2022

UNIVERSITY OF SOUTH ALABAMA
UNDERGRADUATE RESEARCH

UNDERGRADUATE RESEARCH SYMPOSIUM

24TH ANNUAL

THURSDAY, OCTOBER 27, 2022
1:00 PM

USA STUDENT CENTER BALLROOM

24th Annual Undergraduate Symposium
Thursday, October 27, 2022

Welcome
Dr. Christy Wheeler West
Director of the Office of Undergraduate Research

Dr. Harold Pardue
Dean of the Graduate School and
Associate Vice-President for Academic Affairs

Invited Student Presentations:
Destinie Diggs, Computer Engineering
Nick Flynn, Information Technology
Sylvie Gray, Exercise Science
Josephine Jalkh, Biomedical Sciences
Katie West, Psychology
Allan Wilson, Chemical Engineering

Phi Kappa Phi Best Poster Award
Sigma Xi Best 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!

At this 24th Annual Undergraduate Research Symposium at the University of South Alabama, we gather to celebrate the efforts and achievements of 80 budding scholars. Whether you join us as a proud mentor or parent, a curious student or faculty member, a University administrator, or other guest, I know you will be impressed with all these outstanding student researchers have accomplished, especially through the challenges faced in the last couple of years.

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. Still, our work would be empty without the tremendous commitment of the faculty mentors who not only foster the progress of the research projects but also nurture the undergraduateresearchers in their scholarly development.

We are grateful for the generous sponsorship of the Alabama Space Grant Consortium, the Academic Affairs Office, and individual collegesand departments. We also express our appreciation to the members of the University Committee on Undergraduate Research, especially for their time and insight in support of the Summer Undergraduate Research Fellowship (SURF) program.

Dr. Christy Wheeler West
Director, Office of Undergraduate Research

Dear Colleagues and Students,

Welcome to the 24th Annual Undergraduate Research Symposium at the University of South Alabama. The benefits of embracing undergraduate research are well documented. Not only does engaging in research under the tutelage of a faculty mentor enhance students' critical thinking and foster verbal and written communication skills,it also increases their time to degree completion and enhances career prospects. Ultimately, these students are well prepared for their professional careers. It has also been well documented that undergraduate research programs benefit, not only the participating students and faculty but the university as a whole. The institution thrives on the dissemination of the research that occurs as students and faculty collaborate to share their work in the scholarly community. We are very proud of our students and extraordinary faculty who participate in the research endeavor through the Office of Undergraduate Research. We know that this is only the beginningof great things that are in the future for these talented individuals.Enjoy the symposium!

Andrea (Andi) M. Kent, Ph.D.
Provost and Senior Vice PresidentAcademic Affairs

Welcome to the Undergraduate Research Symposium.

Research is, in part, about learning more and more about less and less. A willingness to do this is whatsets all of you apart from the vast majority of people who are quite content to merely accept the benefits and influence of “magic” on theirlives. When they use their smartphone for example, it isfor them, magic. They accept there are mysterious forces beyond their understanding that daily conjures phenomena indispensable to their very existence. But this magic is only possible because someone like you was willing to learn a great deal about a very specific aspectof the physics of electromagnetic waves. It is with this knowledge and the sudden clarity of understanding that the realmagic occurs, the magic of discovery. We recognize and applaudthe long hours you spent to fully understand the sometimes incomprehensible minutia that, in the larger progression of humanity, enables the magic of science. Thank you for joining us today, and enjoy the Symposium!

Dr. Harold Pardue
Dean of the Graduate School

Oral Presentations

Diggs, Destinie

Major: Computer Engineering
Faculty Mentor: Dr. Na Gong
Department: Computer Engineering
College: College of Engineering

Viewer-Aware Power-Efficient Adaptive Mobile Video System Reducing Power Consumption using Video Bit Truncation Based on Ambient Luminance

Flynn, Nicholas

Major: Information Technology
Faculty Mentors: Ms. Marianne Loes, Dr. Al Chow
Department: Marketing and Quantitative Methods
College: Mitchell College of Business

Turning Social Media Marketing Big Data into Information

Sylvie Gray:

Major: Exercise Science
Faculty Mentor: Dr. Joshua Keller
Department: Health, Kinesiology, and Sport
College: College of Education and Professional Studies

Sex and Cuff Pressure Specific Hemodynamic Responses to Blood Flow Restriction Leg Extensions

Josephine Jalkh:

Major: Biomedical Sciences
Faculty Mentor: Dr. Thomas Rich
Department: Pharmacology
College: College of Medicine

Excitation Scan-Based Hyperspectral Imaging of Gq-Mediated Calcium Signals in Human Airway Smooth Muscle Cells

Katie West

Major: Psychology (BA)
Faculty Mentor: Dr. Heidi Lyn
Department: Psychology
College: College of Arts and Sciences

Thin Striped Hermit Crabs and the Impact of Rising Sea Temperature

Allan Wilson

Major: Chemical Engineering
Faculty Mentor: Dr. Kevin West
Department: Chemical Engineering
College: College of Engineering

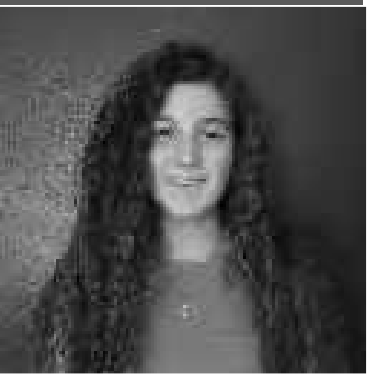
Solid-liquid Phase Equilibria for Tetraphenylphosphonium Bistriflimide with Mixtures of Benzanilide

University Committee on Undergraduate Research

Program Director: Dr. Christy Wheeler West

College	Member, Department
Pat Capps Covey College of Allied Health	**Robin Mockett**, Biomedical Sciences
College of Arts and Sciences	**Jason Coym**, Chemistry **Lesley Gregoricka**, Sociology, Anthropology, and Social Work **Zoya Khan**, Foreign Languages **Steven Schultze,** Earth Sciences **Jack Shelley-Tremblay**, Psychology **Jason Strickland**, Biology
Mitchell College of Business	**Al Chow**, Marketing **Kelly Woodford**, Management
School of Computing	**Tom Johnsten**, Computer Science
College of Education and Professional Studies	**Ryon McDermott**, Professional Studies
College of Engineering	**Na Gong**, Electrical and ComputerEngineering **Silas Leavesley**, Chemical and Biomolecular Engineering
Honors College	**Doug Marshall**, Sociology
College of Medicine	**Thomas Rich,** Pharmacology
College of Nursing	**Rebecca Graves**, Research, Development, and Evaluation

The Office of Undergraduate Research is located in the Department of Chemical and Biomolecular Engineering Shelby Hall, Room 4135.
(251) 341-3078



Poster #1
Adams, Kylie
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. David Forbes
Department: Chemistry
College: College of Arts and Sciences
Funding Source(s): SURF

The Search for a More Efficient Synthesis of Diaziridines

This research project is part of ongoing research to find a more efficient synthesis strategy for diaziridine. Diazirines have been useful compounds in research and photoaffinity labeling since their discovery. Our goal in the lab is to find an efficient procedure for producing diaziridines, then using electrochemistry to synthesize diazirines. Different compounds are being tested to find which works best for our reaction.

Poster #2
Agrawal, Trisha
Major: Psychology (BA)
Faculty Mentor: Dr. Dhananjay T. Tambe
Department: Mechanical Aerospace, and Biomedical Engineering, College of Engineering Director. Center for Lung Biology, College of Medicine Joint Faculty.
Funding Source(s): SURF

Development of a Mathematical Model to Guide Surgery for Correcting Kneecap Dislocation

Kneecap dislocation is the most common knee condition in the pediatric and adolescent population, with an incidence of 50 in 1000 and a peak age of 15.(1,2) Such dislocation arises primarily from two anatomical abnormalities: (1) shallow groove that the kneecap sits in, and (2) kneecap is tethered off-center on tibia. Orthopedic surgeons have three common strategies to correct these abnormalities: (1) deepening the shallow groove, (2) realigning the off-centered tether, (3) inserting a new tether on the side of the kneecap. Currently, the choice of corrective strategy for a specific patient is not determined through objective guidelines, but instead through intuition and prevailing regional practice. To introduce objectivity in these surgical procedures, we used Newtons' laws of force equilibrium to derive an equation for a lateral force on the kneecap. The magnitude of this force would be proportional to the tendency of the kneecap to dislocate. The equation can be used to generate patient-specific comparisons of the impact of each surgical strategy. This novel approach could form the basis for a computer-aided diagnosis for the best course of action.

References

1. Vinod, A. V., Hollenberg, A. M., Kluczynski, M. A. & Marzo, J. M. Ability of Medial Patellofemoral Ligament Reconstruction to Overcome Lateral Patellar Motion in the Presence of Trochlear Flattening: A Cadaveric Biomechanical Study. Am. J. Sports Med. 49, 3569–3574 (2021).

2. Hasler, C. C. & Studer, D. Patella instability in children and adolescents. EFORT Open Rev. 1, 160–166 (2016).

Poster #3
Agyemang, Priscilla
Major: Sociology (BS)
Faculty Mentor: Dr. Roma Hanks
Department: Sociology, Anthropology, and Social Work
College: College of Arts and Sciences
Funding Source(s): N/A

Motivators to Becoming a Community Health Advocate

Community Health Advocates (CHAs) or Community Health Workers (CHWs) is a term used for people who group together to take a position or stance in a certain area of health care and willingly impact the people around them by influencing or informing them about that area. Usually, these advocates share realistic common beliefs about different areas or aspects of health care. Through this research I am looking to address the key themes or values that motivate the signing up of volunteers to be a part of one University-affiliated Community Health Advocacy (CHA) program and if one of the main themes is health disparities/ inequities. Keeping the Sociological context in mind, I will conduct an analysis of secondary data. The conceptual significance of this research would be to better understand the importance of these volunteers to the healthcare industry in relation to health disparities.

Poster #4
Altawal, William
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. Brooks Rabideau
Department: Chemical Engineering
College: College of Engineering
Funding Source(s): SURF/ASGC

Thermodynamic and Transport Property Predictions of Ionic Solutions Using Molecular Simulations

The design of new chemical compounds that can replace those in current use often warrants a full evaluation of their predicted behavior. In many cases, a major change to the chemical process is not feasible because of the large capital costs incurred for these changes. In these situations, having a "drop-in replacement" of the working compound, instead of major changes to the equipment or their operation is preferred. For complex chemical processes that involve multiple physical phenomena such as fluid flow, adsorption, diffusion, and reaction, this requires an evaluation using process-scale models. Any process-scale model, however, requires a good knowledge of the thermodynamic and transport properties of the compound in question.

One method for obtaining property predictions of that does not require the actual synthesis or experimental testing of the new compounds is to simulate their behavior with high performance computers. One can construct molecular models of the compounds in question, assemble them at a given composition, provide the necessary conditions (e.g. temperature, pressure, external forces), and simulate their behavior to determine their macroscopic properties. Here we present how physical properties including the density, diffusivity, viscosity, surface tension are determined for an ionic solutions over wide range of concentration and temperature.

Poster #5
Annulis, C.C.
Major: Marketing (BSBA) - Marketing Management Concentration
Faculty Mentors: Dr. Al Chow and Dr. Reid Cummings
Department: Marketing and Quantitative Methods
College: Mitchell College of Business
Cummings- Finance and Real Estate
Funding Source(s): To be determined

Adding Green to the Palette: United Kingdom Cosmetic Companies Shift to Green Supply Chain

Green marketing, sustainability, and eco-friendly products in the cosmetic industry in the United Kingdom result in new demands for green supply chain management. The growth of consumer demands for environmentally friendly products and the pressure of social responsibility in cosmetic industries drive UK-based companies to introduce green practices into their supply chain. The research surrounding green marketing helps improve the effectiveness of companies' performance in the quickly growing green market. This research will continue with a survey on attitudes towards green cosmetics from women attending mid-sized universities in the Southeast United States. Ultimately, this paper provides a foundation for further research on businesses' responsibility to create sustainability in industries worldwide.

Poster #6
Atchison, Anna
Major: Biology (BS)
Faculty Mentor: Dr. Hana Zickgraf
Department: Psychology, Emory University
College: College of Arts and Sciences, Emory University
Funding Source(s): SURF

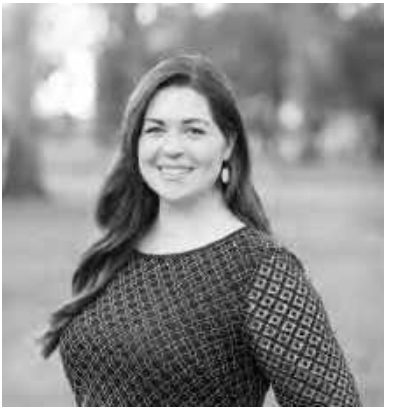
Orthorexia Nervosa and the Role of Fat Avoidance

Orthorexia Nervosa (ON) is defined as an unhealthy preoccupation or obsession with healthy eating which causes distress or impairment related to this preoccupation. There is still debate concerning whether ON should be considered a distinct disorder or a manifestation of AN. Individuals with AN engage in fat avoidance due to the high caloric content of fat. The objective of this study is to understand if ON is motivated by drive for thinness by investigating if individuals with ON engage in fat avoidant behavior. This may give a better understanding of if ON should be considered a manifestation of AN. The Fat Preference Scale (FPS) was utilized to measure fat avoidance; linear regression was utilized in which fat avoidance was the outcome variable, and ON, healthy orthorexia (HO), and restrictive disordered eating behaviors were the outcome variables. Moderation analysis was also conducted to see if ON levels moderated the relationship between health beliefs about fat and fat avoidance. ON was initially found to be a predictor of fat avoidance, but the relationship was completely attenuated by HO, indicating that HO is a unique predictor of fat avoidance. EDEQ restraint was also found to be a unique predictor of fat avoidance. ON was not found to moderate the relationship between health beliefs and fat avoidance. While ON was not found to be a predictor of fat avoidance, HO was. This may indicate that ON should be classified as distinct from AN. We also found that how healthy or unhealthy an individual with high levels of ON believes fat to be does not impact whether or not they avoid fat. These results could possibly be explained by a lack of nutritional awareness in individuals with ON, as opposed to a greater degree of nutritional knowledge in individuals with HO.

Poster #7
Azar, Stephen
Major: Biology (BS)
Faculty Mentor: Dr. Padmamalini Thulasiraman
Department: Biomedical Sciences
College: College of Medicine
Funding Source(s): SURF

Understanding the Role of Hydroxytyrosol on the Expression of Proteinase Inhibitor 9 and Granzyme B in Mammary Carcinoma Cells

One mechanism by which hydroxytyrosol (HT) may target cancer cells is sensitization to the perforin/Granzyme B (GrB) pathway utilized by cytolytic lymphocytes to kill target cells. Previous work in our lab has shown that HT treatment of MCF-7 cells inhibits expression of Proteinase Inhibitor 9 (PI-9). PI-9 is a serine protease inhibitor (serpin) expressed in human cells and is known to inhibit GrB via complex formation. By reducing PI-9 expression and simultaneously upregulating GrB levels, HT may boost immunosurveillance by enhancing the effectiveness of the perforin/GrB pathway. The purpose of this project was to determine whether the regulation of PI-9 and GrB by HT is a global phenomenon among estrogen-receptor positive (ER+) breast cancer cells. T47D was selected as a model ER+ breast cancer cell line. Western blot analysis was conducted to assess effects on expression levels of PI-9 and GrB. Additionally, effects on cell proliferation were assessed via MTT assay. HT was found to exhibit a dose-dependent inhibition of cell proliferation following a treatment period of 72 hours. Downregulation of PI-9 was observed after treatment with 75 µM HT, while GrB levels remained unaffected by all treatment levels.



Poster #8
Barnes, Sarah
Major: Economics & Finance (BSBA) - Finance Concentration
Faculty Mentors: Dr. Misty Sabol and Dr. Al Chow
Department: Marketing and Quantitative Methods
College: Mitchell College of Business
Funding Source(s): n/a

Exploring the Effects of Data Interactivity on Comprehension and Confidence

In the modern digital age, the ease of gathering data can create difficulties for an individual who likely does not realize the potential of the information hidden within the numbers. This phenomenon, known as “big data,” refers to the massive sets of data that are difficult to organize, store, and process. One of the tools that allows individuals to harness the power of their data is data visualization. Data visualization is the graphical representation of data. It allows for more effective and efficient understanding of data by humans, who are very visually oriented. Some common examples include elements like charts, maps, and graphs. These elements have evolved over time to include some of the well-known examples used today, such as pie charts, bar charts, and line charts. Tracking the improvement of technology, the field of data visualization has continued to improve. Specifically, interactive data visualizations are growing more popular as they allow the user to explore and analyze the data using tools embedded within its visual format. This research specifically explores current findings in the field of interactive data visualization and its applications, benefits, opportunities, and tools. The findings indicate that further research should be done to understand the relationship between the presentation of the data (interactive versus noninteractive) and students’ comprehension and confidence.

Poster #9
Boles, Azriel
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Robin Mockett
Department: Biomedical Sciences
College: Covey College of Allied Health Professions
Funding Source(s): SURF

Effect of Rapamycin on the Life Span of Drosophila Melanogaster

Rapamycin is an inhibitor of fungal growth and of the TOR signaling pathway that has been reported to extend the life span of flies and mice and is proposed as a potential anti-aging intervention for humans. In this laboratory, rapamycin was previously found unexpectedly to have a drastic life-shortening effect in y w and w 1118 Drosophila fly strains on a Torula yeast-based food medium, whereas in another laboratory, it lengthened life span of w Dah flies on a Brewer's yeast medium. The goal of the current project was to compare effects of rapamycin on longevity in males and females of all three strains on both media. Life span was increased by 1-8% by rapamycin supplementation on Brewer's medium except in y w female flies and was shortened on Torula food by 8-43% except in w 1118 females. In additional groups of w Dah flies supplemented with rapamycin in the absence of acids and methylparaben that are normally included as food preservatives, rapamycin decreased the life span of both sexes on both media. In all cases, flies had a shorter mean life span (0.2-29%) on the Brewer's vs. Torula medium. The results show that the effect of rapamycin on longevity depends strongly on the composition of the diet, with harmful effects usually becoming apparent under dietary conditions that would normally favor long life.

Poster #10
Bonnie, Frederic
Major: Biology (BS)
Faculty Mentor: Dr. Natalie Bauer
Department: Pharmacology
College: College of Medicine
Funding Source(s): N/A

Repair of Endothelial Inflammation in Pulmonary Hypertension: PKA Signaling

Pulmonary hypertension (PH) is a deadly disease that currently has no cure. The mean survival for patients after diagnosis is 2.8 years. The second messenger signaling molecule, cAMP, is reportedly capable of repair of some of the vascular damage observed in PH. However, cAMP is unstable in the circulation and cannot be used in its innate form for effective treatment. Dr. Bauer's laboratory discovered that cAMP can be enriched in extracellular vesicles. EVs are biological nanosized, intact vesicles that are released from healthy cells such as the endothelium that line blood vessels. These EVs carry signaling molecules and are capable of inducing changes in downstream recipient cells. While it is evident that cAMP-EVs can have effects on the pulmonary endothelium beneficial in PH, the signaling mechanism and specific outputs remain unknown. Our initial studies over the summer were designed to establish the baseline of downstream effectors of cAMP in pulmonary endothelial cells, both healthy cells and cells from models of PH. We determined the baseline measures of ICAM-1, an intracellular adhesion molecule responsible for attracting inflammatory cells to vascular lesions in PH. Our other endpoint, endothelial nitric oxide synthase (eNOS) is regulated by phosphorylation by protein kinase A the downstream effector of cAMP. Thus, establishing baseline measures of these two endpoints provide us the opportunity for in-depth studies of cAMP-EV signaling in pulmonary endothelium.

Poster #11
Bryant, Sloan
Major: Economics & Finance (BSBA) - Finance Concentration
Faculty Mentor: Dr. Al Chow
Department: Marketing and Quantitative Methods
College: Mitchell College of Business
Funding Source(s): N/A

Evaluating Various Estimators of Future Equity Returns using Four Measures of Market Return and the Fama - French Three Factor Model

Stock return volatility is an important measure for investors. Volatility measures the variability of the return of the equity or portfolio. Two measures of volatility are the variance (or standard deviation) of the return, and beta, which measures the relationship of the equity's (or portfolio's) return against a measure of the overall market. In this study, we calculate several measures of beta based on four market measures based on monthly returns, then estimate the monthly returns for the next year using the Fama - French three factor model. The beta based estimators are then evaluated to see if one calculated beta provides a more efficient estimator of the future returns than the others. We utilized Python code to download the returns for each of the components of the Dow Jones Industrial Average for each month from January 2016 through December of 2018. We regressed the three factor data using four measures of market performance: Center for Research in Security Prices (CRSP), S&P 500, NASDAQ, and Russell 2000. Beta for each market measure and each of the other two Fama - French factors were then used to estimate the monthly returns for 2019. The Mean Squared Error (MSE) was calculated for each market measure based estimator against the actual returns for each equity. An overall Pitman style nearness measure utilized the MSE's across each equity to determine the overall nearest estimator to the actual returns.

Poster #12
Burleson, Andrew
Major: Civil Engineering (BSCE)
Faculty Mentor: Dr. Shenghua Wu
Department: Civil, Coastal, and Environmental Engineering
College: College of Engineering
Funding Source(s): SURF

Can Cracking Tolerance Index (CTindex) Correlate with Long-term Field Cracking Performance of Asphalt Pavements?

In response to the increased demand for an effective and simple testing method to assess cracking resistance of asphalt mixtures, the Indirect Tensile Asphalt Cracking Test (IDEAL-CT) and its corresponding cracking tolerance index (CTindex) have been developed. Can CTindex correlate well with long-term field cracking performance? To answer this question, this study was aimed at evaluating the effectiveness of CTindex with a null hypothesis that the larger the CTindex value, the less cracking in the field. All calculations and resulting conclusions were based on a large database that consisted of various asphalt mixture types and long-term field cracking data. A total of 45 hot mix asphalt (HMA) and warm mix asphalt (WMA) pairs, 213 field cores from 28 field projects in four climate zones across the United State were studied. To assist in this validation of CTindex, other material properties such as indirect tensile (IDT) strength and vertical failure deformation were compared to field cracking as well. The statistical analysis results indicated that CTindex is generally a good indicator of transverse cracking. However, the correlation of the other fracture parameters with cracking is inconclusive. This study provided evidence that CTindex could be used to characterize long-term transverse cracking. In addition, all three fracture material properties studied indicate that there is no statistical difference in cracking resistance between HMA and WMA field cores.

Poster #13
Chaudhary, Neil
Major: Biomedical Sciences
Faculty Mentor: Dr. Glen Borchert
Department: Pharmacology
College: College of Medicine
Funding Source(s): SURF

sdRNAs Participate in the Maintenance and Onset of Prostate Cancer

Among 38 specifically excised, differentially expressed snoRNA fragments (sdRNAs) in TCGA prostate cancer (PCa) patient samples, snoRNA-derived fragments sdRNA-D19b and sdRNA-A24 emerged among the most differentially expressed as compared to normal prostate controls. These sdRNAs were selected for further experimentation. The overexpression of either of these sdRNAs significantly increases PC3 (a well-established model of castration-resistant prostate cancer (CRPC)) cell proliferation, and sdRNA-D19b overexpression also markedly increases the rate of PC3 cell migration. Aggressive proliferation, rampant metastasis, and recalcitrance to chemotherapy are core characteristics of CRPC that synergize to produce a pathology that ranks second in cancer-related deaths for men. This study defines sdRNA-D19b and -A24 as contributors to prostate cancer, potentially providing novel biomarkers and therapeutic targets of use in PCa clinical intervention.

Poster #14
Clark, John
Major: Physics (BS)
Faculty Mentor: Dr. Martin Frank
Department: Physics
College: College of Arts and Sciences
Funding Source(s): SURF/ASGC

The Search for Slow Magnetic Monopoles with NOVA's Recently Calibrated Data

Singular magnetic poles, north or south, have been theorized to exist for thousands of years. In the modern day, the elusive singular magnetic pole still eludes us. The appearance of this particle would help confirm many GUT theories and revolutionize our understanding of some of the fundamental forces of the universe. Fermilab's NOvA team is working on ways to screen and detect magnetic monopoles coming from outer space.

Poster #15
Clay, Taylor
Major: Biology (BS)
Faculty Mentor: Dr. Jeremiah Henning
Department: Biology
College: College of Arts and Sciences
Funding Source(s): SURF

Impacts of Disturbance and Nutrient Addition on Ghost Crab Burrow Diameter and Density on Dauphin Island

The Atlantic ghost crab (Ocypode quadrata) is a widely distributed scavenger and predator and critical indicator species occurring across the Gulf Coast. Ghost crabs must adapt to frequent changes in biotic and abiotic environments of these dynamic ecosystems which include frequent disturbances and shifts in resource availability via tropical storms and human activity. To understand how disturbance and nutrient availability individually and interactively impact ghost crab burrow size and density, we collected weekly burrow assessments and performed a mark-and-recapture study in a pre-existing disturbance and nutrient addition experiment on Dauphin Island. Our experiment consisted of twenty 5x5m plots in which we factorially crossed disturbance using a rototiller and application of 10g m2 yr-1 nitrogen, phosphorus, and potassium fertilizers. We hypothesized that ghost crabs would be negatively affected immediately after the disturbance, however, would increase in abundance rapidly in the loose disturbed dune soil. Overall, we found no difference in the burrow density among our experimental treatments; however, we did find larger diameter crab burrows in the disturbed plots, indicating larger ghost crabs were able to access the newly disturbed habitat. After marking ~60 ghost crabs across the summer, we only recovered one marked crab which suggests that the crab population is very large and highly mobile. Taken together, our results suggest that ghost crab burrowing behavior is dynamic, reflecting the dynamic nature of dune ecosystems.

Poster #16
Colley, Dasani & Sawyer, Anna
Major: Biomedical Sciences
Faculty Mentor: Dr. Thomas C. Rich
Department: Pharmacology
College: College of Medicine
Funding Source(s): SURF, Frederick P. Whiddon College of Medicine Office of the Dean, NSF MRI1725937, and NIH P01HL066299

GsPCR-Mediated Regulation of Mechanical Forces on Pulmonary Microvascular Endothelial Cell Monolayers

Pulmonary microvascular endothelial cells (PMVEC) line the pulmonary capillaries. PMVECs help regulate the passage of materials into and out of the bloodstream. They are essential for gas exchange between the alveoli and capillaries. This barrier is regulated by cell-cell junctions and cell-matrix attachment. It is important for the endothelial barrier to have a low permeability because it helps prevent unnecessary materials from entering the bloodstream. Cyclic AMP is a second messenger that is known to stabilize endothelial barrier integrity. Data from our group suggest that distinct subcellular distributions of cAMP are triggered by activation of different Gs Protein Coupled Receptors (GsPCR). Specifically, β2 adrenergic receptor (β2AR) agonists trigger cAMP production at the plasma membrane, whereas EP receptor (EPR) agonists trigger cAMP production at the plasma membrane and at intracellular locations. This led us to ask whether β2AR and EPR receptor agonists trigger distinct changes in mechanical forces within endothelial monolayers. To test this, we used an approach called monolayer stress microscopy. PMVECs were plated at a density of 220,000 cells per well of a 6-well plate on hydrogels containing both small and large fluorescent beads. After 48 hours, cells were loaded with Cal- 520 for 20 minutes and then washed with buffer. Cells were imaged using an excitation scan based hyperspectral microscope system. The dynamics of cellular forces were measured for 5 minutes under baseline conditions. Prostaglandin E1 (PGE1), isoproterenol, or vehicle control were added at 5 minutes. Cell shape and displacement of small beads were used to estimate mechanical forces between cells and between cells and substrate. Displacement of large beads was used to track drift of the microscope stage. We are currently analyzing datasets to determine whether these agonists trigger distinct changes in mechanical forces in PMVECs.

Poster #17
Coppinger, Grace
Major: Biology (BS)
Faculty Mentor: Dr. Jason Strickland
Department: Biology
College: College of Arts and Sciences
Funding Source(s): SURF

Venom Transcriptomics of the Rear-fanged Snake Thamnophis Sirtalis.

Venomous species, particularly snakes, have captured human interest for thousands of years. Over the last few decades, scientists have been studying front-fanged venomous snakes to develop drugs, to treat disease, better manage snakebites, and to answer ecological and evolutionary questions. These studies have largely ignored rear-fanged snakes which account for only twenty-three percent of species with published venom gland transcriptomes, despite accounting for approximately two-thirds of snake biodiversity. To begin to address the lack of knowledge about rear-fanged snake venom, we will sequence the messenger RNA from the Duvernoy's gland (i.e., venom gland) in the Common Garter Snake, Thamnophis sirtalis. Snakes in the genus Thamnophis produce relatively large amounts of venom and have not been previously reported on. We have collected venom and Duvernoy's gland tissue from eight males and nine females of various sizes and ages. Once sequencing is complete we will know the unique toxins present in their venom and their relative expression. The sequences can then be used by other researchers to determine if any can be used to treat human diseases and provide data on rear-fanged species for understanding more about their biology.

Poster #18
Cottrell, Michael
Major: Mechanical Engineering (BSME)
Faculty Mentor: Dr. Shenghua Wu
Department: Civil Engineering
College: College of Engineering
Funding Source(s): SURF

Evaluation of an Innovative Water Contactless Method for Measuring Specific Gravity of Aggregates and Asphalt Mixtures

Accurate and efficient determination of specific gravities of aggregate (Gsb) and asphalt mixtures cylinders (Gmb) are critical for mix design and quality control and quality assurance processes for state agencies and contractors. The current practice for measuring Gsb of coarse aggregate follows AASHTO T85 and CoreLok Methods, and the method for measuring Gmb of asphalt mixture is based on a water displacement method, AASHTO T166. However, potential issues occur for the samples that have large air voids content and highly absorptive aggregates. To address those issues, this study investigates the feasibility of a new instrument, the universal volumetric measurement device (VM-100), to be water contactless and to provide a simple and efficient method for directly measuring the volume of specimens. Various asphalt mixtures and aggregate types were used to compare three methods: VM-100, T166, and CoreLok. The testing results have proved that the VM-100 method is able to determine Gmb of various asphalt mixtures and Gsb of coarse aggregate in one machine, which is an efficient and effective water contactless method, simple to operate and easy to calculate specific gravities results, and has a great potential for industrial application.

Poster #19
Crowley, Margaret (Maggie)
Major: Chemistry (BS)
Faculty Mentor: Dr. James Davis
Department: Chemistry
College: College of Arts and Sciences
Funding Source(s): National Science Foundation (grant number CHE- 2102978)

Synthesis and Characterization of Novel Boronium Cation Structures for Evaluation in the Formation of Ionic Liquids and Hybrid Organic-Inorganic Materials

Only simple synthetic methods are needed for creating boronium cation structures from tertiary amines. This process was used in the synthesis of the boronium cation from N,N,N',N'-tetramethylcyclohexane- cis-1,3-diamine. The structure of the cation is confirmed by NMR spectroscopy of the I- salt and X-ray structural characterization of the BPh_4^- salt.

Poster #21
Dickens, Micah
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. Brooks Rabideau
Department: Chemical engineering
College: College of Engineering
Funding Source(s): SURF/ASGC

Understanding the Effect of Alkali Metal Addition on the Electrochemical Upgrade of CO_2

Electrochemical upgrade of CO_2 (or making CO out of CO_2 using electrochemistry) is a vital chemical technology that can be used in many current scenarios but has yet to be fully implemented because of the lack of understanding of the liquid solution structure. This lack of knowledge makes this technology hard to improve upon. Therefore, it remains unused. Work has already been done that hypothesized: that adding Alkali metals of varying sizes with monoethanolamide (MEA) captured CO_2 in a system with a charged surface improves the efficiency in the electrochemical upgrade of CO_2 . However, it is still unclear what effect the alkali metals had in the electron double layer (EDL) structure that led to this enhancement. Molecular dynamics have long been used to study the structure of the EDL involving electrolytes. In this study, we use molecular dynamics simulations to understand the structure of the EDL of MEA captured CO_2 with alkali metals in a system with charged electrodes. These simulations will provide the needed information for understanding this complex chemical system. Because of the improvement in understanding, this chemical technology could be improved and implemented. This implementation will be a significant step toward a cleaner atmosphere.

Poster #20
Diggs, Destinie
Major: Computer Engineering (BSCpE)
Faculty Mentor: Dr. Na Gong
Department: Computer Engineering
College: College of Engineering
Funding Source(s): SURF/ASGC

Viewer-Aware Power-Efficient Adaptive Mobile Video System Reducing Power Consumption Using Video Bit Truncation Based on Ambient Luminance

Videos can be watched on demand with mobile devices, like smartphones. The intensive computing power, and large amounts of data used during video processing consumes lots of power, thus greatly draining the battery on mobile devices. To solve this problem mobile device designers concentrate only on hardware design techniques which manage the abundance of video data. These existing solutions fall short of saving power and use excess resources. This project aims to save power by considering how the viewers see and watch videos in the real world.

We have developed a bit-truncation technique to adaptively adjust the power consumption and video quality. Bits are tiny parts of memory that make up the video, truncating the bits basically deletes them to save memory. The more bits in a video means the higher the video's quality. This system truncates bits based on the brightness of the user's environment. Humans are less perceptive of video quality in very bright environments, so when it's bright several bits can be truncated without users noticing a difference in video quality.

The system is tested using a Udoo Bolt-v8 computer, and luminosity sensor. The computer runs a Python program that uses the luminosity sensor to measure the brightness of the environment then truncates the video based on the brightness detected. Bits are deleted, so memory is saved which in turn saves power but the users never notice a difference in quality because this is all done based on the brightness.

Poster #22
Dunn, Patrick
Major: Mechanical Engineering (BSME)
Faculty Mentor: Dr. Anh-Vu Phan
Department: Mechanical Engineering
College: College of Engineering
Funding Source(s): SURF, University of South Alabama College of Medicine

Creating Finite Element Meshes from Images of Cellular Clusters for Simulations of cAMP Intercellular Signaling through Gap Junction Channels

A two-dimensional finite-element analysis model (FEA) in a cluster of cells is created from cellular. Images supplied by the University of South Alabama College of Medicine. The clusters are observed to understand how the cAMP communicates between the cells. Creating finite element meshes from images of clusters of cells for simulations for cAMP intercellular signaling through gap junction channels will help with the understanding of how cells communicate with each other. This is significant because intercellular signaling is the transfer of information from one cell to another. Cells signal each other by direct contact with each other or by the release of a substance from one cell that is taken up by another cell.

Poster #23
Edmondson, Emma
Major: Biology (BS)
Faculty Mentor: Dr. Laura Frost
Department: Biology
College: College of Arts and Sciences
Funding Source(s): CPING (Consortium for Plant Invasion Genomics)

Investigating Cryptic Invasion in Rat's Tail Grasses (Sporobolus indicus complex)

Imagine an invasive plant species spreading throughout the southeast. You might think that it's a simple process to find these invaders, but they can go about unnoticed for years! Cryptic invasion occurs when the spread of non-native species goes unnoticed due to misidentification or taxonomic confusion. Rat's tail grasses (S. indicus complex) are distributed globally and many species are invasive or naturalized outside of their native ranges. Abnormally tall Rat's Tail grasses were observed and recorded in Alabama. The native species (S. indicus and S. jacquemontii) overlap morphologically with non-native species (S. fertilis and S. pyramidalis), leading to questions of whether the tall individuals belonged to the native species or were unnoticed invaders. Coarse and fine morphological measurements were recorded for specimens collected throughout the southeast. A Principle Components Analysis (PCA) was used to test if taller individuals formed discrete morphological clusters. Through the PCA and measurements taken, a clear distinction between these morphotypes could not be determined. These results lead to uncertainty about the number and identity of Rat's Tail Grass species present. Future work will involve using DNA sequencing to determine if the observed variation is due to the presence of non-native species or morphological diversity in the native species.

Poster #24
Flood, Zachary
Major: Chemical Engineering
Faculty Mentor: Sean Walker
Department: Chemical and Biomolecular Engineering
College: University of South Alabama
Funding Source(s): None

Modeling Heavy Duty Hydrogen Truck Stations

As automobile and semi-truck manufacturers wheel out new electric and hydrogen fue cell vehicles, new infrastructure to refuel these vehicles must be developed. In th project, the author uses a sensitivity analysis with a simulation of the process c refueling a hydrogen fuel cell electric truck (FCET) on H2FILLS. Using this simulation program, the author will determine the equipment and requisite costs of building an operating FCET refueling stations in the state of Alabama. In addition to the economi analysis, safety calculations including blast radius and fault tree analysis will b performed for hydrogen and combined hydrogen and diesel refueling station: Currently,no infrastructure exists in the state to support the use of FCETs. Howeve given the presence of Interstates 10 and 65 which connect northern cities like Chicag and Indianapolis with shipping ports like New Orleans and Mobile, regiona infrastructure will be required to support these new trucks. In this project, the autho considers the potential operating and capital costs of installing the necessar infrastructure along the Alabama portion of Interstate 65 from Mobile to Huntsville.

Poster #25
Flores, Danielle
Major: Chemical Engineering
Faculty Mentor: Dr. Yang Liu
Department: Engineering and Physiology
College: East Carolina University
Funding Source(s): NSF

Quantification of Western Diet and Physical Activity Effects on Drosophila Simulans Hearts Using Novel Edge-Detection Software

A semi-automatic algorithm that is specialized for rapid observation of contraction-relaxation parameters in the hearts of male Drosophila simulans is proposed. The algorithm uses three different segmentation techniques, including manual, automated, and supervised Random walker, to identify edges and create a separation distance signal from an optical recording. This signal can be used to identify heart parameters such as heart rate, heart period, and heart rhythmicity as well as contractility parameters such as systolic and diastolic diameters, fractional shortening and maximum contraction and relaxation velocity over the entire recorded period. Here, we applied our algorithm to fly groups in differing diet patterns or physical activity and found previously undocumented effects on specific heart functions. It was found that the Western diet (i.e., a diet high in fat, sugar, and salt) reduces cardiac function. This is due to reduced fractional shortening from an increased systolic diameter and a decrease in both relaxation and contraction velocities. Interestingly, the addition of exercise to a Western diet significantly improved heart contractility in Drosophila.

Poster #26
Flynn, Nicholas
Major: Information Technology (BSIT)
Faculty Mentors: Ms. Marianne Loes, Dr. Al Chow
Department: Marketing and Quantitative Methods
College: Mitchell College of Business
Funding Source(s): SURF

Turning Social Media Marketing Big Data into Information

With the exponentially growing amount of data in the world today, Big Data can cause more challenges than it provides solutions. Large sums of data alone are not as useful as information which is when data facts are used to answer specific questions. Therefore, the goal that this research project explored is to determine how to turn social media data into information that can be used to answer research questions. The data analysis industry has programs that have been built to scrape social media sites and collect data, however, there is little literature on which process is the most ideal. This study aimed to test capture methods to easily compare them. Methods that were explored included Python scripts to scrape data from specific Twitter, Facebook, and LinkedIn accounts. The same accounts were run through software such as Nvivo – Ncapture, Data Miner, Octoparse, and Phantom Buster. It was determined that an experienced coder can write Python scripts to effectively scrape data, and that Octoparse and Phantom Buster are ideal if Python is not applicable. We also found that Twitter is the best social media platform for scraping compared to Facebook and LinkedIn. Because of the lack of literature on the subject, the compiled list of positive and negative attributes of each program should serve as potential starting points for future researchers.

Poster #27
Foret, Marie
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Padmamalini Thulasiraman
Department: Biomedical Sciences
College: Covey College of Allied Health Professions
Funding Source(s): This work was supported by the startup funds from the Pat Capps Covey College of Allied Health Professions at the University of South Alabama.

An Investigation on Curcumin as a Regulator of Cancer Metabolism

Triple-negative breast cancer (TNBC) is characterized by the lack of estrogen receptors (ER), progesterone receptors (PR), and human epidermal growth factor (HER2) receptors, which makes this type of breast cancer difficult to detect and treat. Uncontrolled proliferation in TNBCs is attributed to an increased uptake in molecules such as glucose. Overexpression of transmembrane proteins such as Glucose transporter 1 (GLUT1) can facilitate the transport of glucose across the plasma membrane and ultimately promote chemoresistance, making it an important target in cancer therapy. Chemotherapeutic agents derived from natural products can aid in treating various diseases and even cancer. The polyphenol extract, curcumin, has been shown to suppress growth through the regulation of genes involved in metabolism such as PPAR$\delta\delta$. PPAR$\delta\delta$, peroxisome proliferator-activated receptor $\delta\delta$, is a nuclear hormone receptor that plays a large role in inflammation in the body. The purpose of this research is twofold: (i) to determine if curcumin suppresses GLUT1, and (ii) to assess whether activation of PPAR$\delta\delta$ reverses the reduction of GLUT1 by curcumin. Here, we found that curcumin was shown to directly inhibit the protein expression of GLUT1. Using PPAR$\delta\delta$ siRNA, we did not observe knockdown of the PPAR$\delta\delta$ protein in MDA-MB-231 cells, which requires further investigation.

Poster #28
Foster, Amanda
Major: Speech and Hearing Sciences (BS)
Faculty Mentor: Dr. Kimberly Smith
Department: Speech and Hearing
College: Covey College of Allied Health Professions
Funding Source(s): SURF

Relationship Between Eye Movements During Reading and Reading Comprehension Ability of Persons with Aphasia

Eye movements reflect the cognitive-linguistic processing of normal readers. Measures obtained from eye movements such as fixation duration, saccade amplitude, word skipping, and regressions, have been shown to reflect online language processing during reading. Eye movements have also been used to examine language processing and reading in disordered populations including those with aphasia and alexia. The purpose of this study was to examine the relationship between the severity of reading skills in individuals with aphasia and eye movements observed during reading. Data that was previously collected from Twenty-four participants with aphasia were re-analyzed using Pearson correlations to examine the associations between Reading Comprehension Battery for Aphasia-2 subtests and the eye movement measures: mean fixation duration, mean saccade, amplitude, regression path duration saccades, rereading time, and the number of words skipped. The results indicated that saccade amplitude and rereading duration were the only reading measures associated with RCBA-2 subtests.

Poster #29
Goodman, John Thomas
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Natalie Bauer
Department: Pharmacology
College: College of Medicine
Funding Source(s): SURF, USA College of Medicine

Repair of Endothelial Inflammation in Pulmonary Hypertension: ICAM-1 Expression

Pulmonary hypertension (PH) is a deadly disease that currently has no cure. The mean survival for patients after diagnosis is 2.8 years. During the progression of PH, the blood vessels in the lung express inflammatory molecules such as intracellular adhesion molecule-1 (ICAM-1) that attract circulating inflammatory cells. This inflammatory cell invasion contributes to vascular lesions that worsen the hypertension of the vessels. Extracellular vesicles (EVs) are released from healthy endothelial cells into the circulation and have been found to carry signaling molecules capable of inducing changes in downstream receptor cells. The effects of EVs on the progression of PH are still being studied, however previous work has shown that cAMP-enriched EVs are capable of improving pulmonary vascular function in the animal model of PH. For this project, isolated cultured endothelial cells are being used as a cellular model of pulmonary hypertension. The purpose of this project has been to obtain baseline levels of ICAM-1 expression in healthy and injured rat pulmonary artery endothelial cells. The two forms of injury induced upon the cells were hypoxia treatment and cytomix treatment. Cytomix is a proprietary mixture of inflammatory cytokines. Cultured endothelial cells were treated and examined using flow cytometry, a method allowing for the recognition of cells expressing high levels of ICAM-1. Once baseline expression is established, we can begin treating with cAMP-enriched EVs to determine their role in regulation of ICAM-1 expression on pulmonary endothelium.

Poster #30
Gray, Sylvie
Major: Exercise Science (BS) – Pre-Professional Concentration
Faculty Mentor: Dr. Joshua Keller
Department: Health, Kinesiology, and Sport
College: College of Education and Professional Studies
Funding Source(s): SURF

Sex and Cuff Pressure Specific Hemodynamic Responses to Blood Flow Restriction Leg Extensions

PURPOSE: Women exhibit an attenuated exercise-pressor reflex (EPR) compared to men. Limited data exists on resistance training (RT) with blood flow restriction (BFR) on EPR, especially between men and women. Therefore, our purpose was to examine the cuff pressure- and sex-specific responses to BFR RT on EPR.
METHODS: 33 young (24±6 yrs) adults (16 male) completed 2 visits. The exercise included 4 sets (1x30, 3x15) during which the femoral arteries were occluded at 40% and 60% of the minimum arterial occlusion pressure (AOP). Heart rate and BP were recorded after the last set. Percent change from baseline was calculated for HR and BP. Separate Sex × Cuff Pressure mixed-factorial ANOVAs were performed to examine mean differences in mean arterial pressure (MAP) and HR.
RESULTS: For MAP, there was not a significant interaction (p=0.446) for Sex (p=0.254). There was a significant interaction for Cuff Pressure (p=0.038,=0.175). The comparisons collapsed across sex indicated that the percent increase in MAP was significantly greater for the 60% AOP compared to the 40% (23.5 ± 10.3 vs. 17.6 ± 7.1%; Δ = 5.9%, CI 95% = 0.366 – 11.4). The HR responses indicated that there was an increase not specific to Sex or Cuff Pressure.
CONCLUSIONS: Using an exercise intervention that augments metabolic byproduct accumulation eliminated the commonly reported sex difference in the exercise pressor reflex. Interestingly, tighter cuff pressures induced a greater exercise pressor reflex than lessor pressure.

Poster #31
Green, Lily & Lewis Darcy
Major: Political Science (BA)
Faculty Mentor: Dr. Corina Schulze
Department: Political Science and Criminal Justice
College: College of Arts and Sciences
Funding Source(s): No funding

Perceptions of Critical Race Theory and the State of Education

Since the foundation of this nation, race has been an integral part of the U.S. government and judicial system; however, Americans have avoided necessary conversations on the making of race. Within the past few years, the topic of race and identity has been an especially salient feature of political activism. Race-conscious approaches in education are one of the most important results. These approaches seek to understand the role of race in society rather than ignoring it as a contributing variable to many of the social and political inequalities which remain. Critical Race Theory (CRT), a legal methodology that calls for a revaluation of how the justice system and race interact, has been targeted by opponents of race-conscious pedagogy, leading to nationwide attempts to ban CRT in public education. The methodology has been accused of indoctrinating students into believing that they are guilty for the actions of their ancestors and, therefore, are inherently racist. This study proposes that anti-CRT attempts strategically target race-conscious educational approaches in order to disguise vested political interests. This qualitative pilot study consists of semi-structured interviews with instructors and students from a mid-sized, southern university to provide insight into how the political rhetoric surrounding CRT is interpreted. Specifically, the results seek to better understand how legislators and constituents frame current issues of race, politics, and education.
Keywords: Critical Race Theory, race relations, legislation, education

Poster #32
Hamlett, Anna
Major: Exercise Science (BS) – Pre-Professional Concentration
Faculty Mentor: Dr. Neil Schwarz
Department: Health, Kinesiology, and Sport
College: College of Education and Professional Studies
Funding Source(s): SURF

The Effect of Energy Drink Consumption on Resting Energy Expenditure, Core Temperature, and Hemodynamics

Energy drink sales in the United States reached 14 billion dollars in 2021 according to Beverage Industry Magazine, but the functional claims stated on their product labels remain largely unvalidated. In particular, some energy drinks, including Reign InfernoTM and Celsius HeatTM, claim to increase metabolic rate and thermogenesis. Thus, the goal of this study was to determine if these energy drinks increase thermogenesis and metabolic rate, as advertised, after acute consumption. Twenty healthy participants (10 females and 10 males) completed three separate testing sessions in a randomized, cross-over, double-blind, placebo-controlled fashion. Participants reported to the lab in the morning in a fasted state. Upon arrival to the lab, participants' hemodynamics, core temperature, and resting metabolic rate were assessed before and 45 minutes after consumption of the assigned energy drink or placebo. There was no significant time (PRE/POST) × condition (Celsius/Reign/Placebo) interaction effects for any of the outcome variables measured during the study. Significant time effects were observed for resting heart rate, mean arterial pressure, resting metabolic rate, and respiratory quotient (all variables $p < 0.05$). Resting heart rate and respiratory quotient were lower at post time point compared with pre time point. Resting metabolic rate and mean arterial pressure were higher at post time point compared with pre time point. No time effects were observed for core temperature. In conclusion, ingestion of energy drinks purported to increase thermogenesis did not differentially alter hemodynamics, core temperature, or resting metabolic rate when compared with a placebo beverage.

Poster #33
Hellenkamp, Skye
Major: Geography (BS)
Faculty Mentor: Dr. Gabriel de Oliveira
Department: Earth Sciences
College: College of Arts and Sciences
Funding Source(s): SURF

Spatio-Temporal Dynamics of Land Surface Temperature and NDVI Over Mature Evergreen Forests and Agricultural Areas in the Mobile-Tensaw Delta

The Mobile-Tensaw Delta is one of the most biodiverse regions within the United States and is heavily understudied compared to other ecosystems of its size and significance. Different vegetation patterns can influence how water and carbon cycling occur across the Earth's surface. In this regard, it is extremely important to track how plants can adapt and behave under critical environmental conditions. This study uses remotely sensed imagery to explore the vegetation dynamics across different terrestrial ecosystem types within the Mobile-Tensaw Delta, southern Alabama. Using data obtained from NASA's Terra and Landsat satellites, land surface temperatures (LST's) and normalized difference vegetation indices (NDVI) were compared and analyzed on spatial and temporal scales. The two study areas compared in this research were mature evergreen forest and agriculture over a decade, from 2011 to 2021. The areas displayed distinguished LST and NDVI magnitudes and temporal variability over a monthly, seasonal, and yearly basis. The mature evergreen forest presented annual average LST and NDVI of 21.2℃, and 0.75, while the agricultural site presented values of 21.8℃, and 0.68, respectively. On a seasonal scale, the mature forest showed consistently lower LST's and ~17% higher NDVI in the spring. Our results evidence that land cover changes in the Mobile-Tensaw Delta impact the vegetation structure, which in turn affects the energy absorption in these areas, causing warmer land surface temperatures when natural ecosystems, such as mature evergreen forests, are replaced by row crops in the region, such as
cotton, corn, among others.

Poster #34
Hickman, Constance
Major: Civil Engineering (BSCE)
Faculty Mentor: Dr. Stephanie Patch
Department: Civil Engineering
College: College of Engineering
Funding Source(s): SURF

"Will I Stay or Will I Go?"

This study utilizes the numerical modeling system, XBeach, to simulate the hydrodynamics and morphological changes experienced on Dauphin Islands western end during potential storms. Dauphin Island is a low-lying barrier island situated between the Mississippi Sound and Gulf of Mexico. It is home to nearly 1200 residents and serves as the mainland's first line of defense during storm conditions.

Poster #35
Holdbrooks, Davis
Major: Biomedical Sciences
Faculty Mentor: Dr.Jonathan O. Rayner
Department: Microbiology and Immunology
College: College of Allied Health Professions
Funding Source(s): SURF

Surveillance of Arthropod-Borne Infectious Diseases

Arthropod-borne infectious diseases are on the rise. Tick populations, for example, have been shown to be spreading north from the southern states in the U.S. As tick populations spread more geographically, the number of viral, bacterial, and parasitic vectors and pathogens they possess also increase. In the state of Alabama, mosquitoes are responsible for many pathogens such as West Nile Encephalitis, Eastern Equine Encephalitis, St. Louis Encephalitis, Chikungunya Virus, Dengue Virus, and Zika Virus. In Alabama, tick-borne diseases such as spotted fever rickettsios are of the greatest consequence as evidenced through reports of human cases to the CDC by Alabama Public Health (ADPH). Another tick-borne disease, Heartland Virus (HRTV), was previously not known to be present in Alabama until recent studies. Surveillance of these arthropods is critical in assessing new population patterns as well as generating methodology for detecting arthropod pathogens. We have collaborated with the Mobile County Health Department and ADPH to undergo surveillance on mosquitoes and ticks respectively. Despite recent efforts, we have not detected HRTV in tick populations, therefore we have been performing studies to verify the methods of detection and if DNA and RNA pathogens can be detected using these methods. The established methods we use for mosquito-borne disease surveillance have been used on Aedes and Culex species since March but there has been no evidence of diseases. Surveillance of these arthropods and their infectious diseases is critical in understanding geographic host ranges and emerging diseases.

Poster #36
Iweka, Rachel
Major: Geography
Mentor: Alexis Wilson, PhD Candidate, Stanford University v Earth System Science
PI/Faculty Mentors: Dr. Scott Fendorf, Fendorf Soil and Environmental Geochemistry Lab, Stanford University, Earth System Science
Dr. Chris Field, Global Ecology and Climate Solutions Lab, Stanford University Dept. of Earth System Science
Funding Source(s): NSF, Stanford University

Assessing Heavy Metal Contamination in Urban School Garden Soils in Northern California and its implications for Environmental Justice

Urban agriculture has been defined as the cultivation and distribution of agricultural products in urban and suburban areas. This practice has many benefits, particularly for low-income communities and communities of color, because it offers a cultural connection with the environment and relieves those at risk of food insecurity. However, anthropogenic activities have significantly increased the levels of heavy metals, such as lead, in urban soils which poses a health risk to those exposed to toxic levels. This becomes an environmental justice issue because communities of color and low-income communities are known to disproportionately face the impact of environmental pollution and food insecurity due in part to policies such as Redlining. The combination of these factors may put these communities at an increased risk of lead exposure through urban garden soils. The purpose of this research is to assess lead concentrations in school garden soils and the exposure risk to students and staff within an urban center in Northern California. We hypothesize that lead levels will be above the California Toxic Substances Control screening level of 80 mg/Kg in residential soils because of factors ranging from formally redlined areas, racial and socioeconomic demographics of the school population, and proximity to potential atmospheric pollution sources. Through a community-based partnership with the school district, a multidisciplinary approach was taken to assess two school sites that have different socioeconomic and environmental histories. Fieldwork was conducted for the collection of soil samples while lab work consisted of soil characterization (pH, organic matter content, etc) and the use of X-Ray Fluorescence Spectrometry to determine heavy metal concentrations. This research will provide an increased understanding of the risk of exposure to lead in urban school garden soils and its particular impact on low-income and communities of color.

Poster #37
Jackson, Cheyenne
Major: Economics & Finance (BSBA) - Finance Concentration
Faculty Mentor: Dr. Al Chow
Department: Marketing and Quantitative Methods
College: Mitchell College of Business
Funding Source(s): None

Pre-Pandemic, Post Pandemic, and Portfolios

Fluctuation and variation in stock market returns is important to investors for many reasons. One reason is the impression of stability in the market. Often times world events have significant impact on financial markets. The COVID-19 pandemic had a significant impact on everyday life around the world and continues to still have an impact. Our study attempts to determine if there was significant impact on the volatility of portfolio returns in the post March 2020 timeframe. Utilizing data from the Fama-French data site, we looked at the 24-month period prior to the pandemic is the United States and calculated the variance of each of the six portfolios established on size and book to market. We used Python coding to extract the data sets from the site and calculate the monthly, weekly, and daily variance of each portfolio, then repeated the calculation for the 24 months after the start of the pandemic. To test the null hypothesis that the variance was unchanged in the post pandemic timeframe, we utilized three tests for differences in variance, Barlett, Fisher, and Levene. To determine if the volatility of the portfolios changed in regard to their relationship to the overall market, we regressed the portfolio returns against the market returns using three measures of the market (S&P 500, NASDAQ, Russell 2000), calculating the beta for each portfolio and market measure. We then tested to determine if the beta for the portfolios significantly changed from the pre and post pandemic timeframe.

Poster #38
Jalkh, Josephine
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Thomas Rich
Department: Pharmacology
College: College of Medicine
Funding Source(s): NIH grant awards P01HL066299, R01HL58506, R01HL137030, and AHA 903376

Excitation Scan-Based Hyperspectral Imaging of Gq-Mediated Calcium Signals In Human Airway Smooth Muscle Cells

Gq-mediated increases in calcium regulate a wide variety of cellular responses, including gene transcription, translation, excitability, migration, and contraction. While Gq-mediated calcium release and subsequent calcium influx are known to trigger contraction of human airway smooth muscle cells (HASMCs), recent studies have revealed that a subset of Gq-mediated responses, those triggered by activation of bitter taste receptors, trigger relaxation of HASMCs. We sought to understand the differences between calcium signals triggered by distinct GqPCR agonists in HASMCs. Specifically, we are investigating differences in the spatial distributions and kinetics of Gq-mediated calcium signals in response to histamine, carbachol, and chloroquine. HASMCs were plated on laminin-coated coverslips and placed in a humidified atmosphere at 37˚C for 48 hours. HASMCs were then loaded with Cal-520/AM, a fluorescent calcium indicator, and imaged using an excitation scan-based hyperspectral imaging system. Calcium signals were trigged by addition of varying concentrations of histamine, carbachol, or chloroquine. Hyperspectral image stacks were analyzed using custom scripts written in ImageJ and MATLAB. Data are currently being assessed using region of interest tracking software (S8) to discern potential differences in calcium signals triggered by these agonists. This work was supported by the Medical Student Summer Research Program, SURF Program, the Center for Lung Biology, and NIH grant awards P01HL066299, R01HL58506, R01HL137030, and AHA 903376.

Poster #39
Kantzler, Amanda Rae
Major: Biology (BS)
Faculty Mentor: Dr. Larry Yet
Department: Chemistry
College: College of Arts and Sciences
Funding Source(s): SURF

Synthesis of Mpro Inhibitors of SARS-CoV-2

The coronavirus pandemic known as COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), a mutated strain of SARS-CoV. The single positive-stranded RNA virus contains a genomic RNA which encodes a functional protein called Mpro, which plays a key role in polyprotein processing from the genomic RNA into the structural and nonstructural protein components vital for the replication and packaging of new generation of viruses. Mpro inhibitors are reported in the literature with reasonable activity. We are interested in inhibition of Mpro as a very promising target for the development of broad-spectrum anti-SARS and anti-MERS therapeutic agents due to its highly conversed three-dimensional structure among the various coronaviruses.

Poster #40
Kerby, Anabelle
Major: Biology (BS)
Faculty Mentor: Dr. Juan Mata
Department: Biology
College: College of Arts and Sciences
Funding Source(s): None

Endophytic Fungi in Aquatic Vascular Plants

The effects of fungal endophytes on vascular plants range from beneficial to pathological. They are almost ubiquitous in land plants, but scarcely researched and documented amongst aquatic vegetation. Mobile Bay affords an ideal environment for a diversity of life. In this research report, two angiosperms, a native species, Vallisneria neotropicalis (tapegrass), and an invasive species Myriophyllum spicatum (Eurasian Water Milfoil) are used to evaluate, identify, and document fungal endophytes colonizing their leaves and stems. This area of research is vital to increase our documentation of aquatic fungal endophytes and their relationship with local plant life. The purpose of this project is to identify culturable endophytes and to classify them taxonomically as well as examine if there are temporal effects on endophyte communities. Stems and leaves were collected from the Mobile Bay Causeway, and 1 cm fragments were embedded into agar after they were surface sterilized in diluted bleach to promote endophyte growth. The plates were checked daily for growth as well as endophytes grown in their own plates upon isolation. Currently, 109 fungi have been isolated. Out of the isolates, 23% are suspected to be unique endophytes. From January to February, the number of isolates per number of samples from M. spicatum decreased from 59% to 54%. V. neotropicalis isolate percentage increased from 34% to 67%. Mycelia from the isolates were used for DNA extractions. Permanent slides of each fungus's mycelium were made to document morphological data. When isolates were morphologically identical, restriction digests were performed on ITS-PCR products. In the future, ITS-PCR products suspected to be non-identical to others will be sent for sequencing and taxonomic determination.

Poster #41
Ladner, Emma
Major: Psychology (BA)
Faculty Mentors: Dr. Krista Mehari, Dr. Jasmine Coleman
Department: Psychology
College: College of Arts and Sciences
Funding Source(s): University of South Alabama

Association Between Substance Use and Dating Violence Perpetration Among Adolescents

Substance use is associated with negative outcomes. Research has examined the relation between substance use and dating violence perpetration in adults. However, less research has been done in youth. The purpose of this study was to investigate the associations between substance use and dating violence perpetration. We hypothesized that substance use would be concurrently and longitudinally associated with dating violence perpetration. Analyses were conducted using data from 185 ninth-grade students (Mage = 14.3 years, SD = 0.56) who endorsed being in a current relationship. Surveys were administered in the fall and winter of 2019. About half of the sample identified as female (52%) and most students identified as African American (92%). Substance use was assessed using the substance use subscale of the Problem Behavior Frequency Scale - Adolescent Report (Farrell et al., 2020). In-person dating violence perpetration (physical and psychological) was assessed using the Dating Violence Scale (Foshee et al., 1996). Consistent with our hypothesis, Wave 1 substance use was positively associated with Wave 1 dating violence, ($\beta = .38$; $p < .001$), after controlling for age and gender. Contrary to our hypothesis, Wave 1 substance use did not predict Wave 2 dating violence perpetration ($\beta = .01$; $p = .86$), after controlling for age, gender, and Wave 1 dating violence perpetration. Findings indicate that substance use is concurrently, but not longitudinally, associated with perpetration of dating violence. More research is needed to identify moderators of the relation between substance use and dating violence perpetration in youth.

Poster #42
Lawrence, Ensley
Major: Hospitality and Tourism Management (BS)
Faculty Mentor: Dr. Eun Min Hwang
Department: Hospitality and Tourism Management
College: College of Education and Professional Studies
Funding Source(s): SURF

Exploring the Demand for a Mobile Tourism Application that Focuses on Urban Tourism

Mobile tourism applications are becoming an increasingly popular tool when it comes to traveling, and a limited amount of studies have explored the impact these applications have on a traveler's overall experience when visiting an urban tourism destination. This study aimed to highlight the potential need of creating a mobile tourism application that may help promote urban tourism destinations. A total of 272 participants completed the online survey through Qualtrics. More than 96% of the participants indicated that they would seek help from a mobile tourism application when traveling. They were most likely to seek support from a mobile tourism application for urban tourism destinations (44.4%) followed by coastal tourism destinations (40.2%). By utilizing the three major factors of Davis's technology acceptance model (TAM), the research aimed to better understand the travelers' perception of Mobile Tourism Application when traveling tourism destinations and examine the influence of those factors on their intention to travel. The study results revealed that the positive influence of perceived usefulness and perceived enjoyment of mobile tourism applications positively influenced the participants' travel intention to tourism destinations that provide mobile tourism applications. Interestingly, perceived ease of use presented an insignificant contribution on the respondents' travel intention.

Poster #43
Mack, Britney
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. Kevin N. West
Department: Department of Chemical and Biomolecular Engineering
Funding Source(s): SURF, Department of Energy

Investigation of a Self-Neutralizing, Thermally Robust Ionic Liquid as an Acid Catalyst Solvent System

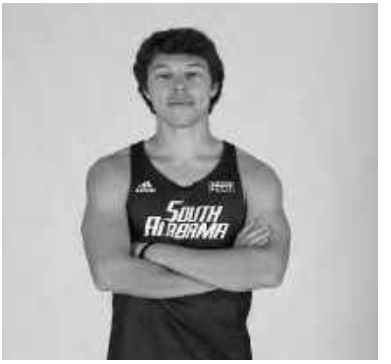
In industrial chemical processes, solvation is required for reasons including reagent solvation, enhancing chemical reaction rates, and a means of temperature control. Most of these processes include catalysts, often acids, that serve to increase the rate of the reaction, but pose the issue of waste disposal. At present, the separations techniques involved are energy extensive. The investigation of self-neutralizing, acidic ionic liquids (ILs) can serve as an alternative solvent system that allow for non-volatile and re-usable materials in high temperature reactions. In this analysis, an alkylation reaction of t-butanol and phenol in non-hydroxylated tetraphenylphosphonium (TPP) cation paired with a bistriflimide (Tf2N) anion is to be used as a solvent. A follow-up reaction of t-butanol and anisole in a similar ionic liquid involving TPP's hydroxylated analogue, TPHP, to determine the IL's ability to serve as both a solvent and catalyst for the system. A series of temperature dependent reactions are to be done for both reactions, and these product mixtures are analyzed via gas chromatography to further understand the kinetics of each. This data will provide some understanding of solute-solvent interactions taking place since there is little predictability of molecular-level interactions and changes in thermal properties when modifying ionic liquids. This information would then serve as a model in designing task specific ILs for novel solvent systems and more energy efficient processes. In this investigation, [TPP][Tf2N] was proven to successfully solvate the reaction producing relatively small amounts of two major products, 2-t-butylphenol and 4-t-butylphenol. There are no indications of decomposition at 220℃, but completion of the reaction series approaching higher temperatures will be more informative of any possible degradation. At present, [TPP][Tf2N] is a promising alternative to begin developing a novel solvent system.

Poster #44
Martin, Jade
Major: Geography (BS)
Faculty Mentor: Dr. Steven Schultze
Department: Earth and Sciences
College: College of Arts and Sciences
Funding Source(s): SURF/ASGC

The Implications of Climate Change on the Gulf of Mexico Dead Zone

The Gulf of Mexico hypoxic zone is an area south of the Louisiana coast that is characterized by significantly low dissolved oxygen. Through the process of eutrophication and several factors such as salinity, temperature, freshwater discharge, precipitation, and nutrient loading, the hypoxic zone forms every summer. This project sought to find what, if any, correlations there were between climate change and the size of the hypoxic zone. For this project, water data Water gauge and specific conductance data from the Mississippi River were obtained from the USGS Water Resources database. Climate data and projections were acquired from the USGS National Climate Change Viewer. We used the RCP4.5 and RCP8.5 climate model projections from the time frame 1950-2099. We ran correlations for the relationship between average summer temperature and average precipitation compared to the historical sizes of the hypoxic zone. We found that average summer temperature had a correlation of -0.14 and precipitation had a correlation of 0.43. This suggests that precipitation has more of an influence on hypoxic zone size, rather than temperature. The climate projections showed no significant trend in precipitation for Louisiana. However, there is an expectation of higher variability, which could cause the hypoxic zone to be quite large in some years. With projected variability of hypoxic zone size, the industries and people who rely on this area could face a more unstable environment.

Poster #45
Marty, Cade
Major: Civil Engineering (BSCE)
Faculty Mentor: Dr. Shenghua Wu
Department: Civil, Coastal, and Environmental Engineering
College: College of Engineering
Funding Source(s): SURF



Forensic Evaluation of Field Performance of 100% Reclaimed Asphalt Pavement Cold Mix with Rejuvenator in A Low Volume Road

Utilization of reclaimed asphalt pavement (RAP) at lower production temperature is a sustainable technology in asphalt industry. This study provides a forensic evaluation on a low volume road in Florida that used 100% RAP cold mix with a rejuvenator. Two field distress surveys were completed after 7 and 22 months of service, and the effect of staged construction and edge compaction on the road conditions were evaluated. Alongside the field survey, the asphalt mixture properties were analyzed in terms of field cores' volumetric properties, Cantabro loss, Hamburg Wheel Tracking, indirect tensile resilient modulus, and fracture tests. The ride quality was good, but the main distresses were weathering and raveling. It was determined that the field cores had high air voids, resulting in high Cantabro loss, which is consistent with field raveling observation. The Hamburg wheel tracking test results showed that rutting resistance and moisture resistance are good for 100% RAP cold mix with rejuvenator. To improve field performance, it is recommended to mix and compact 100% RAP cold mix with rejuvenator on the same day, as well as improve compaction on the edge to achieve higher in-place density.

Poster #45

Mitchell, Brianna
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Meghan Hermance
Department: Microbiology and Immunology
College: College of Medicine
Funding Source(s): Grants from Dr. Meghan Hermance

Effect of Temperature on the Localization of Microbiota in a Laboratory-Reared Colony of Haemaphysalis Longicornis Ticks

Haemaphysalis longicornis ticks are invasive to the United States with the potential to transmit several tick-borne pathogens that are native to the United States. Based on existing locations of H. longicornis in its native regions in Asia, as well as its invasive populations that are established in the United States, several geographic range prediction models have been produced to help understand future range expansion and distribution of this invasive tick in North America. Unfortunately, these models do not all agree, and there is uncertainty associated with the potential geographic range expansion of H. longicornis ticks in North America. Climate can affect tick populations by impacting where they spread geographically, and whether they will survive and reproduce. Furthermore, recent studies have shown that the microbial communities within ticks (a.k.a the tick microbiome) can impact tick fitness and pathogen acquisition/transmission. Therefore, it is important to understand the impact of various temperatures on the microbial communities within H. longicornis ticks. The objective of my work is to characterize how temperature affects the microbial diversity and composition within H. longicornis. Laboratory-reared cohorts of adult female H. longicornis ticks were maintained at three different temperatures of 4℃, 20℃, and 30℃ with a constant relative humidity. DNA was extracted from ticks exposed to each temperature and 16S rRNA sequencing was performed to assess bacterial community composition. The 16S rRNA sequencing showed more bacterial diversity within ticks exposed to higher temperatures and less bacterial diversity at lower temperatures. RNA in situ hybridization (ISH) was also performed on whole and dissected tick samples from these temperature-exposed cohorts. RNA ISH showed that the pan-eubacteria signal was present in tick midguts and salivary glands across all temperatures, but the pan-rickettsia signal did not localize to these tick tissues.

Additional work is underway to examine the tissue localization of certain bacteria within these tick cohorts, and real-time quantitative PCR will be used to validate the 16S rRNA sequencing data.

Poster #48
Mock, Abby
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. David Forbes
Department: Chemistry
College: College of Arts and Sciences
Funding Source(s): SURF

Efficient Synthesis of Diazirine Functionality

Holistically, the focus of the project is synthetic organic chemistry research of diazirine functionality synthesis. The purpose of this research project is to find a high-yielding, cost-effective, and reproducible approach to synthesizing diazirine functionality. Currently, there are methods to synthesizing molecules with diazirine functionality, yet these processes use an excessive amount of ammonia. One goal of this project is to find a synthesis that uses less or no ammonia to form the desired materials. In addition, this project will evaluate the efficiency of different diazirine molecules as propellants. Some common propellants include alcohol, hydrazine, hydrogen, and kerosine. According to NASA, diazirines have the potential to make up components of propellants, specifically for missiles. Starting with different aldehydes and ketones as the reagents, an array of molecules with diazirine functionality are formed. Moreover, this multi-step process involves the use of electrochemistry to stimulate the movement of electrons. The addition of electrochemistry will significantly reduce the synthetic overhead. Since diazirines are useful for many biological processes and have the potential to be efficient propellants, this is what makes this project important.

Poster #49
Mooney, Kyle
Major: Computer Engineering (BSCpE)
Faculty Mentor: Dr. Jinhui Wang
Department: Electrical and Computer Engineering
College: College of Engineering
Funding Source(s): SURF, Alabama Space Grant Consortium

High Performance and Low Power Edge Artificial Intelligence (AI) Design

Under the explosive development of the internet of things (IoT), edge computing is facing unprecedented challenges including the limited energy budget, large system latency, and shortage of storage and computing resources. Especially for edge AI (Artificial Intelligence), the required real-time response and online learning in various scenarios are translated into urgent demands for high-speed, power-efficiency hardware components. In this project, the design of artificial intelligence for edge devices was investigated to find different ways to increase the efficiency of machine learning in terms of performance and power consumption. The system used as a base for the project was an environmental data collection system that already had the ability to collect data such as temperature, humidity, barometric pressure. Using the camera module attached to the system, video was captured to test the real-time object detection AI algorithm implemented on it. While the detection operated successfully, the rate of predictions made by the algorithm was too slow to be considered useful in real-time situations. Attention was then focused on how the AI algorithms worked in detail. While the project was not completed at the time of writing, the basis for the next phase of the project was formed.

Poster #50
Morgan, Savannah
Major: Psychology (BA)
Faculty Mentor: Dr. Krista Mehari
Department: Psychology Department
College: College of Arts and Sciences
Funding Source(s): N/A

Effectiveness of the SCORE Jail Diversion Program: A Mixed Methods Approach

Drug-related incarcerations are fairly common and have serious consequences. Incarceration, however, is not always effective at reducing drug-related activities. Although there is research supporting the effectiveness of jail diversion programs, more research is needed to understand potential mechanisms through which these programs are effective. The aim of this study was to evaluate the effectiveness of Second Chance or Else (SCORE), a jail diversion program, using a mixed methods approach. Participants were 17 male adults (Mage = 41.9, SD = 12.4) representing four cohorts of individuals that participated in SCORE between 2016 and 2021. Most participants (82.4%) identified as African American. Participants' report of their educational, employment, and driver's license statuses was collected before and after the program. Following their participation, participants completed qualitative interviews. Concepts were categorized into themes during open coding and relations among themes were identified during secondary coding. Results indicated significant increases in possession of a driver's license from pre-intervention (M = .41, SD = .51) to post-intervention (M = .82, SD = .39) and significant increases in employment status from pre-intervention (M = .21, SD = .43) to post-intervention (M = .86, SD = .36). Themes emerged in the interviews, including perceptions of SCORE's positive impact on their lives and components they found helpful. These findings are helpful for understanding the mechanisms through which participation in the SCORE program influences reoffending. Participation in the SCORE jail-diversion program increased participants' driver's license and employment status, which may help to reduce difficulties faced by individuals following incarceration.

Poster #50
Motamed, Lydia
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Robert Barrington
Department: Microbiology and Immunology
College: College of Medicine
Funding Source(s): SURF, MOWYCAL LLC

Mechanism of FPRLx in Promoting Wound Healing in Autosomal-dominant Hyper Immunoglobulin E Syndrome

Autosomal-dominant Hyper Immunoglobulin E Syndrome (AD-HIES) is a rare pediatric immunodeficiency caused by mutation of the signal transducer and activator of transcription 3 (STAT3) gene. AD-HIES patients present with several detrimental symptoms, one of the most severe being abnormal wound closure. This slow and incomplete wound closure predominantly impacts the lungs, leading to recurrent secondary bacterial and fungal infections that can be fatal. Prophylactic antibiotics to treat secondary bacterial infections are supportive in nature but do not treat the underlying predisposition for recurrent infection. Unpublished data from our laboratory found that peptides called FPRLx targeting formyl peptide receptor 1 (FPR1) enhance wound closure in vitro. We hypothesized that the FPRLx-FPR1 interaction stimulates production of genes involved in the extracellular matrix (ECM), thereby enhancing wound closure. To address this, reverse transcriptase quantitative polymerase chain reaction (RT-qPCR) was used to measure expression of genes encoding for ECM components. To determine the importance of the FPRLx-FPR1 interaction in AD-HIES, we compared RT-qPCR results in wild type cells to those treated with alantolactone, a pharmacologic STAT3 inhibitor. Experiments are currently in progress to determine whether the FPRLx-FPR1 interaction induces the predicted effect.

Poster #52
Myers, Sienna
Major: Biology (BS)
Faculty Mentor: Dr. Jason Strickland
Department: Biology
College: College of Arts and Sciences
Funding Source(s): SURF

New Species Detection of Kinosternon Turtles Using DNA Sequencing

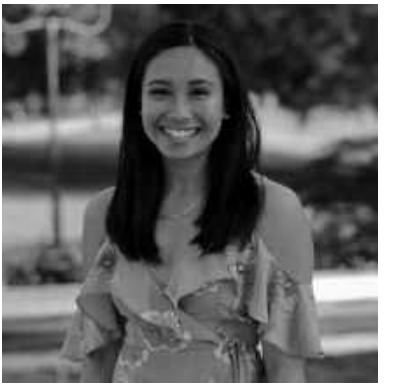
In 2020, a new species of Mud Turtle in the family Kinosternidae, Kinosternon cora, was discovered in Mexico. Additional samples from other nearby bodies of water were collected that may also represent a new species of turtle. Using supplemental samples from Alabama and publicly available data, we compared the DNA sequences of known Mud Turtles with the sequences from the potentially new species from Jalisco, MX. Tissue samples were collected from Mexico via collaborators. Local sampling was conducted on USA's campus from a pond on the Glen Sebastion Trail . We used a hoop net turtle trap baited with sardines to capture turtles. We successfully captured five Kinosternon subrubrum (Eastern Mud Turtle) and six Sternotherus odoratus (Stinkpot/Common Musk Turtle), collected blood samples from the subcarapacial sinus, and released the turtles after measurements and photos were taken. We have successfully extracted DNA from the blood samples and the Mexican tissue samples. We sequenced the DNA from our samples using primers for two mitochondrial loci and four nuclear loci. Poor primer binding required us to create family-specific primers for the Kinosternidae to increase Polymerase Chain Reaction (PCR) succes. Based on sequence similarity to known species of turtles, we were able to determine if the potentially new species was in fact unique. Many turtles are currently threatened or endangered, it is important to document and identify all turtle species before it is too late. My work will help catalog the biodiversity in Mexico which will provide a better understanding of what species of Mud Turtles exist in the ecosystems before they are potentially lost due to extinction.

Poster #53
Nelson, Julia
Major: Mechanical Engineering (BSME)
Faculty Mentor: Dr. Michael Francis
Department: Physiology and Cell Biology
College: College of Medicine
Funding Source(s): This work was supported by a Research and Scholarly Development Grant from the USA Office of Research and Economic Development.

Testing a Novel Device for Detecting Peripheral Artery Disease Using Radio Frequency Energy

Peripheral Artery Disease (PAD) is a cardiovascular disease characterized by a lack of blood flow in the arteries of the arms and legs. Untreated PAD increases the risk of cardiovascular events such as stroke and heart attack. Our lab is developing a device for quick and easy detection of PAD in asymptomatic patients. This technology (Milliflo) uses low-power radio frequency energy to heat the skin, while simultaneously measuring the surface temperature. The amount of blood flowing through the vasculature affects the temperature of the skin during and after heating, which will allow us to define 'normal' blood flow versus that of PAD. We have tested our methodology in vivo using an animal model, in silico with a computer-generated flow model, and on a phantom skin model. We have designed an advanced prototype that is more compact and portable than previous versions. The device is battery powered to avoid risk of shock. We have incorporated an overheat shutoff feature to avoid burning the skin. We have obtained approval from USA's Institutional Review Board (IRB) to conduct experiments using human volunteer subjects and we anticipate starting testing during the Fall of 2022. Measurements will be performed prior to, during, and after tourniquet-induced ischemia, using both the Milliflo device and a near-infrared spectroscopy (NIRS) device. Our hypothesis is that the blood flow results as indicated by the Milliflo device will correlate with readings from the NIRS device.

Poster #54
Nguyen, Ivy
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. David Forbes
Department: Chemistry
College: College of Arts and Sciences
Funding Source(s): SURF



Electrosynthesis of Diazirine-Based Photoaffinity Probes

A viable biochemical strategy for target identification of complex protein mixtures is photoaffinity labeling. The identification and localization of targets of active molecules is significant in the field of drug discovery and biomedical research as it allows researchers to study, understand, manipulate, and control complex biological systems. Of the photo-reactive groups commonly employed, diazirine functionality offers the highest number of benefits. The most notable benefit is the covalent bond formed between active site and photoreactive group via a carbene upon diazirine exposure to longwave UV irradiation. We have initiated a study which focuses on a cost-effective and atom-economic approach toward the assembly of diazirine functionality. The two specific aims circumvent the surplus use of ammonia in the formation of the diaziridine scaffold and utilize an IKA ElectroSyn 2.0 in the oxidation of diaziridine to yield diazirine functionality. Success with either specific aim will substantially reduce the synthetic overhead currently observed with existing methodologies.

Poster #55
Nguyen, Antony
Major: Computer Engineering (BSCpE)
Faculty Mentors: Dr. Jinhui Wang, Dr. Na Gong
Department: Electrical and Computer Engineering
College: College of Engineering
Funding Source(s): NASA/Alabama Space Grant Consortium

6T SRAM Memory Design and Verification

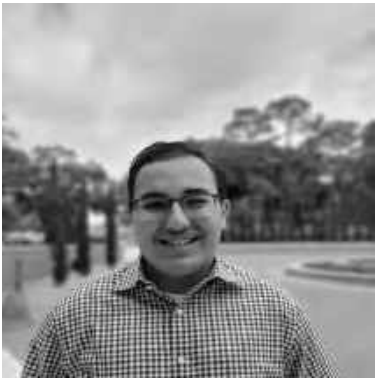
Computer memory refers to the semiconductor devices in computers whose primary function is to electronically store information in the form of bits. One type of semiconductor memory is the random-access memory (RAM). There are two main types of RAMS: Dynamic (DRAM) and Static (SRAM). The Increasing demands for more efficient and faster devices has fostered a high focus on research and development of the SRAM memory design due to its large on-chip cache structures employed in current processors – many of which have been observed to be the main power-consuming source in current systems. This research explores the basics of designing the 4x4 SRAM memory array and verifying its function. The schematic design for SRAM was implemented in Cadence Virtuoso using 15nm and 45nm technology. The inverter, row decoder, write driver, sense-amplifier, and 6T SRAM were all components designed for the 4x4 SRAM memory array. While there are still many other areas of the design to be improved on, the next step is to introduce power-saving techniques and adjust the component's architectures to use even less power.

Poster #56
Omar, Mariam
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. Sean Walker
Department: Chemical Engineering
College: College of Engineering
Funding Source(s): SURF

Air Pollution Assessment in Chickasaw, AL

Airborne pollution due to the use of internal combustion engine vehicles can have a detrimental impact on human health and the environment. Assessments of air quality can play a key role at individual and global health promotion and disease prevention levels. This project focuses on identifying the health effects of fine particulate matter (PM2.5) and sulfur dioxide (SO2) in Chickasaw, AL. This was done by analyzing air quality data from the EPA and calculating the uncertainty of the analysis. Future work involves assessing the health effects of air pollution levels and producing an analytical model to predict the effects of PM2.5 and SO2 on mortality levels.

Poster #57
Patel, Savan
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. David Forbes
Department: Chemistry
College: College of Arts and Sciences
Funding Source(s): SURF



Protein Phosphatase Inhibitors: An Analysis of Diazirine Functionalization

This project focuses on synthesizing an effective inhibitor to Protein Phosphatase 5 (PP5), a serine/threonine phosphatase that is known to regulate cell signaling cascades that can suppress growth and/or stimulate apoptosis in response to genetic stress. PP5 responds to hypoxia inducible factor-1 (HIF-1) and estrogen, both of which have been correlated with the growth of breast cancer. As a result, over expression of PP5 has been associated with increasing tumor growth. Cantharidin is a naturally occurring toxin produced by the male blister beetle which has been used for years in Chinese medicine to treat tumors and acts as a "semi- selective inhibitor of PPP-family Ser/Thr protein phosphatases." Norcantharidin, the demethylated derivative of cantharidin, has shown to be a viable candidate for selective inhibition of protein phosphatases and follows a cost-effective synthetic prep where modifications to the core scaffold can easily be implemented. Photoaffinity labelling is the process of using a photoreactive group (PG) that will, upon irradiation, generate a reactive intermediate that will covalently bind a ligand to its target molecules. Diazirines, three-membered rings consisting of one carbon and two nitrogen atoms with a double bond between the two nitrogen atoms, have been found to be potent photoreactive groups due to its stability and small size. Upon irradiation, diazirines form reactive carbenes via the loss of nitrogen which can rapidly form a covalent bond with the "nearest target molecule." A new approach to inhibiting PP5 activity will involve the functionalization of diazirines as a photoaffinity label within a norcantharidin derivative.

Poster #58
Phillips, Olivia
Major: Political Science (BA)
Faculty Mentor: Dr. Ryan Williams
Department: Political Science
College: College of Arts and Sciences
Funding Source(s): SURF

Intersectionality, Methods of Selection, and Dissent on State Supreme Courts

Because the diversification of the legislature is relatively recent, there is not extensive research on the effects such representation has on the judiciary. By analyzing the role of intersectional identity in state supreme court decisions and by attempting to understand the relationship that selection method has on diversification and judicial opinions, we hope to better explain the role of intersectionality within the judiciary. Looking at the dissent rates of each identity group will aid in this analysis, as this will showcase the significance of the judicial opinions of each group. We conducted a statistical analysis on each state's supreme court decisions dating from 1995-2010 after determining the selection method of each state and the race and gender of each justice. Our data so far has shown that white men are more likely than any other identity group to dissent, although the differences across each identity group are not significant. Partisan elections were also the selection method that created the highest dissent rate, which aligned with our prior research.

Poster #59
Provencher, Brianna
Major: Physics (BS)
Faculty Mentor: Dr. Jianing Han
Department: Physics
College: College of Arts and Sciences
Funding Source(s): SURF/ASGC

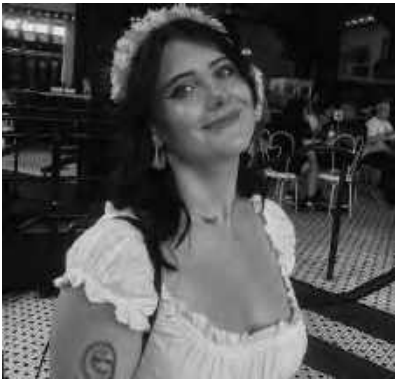
Towards Optimizing Magneto-Optical Traps

Magneto-optical traps (MOTs) are a method of containing atoms and cooling them to ultracool temperatures. Atoms can be cooled with lasers by utilizing electron excitation, the conservation of momentum, and the Doppler effect. The goal of the experiment was to image Rubidium atoms in their ground and excited states, but it was diverted to focus on the optimization of the MOT itself for higher quality images of the ground state before focusing on the excited state. MOTs were found to stabilize and become more intense under a stronger magnetic field and a higher population of atoms within the trap. By observing the structure and nature of MOTs, one can learn more about the fundamental forces and interactions between individual atoms.

Poster #60
Richardson, Lilly
Major: Biology (BS)
Faculty Mentor: Dr. Juan Mata
Department: Biology
College: College of Arts and Sciences
Funding Source(s): None

Chanterelles in Mobile County

Chanterelles are mushrooms belonging to the genus Cantharellus. (Order Cantharellales, Phylum Basidiomycota). Because they are considered one of the best edible forest mushrooms their international commercial value exceeds a billion dollars annually. The most common chanterelle types are those having shades of yellow or orange, but different colors can be observed ranging from white, red, to brown. The pileus often has an infundibuliform shape with irregular lobe margins and a smooth, dull surface, with a fertile underside that is not truly gilled, but rather smooth, veined or ridged. The fertile underside is a key feature in distinguishing the chanterelles from true gilled mushrooms. Spore prints range from a light shade of yellow to white. The position of the stipe is often central and often is similarly colored to the pileus. Chanterelles often grow in clusters and are often found under woody trees. They are considered mycorrhizal meaning they have a mutualistic symbiotic relationship with vascular plants, especially hardwoods, in which they assist with the tree's intake of water and nutrients. There are around 90 described Cantharellus species worldwide, about 40 species in the US, and seven species reported in the state of Alabama. The main objective of this project is to determine how many Cantharellus species are present in Mobile County. So far, 29 collections at five different locations have been made, with C. altipes occurring at every location. Future goals include spore measurements and DNA extraction and sequencing to compare and determine the taxonomic nature of specimens collected.



Poster #61
Rowland, Joshlyn
Major: Biology (BS)
Faculty Mentors: Dr. Jeremiah Henning and Emily Newman
Department: Life Sciences
College: College of Arts and Sciences
Funding Source(s): SURF

Native Coastal Dune Mycorrhizal Communities Improve Salinity Tolerance but Do Not Aid in Inundation Stress of Panium Amarum

Coastal dunes serve as the first line of defense for tropical storms hitting the Gulf Coast and provide critical habitat for endangered and protected species. Rising sea levels and increasing tropical storm intensity are further exacerbating the stressors faced by dune communities by increasing salinity stress and the frequency of water inundation plants experience. Using Panicum amarum, a common dune grass used in restoration, we conducted two greenhouse experiments with a total of 240 plants using either 'live' soils collected from intact dunes on Dauphin Island with intact mycorrhizal communities or a sterilized soil treatment to remove mycorrhizal communities to serve as a control. P. amarum was grown under varying degrees of salinity stress and watering frequency, and over the course of four months, bi-weekly growth and survival data was collected. After the 4 months, we harvested Pancium and collected total live and senesced aboveground biomass, belowground biomass, and root:shoot ratios, as well as a suite of leaf and root traits. Overall, we found that mycorrhizal fungi benefitted plant survival, growth, and final biomass production in low salinity (2.5 ppt), however, Panicum grown in medium and high salinity experienced high mortality regardless of mycorrhizal treatment. Mycorrhizal fungi improved growth and survival of plants with frequent inundation, however, plant survival was generally lower in plants with mycorrhizae, suggesting that mycorrhizal fungi may become parasitic during frequent inundation events. Our results suggest that native mycorrhizal fungi may provide mild salinity tolerance, although the impacts of inundation warrant further investigation.

Poster #62
Saoud, Waleed
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. Silas Leavesley
Department: Chemical and Biomolecular Engineering College: College of Engineering
Funding Source(s): NIH awards P01HL066299 and S10OD028606, NSF RET1953544 and MRI1725937, and the Alabama Space Grant Consortium

Can Excitation-Scan Hyperspectral Imaging Identify Spectroscopic Differences Between Normal and Cancerous Colorectal Tissues?

Imaging of tissues is vital in our progression in the medical field because it allows an understanding of both the anatomical structure and, at times, the physiological state of tissues. There are many modalities for imaging tissues, including X-rays, MRI, and CT scans. The current screening of the upper airways and gastrointestinal tract for cancers is frequently performed using endoscopy. Endoscopic screening uses white light or a narrow imaging band to detect cancerous lesions. Many studies have indicated that early detection likely plays a critical role in helping lower colorectal cancer mortality rates. Hyperspectral imaging is a method of imaging that provides image data at many distinct and narrow wavelength bands. In contrast, traditional white light imaging only provides data in three broad bands: red, green, and blue. The additional spectroscopic information provided by hyperspectral imaging allows us to detect differences in tissue. Sets of hyperspectral images of cancerous and noncancerous tissue were obtained. The images were then corrected using MATLAB code that accounts for background spectra, and a correction factor that ensures a uniform flat spectral response. Initial results indicated that differences between the images is spectra emitted, the cancerous tissue had a lower magnitude of total intensity when compared to the noncancerous tissue. This difference in intensity can be seen especially in 520 nm wavelength.

Poster #16
Sawyer, Anna & Green, Lily
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Thomas Rich
Department: Pharmacology
College: College of Medicine
Funding Source(s): The American Heart Association

GsPCR-Mediated Regulation of Mechanical Forces on Pulmonary Microvascular Endothelial Cell Monolayers

Pulmonary microvascular endothelial cells (PMVEC) line the pulmonary capillaries. PMVECs help regulate the passage of materials into and out of the bloodstream. They are essential for gas exchange between the alveoli and capillaries. This barrier is regulated by cell-cell junctions and cell-matrix attachment. It is important for the endothelial barrier to have a low permeability because it helps prevent unnecessary materials from entering the bloodstream. Cyclic AMP is a second messenger that is known to stabilize endothelial barrier integrity. Data from our group suggest that distinct subcellular distributions of cAMP are triggered by activation of different Gs Protein Coupled Receptors (GsPCR). Specifically, β2 adrenergic receptor (β2AR) agonists trigger cAMP production at the plasma membrane, whereas EP receptor (EPR) agonists trigger cAMP production at the plasma membrane and at intracellular locations. This led us to ask whether β2AR and EPR receptor agonists trigger distinct changes in mechanical forces within endothelial monolayers. To test this, we used an approach called monolayer stress microscopy. PMVECs were plated at a density of 220,000 cells per well of a 6-well plate on hydrogels containing both small and large fluorescent beads. After 48 hours, cells were loaded with Cal- 590 for 20 minutes and then washed with buffer. Cells were imaged using an excitation scan based hyperspectral microscope system. The dynamics of cellular forces were measured for 5 minutes under baseline conditions. Prostaglandin E1 (PGE1), isoproterenol, or vehicle control were added at 5 minutes. Cell shape and displacement of small beads were used to estimate mechanical forces between cells and between cells and substrate. Displacement of large beads was used to track drift of the microscope stage. We are currently analyzing datasets to determine whether these agonists trigger distinct changes in mechanical forces in PMVECs.

Poster #63
Seiber, Kriston
Major: Psychology (BA)
Faculty Mentor: Dr. Robyn Brouer
Department: Management
College: Mitchell College of Business
Funding Source(s): SURF

The Impacts of Enacted, Espoused Value Match and Person-Organization Fit on Performance

This study explores the relationship between values, fit, and performance. The study seeks to gauge the impacts these factors have on one another and discuss how those interactions relate to an individual and company performance. The surveys consists of two waves sent to healthy, consenting human beings. Their answers are matched with their performance score. Analysis is done to find impacts and correlation among enacted, espoused value match, person organization fit, and performance. Work Family Conflict is also measured as a mediator of enacted, espoused value and performance.

Poster #64
Servos, Daniel
Major: Biology (BS)
Faculty Mentor: Dr. Sinéad M. Ní Chadhain
Department: Biology Department
College: College of Arts and Sciences
Funding Source(s): USA Biology Department

Genomic Analysis of Naphthalene Degradation in Pseudomonas Strain NP204

The extraction, processing, and use of fossil fuels, such as oil and coal, have led to an increase of polyaromatic hydrocarbons (PAH) in the environment. These compounds are highly stable and have been found to cause harmful health effects and damage to various ecosystems. In this study we isolated a collection of naphthalene degrading bacteria from midtown Mobile soils. One isolate, NP204, was chosen for further study. The NP204 genome was sequenced, assembled and annotated using PATRIC. Similar genome finder identified NP204 as Pseudomonas taeanensis. Pseudomonads are well known for their ability to use a wide variety of compounds as carbon sources. The PATRIC pathway finder tool was used to identify fourteen PAH degradation genes. PCR primers targeting 3 genes, the alpha and beta subunits of naphthalene 1,2-dioxygenase and the alpha subunit of a ring hydroxylating dioxygenase were designed and tested for use in reverse transcriptase PCR (RT-PCR). NP204 was then grown in liquid media containing either naphthalene, phenanthrene, biphenyl, or glucose. RNA was extracted from the cultures and RT-PCR was preformed to check for gene expression. I predicted that the genes would be expressed on PAHs but not on glucose. However, initial results were inconsistent and the experiment is being repeated. When complete, this study will advance our understanding of the genetics and regulation of PAH degradation by pseudomonads.

Poster #65
Sheth, Hridhay
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Glen Borchert
Department: Pharmacology
College: College of Medicine
Funding Source(s): SURF

LG4s in the Human Genome Constitute Functional Enhancers that Coordinate Neighboring Gene Expressions

The human genome is rife with regulatory elements that control which genes are expressed or silenced. While regulatory elements such as epigenomic modifications, transcription factors, promoters, and enhancers are well established, still there remain regulatory elements that are poorly characterized or even undiscovered. In 2020, our group identified 301 Long G4-capable regions (LG4s) in the human genome and found most of these overlap annotated enhancers. Interestingly, we find the promoters regulated by these enhancers are, similarly, markedly enriched with G4-capable sequences leading us to hypothesize that: the high number of available G4 donor sequences in a LG4 allows LG4 enhancers to act as long “Velcro-like” regions that simultaneously interact with multiple neighboring promoters to coordinate their expressions. At the level of chromatin conformation, we developed a custom Hi-C analysis pipeline to characterize the interactome of LG4 regions. The pipeline successfully identified LG4 contacts with local genes and regulatory elements, indicating that LG4s form topologically associated domains and likely function as a novel mechanism of gene regulation and genomic organization.

Poster #66
Singh, Shubhangi
Major: International Studies in Global Health
Faculty Mentor: Dr. Santanu Dasgupta
Department: Pathology Department
College: College of Arts and Sciences
Funding Source(s): SURF, MCI

Differences in Tumor Vascular Density Between Smoker and Non-smoker Cancer Patients.

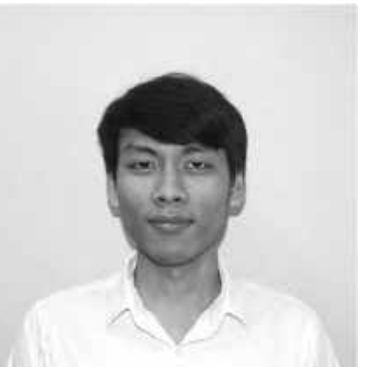
Smoking is among the most significant preventable risk factors associated with cancer and other diseases. Cancer development is a multistep process in which transforming cells gradually gain malignant properties through a series of oncogenic genetic alterations. Successful cancer progression also depends on the remodeling of the surrounding stroma, which feeds the cancer cells in a host-parasite interaction. Tumor angiogenesis, the process of blood vessel formation, is an essential feature of solid tumors to provide them food and oxygen for their growth. We previously demonstrated that nicotine, an addictive component of tobacco-smoke, promoted tumor angiogenesis by impacting the growth of the endothelial cells. In the present work, we examined the differences in tumor vasculature between smoker and non-smoker patients to support my laboratory findings. After searching the available tumor cases in repository for patient's smoking history, I selected 27 smoker (12 lung and 15 prostate adenocarcinomas) and 19 non-smoker (4 lung and 15 prostate adenocarcinomas) cases. The tissue blocks were sectioned and subjected to hematoxylin and eosin staining and immunohistochemistry using antibody against CD31, a biomarker for endothelial cells. Following digital scanning, all slides were reviewed to identify tumor areas and CD31+ tubular structures (blood vessels). We observed that lung and prostate tumor tissues from smoker patients had significantly higher number of blood vessels than those from non-smoker patients. Thus, increased tumor vascularization appears to be a common feature of smoker cancer patients providing clinical support for a novel mechanism by which smoking contributes to tumor pathobiology.

Poster #67
Stallings, Jason
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. Kevin West
Department: Chemical Engineering
College: College of Engineering
Funding Source(s): SURF/ASGC

Synthesis of a Regenerable Anti-microbial Dye for Textile Industry

Antimicrobial fabrics have been studied, developed, and improved in recent decades, resulting in advancements of medical and personal protective equipment. This project aims to further develop a novel, regenerable anti-microbial dye for the use in the textile industry through the use of N-halamines and triazine dye chemistry. The dye's anti-microbial effect can be regenerated through contact with a 1% hypochlorite (bleach) solution, seemingly allowing for the anti-microbial nature to endure the lifetime of the fabric to which it is attached. Testing of the dye has been completed through the utilization of NMR, IR, and a double-blind microbial testing conducted using S. marcescens. Further developments are aimed at improving industrial viability of the product dye and practical testing of dyed fabrics.

Poster #68
Thai, Quang
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Martin Frank
Department: Physics
College: College of Arts and Sciences
Funding Source(s): SURF/ASGC



High Gain Data Study for the Existence of Super Slow Magnetic Monopole

The research study looked into ways to improve the reconstruction algorithm to see if there is a better way to search for slow magnetic monopoles within the cosmic ray data that was collected from the NOvA Far Detector. The Far Detector is a massive 14 kilotons made up of 144,000 liquid scintillator detectors used by Fermilab to study muons. The experiment used an algorithm to search for and reconstruct a possible magnetic monopole within the event of the Far Detector. In order to test the performance of the algorithm and see where we can improve it, simulated magnetic monopoles (MC) are placed within the data where they will be coming in at various angles and velocities. The experiment showed that the algorithm has many short falls. The algorithm had difficulty in finding the MC if the angle of its impact was too high (>85 degrees to the horizontal plane) and the distance they traveled with the Far Detector was too short (<1000 cm). Some other short fall of the algorithm is its ability to find the MC put within the Far Detector decreases as the speed of the MC decreases to less than 3.16 x 10^-4(speed of light). This could be due to the energy detected from the very slow simulated magnetic monopole becoming harder to distinguish from the background noise of cosmic rays such as neutrinos.

Poster #69
Thaxton, Anne
Major: Biology (BS)
Faculty Mentor: Dr. Jason Strickland
Department: Biology Department
College: College of Arts and Sciences
Funding Source(s): SURF, Sigma Xi Student Research Grant, SWAN Howard-McCarley Student Research Grant

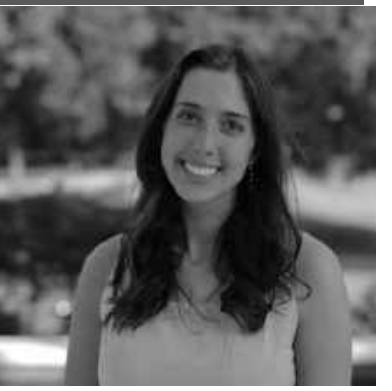
Testing the Timing of Gene Expression during Venom Replenishment for Three Scorpion Genera

Venom replenishment within scorpions requires a poorly understood, complex system to synthesize an estimated 100 proteins. There is roughly a 1-1 match between genes in the genome and proteins in the venom, but the timeline of production of these polypeptide chains is unknown. The composition of scorpion venom is controlled through transcription where mRNA transcripts that are expressed will ultimately be translated into venom proteins. The timing and level of gene expression directly correlates with the timeline and volume of protein production. Apocrine secretion is used in scorpions to replenish their venom, which entails the venom gland cells budding off via exocytosis into the lumen of the venom gland. The vesicles contain fragments of mRNA and toxic proteins, which makes it possible to measure levels of gene expression directly from the venom. One individual's venom may be sampled at various time points using this method, allowing information about expression at various stages of the venom production to be obtained. Venom production is highly energetically costly; therefore, it can be reasonably understood that the proteins most important in prey capture and defense will be produced at the earliest stages of venom regeneration and at the greatest volume. This project will collect six individuals from three species (Diplocentrus Lindo, Vaejovis intermedius, and Centruroides vittatus) and sample venom from each individual at time points zero, one, two and four days after the gand has been emptied. The purpose of this project is to determine if there is differential gene expression across these time points, indicating relative importance of certain proteins within the venom for functional usage.

Poster #70
Thomley, Matthew
Major: Secondary Education Biology (BS)
Faculty Mentor: Dr. Ryan S. Littlefield
Department: Biology
College: College of Arts and Sciences
Funding Source(s): SURF

Translocation Reporters Allow for Real Time Observation of Gene Expression

Green fluorescent protein (GFP) is commonly used as a reporter of gene expression in many organisms; however, the ~30-minute maturation time of GFP, prevents its effective use as an observational tool, when the focus of investigation is within the window of time encompassing the nonfunctional period of fluorescent reporters following their expression thereby preventing view of certain dynamic aspects concerning expression and protein assembly. Recently, gene expression was visualized in real time in yeast using fluorescent protein translocation reporters (FPTRs), a two-part system that moves mature GFP from the cell cytoplasm to the nucleus within a minute after gene expression begins (Aymoz et al, 2016). We intend to demonstrate that FPTRs can be used in the model organism, C. elegans, and use this technique to investigate the onset of myofibril gene expression during embryogenesis. Starting with a transgenic strain that co-expresses GFP from the ubiquitously-expressed ribosomal gene rpl-13, we used CRISPR-Cas9 gene editing to add a short interaction tag to the GFP coding sequence. To observe when the myosin proteins MHC A and MHC B are expressed during muscle development, we will co- express from the endogenous promoters (myo-3 and unc-54, respectively) a short complementary interaction tag with nuclear localization sequence (NLS) tag that will translocate the GFP into the cell nucleus. Our project will demonstrate that FTPRs can be used within multicellular organisms to observe gene expression in real time and to reveal the relative timing of muscle protein gene expression during myofibril assembly.



Poster #70
Vavrinek, Andrea
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Terrence Ravine, Dr. Phoibe Renema
Department: Biomedical Sciences
College:
Funding Source(s): SURF, Pat Capps Covey College of Allied Health Professions. Additional support was received from the USA Center for Lung Biology. We thank Timothy Yahr (University of Iowa), Matthew Wolfgang (UNC Chapel Hill),

Pseudomonas Aeruginosa ExoY Does Not Affect ExoS/T-Induced Cytotoxicity in Pulmonary Microvascular Endothelial Cells.

Pseudomonas aeruginosa (P. aer) is the most common cause of ventilator-associated pneumonia (VAP) in intensive care unit (ICU) patients. P. aer uses a type III secretion system (T3SS) to inject exoenzymes Y, S, T, and U into pulmonary microvascular endothelial cells (PMVECs) resulting in cell rounding and/or cell death. ExoY causes PMVECs to lose cell to cell contact and round up, but does not lead to cell death. Conversely, ExoS causes cell death. It has previously been shown that ExoY inhibits ExoS-induced cell death in lung epithelial cells. We hypothesized that ExoY inhibits Exo S/T-mediated cell death in PMVECs. P. aer strain PAK, which produces STY (parent), was compared to isogenic mutant strains expressing either S, SY, T, TY, Y or lacking STY (Null). PMVECs were infected for 6 hours at an MOI of 20:1. Post-infection supernatants and cell lysates were collected separately to determine the amount of LDH released into the supernatant. Increased LDH release indicates cell cytotoxicity (death). Strain STY causes significantly more LDH release compared to either Null, T, TY, or Y. Strain ExoY did not cause LDH release compared to the control or null. There was no significant difference in LDH release between SY and Y, and TY and Y. These data indicate that ExoY does not inhibit ExoS/T-mediated cell death in PMVECs under current experimental conditions. The mechanism by which ExoY avoids cell death remains unknown. Future studies are needed to determine whether ExoY actively inhibits apoptosis pathways such as Bcl-XL/Bcl2 regulated cytochrome C release.

Poster #72
Watson, Skylar
Major: Psychology (BA)
Faculty Mentors: Dr. Krista Mehari, Dr. Jasmine Coleman
Department: Psychology
College: College of Arts and Sciences
Funding Source(s): N/A

Longitudinal Relation Between Positive Outlook and Substance Use Among Adolescents

Positive outlook, or optimism about future outcomes, can guide individuals' behavior. The relation between positive outlook and substance use has been examined among adults but not among adolescents. The purpose of this study was to examine the longitudinal relation between positive outlook and adolescents' substance use. We hypothesized that positive outlook would predict subsequent substance use. Participants were a predominantly African American (92%) sample of 262 ninth-grade students (M age = 14.3 years, SD = 0.52). The sample was predominantly African American (92%) and was about evenly divided by gender (52% female). Data were collected at two time points about three months apart (i.e., fall and winter) in 2019. Self-report of positive outlook was assessed using the 6-item positive outlook subscale of the Individual Protective Factors Index (Springer & Phillips, 1992). Self-report of substance use was assessed using the 9-item substance use subscale of the Problem Behavior Frequency Scale –Adolescent Report (Farrell et al., 2020). Consistent with our hypothesis, Wave 1 positive outlook predicted adolescents' Wave 2 substance use ($\beta = -.13$; $p = .03$), after controlling for age, gender, and Wave 1 substance use. These findings indicate that positive outlook in the beginning of the school year predicts lower rates of substance use three months later. Future research should examine mechanisms through which positive outlook leads to lower rates of substance use, such as reduced stress or distress or higher self-efficacy. Improving adolescents' optimism about their future may increase the effectiveness of substance use prevention strategies.

Poster #73
West, Katie
Major: Psychology (BA)
Faculty Mentors: Dr. Annabelle Fonseca and Dr. Krista Mehari
Department: College of Medicine (Fonseca)
College: College of Arts and Sciences
Funding Source(s): College of Medicine

Assessing Barriers to Oncological Care: A Patient-Centered Approach in the Rural South

Oncological care is vital to those diagnosed with cancer. However, there are barriers that prevent some individuals from receiving care. For instance, lower socio-economic status and insurance status predict worse outcomes in cancer patients' survival rate, highlighting the need to understand factors that impact individuals' access to oncological care. The purpose of this study was to explore factors that created barriers to care for oncological patients using qualitative research. We hypothesized that themes would emerge regarding potential barriers to receive oncological care. Data collection and analysis of interviews is ongoing. Data has been collected from 6 participants ranging from 49 to 63 (Mage = 57.6, SD = 5.79), with a target N of 15. Participants completed interviews on factors that impact their access to oncological care; trained interviewers conduct the interviews before or after patients' appointments, and interviews take an average of 35 minutes. Interviews are transcribed after completion. Qualitative analysis is ongoing using a grounded theory approach. Themes that were generated through open coding thus far include difficulties related to transportation, decreased quality of care due to insurance status, wage loss due to treatment, and lack of social support. For example, one patient said, "They don't care about you if you ain't got insurance." Barriers to oncological care contribute to a larger public health issue. By addressing the barriers of oncological care using a patient-stakeholder centric, community-based research model, we can identify and implement systems-level-interventions based on the voices of the community, stakeholders, patients, and caregivers.

Poster #74
West, Katie
Major: Psychology (BA)
Faculty Mentor: Dr. Heidi Lyn
Department: Psychology Department
College: College of Arts and Sciences
Funding Source(s): SURF, Heidi Lyn holds the Joan M. Sinnott Chair of Psychology, which is funded by the USA Foundation

Thin Striped Hermit Crabs and the Impact of Rising Sea Temperature

Climate change occurs naturally; however, the rate of that change has been increasing over recent decades. Increased knowledge of the behaviors associated with temperature changes can increase our understanding of potential impacts of rising sea temperatures. Temperature is predicted to increase 5℃ before the year 2101. Marine animals such as ectotherms play a vital role in the food web and are likely to be impacted by increasing rates of climate change, however, both invertebrates and vertebrate ectotherms are largely understudied. Invertebrates such as Clibanarius vittatus, the thin-striped hermit crab, can provide researchers with abundant information on the effects of climate fluctuations both in the depths of the sea and in our backyard. Assessing shell choice patterns, activity, retraction duration, and aggression in relation to simulated temperature fluctuations provides information on changes in behavior. We engaged in the experimental process of modifying temperature in a controlled setting, observing the behaviors of 18 thin-striped hermit crabs via video and manual screenings. This design enabled us to examine externally visible behavior in correlation to temperature, while expanding the literature on an understudied marine species. The results indicate that with rising temperatures the hermit crabs chose shells with a shorter aperture height and spent less time in retraction (a threat response). In contrast to our hypothesis, activity level and aggression remained the same in both temperature conditions. These results suggest that rising sea temperatures will cause distinct and potentially harmful behavioral changes in marine invertebrates, potentially impacting the larger food web.

Poster #75
Wilkenson, Mary
Major: Exercise Science (BS) – Pre-Professional Concentration
Faculty Mentor: Dr. Ryan Colquhoun
Department: Health, Kinesiology and Sport
College: College of Education and Professional Studies
Funding Source(s): SURF

Effect of Blood Flow Restriction on Neuromuscular Fatigue

Blood flow restriction (BFR) is commonly used in rehabilitation settings with the goal of improving muscle function. Traditionally, BFR is used in conjunction with low-load resistance exercise and has been previously shown to have positive effects on muscle size and strength. However, the underlying mechanisms, particularly within the neuromuscular system, remain unclear. Therefore, the purpose of this project is to examine the changes in neuromuscular function following low-load resistance exercise with (BFR) or without (TREx) blood flow restriction. Thirteen healthy participants (3 females and 8 males) completed a maximal voluntary isometric contraction (MVIC) prior to and immediately following 4 sets of exercise in each condition. Surface electromyography of the biceps brachii was measured throughout. Participants were able to complete significantly less repetitions (BFR: 68.5 ± 8.1 reps; TREx: 74.8 ± 0.6 reps; $p = 0.026$) and reported a higher RPE (BFR: 9.1 ± 0.9 au; TREx: 7.9 ± 1.3 au; $p = 0.002$) during the BFR condition. MVIC strength and EMG mean power frequency (MPF) significantly declined post-exercise, but there were no significant differences between conditions. Our data suggest that BFR and TREx exhibit similar declines in neuromuscular function of the elbow flexors, despite differences in perceived exertion and total work.

Poster #77
Wilson, Aaron
Major: Biomedical Sciences (BS)
Faculty Mentor: Dr. Robert Barrington, Ph.D.
Department: Microbiology & Immunology
College: USA College of Medicine
Funding Source(s): SURF, American Lung Association Biomedical Research Grant RG-349167

Single Cell-Level Transcriptomics of Self-Reactive B Cells in Mice with Pulmonary Alveolar Proteinosis

Autoimmune pulmonary alveolar proteinosis (aPAP) is a rare, often terminal lung syndrome affecting adults. aPAP is caused by autoreactive B cells that produce antibodies (gmAAB) against granulocyte-macrophage colony stimulating factor (GM-CSF) thereby neutralizing its activity. Neutralization of GM-CSF results in the accumulation of pulmonary surfactant in the alveoli causing respiratory insufficiency.1,2 To remove excess surfactant, patients undergo whole-lung lavages to clear the airways. However, this procedure offers only temporary relief. Recently, our lab discovered a novel rodent model in which mice with aPAP have higher frequency and quantities of GM-CSF specific B cells as well as gmAAB compared to healthy mice. This parallels findings in aPAP patients that have higher titers of gmAAB compared to healthy individuals.3 Little is known regarding genes encoding for the gmAAB produced by GM-CSF specific B cells from healthy vs. patients with aPAP. This study aims to investigate differences in the genes encoding for these gmAAB by using single-cell transcriptomics from GM-CSF specific B cells of healthy mice and mice with aPAP. We hypothesize that gmAAB will differ between mice with and without aPAP. Our preliminary data analysis of single cell RNA-seq libraries support our hypothesis in that gmAAB from aPAP and healthy mice differ significantly.

Poster #76
Wilson, Allan
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. Kevin West
Department: Chemical Engineering
College: College of Engineering
Funding Source(s): Funded by DoE and SURF

Solid-Liquid Phase Equilibria for Tetraphenylphosphonium bistriflidmide with Mixtures of Benzanilide

Climate change is one of the most pressing issues facing humanity in the 21st century. A major contributing factor to this problem is the continued use of fossil-fuel based sources for energy. Concentrated solar power (CST) with thermal energy storage provides a potential opportunity to support this transition away from fossil fuels but suffers from high costs and extended downtimes. Current heat transfer fluids often consist of mixture of alkali metal nitrate with melting points above 200°C. For CST and thermal storage to be viable, a thermally stable, low melting fluid is needed. Ionic liquids (ILs) provide a very feasible form of thermal energy storage due to their high heat capacities and low melting points. Thermally robust ILs can be synthesized by restricting functionality on the cation and coupling these cations with a thermally stable anion. However, these synthetic restrictions result in salts with melting points at or above 100°C. Mixtures of these salts, with each other or with structurally similar molecular species, can yield fluids with melting temperatures low enough to be effective thermal storage fluids. In this project, the phase equilibrium of a binary mixture of tetraphenyl phosphonium bistriflimide (TPP) and benzanilide was examined to provide valuable information on eutectic behavior for organic ionic liquids with aromatic compounds. The use of digital scanning calorimetry (DSC) (Solid/Liquid Equilibrium, SLE) along with cloud-point analysis (Liquid/Liquid Equilibrium, LLE) was used to study this behavior. The phase transitions, including eutectic behavior, are expressed on a binary T-x diagram and show how the phase behavior varies with temperature and composition. Solid/liquid equilibrium behavior is compared to the ideal solution model to aid in understanding molecular-level interactions in the mixture. The study showed a minimum eutectic melting temperature of below 100 °C and liquid-liquid interactions in compositions having high amounts of TPP compared to benzanilide. The findings of this study can be used to further develop ILs and their mixtures as viable thermal energy storage fluids that could dramatically reduce the cost and difficulty of operating CST at scale.

Poster #78
Zang, Lihua
Major: Chemical Engineering (BSChE)
Faculty Mentor: Dr. Kevin West
Department: Chemical Engineering
Funding Source(s): SURF

Investigation of thermal stability of thermally robust Ionic Liquid in solar thermal power plant

Ionic liquids (ILs), known as molten salts at room temperature, are considered a promising working fluid to replace the conventional oil/molten salt in solar thermal energy applications due to their non-flammable, low melting point, high heat capacity, and thermal stability properties. The molten salt Tetraphenylphosphonium bistriflimide [TPP][NTf2] was synthesized and investigated using the thermogravimetric analysis (TGA) method to obtain its thermal stability. To test its degradation, the thermal decomposition kinetics of the sample was analyzed by using the pseudo-zero-order rate law and Arrhenius equation to obtain the parameter T0.01/10h, which is the maximum operating temperature that is taken at 1 % mass loss at 10 hours. The parameter was calculated to predict thermal stability in a long-term period. The calculated thermal stability for [TPP][NTf2] was found with isothermal stability testing at 300 0C for 10 hours in a platinum pan with 1% mass loss and at 270 0C for 96 hours with 2.3% mass loss. The inconsistency of experimental results obtained from different authors may be caused by instrument type, sample mass, flowing rate, sample pan material, and heating rate. However, based on the experimental results, the molten salt [TPP][NTf2] showed a strong hint of extraordinary thermal robustness and would be an excellent suitable material as a heat transfer liquid and thermal storage media in concentrating solar power (CSP) systems. In this perspective, the feasibility of thermally robust ionic liquids as a renewable working fluid in solar power systems is discussed and provides an overview of a promising ionic liquid in the solar thermal energy future.

UNIVERSITY OF SOUTH ALABAMA
UNDERGRADUATE RESEARCH

University of South Alabama
Office of Undergraduate Research
Shelby Hall Room 4135
150 Student Services Dr.
Mobile, Alabama 36688
Ph: (251) 341-3078