a more clear and coherent fiber that is more sound and stable. Therefore the variables of QA were related throughout the Spanish English language test. The participants were drawn from the University of North Texas Health Science Center's Healthy Aging Brain Study. The participant pool also focused on Hispanic adults. We hypothesized that higher integrity of white matter tracts is associated with less delay in response and also increased memory. Our results found that the tracts of the middle cerebellar peduncle were associated with decreases of learning and memory. Increased delay recall was associated with the right cingulum parolfactory, and the right cingulum frontoparietal. More incorrect delayed recall was also associated with the middle cerebellar peduncle, and the left cerebellum. These findings suggest that both positive and negative associations between QA and delayed recall are present in specific white matter tracts, while the opposite relationship is present in other white matter tracts. This study highlights the value of tract-centric imaging approaches in identifying the neuroanatomical correlates of memory within an aging Hispanic population, contributing to a more nuanced understanding of white matter contributions to cognitive health across diverse groups.

Poster: 77

Natalie Rische

Major: Computer Engineering

Faculty Mentor:
Dr. Daniela Wolter Ferreira Touma

Department: Electrical and Computer Engineering

College: College of Engineering

Fleet Vehicle Fuel Consumption Forecasting with Concept Drift Correction

Transportation is a crucial part of our society. The supply chain and fleets rely on fuel consumption, making fuel consumption a crucial aspect to closely monitor. There are many factors that go into vehicle fuel consumption (VFC), making it difficult to understand what influences VFC to be able to predict it. This research aims to improve on previous VFC prediction research using artificial intelligence and concept drift correction. A dataset that consists of one year of natural driving data from a personal vehicle will be used with two fleet datasets of 3 months to address the long-term effects of VFC prediction. A Feed Forward Neural Network (FFNN) and Long Short-Term Memory (LSTM) model will be utilized and compared with adding concept drift correction to both models. This research has the potential to help fleet managers and the supply chain make better economic decisions using VFC prediction.

Poster: 69

Julia Sanders

Major: Mechanical Engineering

Faculty Mentor:
Dr. Anh-Vu Phan

Department: William B. Burnsed Jr. Mechanical, Aerospace, and Biomedical Engineering

College: College of Engineering

Funding Source(s): SURF

Aerodynamic Analysis of Airfoils Using Computational Fluid Dynamics

Innovation in the aerospace industry has been costly, time-consuming, and unsustainable. However, with new methods and technologies aerospace research has become more practical. Using computational fluid dynamics (CFD) to analyze the aerodynamic flow of an aircraft can set a new precedent for time and cost-efficient air travel. By using CFD to simulate and analyze a NACA 2412 airfoil, comprehensive results can be determined from data that was gathered. This research expands on the methods that are used to obtain the most accurate result for lift and drag coefficients for the NACA 2412 airfoil.

Poster: 7

Rodrigo Sankone

Major: Chemistry

Faculty Mentor:
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Department: Chemistry

College: College of Arts and Sciences

Funding Source(s): NOAA National Sea Grant

Quantification of Microplastics in Public Water and Groundwater Samples

Microplastics contaminate local water sources and raise concerns on health risks towards living organisms. Microplastics are polymers that are hard to break down and pose a threat to human body systems and aquatic environments. This research focuses on the identification of microplastics found within public water and roadway samples. Local samples from the Gulf Coast were obtained, separated from sedimentation, processed through vacuum filtration and analyzed using Micro-Fourier Transform Infrared spectroscopy (FTIR). Through this research, we are able to break down what plastics are prominent within specific areas to highlight the importance of microplastic pollution. The most commonly found microplastics involved in this research include polyethylene terephthalate (PET), Polyethylene (PE), Polypropylene (PP), Polyurethane (PU), Polystyrene (PS), Polyvinyl Chloride (PVC), Acrylic, Nylon, Teflon, and Low-density Polyethylene (LDPE). This research aims to identify microplastics to facilitate an easy approach on combating certain plastics from entering local water sources.

Poster: 79

Nafia Sarhadi

Major: Biomedical Science

Faculty Mentor:
Dr. Brenda Beverly

Department: Speech Pathology and Audiology

College: Pat Covey College of Allied Health Professions

Funding Source(s): SURF

Piloting a Pediatric Screener for Assessing Emerging Literacy with Preschool Children

Assessing preschool children's emergent literacy skills can support prevention and intervention activities that lead to improved literacy and academic outcomes. One screener, The Reading House (Hutton et al., 2019), has been implemented by pediatricians to consider reading readiness by 3- and 4-year olds. The Reading House is a brief, 14-page board book that probes critical emergent literacy skills; such as, children's knowledge of print, alphabet letters, and corresponding sounds; rhyming; syllable blending; spoken vocabulary; and emergent writing. Although psychometric properties support using The Reading House as a screener, it is not known if it can measure developmental change and learning. As part of a larger shared book reading intervention (Community Partners Engaging in Emergent Literacy), efficient methods to assess project outcomes are needed. This study method included engaging with a community health worker in the 36617 community who facilitated meetings with six preschool programs in the 36617 and 36610 communities. Cooperation by one 36617 daycare director led to the development and IRB approval of a recruiting flyer, consent materials, and a demographic questionnaire. Additionally, the investigator completed training for administration and scoring of the The Reading House. Next steps are to enroll 20 preschoolers for two administrations of The Reading House, with about 8-10 weeks between testing times. If developmental change can be shown with just 2-3 months between two administrations, then The Reading House can serve to support assessing child outcomes as part of the larger intervention study.

Poster: 80

Tanner Sinclair

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle, Dr. Ronald Baker

Department: Stokes School or Marine and Environmental Sciences

College: College of Arts and Sciences

Baseline Data for *Cardisoma guanhumi* in Calabash Caye, Belize

This project establishes baseline data for the blue land crab (*Cardisoma guanhumi*) along the first segment of the nature trail at Calabash Caye Field Station in Belize. We recorded carapace width measurements and examined their relationship to sex, while also assessing the species' ecological role within the surrounding coastal ecosystem. Additionally, we analyzed lunar phases in relation to nightly crab abundance to identify potential patterns in activity. Although we marked captured individuals for a mark-recapture study, no recaptures were recorded, preventing the use of the Lincoln-Petersen method to estimate population size. However, we maintained a nightly count of crabs observed along the study area to provide insight into population trends. We noticed a decrease in observed population size and a distinct difference in carapace width.

Poster: 82

Nake Singh

Major: Biology

Faculty Mentor:
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Department: Biology

College: College of Arts and Sciences

Funding Source(s): NSF

Functions of Nanodomain Proteins Remorin in Plant Resistance Against Microbial Infection

One of the major differences between plants and animals is that plants do not have an adaptive immune system. This means that when a plant contracts disease, they rely mainly on innate immunity as the first line of defense against microbial infection. Plants produce reactive oxygen species, such as hydrogen peroxide, which can kill pathogens and signal defenses. These defensive responses are controlled partly by plant membrane receptors, and remorin proteins, a nanodomain-ocupying protein family that has been linked to the production of these reactive oxygen species. In this project, we aim to explore how Group 1 Remorin proteins contribute to innate immunity in plants and their responses to microbial infections through the functional characterization of remorin mutants and overexpression lines. Investigating the effects of remorin mutants will help us to better understand how to combat common pathogens that adversely affect agriculture.

Poster: 81

Kealey Skinner

Major: Biology

Faculty Mentor:
Dr. Jeremiah Henning

Department: Biology

College: College of Arts and Sciences

Funding Source(s): Recycle for the Coast (ReCoast) and Glass Half Full by the National Science Foundation Convergence Accelerator Program.

Bottles, Butterflies, and Biomass: Recycled glass sand, microbial additions, and herbivory effects on milkweed growth

Coastal ecosystems in the Gulf of Mexico are increasingly threatened by human disturbance, rapid urbanization, erosion, and shortage of restoration material. At the same time, glass waste continues to accumulate in landfills. One proposed solution to counter two environmental issues is recycling glass into sand for use in coastal restoration. Although recycled glass sand is physically and visually indistinguishable from beach sand, there is more to be discovered about its ecological role in plant growth and herbivore interactions. This study used common milkweed (*Asclepias syriaca*) to test how substrate type (beach vs. glass sand), microbial additions, and herbivore activity (*Danaus plexippus*) interact to influence plant performance. Forty-four milkweed plants were grown under a fully factorial greenhouse design, with biweekly measurements of plant height and leaf count, followed by biomass harvest. We found limited impact between beach sand and glass sand, and where we did, glass sand resulted in taller plants over time, compared to beach sand. Additionally, we found that microbial addition increased root biomass, suggesting microbes enhance nutrient acquisition regardless of soil type. Caterpillar feeding reduced plant height and leaf number across all treatments, but the effects of herbivory were felt more strongly on beach-grown plants. These findings suggest recycled glass sand can support plant growth comparable to, and in some cases more resilient than, natural beach sand, particularly when paired with microbial addition. Importantly, the interaction between substrate and herbivory highlights trade-offs between plant vigor and herbivore resistance in shaping restoration outcomes.

Poster: 83

Bradley Snyder

Major: Physics

Faculty Mentor:
Dr. Martin Frank

Department: Physics

College: College of Arts and Sciences

Funding Source(s): NSF

Efficency of Certain Filters for Detecting Simulated High Speed Magnetic Monopoles

The NOvA experiment's main goal is to study the oscillatory behavior of neutrinos, however a sub goal of the experiment is to detect the elusive monopole. Magnetic monopoles are theorized particles thought to have been created at the beginning of the universe and have grand implications if found. Using the Far Detector in Ash River, MN, we have the possibility to observe a monopole that happens to pass through the detector amid cosmic rays. To know whether or not we found one, we use reconstruction algorithms to recreate their track through the detector against a background of cosmic noise. Using simulations, we increase the efficiency of our algorithms by applying certain filters and observing the number of simulated monopoles that are detected. In a past honor's thesis, it was found that certain filters were efficient for slow monopoles moving less than a thousandth of the speed of light. Recently, these filters were applied to faster monopoles to know how efficient these filters were at higher speeds. The efficiency at higher speeds than those tested in the honor's thesis were found to be approximately 1%-5% less. The reason as to why there is a drop in efficiency is currently being studied.

Poster: 96

Jack Spedale

Major: Biomedical Science

Faculty Mentor: Dr. Terrence Ravine | Dr. Ronald Balczon

Department: Biomedical Sciences | Biochemistry and Molecular Biology, Center for Lung Biology

College: Pat Covey College of Allied Health Professions | Frederick P. Whiddon College of Medicine

Funding Source(s): SURF, USA Center for Lung Biology, College of Medicine, NIH/NHLBI

Evaluating protein ubiquitination in pulmonary microvascular endothelial cells during *pseudomonas aeuruginosa* exoenzyme y intoxication

Pseudomonas aeruginosa is the most common cause of ventilator-associated pneumonia (VAP). During infection *Pseudomonas* uses a type III secretion system (T3SS) to inject a combination of exoenzymes (ExoS, ExoT, ExoU, ExoY) into target cells, including pulmonary endothelial cells. ExoY, which is most associated with clinical isolates recovered from intensive care unit (ICU) patients with *P. aeruginosa* VAP, is a promiscuous nucleotydal cyclase that promotes the secretion of tau and beta amyloid of infected cells. This study aims at investigating the effect of ExoY intoxication on ubiquitin expression and tests the hypothesis that ExoY intoxication leads to ubiquitination and secretion of tau and beta amyloid from pulmonary endothelial cells. Initial studies using immunofluorescence staining for ubiquitin and western blotting were paired to identify bulk changes in protein ubiquitination during ExoY infection. To investigate specific protein targeting, tau and beta amyloid were immunoprecipitated from soluble, insoluble, and secreted protein fractions, followed by immunoblotting for ubiquitin. These studies demonstrated increased ubiquitinated tau and beta amyloid during ExoY-intoxicated conditions. Quantitative fluorescence analysis and densitometry of immunoprecipitated samples will be performed to quantify differences in ubiquitination patterns following ExoY intoxication. Collectively, the data demonstrate that ExoY intoxication of pulmonary microvascular endothelial cells leads to ubiquitination of tau and beta amyloid.

Poster: 89

Dylan Stapleton

Major: Criminal Justice

Faculty Mentor:
Dr. Jeffrey Rush

Department: Political Science and Criminal Justice

College: College of Arts and Sciences

Funding Source(s): SURF

Barriers to Accessing Mental Health Services

People with mental health disorders, those who need resources the most, face the most barriers when pursuing help. This project intends to determine areas that should be addressed to reduce these barriers. When conducting my research, the main goal was exploration. Perhaps this could be a flaw in the research process, as having clear intention and expected end results can often be essential for external validity. Nevertheless, initial research determined institutions that commonly interact to represent relevant barriers to mental health resources. Secondary research compared different methods of examining similar systemic barriers, searching for a clear and concise categorical lenses to view the three different institutions. Specific barriers (and in the case of the Government section, some actions taken to address some of these barriers) and their interactions were explored from the perspective of individuals with mental health disorders and statistical evidence was gathered to demonstrate the effects on access to mental health resources. Compilation and organization has done much to clarify the roles played by major institutions in the process through which those with mental health disorders seek proper resources and services. One common issue among all of the studied institutions is the lack of available and clear information, whether that be communication shortcomings, intentional policy complexity, or rampant misinformation. It seems that many of the issues caused by the health care system itself stem from resource issues and financial accessibility. Problems seeming to be caused by insurance companies and policies indicate that systemic issues add to the financial stress of the health care system and consumer. (It is important to note that this is a surface level analysis and weakly supported by statistical evidence.) It is clear there is more research to be done to examine conceptual purposes and goals of these institutions and how that affects the necessity of those institutions.

Poster: 86

William Starling

Major: Computer Science

Faculty Mentor:
Dr. Aviv Segev

Department: Computer Science

College: School of Computing

Funding Source(s): US Space and Missile Defence

Exploring an Embodied Conversation Agent to Act as an Empathetic Doctor for use in Telehealth

This study examines the difference in people's perceptions of an embodied and a nonembodied conversational agent. It also discusses the potential use of embodied AI in the telehealth industry. A GPT assistant was created with the instruction to act as an empathetic doctor, and an embodied conversation agent system was designed for it to use in interactions. Research participants interacted with both embodied and nonembodied versions of the assistant and recorded their experience through a survey. Results showed that participants had higher standards for an embodied AI and desired a more human-like interaction. If these expectations are not met, their preference shifts in favor of nonembodied AI. Users would be comfortable using embodied AI in telehealth settings, however, a preference still exists for actual doctors. Measures would also have to be taken to ensure their medical information is kept secure.

Poster: 99

Caleb Steele

Major: Computer Engineering

Faculty Mentor:
Dr. Jinhui Wang

Department: Electrical and Computer Engineering

College: College of Engineering

Funding Source(s): SURF

An IoT-Based Framework for Real-Time Monitoring of Airborne Microplastics and Environmental Conditions

This research presents the design and deployment of an IoT-enabled environmental monitoring platform for detecting airborne microplastic pollution. Leveraging cost-effective Raspberry Pi 4 nodes equipped with particulate matter (PM2.5/PM10), GPS, and environmental sensors, the system captures geotagged air quality data as a scientifically supported proxy for airborne microplastic concentration. Sensor readings are transmitted to a Google Cloud backend, stored in BigQuery, and visualized on an interactive map through Looker Studio for real-time spatial analysis. A pilot deployment demonstrated the feasibility of this framework, successfully collecting and mapping air quality data across test locations. The system offers scalability through multiple communication protocols (WiFi, LTE, ZigBee) and provides a foundation for AI-driven predictive models linking particulate matter to microplastic distribution. This platform represents a flexible, low-cost approach to monitoring emerging contaminants and advancing understanding of their environmental and health impacts.

Poster: 41

Faith Stewart

Major: Marine Sciences

Faculty Mentor:
Dr. Amy Sprinkle, Dr. Ronald Baker

Department: Stokes School of Marine and Environmental Sciences

College: College of Arts and Sciences

Driving Factors of Lionfish Diet in Calabash Caye, Belize

Lionfish (*Pterois spp.*) are invasive predators in the Caribbean that have rapidly colonized reef ecosystems such as Turneffe Atoll, Belize, posing a serious threat to native biodiversity. In this study, we examined the stomach contents of 88 lionfish collected from eight sites to assess prey composition and feeding patterns by time of day. Stomachs were dissected and prey items identified to the lowest possible taxonomic level, then categorized as fish, crustaceans, or gastropods. Results revealed that fish were the most frequently consumed prey, particularly in lionfish measuring 150–275 mm, while crustaceans were consistently present across all size classes. Time-of-day analysis indicated peak feeding activity in the morning, with fish and crustaceans comprising the majority of prey. These findings highlight the role of lionfish as dominant reef predators and provide critical insights to inform management and mitigation strategies.

Poster: 87

John Stewart

Major: Mechanical Engineering

Faculty Mentor:
Dr. Shenghua Wu

Department: Civil, Coastal, and Environmental Engineering

College: College of Engineering

Funding Source(s): SURF

Evaluation of a 100% Reclaimed Asphalt Pavement Cold Mix Overlay on a Low-Volume Road

This project presents a long-term field performance evaluation of a 100% reclaimed asphalt pavement (RAP) cold mix overlay on a low-volume road. The primary objective was to assess the durability of sustainable pavement in a warm, non-freezing climate over a 69-month service period. The study focused on analyzing the progressive distress of the pavement, with particular attention paid to the effects of construction variables like staged compaction and edge compaction.

Field distress surveys conducted over 69 months revealed that raveling and weathering were the primary distress mechanisms. Analysis showed that a significant drop in Pavement Condition Index (PCI) for raveling occurred in the first two years, but successive surveys showed a stabilization, and even a minor recovery, in the later months. Rutting was minimal for the first five years but showed a notable increase in the final survey. Furthermore, sections compacted on the same day as mixing consistently demonstrated superior performance compared to sections with a one-day compaction delay. This suggests that the timing of compaction is a critical factor for long-term durability. While edge compaction initially proved to be an issue, later surveys showed the center and edge performance became more similar. Overall, the findings suggest that 100% RAP cold mix is a viable and environmentally friendly solution for low-volume roads, provided that key construction practices are followed.

Poster: 88

Noah Sugg

Major: Biomedical Science

Faculty Mentor:
Dr. John Soltys

Department: Neurology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF, USA Department of Neurology

Plasmid Transfection and Insights Into the PCR of Proteins of Interest

Recombinant DNA is a very useful technique for studying the interactions of proteins in greater depth. This experiment, in two parts, to develop recombinant DNA for insertion into cell cultures. The first portion of this experiment successfully transfected and incubated stock cultures of the pCEP4 and pcDNA3.1 plasmids at both the micro and macro scale using Top10 chemically competent *E. coli* cells using standard plasmid transfection and extraction techniques via Qiagen mini and maxiPrep kits. The second portion of this project aimed to explore how small changes in procedure during the polymerase chain reaction can drastically alter both yield and purity of the resulting DNA, using GoTaq Green master mix and Q5 Hi-Fidelity polymerase models. The number of PCR cycles, annealing time, and type of polymerase were varied between trials. Increasing the number of cycles increased total time taken, but also significantly increased yield (+20ng/µL), and adding more annealing time decreased yield by drastically decreasing purity. Different polymerases use drastically different reaction conditions and are thus less comparable, but in this experiment, slower polymerases generated higher yields with comparable purity. The DNA stocks generated by this project will fuel future experiments aiming to add the generated recombinant DNA back to plasmid models that can then be implanted into human cells to develop cell cultures of the various proteins of interest.

Poster: 84

Edward Sullivan

Major: Marine Sciences

Faculty Mentor:
Dr. Charlie Martin

Department: Stokes School or Marine and Environmental Sciences

College: College of Arts and Sciences

Funding Source(s): NSF

Buried Alive: Impacts of Dredged Sediment Depth on the Growth and Restoration of *Vallisneria americana*

Increased human activity and climate change have introduced new stressors to coastal ecosystems, particularly submerged aquatic vegetation (SAV). *Vallisneria americana* (wild celery), a native SAV in Mobile Bay, provides critical ecosystem services by stabilizing sediments, enhancing water clarity, and supporting fish and invertebrate communities. Thin-layer placement (TLP) of dredged sediment may aid in SAV restoration, but excessive burial can smother plants and limit success. To test how burial depth influences wild celery growth and survival, we conducted a mesocosm experiment with standardized shoots collected from Chocolatta Bay, AL. Shoots were planted in buckets (n = 30) and randomly assigned to five treatments: time-zero sacrificial, control, 25%, 50%, or 75% burial. Sacrificial samples provided baseline metrics. Shoot length, blade width, biomass, and survival were measured after three weeks, and treatment effects were analyzed with one-way ANOVA. Results showed significant declines in shoot length with increasing burial. Shoot width increased at moderate burial depths but declined at 75% coverage. Survival was highest in the 25% group (100%) and lowest in the 75% group (25%). These findings suggest wild celery may allocate resources toward blade thickening rather than elongation under moderate sediment stress, but excessive burial causes mortality. Our results highlight burial depth as a key factor for SAV restoration success. Low sediment burial may enhance survival and inform TLP as a viable restoration strategy for wild celery, while high burial undermines recovery. This work offers insight into the use of dredged material management as a tool for estuarine restoration.

Poster: 90

Alayna Tagert

Major: Biology

Faculty Mentor:
Dr. Jason Strickland

Department: Biology

College: College of Arts and Sciences

Funding Source(s): SURF, Research & Scholarly Development Grant from USA and NIH

A Bite of Insight: Gene Expression in Ticks and Hosts for Understanding Viral Transmission

Ticks are major vectors of pathogens (e.g., bacteria and virus) that are transmitted during blood feedings. This process, known as saliva-assisted transmission (SAT), is aided by the components in their saliva that potentially suppress the host immune system and promote pathogen invasion. Severe Fever with Thrombocytopenia Syndrome Virus (SFTSV), an emerging virus transmitted by the invasive Asian longhorned tick (*Haemaphysalis longicornis*), is thought to utilize SAT; however, the mechanisms remain unclear. To investigate this, RNA was extracted from salivary glands of *H. longicornis* across unfed and fed states with and without viral injections. RNA-seq libraries were sequenced and differential gene expression was assessed using bioinformatics pipelines. Multidimensional scaling (MDS) analyses revealed that feeding status was the strongest driver of transcriptomic differences, with unfed and fed ticks clustering separately. Unexpectedly, the mock injection (control) caused salivary gland gene expression changes. Across treatments, differentially expressed genes included importin-5-like, involved in nuclear transport, and ubiquitin carboxyl-terminal hydrolase 16, linked to protein turnover/stress response, as well as two uncharacterized proteins. Future work will assess host bite site responses to better define tick, virus, and host interactions, and will need to account for changes in gene expression resulting from the viral injection process.

Poster: 91

Mai Tannehill

Major: Marine Sciences

Faculty Mentor:
Dr. Jeremiah Henning

Department: Biology

College: College of Arts and Sciences

Funding Source(s): NSF REU Site: Interdisciplinary Research to Address Microplastics in the Gulf Coast Region

Uptake and Distribution of Microplastics in Native Gulf Coast Plant Species

Microplastics are emerging environmental pollutants that can accumulate in soil, plants, and animals, posing risks to both ecosystem and human health. Understanding how organisms accumulate microplastics from the environment can provide insight into their bioaccumulation within food webs and offer opportunities for bioremediation. To examine how common coastal plants accumulate microplastics across roots, stems, and leaves, we exposed four species (*Avicennia germinans*, *Juncus roemerianus*, *Distichlis spicata*, and *Panicum amarum*) to 0.2 µm polystyrene beads at concentrations ranging from 0 to 0.1125 mg over 5 weeks. We recorded plant height and leaf number prior to microplastic exposure and again after 5 weeks of growth. Additionally, we measured the final biomass of the roots, stems, and leaves. Plant tissues were enzymatically digested and filtered to isolate and quantify microplastic uptake in each taxon. We predicted that microplastic uptake would be highest in the roots, with fewer microplastics reaching the stems and leaves. Our results will shed light on microplastic accumulation within common and widespread taxa. Furthermore, they will highlight the potential for bioaccumulation in higher trophic levels, as well as the possibility of using plants for bioremediation to remove microplastics from the environment.

Poster: 92

Ally Taranto

Major: Speech and Hearing Sciences

Faculty Mentor:
Dr. Brenda Beverly

Department: Speech Pathology and Audiology

College: Pat Covey College of Allied Health Professions

Funding Source(s): SURF

Measuring Shared Book Reading Early Literacy Intervention Benefits for Children on the Autism Spectrum

Parents Engaging in Emergent Literacy (PEEL) is an 8-week shared reading intervention built on remote child assessments and asynchronous text messaging to teach parents evidence-based interactive strategies (Henbest et al., in revision). Initial research findings showed that interactive strategies had a positive impact on some literacy skills for typically developing 4-year olds. The impetus for the current study was PEEL program limitations revealed by the inclusion of two children with autism and their parents. The current project had two objectives. First, assessment tools and outcomes from published shared book reading investigations with autistic children were summarized, revealing a focus on meaning-based strategies and content (i.e., dialogic reading, listening comprehension) rather than code-based skills (i.e., rhyming, letter-sound correspondences). The second objective was to analyze the videotaped PEEL sessions for the two autistic participants. The five-year-old male participant showed substantial improvement in attention to the book, and his parent(s) increased their talk about the book including posing questions, commenting, and prompting joint attention. His pre- to post-test scores increased for receptive vocabulary, word relationships, listening comprehension, and book handling. Participant two, a four-year-old girl, also had improved attention to the book reading following the intervention. Given her parent(s)' increased efforts to promote joint attention and input complexity, she decreased her extra talking which led to better conversational turn-taking and more relevant responses to questions. Findings will support PEEL modifications designed to accommodate participation by neurodiverse children (i.e., autistic or language impaired) and support their reading readiness.

Poster: 59

Morgan Taylor

Major: Secondary Education Mathematics

Faculty Mentor:
Dr. Sarah Allred, Dr. Jeffrey Mudrock

Department: Mathematics and Statistics

College: College of Arts and Sciences

Funding Source(s): Faculty Development Council Grant Program

Enumerative Chromatic-Choosability of Multipartite Graphs

Graph coloring was introduced in the 1850s with the famous Four Color Problem about coloring maps in such a way that any two regions sharing a border receive different colors.
Over the past 170 years, the study of graph coloring has led to the discovery and development of beautiful mathematics with many applications including in computer science, scheduling, problems on social networks, and register allocation.
In this project, we study a variant of graph coloring called list coloring which was introduced in the 1970s. One famous notion in list coloring that has received significant attention in the literature is chromatic-choosability. We examine an enumerative analog called enumerative chromatic-choosability; furthermore, we prove that certain complete multipartite graphs are weakly enumerative chromatic-choosable. This is joint work with Sarah Allred, Andy Fritz, Aiden McCain, and Jeffrey A. Mudrock.

Poster: 93

Preston Vardaman

Major: Computer Science

Faculty Mentor:
Dr. J. Todd McDonald

Department: Computer Science

College: School of Computing

Funding Source(s): ASGC, SURF

Using Software-Based Hardware Abstraction to Facilitate Hybrid Program Protection

Software piracy and reverse engineering pose significant challenges to protecting intellectual property, resulting in annual costs of billions of dollars. This work leverages “Software-Based Hardware Abstraction” to develop a hybrid software/hardware solution. The system utilizes a Xilinx Zynq-7000 SoC on an Arty Z7-10 development board, which features both a Cortex-A9 processor and FPGA fabric. Passwords are entered by the user and then translated into bit strings on the processor, which are received via U-ART. Then the bit string gets put through a series of logical gates that have an embedded password on the FPGA fabric. The single output bit then gets evaluated to determine if it is one or zero. This approach ensures secure authentication by not exposing the password in code, which offers solid protection against “Man-at-the-end” attacks, which means the attacker has access to the execution environment of the software. This process of authentication also ensures intellectual property is protected because the verification is entirely offloaded onto the FPGA fabric. This solution is also cost-effective to implement, offering a better alternative to more traditional methods.

Poster: 94

Jonathan Vieyra-Sanchez

Major: Electrical Engineering

Faculty Mentor:
Dr. Daniela Wolter Ferreira Touma

Department: Electrical and Computer Engineering

College: College of Engineering

Dynamic Wireless Power Transfer using different Magnetic Cores

With the increasing public awareness of vehicle emissions, the demand for electric vehicles (EVs) is rising, but many buyers are still hesitant due to some concerns, such as range anxiety. Range anxiety is the concern that the charge of an EV will not be enough to reach one's destination or a charging station. Dynamic Wireless Power Transfer (DWPT) aims to address this concern by allowing EVs to be charged while driving using inductive power transfer. There are many factors that affect the efficiency of DWPT, such as coil design and magnetic core material. Magnetic cores are magnetic materials placed under both the transfer and receiving coils in order to increase mutual inductance. This study tests the efficiency of several magnetic cores in a dynamic system by collecting mutual inductance measurements between a receiving coil and three transfer coils at various positions. The magnetic cores used in this study are Ferrite, Flex Ferrite, and Magnetorheological Fluid (MR Fluid). These three magnetic cores are also compared to a baseline condition in which no magnetic core is used. The DWPT with Ferrite cores shows the highest mutual inductance, while MR Fluid comes next. The DWPT with Flex Ferrite cores has the lowest mutual inductance of the three cores, performing only slightly better than the baseline. Besides mutual inductance, other properties of the material need to be considered for their implementation in roads. Although Ferrite may have the highest mutual inductance, it is brittle and difficult to shape into varied forms as cores. So, despite MR Fluid having a lower mutual inductance than Ferrite, it may serve better as a magnetic core for roads, as it is durable and can be shaped in more varied ways.

Poster: 95

Veronica Webb

Major: Exercise Science - Health and Fitness Concentration

Faculty Mentor:
Dr. Shelley Holden

Department: Health, Kinesiology, and Sports

College: College of Education and Professional Studies

Funding Source(s): SURF

Nutrition Education/Intervention and Knowledge of College-Aged Students: A Research Project

We know and understand that nutrition education is not at the forefront of education in the United States. If nutritional education is more accessible and taught in a hands-on approach, we could see a decline in obesity and obesity related health issues. Through this project, I want to prove better retention of information taught and knowledge shared amongst peers and families using a hands-on teaching approach over traditional lecture-based teachings. This project was a six-week course taught in two groups: the control group in a classroom lecture-based setting, and the experimental group with hands-on learning through games, activities, and out-of-classroom experiences. Each group began with a knowledge-based survey, and at the end of the six weeks, the same survey was conducted to see if the participants grasped the nutritional concepts taught. Both groups were given the same information; the control group did not do a cooking class like the experimental group, but took a virtual cooking class in the lecture-based setting. The methods for each group were vastly different, but both groups obtained identical information through the program. The survey at the end suggested that the participants did not retain the information taught, and some scored lower on the end survey than on the initial survey. The results were also inconclusive as the sample size was not large enough, and some participants did not complete the course. Though the results were inconclusive for my project, it is still known that nutritional education is imperative for change within our society. I believe that through the education of nutrition, many lives can be affected and changed for the better. I will continue to prove that any education is better than none, and hands-on learning will have a longer-lasting impact on those participating in nutrition education.

Poster: 85

Aaron Wiggs

Major: Biology

Faculty Mentor:
Dr. Jeremiah Henning

Department: Biology

College: College of Arts and Sciences

Funding Source(s): SURF

Buried Bioindicators: A Geospatial View of Anthropogenic Disturbances and their Effect on Ghost Crab (*Ocypode quadrata*) Burrow Architecture

Atlantic Ghost Crabs, *Ocypode quadrata*, are environmental engineers that serve as bioindicators of human impact on coastal beach ecosystems. *O. quadrata* is a common and abundant species ranging from Maine to Brazil which serves as a crucial prey item for coastal birds and mammals. This semi-terrestrial invertebrate excavates burrows as a means for shelter in coastal dune environments. Burrow construction is an energetically costly process that is affected by various environmental stressors such as predation, beach morphology, and human disturbance. To better understand how *O. quadrata* burrow architecture, anthropogenic disturbance of each site was quantified using remotely sensed artificial light at night (ALAN) data in combination with distance from parking lots. We collected plaster casts of burrows from seven beaches across the Northern Gulf Coast. Sites selected for this study ranged from secluded beaches with lower human presence to heavily impacted beaches in tourist heavy areas such as Destin, Fl. Overall, we found that burrowing strategy shifts in response to variations in ALAN and parking lost distance, indicating crab burrowing behavior is sensitive to human activity. This study highlights the critical role that *O. quadrata* serves in assessing the present and continual impact of anthropogenic disturbance on coastal dune beach ecosystems.. By further understanding the impacts ALAN and human disturbance can be use to improve management practices within beach and dune ecosystems.

Poster: 97

Brionna Wilson

Major: Biomedical Science

Faculty Mentor:
Dr. Santanu Dasgupta

Department: Biochemistry and Molecular Biology

College: Frederick P. Whiddon College of Medicine

Funding Source(s): SURF, Dr. Dasgupta

Extracellular Vesicle Extraction & Quantification Potential Breast Cancer Biomarker

Extracellular vesicles (EVs) are membrane-bound vesicles secreted by cells in the body. They play an important role in intracellular signaling, immune modulation and transferring of biomolecules between cells. Research has indicated that EVs play a role in tumor growth and the creation of a favorable microbial environment for tumor cells. This study aims to investigate the concentrations of EVs in the blood serum of breast cancer patients compared to healthy controls, having the goal of observing the potential of EVs being used as a non-invasive biomarker for early cancer diagnosis and tumor progression. EVs were isolated using centrifugation and quantified using ZetaView Nanoparticle Tracking Analysis (NTA). The hypothesis tested in this study was that blood serum of breast cancer patients would have a higher concentration of EVs then blood serum of healthy controls due to an increased vesicle release from tumor cells. Preliminary research suggests that higher EV concentrations are associated with tumor growth, which supports the idea that EVs could be used as a potential biomarker. These findings could aid in the development of a new method of early cancer detection that is less invasive, more cost-effective, and has the potential for personalized cancer monitoring.

Poster: 98

Nakeria Woods

Major: History

Faculty Mentor:
Dr. Timothy Lombardo

Department: History

College: College of Arts and Sciences

Funding Source(s): SURF, Jahan Mahan

Furthering the Dream: An Examination of the Early Formation of the Collective Memory of Martin Luther King Jr. in the United States

On November 2, 1983, a disparate group of individuals gathered in the White House Rose Garden to celebrate a man who only fifteen years prior had been seen by majority of white America as a dangerous radical. This man was the famous civil rights leader Martin Luther King Jr., who on that day became one of three figures to have a national holiday. Much work has been done by scholars to examine the conditions that made the King holiday possible. Most emphasize the role of political conservatives like Ronald Reagan and their desire to appear as racial moderates, while simultaneously opposing active civil rights efforts. This paper works to complicate this narrative by considering the early actions of King's "mnemonic gatekeepers," or the people that intimately knew and worked with King during his life. The work and efforts of King's mnemonic gatekeepers directly after his death and into the seventies are significant to understanding how King's memory became white-washed. These actors were not passive characters in the formation of King's memory, but active participants. The change of King's collective memory does not begin with the creation of the national holiday, but instead with the work of these historical actors.

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