CENTER FOR UNDERGRADUATE RESEARCH

UNDERGRADUATE RESEARCH SYMPOSIUM

Celebrating

— 25 YEARS —

SPRING 2024

UF Center for Undergraduate Research
UNIVERSITY *of* FLORIDA

The University of Florida was named one of three Awardees of the 2023 Campus-Wide Award for Undergraduate Research Accomplishments (AURA) by the National Council on Undergraduate Research. This award recognizes institutions with exemplary programs that provide high-quality research experiences for undergraduates.

Go Gators! Go Research!

Table of Contents

Welcome

This year we are celebrating the 25th Anniversary of the Undergraduate Research Symposium. For the past 25 years, hundreds of students supported by supportive faculty in all colleges have had the opportunity to present their undergraduate research to the wider UF community. The remarkable effort by our faculty to provide our students with this valuable experience as an undergraduate was just recognized by the National Council on Undergraduate Research by selecting UF as a recipient Campus-Wide Award for Undergraduate Research Accomplishments (AURA). This is national recognition or all of the hard work our faculty have done to make UF a place where undergraduates can have exceptional research experiences. Faculty mentors are listed following the abstracts.

Once again, we have exceeded previous numbers of poster presented, making this the largest celebration of undergraduate research at UF yet, with a record number of posters (546). We are celebrating the undergraduate research that has been conducted this year in 14 Colleges, the Cancer Center, and the Florida Museum of Natural History, and UF On-line. This year we will also be showcasing over 30 AI USP Scholars for the first time. These students have conducted research in 27 departments.

This large number of presenters reflects the team research conducted by many of our students. Of note are the 92 first-year University Research Scholars who will be presenting the research they have conducted in their Course Based Undergraduate Research Courses 27 CUR classes.

CUR strongly supports students research presentation efforts. We also helped support 32 students from 22 departments to present at 26 national professional meetings. 55 UF students presented their research at the Florida Undergraduate Research Conference, held this year at the University of North Florida.

This past year we initiated the Research Excellence Program for Undergraduates to provide them with the opportunity to receive recognition at graduation for their research efforts. Each of these students has benefitted from mentoring provided by exceptional faculty and graduate student researchers. To date 44 students have achieved this distinction.

We encourage you to visit the presentations, talk with the students about their research, and read the collection of abstracts.

Enjoy,

Anne E. Donnelly

Director

Keynote Speaker : Yvonne Hinson

State Representative Yvonne Hinson represents District 21 in the Florida House of Representatives. She assumed office on November 8, 2020. Born and currently living in Gainesville, Representative Hinson is a is a proud Gator and lifelong educator. She earned a B.A. and M.A. in education from the University of Florida in 1971 and 1972, respectively. Ms. Hinson has served as the president of the University of Florida Black Alumni Association staying involved and committed to UF.

Representative Hinson served as a member of the Gainesville City Commissioner in 2012-1015. She has contributed as the finance chair of the Gainesville Housing Authority Governing Board.

Prior to serving Gainesville citizens, she was the owner of Childstart Learning Solutions, and she served as a Principal for over 26 years in the Miami-Dade County Public Schools.

Representative Hinson has worked for her Alachua and Marion county constituents since arriving in Tallahassee by serving on many committees, including the House Judiciary Committee, Joint Administrative Procedures Committee, State Affairs Committee, joint Legislative Auditing Committee the Water Quality, Supply & Treatment Subcommittee and is the Democratic Ranking Member of the Transportation & Modals Subcommittee.

She brings her deep experience to the Postsecondary Education & Workforce Subcommittee.

We are delighted she agreed to join us on this 25th Anniversary Celebration of the UF Undergraduate Research Symposium, I give you Representative Yvonne Hinson.

UF Center for Undergraduate Research
UNIVERSITY of FLORIDA

25th Annual

Spring Undergraduate Research Symposium

April 1st, 2024

Stephen C. O'Connell Center

Program in Brief

11:00 am – 12:45 pm	**Poster Set Up**
1:00 pm – 1:05 pm	**Welcome Remarks** **Dr. Anne Donnelly** Director, Center for Undergraduate Research
1:05 pm – 1:20 pm	**Keynote Speaker** **State Representative Yvonne Hinson** State House District 21 UF Grad '71, '72
1:20 pm – 1:30 pm	**Logistics** **Jenna Molen** Assistant Director, Center for Undergraduate Research
1:30 pm – 2:30 pm	**Poster Session A**
2:30 pm – 2:40 pm	**Poster Swap Intermission**
2:45 pm - 3:00 pm	**Best Paper Contest Winners** **Dr. Neil Weijer** Curator, Harold & Mary Jean Hanson Rare Book Collection & Managing Editor, Journal of Undergraduate Research
3:00 pm – 4:00 pm	**Poster Session B**
4:00 pm	**Poster Take Down**

Arts and Humanities

Dalia Dooley

College of Liberal Arts and Sciences

Advised by Dr. Neil Weijer (Smathers Libraries)

The Unsung Propagandists: Female Ascendancy in the Office of War Information and their Influence on the Development and Dissemination of World War II Propaganda

As the nation rallied its resources for wartime in 1942, the Office of War Information (OWI) assumed a pivotal role in disseminating information related to the war and aimed at mobilizing the American populace. Within the organizational framework of the OWI, a small cohort of pioneering women ascended to leadership positions, challenging prevailing gender norms and reconfiguring the narrative surrounding women's wartime engagement. Classified after the war's end, their records are now part of the 7,112 boxes that encompass the totality of the OWI's records, now housed in the National Archives. An exploration of the documents of these women, including correspondence, published work, and other internal records, paints the picture of their continuous participation and influence which resulted in some of the most visible domestic propaganda campaigns of the Second World War. Previous scholarship, while plentiful in the exploration of the domestic roles of women during the War, fails to acknowledge the directorship of these women in their efforts to rally national support for not just female recruitment, but other facets of wartime activity. Through an in-depth examination of archival materials collected from the OWI, this research seeks to contribute to a nuanced understanding of female contributions on the American home front.

Social and Behavioral Sciences

Bailey Fawcett

College of Public Health and Health Professions

Advised by Dr. Laurie Gauger (College of Public Health and Health Professions)

Nonword Repetition and Memory for Digits: Are They Predictors for Sight Word Reading and Decoding?

Phonological memory (PM) is thought to be involved in learning sight words and is therefore included in many reading assessment protocols. We compared the performance of young struggling readers between the ages of 7 - 12 years on two tasks of PM, memory for digits and nonword repetition, to their performance on sight word reading and decoding tasks. The Memory for Digits and Nonword Repetition subtests of the Comprehensive Test of Phonological Processing-2 were administered to measure PM. The Test of Word Reading Efficiency-2 was used to measure sight word reading and decoding. Scaled scores from all tests were used to complete Pearson correlation coefficients. Neither digit span nor nonword repetition were significantly related to sight word reading and decoding in a sample of 244 children. Regardless of the children's ages, neither PM task was related to either single-word reading task indicating that age did not appear to be a factor. If PM affects the rate at which individuals learn new sight words as the literature suggests, then it is unclear why we did not find any association between PM and single-word reading skills. These results challenge the conventional understanding of the role of PM in reading acquisition for typically developing children and those with reading disorders, emphasizing the need for a reevaluation of current assessment methodologies. An examination of the relationship between PM performance and children's responses to reading intervention may shed some light on PM's role in reading acquisition. Implications for our findings are presented.

STEM and Medicine

Taylor Thompson

College of Medicine

Advised by Dr. Barry Setlow (College of Medicine)

Effects of Concurrent Cannabis on Cocaine Use and Relapse in Sprague-Dawley Rats

Polysubstance use (PSU), or the ingestion of multiple drugs of abuse simultaneously, is commonplace throughout society, with cannabis and cocaine being among the most prevalent combinations. To better understand this phenomenon, we developed a rodent model of cannabis-cocaine PSU. The purpose of this project was to determine how concurrent cannabis use affects cocaine drug seeking and relapse, to better model the conditions of human PSU, and to understand how co-use affects behavior. Rats were implanted with intravenous catheters and assigned to three distinct smoke conditions (cannabis smoke, placebo smoke, or clean air) before undergoing cocaine self-administration (SA) sessions in standard operant chambers. Smoke sessions occurred five days a week, one of which was followed by a cocaine SA session. During each SA session, the active switch delivered an intravenous infusion of cocaine accompanied by audiovisual cues. It was observed that rats in the cannabis smoke group self-administered less cocaine compared to the placebo smoke and clean air groups during these initial PSU sessions. The subjects then underwent a 30-day abstinence period, during which they no longer received either drug. This period was followed by a reinstatement test in which they were placed back in the operant chambers, however, the active switch triggered only the audiovisual cues and no cocaine delivery. During this session, the cannabis group exhibited elevated cocaine-seeking compared to the control group. Overall, the results demonstrate that even though cannabis co-use attenuates cocaine intake, it produces heightened cocaine-seeking behavior during abstinence when in the presence of drug-paired cues. These findings emphasize the importance of working with animal models that reflect real-world patterns of drug intake.

PRESENTER(S): Emilio Allan
AUTHOR(S): Emilio Allan, Noah Hooper, Yan Liang
FACULTY MENTOR(S): Yan Liang

Geothermometry and Petrology of Martian Meteorite LAR12095

Martian meteorites are presently the only available samples of the Martian crust. Of the 368 extant Martian meteorites, most are broadly catagorized as shergottite, nakhlite, or chassignite (SNC). Shergottites are analogous to terrestrial basaltic rocks and account for 75% of documented Martian meteorites. Our analysis focused on the shergottite Larkman Nunatak 12095 (LAR12095) and what it could reveal about the Martian crust and mantle. We applied a geothermometer that uses the partitioning of aluminum in olivine and spinel, two minerals found in most basaltic rocks, to determine the magmatic history of the meteorite. Using an electron probe microanalyzer (EPMA), we acquired compositional data on several co-equilibrium olivine and spinel grains in order to calculate crystallization temperature and its correlation with several constituent elements. Crystallization temperatures ranged from 1300℃ to 880℃, with 3 distinct "generations" of olivine and spinel indicating magmatic evolution in a mantle plume, upper crustal magma chamber, and surficial lava flow. This petrogenetic history is analogous to that of terrestrial basalts, indicating the many similarities of geologic processes on Earth and Mars.

PRESENTER(S): Kate Aldinger
AUTHOR(S): Kate Aldinger1, 2, Hugh Farrior M.S.1, 2, 3, Ben Phalin Ph.D1, 2, Jason Hunt M.D.1, 2, Laurie Solomon M.D.1, 2, Amanda Janner Psy.D.1, 2, Kent Mathias M.D.1, 2, Scott Teitelbaum M.D.1, 2, Ben Lewis Ph.D.1, 2, 3
FACULTY MENTOR(S): Ben Lewis

Effects of Abstinence and Treatment on Improvements in Pain and Sleep in Substance Use Disorder

Chronic pain and disrupted sleep may function as both precursors and consequences of heavy substance use. Current studies indicate that sleep and pain improve with abstinence, however these studies were conducted in treatment settings and cannot disentangle treatment and abstinence effects. This study examines periods of abstinence prior to and during SUD treatment, facilitating their contrast. The sample consisted of 866 patients receiving residential treatment for SUD at the Florida Recovery Center. Patients completed questionnaires querying length of abstinence upon entering treatment, prevalence and intensity of pain (NIH PROMIS), and sleep quality and disturbances (PSQI) at entry and after 30 days in treatment. Improvement was compared between these time periods. An effect of abstinence length on pain was observed prior to treatment ($p=.08$) and a mild improvement was noted for sleep ($p<.01$). Before entering treatment, pain intensity improved at a rate of .015/day (on a 12-pt scale) and following treatment by .023/day. Sleep disturbances were reduced by .066/day prior to treatment and .094/day following treatment. These results indicate pain and sleep improve with abstinence, although initiation of treatment substantively accelerates these trajectories, highlighting the importance of early treatment entry following abstinence initiation.

PRESENTER(S): Shai Lin
AUTHOR(S): Shai Lin, Shanting Chen, Su Yeong Kim
FACULTY MENTOR(S): Shanting Chen

Neighborhood Ethnic Concentration and Parental Cultural Socialization on Adolescent Ethnic Identity Development in Mexican Americans

For Mexican American adolescents, ethnic-racial identity (ERI) benefits from (a) higher neighborhood ethnic composition (Pasco et al., 2021) and (b) cultural socialization, which are integral to an individual's microsystem in the integrative risk and resilience model (Suárez-Orozco et al., 2018). Therefore, it is crucial to examine the interaction of these two proximal contexts in influencing ERI development, which has yet to be established. This paper aims to analyze the interactive effect of parent CS (mother/father) and neighborhood ethnic concentration on youth ERI. We used a longitudinal dataset of 398 Mexican American youths (M = 13.3, SD = .94, 56.5% female), which measured adolescents' reports of mother CS, father CS, and three dimensions of ERI. Results showed that for youths with low mother CS, high Hispanic neighborhood concentration was linked with lower ethnic resolution, or a person's certainty that their ERI is meaningful to them, (b = -.57, p = .01; Figure 1), reflecting a misfit of family-neighborhood dynamics. Overall, our study highlighted the importance of examining the interplay between neighborhood and family contexts in shaping adolescent identity development.

PRESENTER(S): Mikhail Mikhaylov
AUTHOR(S): Mikhail Mikhaylov, Dr. Heather Stark, Barbara Sousa
FACULTY MENTOR(S): Heather Stark

Strengthening Public Health Surveillance in a South Sudan Internally Displaced Persons (IDP) Camp

Amid a health crisis in South Sudan characterized by political violence and communicable diseases, 1.5 million people are displaced, straining IDP camps. The Southern Sudan Healthcare Organization (SSHCO) works in the Mongalla IDP camp, facing challenges of overcrowding and limited resources. This cross-sectional study aims to use patient electronic health records, addressing healthcare limitations and enhancing surveillance for better patient outcomes in emergencies. We analyzed data from 5,326 anonymous patient visit records at SSHCO between February 2022 and August 2023. Clinic staff, trained to use Android tablets with Kobo Toolbox software, collected demographic and diagnostic information. Our analysis, utilizing SPSS-V28, employed various statistical methods, including descriptive statistics, chi-square tests, and logistic regression analysis. Among 5,326 patient visits from 02/2022 - 08/2023, 63% were female, aged 1 month - 89 years (median age = 13 years). Notably, patients were diagnosed with malaria (88.8%), acute respiratory illness (23.3%), pneumonia (1.3%), and urinary tract infection (5.4%). This study underscores the urgent need to improve public health surveillance, especially in resource-limited settings. Strengthening surveillance capabilities enables the development of solutions that empower evidence-based practices, playing a role in guiding health interventions with precision and efficacy.

PRESENTER(S): Erin Beck
AUTHOR(S): Erin Beck
FACULTY MENTOR(S): Charlie Hailey

Architecture and Building Caretakers

According to a University of Florida custodian, her job is to "be visible, but not all there." This statement reveals that custodians should be engaged in their jobs yet removed from those perceived to hold higher positions. Spaces provided for custodians, such as storage closets and break rooms, are often unfinished and so small that they could be considered insignificant to the rest of a building. These poor designs – like afterthoughts from an architect at the end of a project – demonstrate the subtle (even if unintended) stigmatization of custodial work. How can architecture address functions of building maintenance in addition to the well-being of custodians? To answer this question, the researcher interviewed ten custodial workers on the University of Florida campus and investigated three cases: the University Auditorium, Architecture Building, and Fine Arts C. The research project is divided into three sections: a review of literature on perceptions of custodians, documentation of custodial spaces in the three UF buildings, and interview data from custodians sharing work experiences in these spaces. While this research reveals shortcomings in custodial space design, it also proposes alternatives for custodial space design, which may make the custodial profession more enjoyable, functional, and rightfully respected.

PRESENTER(S): Rachana Kandru, Mansi Patel, Rujuta Kansara
AUTHOR(S): Rachana Kandru, Mansi Patel, Rujuta Kansara
FACULTY MENTOR(S): Ajay Mittal

Understanding COVID-19 Vaccine Perceptions Among Parents of Differing Socioeconomic Backgrounds through Health Literacy

Vaccines act as an effective measure against the outbreaks of major diseases and, therefore, are a highly regarded form of protection in the field of public health. Currently, there is controversy surrounding parental decisions about childhood vaccination. With the rise of the COVID-19 pandemic, the COVID vaccine was rapidly created and dispersed, stoking new waves of vaccine hesitancy, and igniting sects of the anti-vaccine movement. Parental hesitancy to vaccinate their children has become a significant public health concern during the COVID-19 pandemic. Studies have identified a range of factors that may contribute to parental vaccine hesitancy. We aim to focus on the factors that contribute to vaccine hesitancy amongst parents from varying socioeconomic backgrounds by examining the effects of health disparities and health literacy. It is crucial to address the concerns of parents and ensure that they have the information and resources they need to make informed decisions about the COVID-19 vaccine for themselves and their children. The purpose of this literature review, with an emphasis on health disparities, is to discuss and analyze the impacts of educational background and socioeconomic status that contribute to differing vaccine perceptions amongst parents.

PRESENTER(S): Adriana LaVopa
AUTHOR(S): Adriana LaVopa, Bornita Deb, Emma McDougal, Yeongseon Jang
FACULTY MENTOR(S): Yeongseon Jang

Designing a Recombinant Protein-Based Sensory Vesicle System

In the quest to understand the fundamental building blocks of life, artificial cells offer a unique platform for experimentation. Recent studies have demonstrated methods for creating artificial cells, known as protein vesicles, which employ proteins as the main structural component of their membranes. Protein vesicles demonstrate considerable potential in synthetic biology, particularly in their ability to emulate one of the essential functions of natural cells: the ability to sense and react to changing environmental conditions, which can be achieved through proteins at cell membranes. Thus, protein vesicles offer a straightforward way to imbue artificial cells with sensory abilities analogous to those of natural cells. This project utilizes a proof-of-concept for the creation of protein vesicles that selectively interact in the presence of a specific small molecule, known as rapamycin. Vesicles were observed via epifluorescence microscopy over time and under varying rapamycin concentrations. Following data collection, one-way ANOVA and post-hoc statistical analyses were conducted to verify the efficacy of the sensory platform. By exploring the potential of sensing in artificial cells, this project contributes to the design of protein vesicles for eventual use in wide-reaching applications in cell therapy, functional materials, and drug delivery.

PRESENTER(S): Hailey Mangio
AUTHOR(S): Hailey Mangio, Shifeng Wang, Ashley Pitzl, Roy Curtiss III
FACULTY MENTOR(S): Shifeng Wang

Characterization of Sugar-Regulated O-antigen Mutations on Salmonella Resistance

The O-antigen is a polysaccharidic component of lipopolysaccharide (LPS), located on the outer membrane of Gram-negative bacteria. It is a critical surface structure that influences bacterial pathogenesis and contributes to resistance to serum, particularly to heat-sensitive complement components. The O-antigen ligase enzyme, waaL, is involved in the biosynthesis and attachment of O-antigen to the core of LPS, and the pmi gene is required to synthesize the O-antigen side chain. In this project, Salmonella strains with waaL gene expression regulated by the sugars arabinose and rhamnose and with pmi mutations requiring mannose for O-antigen side chain synthesis were generated. Single-sugar and double-sugar regulated strains were compared by analyzing motility, serum resistance, and acid tolerance. Mutation-mediated variations in O-antigen synthesis were found to influence differences in motility, serum resistance, and acid tolerance among the strains tested. This study contributes to current understandings of the impact of surface modifications on Salmonella pathogenesis and informs directions for recombinant attenuated Salmonella vaccine development. Subsequent research could test additional measures such as bile resistance and examine effects of the mutations on Salmonella virulence in animal models.

PRESENTER(S): Nick Blumenthal
AUTHOR(S): Nick Blumenthal, Malcolm Maden
FACULTY MENTOR(S): Malcolm Maden

Characterization of Immune Cell Signaling in A. cahirinus in Response to Skin Wounding

Prior studies detail the regenerative capability of the African spiny mouse Acomys Cahirinus (Acomys) that lacks distinct scarring observed among other mammals across tissues, including skin, muscle, spinal cord, heart, and kidney. Delineating relevant mechanisms offers an opportunity to extrapolate regeneration to non-regenerating mammals. Through comparative analysis of epithelial wounds between Acomys and non-regenerative relative Mus Musculus (Mus), arrays characterized cytokine signaling variation in wound response. Numerous cytokines, including pro-fibrotic factors, were detected in Mus wound homogenates whilst Acomys exhibited only one-third, demonstrating inflammatory supression. A similar pattern was observed for angiogenesis as Mus homogenate contained relatively greater quantities of signaling factors; nevertheless, upregulation of two uniquely present pro-angiogenic factors was identified in Acomys. Further analyses performed using dermal fibroblasts and epithelial keratinocytes indicated another factor uniquely expressed by Acomys keratinocytes. Assays were performed to investigate whether respective wound homogenates are inhibitory to simulated fibroblast regeneration. Mus homogenate proved to impede cellular migration versus equivalent concentrations of Acomys homogenate, suggesting pro-inflammatory factors' to fibrosis in addition to repressed migration critical to the wound healing process. These results demonstrate the Acomys regenerative phenotype involving complex systemic coordination between reduction of both pro-inflammatory and migration-inhibiting cytokines alongside upregulation of pro-angiogenic factors.

PRESENTER(S): Allison Vollmer
AUTHOR(S): Allison Vollmer, Apollonia E. Lysandrou, Ben Phalin, Jason Hunt, Laurie Solomon, Amanda Janner, Kent Mathias, Scott Teitelbaum, & Ben Lewis
FACULTY MENTOR(S): Ben Lewis

Age-Related Differences in Pain and Sleep among Individuals in Treatment for Substance Use Disorders

Pain and sleep disturbance are common sequelae of substance use disorders (SUDs), and particularly prevalent among older adults. However, no available data address susceptibility, trajectories of pain/sleep improvement, or relationships with treatment outcomes among older adults in recovery from SUDs. We hypothesized that pain and sleep disturbance would be more severe among older adults in SUD treatment, and we investigated differences in pain/sleep trajectories and relationships with craving as empirical questions. Patients with SUDs completed assessments of sleep, pain, and craving at intake, 30 days, and discharge. Propensity scores were used to create two matched samples of older (55+; n=211) and younger (30-40; n=211) adults. Older patients reported greater pain at baseline (p=.010) and improved at a slower rate (p=.028). Surprisingly, the association between pain and craving was more robust among younger patients (p=.010). Sleep quality did not differ at baseline, however, older patients improved at slower rates (ps≤.009). Additionally, the association between sleep quality and craving was more robust among younger patients (p<.001). These findings suggest the import of directed interventions for pain and sleep problems regardless of patient age but imply that successful intervention may yield age-contingent effects.

PRESENTER(S): Buse Utkan
AUTHOR(S): Buse Utkan, Sharon DiFino Ph.D., CCC- SLP
FACULTY MENTOR(S): Sharon Difino

The Health Transformation Program's Impact on The Decline in Infant Mortality in Turkey

In 2003, The Ministry of Health in Turkey introduced the Health Transformation Program (HTP) which dramatically reformed the health care system. In the ten years following the inception of the HTP, infant mortality rates in Turkey dropped from 24.697 per 1000 live births to 7.268. The purpose of this presentation is to examine how the HTP impacted this drop in infant mortality. The method of this research is an advanced comprehensive search of databases CINAHL and Web of Science in order to find relevant scientific articles. The results found that the HTP reformed the equity of healthcare in different regions of Turkey, switched the healthcare to the family medicine system, increased emphasis and development of maternal and neonatal care, and further developed the monitoring and reporting system of infant mortality. These reforms caused the infant mortality rate to rapidly decline in Turkey. This presentation describes these reforms and recognizes the HTP as a good example of addressing high infant mortality rates in a country.

PRESENTER(S): Melissa Charret-McGuinness, Gabrielle Makar
AUTHOR(S): Mateus Rocha, Gabrielle Makar, Melissa Charret-McGuinness
FACULTY MENTOR(S): Mateus Rocha

Two-Body Wear Resistance of Universal and Bulk Fill Composites – A Pilot Study

Objective: This study aimed to assess the two-body wear resistance of universal and bulk-fill composites through comprehensive experiments.

Methods: Four resin composites were tested: Bisco Universal prototype, Filtek Universal, Filtek Bulk fill One (FBO), and Reveal HD. Composites (n=4) were incrementally filled, flattened, and light-cured using Valo Cordless. Samples and antagonists were randomly allocated in six trials with eight composites and antagonists each, placed into the chambers of a chewing simulator machine. Samples underwent thermocycling every 90 seconds with preset chewing cycles (10k to 600k). Impressions were made after each cycle, scanned, and analyzed using Geomagic software. Two-way ANOVA and Tukey's test assessed statistical significance.

Results: There was a positive correlation between chewing cycles and volumetric wear loss for all composites, with no differences after 600k cycles. Descriptively, Bisco Universal had 2.4 mm3 wear loss, Filtek Supreme Ultra 1.75mm3, Filter One Bulk Fill 2.25mm3, and RevealHD Bulk Fill 1.8mm3.

Conclusion: Despite pilot study limitations, no differences were found in two-body wear resistance between universal and bulk-fill composites, suggesting similar clinical wear behavior to regular composites, emphasizing a linear correlation between chewing cycles and resin-based composite wear.

PRESENTER(S): Zion Szot
AUTHOR(S): Zion Szot
FACULTY MENTOR(S): Kathryn Sieving

Cranky Cardinals: Artificial Night Lighting and Aggression in Urban Songbirds

Birds (including Cardinalis cardinalis) require sleep for daily functions. In spring, birds sing to protect territory and attract mates. Scant evidence suggests that artificial lighting at night (ALAN) increases avian nighttime activity which contributes to sleep loss. This study investigates how ALAN affects C. cardinalis response aggression to conspecific song playbacks. We hypothesize that high ALAN near cardinal roosting spots will cause those individuals to have less energy for daytime aggressive behaviors, tested through territorial playbacks in low-ALAN and high-ALAN areas. We measured ALAN at dark and bright urban roosting locations and returned in the morning to play cardinal calls and observe individual bird behavior. Standard aggressive measures included response latency, distance from bird to speaker, number of songs, hops, and flip flops. An aggression index was obtained using principal component analysis which confirmed that aggressive responses featured short latency and approach distances, few chips, and many songs, flip flops, and hops. Analysis of variance revealed the opposite response as expected: cardinals sleeping in high ALAN levels engaged in more aggressive morning responses. Preliminary autonomous recording unit (ARU) results found that high ALAN birds were less active in late evening than low ALAN birds, evidenced by monitoring chipping at night.

PRESENTER(S): Taylor Thomson
AUTHOR(S): Taylor N. Thomson 2,5, Katherine M. Gonzalez 1,5, Madison L. Halcomb 2,5, Linda B. Cottler 4,5, Lori A. Knackstedt 3,5, Barry Setlow 2,5
FACULTY MENTOR(S): Dr. Barry Setlow

Effects of concurrent cannabis on cocaine use and relapse in Sprague Dawley rats

The concurrent use of multiple drugs, often involving cannabis and cocaine, is widespread. In collaboration with epidemiologists at UF, we established a rat model to explore this form of polysubstance use (PSU) more thoroughly. Rats were implanted with intravenous catheters and assigned to three smoke conditions (cannabis, placebo, or clean air) and underwent five-hour smoke sessions. Once per week, immediately following smoke exposure, the rats were placed in standard operant chambers where they could make a response, paired with audiovisual cues, to self-administer cocaine. We observed that rats exposed to cannabis smoke showed reduced self-administration during PSU sessions compared to those in control groups. Following 30 days of abstinence, rats were reintroduced to the operant chambers, and a relapse test was conducted. The audiovisual cues remained paired with the response but cocaine was not administered. We observed that rats previously exposed to cannabis smoke demonstrated an increase in cocaine-seeking behavior compared to controls. This outcome highlights that while cannabis may decrease cocaine consumption acutely, it can also intensify the desire for cocaine after abstinence, particularly when in the presence of cues previously associated with cocaine. This study underscores the value of using models that accurately represent real-world PSU consumption patterns.

PRESENTER(S): Qiaowen Chen
AUTHOR(S): Qiaowen Chen1, Xiaolei Guo2, Chiwah Tesung1, German Sandoya3, Alina Zare2, Tie Liu1
FACULTY MENTOR(S): Tie Liu

Detection of Postharvest Quality of Fresh-cut Lettuce Using Hyperspectral Imaging

The shelf life of fresh-cut vegetables and fruits, such as lettuce, is influenced by various factors including environmental stresses and developmental regulation. These factors can affect the lettuce's quality, safety, and how long it remains suitable for consumption. The preservation of freshness and shelf life are critical components of lettuce cultivation. This project aims to examine factors affecting the shelf life of lettuce cultivar through physiological and biochemical analyses and image-based machine learning approaches. Multiple approaches are being conducted, including water loss/weight measurement, color measurement, chlorophyll and antioxidant level measurement as well as hyperspectral imaging (HSI), to comprehensively monitor the senescence of ten lettuce cultivars. By seeking connection between biological data of the lettuce and HSI analysis, this study seeks to identify characteristic features of fresh-cut lettuce during postharvest storage. Thus, the development of more effective methods for lettuce breeding and postharvest quality management.

PRESENTER(S): Jackson Wolfe
AUTHOR(S): Jackson G. Wolfe, Gabriela T. Acevedo T., Marc. C. Pappas, Joshua Wong, MD., Adolfo Ramirez-Zamora, MD., Pamela R. Zeilman, and Diego L. Guarin, Ph.D
FACULTY MENTOR(S): Diego Guarin

Automated Acoustic Analysis in Parkinson's Disease Using a Smartphone

Dysarthria is a common speech disorder observed in Parkinson's Disease (PD). Studies have demonstrated the potential of using the Dysarthria Analyzer software for automatic speech analysis in PD. However, its clinical utility under non-ideal conditions, such as using smartphones for audio recording in busy clinical settings, remains unexplored. This study investigates the Dysarthria Analyzer's performance in a setting more akin to a clinical environment. We compared the results for healthy controls (HC), and PD patients with their deep brain stimulation on (ON-DBS) and off (OFF-DBS). We found a significant decrease in pitch variability and an increase in speech rate for the OFF-DBS group, when compared to the HC. Furthermore, most of the estimated values for the speech markers fall within the reported values in the literature. Our findings demonstrate that the Dysarthria Analyzer effectively extracts relevant speech markers even under non-ideal conditions, emphasizing its potential for widespread clinical adoption.

PRESENTER(S): Dalia Bronisas Dooley
AUTHOR(S): Dalia Dooley
FACULTY MENTOR(S): Neil Weijer

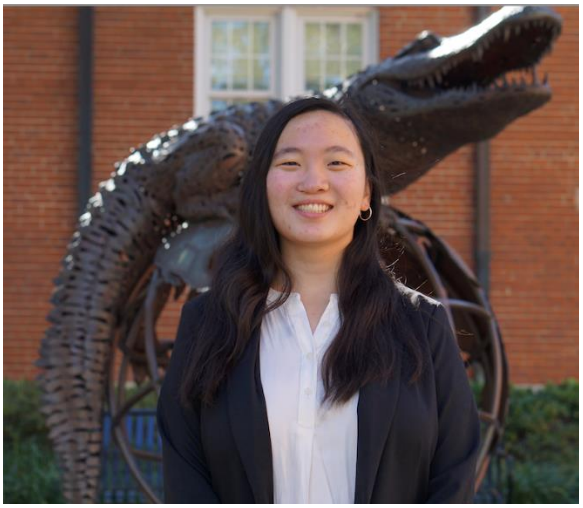
The Unsung Propagandists: Female Ascendancy in the Office of War Information and their Influence on the Development and Dissemination of Propaganda

As the nation rallied its resources for its wartime escapades, the Office of War Information (OWI) assumed a pivotal role in disseminating information related to the war, which aimed at mobilizing the American populace. Within the organizational framework of the OWI, a small cohort of pioneering women ascended to leadership positions, challenging prevailing gender norms and reconfiguring the narrative surrounding women's wartime engagement. Classified after the war's end, these records are now part of the 7,112 boxes which encompass the totality of the OWI's records, now housed in the National Archives. An exploration of the documents of these women, including correspondence, published work, and other internal records, paints the picture of their continuous participation and influence which resulted in some of the most renowned domestic propaganda campaigns published during the Second World War. Previous scholarship, while plentiful in the exploration of the domestic roles of women during the War, fails to acknowledge the directorship of these women in their efforts to rally national support for not just female recruitment, but other facets of wartime activity. Through an in-depth examination of archival materials collected from the OWI, this research seeks to contribute to a nuanced understanding of female contributions on the American home front.

PRESENTER(S): Gradon Robbins
AUTHOR(S): Grady Robbins, Jaehan Bae
FACULTY MENTOR(S): Jaehan Bae

Breaking Free From 2D: A Three-Dimensional Study of Planet-Induced Gaps in Protoplanetary Disks

As they form, planets excite spiral waves which steepen into shocks and open annular gaps in their natal protoplanetary disks. Recent studies have shown that a single planet can open multiple gaps at the radial locations where each spiral wave steepens into a shock. However, these previous studies are limited to a two-dimensional space where the vertical structure of gaps and vertical gas motions within and around gaps cannot be examined. In this paper, we investigate the formation of multiple gaps by a planet using three-dimensional hydrodynamic simulations. We show that a singular planet can open multiple gaps in three-dimensional spaces and that the radial location of the gaps shows an excellent agreement between two- and three-dimensional simulations. The gas around both the primary gap (the gap opening around the planet's orbit) and secondary gaps (gaps opening at a distance from the planet's orbit) experiences a downward motion toward the disk midplane and encounters azimuthal asymmetry. We discuss the observational implications of these velocity structures and note future impacts of using three-dimensional simulations.



PRESENTER(S): Kaidyn Jordan, Kristen Nethercott
AUTHOR(S): Lara Nicolas MD, Desiree Machado MD, Larissa Iapica RN, Leslie Parker PhD, Vivian Valcarce Luaces MD, Nicole Cacho DO
FACULTY MENTOR(S): Lara Nicolas

Parental Perspectives of Feeding Congenital Heart Disease Neonates

In this study, mothers of infants with congenital heart disease (CHD) will complete an internet survey regarding the counseling they received about feeding plan and expectations for their babies in the antenatal consult. These questions will address how well were they counseled about breastfeeding benefits, as well as pumping support received in the first 72 hours after delivery. We will also ask for some demographic information, so that we can accurately describe the general traits of study participants. The aim of this study is to identify how the level of information and preparedness planning can affect expectations of mothers of infants with CHD regarding feeding their children. Also, this study will assess if mothers who received a higher level of information are more likely to have improved breast milk utilization at discharge.

PRESENTER(S): Chloe Quintero
AUTHOR(S): Chloe Quintero, Charlene Pringle
FACULTY MENTOR(S): Charlene Pringle

Evaluating Etiologies Across Different Age Groups for Pediatric Brain Death

Introduction: The "Pediatric Registry on Brain Death Practices" (PROBE) investigates pediatric patients who have had a brain death exam completed between January 1, 2016, and December 31, 2022, in the PICU at UF Health Shands Children's Hospital. This project explores the epidemiology of children evaluated for brain death, examine the safety of apnea testing in children, and determine the reliability and validity of ancillary testing in children. I will use the study's data to answer the proposed question: "Are there common etiologies seen in different age groups leading to pediatric death?"

Methods: Through retrospective chart review, charts of children less than 18 years old tested for brain death will be examined for data extraction. From these charts details such as etiology, age, and gender will be extracted and further analyzed. Etiologies and ages will be categorized. Children will be placed into one of the following defined age groups: Toddler (1-2 years old), Preschool (3-4 years old), Grade schooler (5-12 years old), and Teen (13-18 years old). Following collection, etiologies will be reviewed and placed into broad categories.

Results: Bar charts displaying the frequency of etiologies for each defined age group will be made to visualize the distribution.

Conclusion: PROBE is an ongoing PICU study with data collection projected to be completed by May 2024. Researching common etiologies leading to pediatric brain death is beneficial to not only healthcare professionals, but also to parents and families, public health authorities, and society. Identifying common etiologies for pediatric brain death will advance medical knowledge, help develop preventive measures, and raise awareness which all help decrease the incidence of brain death.

PRESENTER(S): Sacha Glynn
AUTHOR(S): Sacha E Glynn, Bernadette M. Mach, Adam G. Dale
FACULTY MENTOR(S): Adam Dale

Getting sudsy: investigating the effects of insecticidal soap on monarch larval growth development

Nursery growers and landscape professionals treat milkweed to suppress oleander aphids (Aphis nerii, Fonscolombe 1841) and maintain the aesthetic value of the plant. However, many of the insecticides commonly used also negatively affect the monarch butterfly (Danaus plexippus, L.), a dietary specialist of milkweed. There are limited insecticidal options for low-impact and reduced risk pest control that are safe for both larval and adult monarchs. Insecticidal soap is generally recognized as safe by the FDA and is assumed to be low risk to non-target insects. We conducted an experiment to that measured monarch larval weight and leaf area consumed to determine if insecticidal soap has any adverse effects on monarch larvae. Fifty third instar caterpillars were individually placed in petri dishes and fed either soap-treated or soap-free milkweed leaves. Leaves were replenished each day and were treated each time new leaf material was added. We found no statistically significant differences in larval weight or leaf area consumed between larvae fed insecticidal soap-treated or soap-free milkweed, indicating that soap may be a suitable low-impact insecticide option for suppressing aphids on milkweed.

PRESENTER(S): Carpenter Mooney, Casey Farrell
AUTHOR(S): Carpenter Mooney, Casey Farrell, Matthew D. Gibbons, Leonard E. Perez, Toni Betiku, and Jörg Bungert
FACULTY MENTOR(S): Jörg Bungert

Characterization of Synthetic DNA Binding Proteins Targeting a Super-Enhancer Associated with T-Cell Acute Lymphoblastic Leukemia

T-cell acute lymphoblastic leukemia (T-ALL) is an aggressive blood cancer with a subset characterized by aberrantly high-level expression of TAL1, mediated by a mutation of a cis-regulatory DNA element creating binding sites for transcription factor MYB. Binding of MYB forms a super-enhancer (SE) driving high-level expression of TAL1. We generated zinc finger (ZF) DNA-binding proteins targeting the MYB binding site in JURKAT cells, a T-ALL cell line harboring the TAL1-associated mutation. The 8 ZF protein targets a 24 bp sequence overlapping the MYB binding site. In vitro studies demonstrated that the ZF protein interacts with the TAL1-associated binding site with high affinity. The interaction with the wild-type sequence was reduced by 3 to 4-fold. MYB interacted with the TAL1-associated site with lower affinity compared to the 8ZF protein. The 8ZF protein competed efficiently with MYB for binding to the mutant target sequence. Inclusion of a KRAB repressor domain increased the affinity of the 8ZF protein to the TAL-1 associated binding site 4- to 5-fold. Delivery of the 8ZF-KRAB protein to JURKAT cells reduced the growth of the cells. The data demonstrate that synthetic ZF proteins efficiently replaced MYB at the TAL-1 super-enhancer and reduced the growth of T-ALL JURKAT cells.

PRESENTER(S): Izabela Zmirska
AUTHOR(S): Izabela Zmirska, Allison Campbell, Gopal Agrawal, Jacob Fuhr, Prodip Bose, Benjamin G. Keselwosky, Chirstine E. Schmidt
FACULTY MENTOR(S): Christine Schmidt

A Behavioral Analysis of Injectable Therapeutics for Spinal Cord Injury In Viv

There are approximately 300,000 Americans living with spinal cord injury (SCI), a life-altering and debilitating central nervous system injury. Unfortunately, there is no cure for SCI. Indoleamine 2,3-dioxygenase (IDO) is a promising regulator of the immune response in SCI due to its ability to reduce pro-inflammatory potentiation and induce pro-regenerative immune cell phenotypes. When functionalized with Galectin-3 (Gal3), local tissue retention is increased through glycosaminoglycan binding. Another potential therapeutic utilizes injectable decellularized rodent sciatic nerve hydrogels (iPN) that can be mechanically tuned to match native spinal properties, providing the right physical environment for nerve regeneration. By examining how IDO-Gal3, iPN, and IDO-Gal3+iPN hydrogels function in rodent models with SCI, we can determine their effectiveness as a SCI therapeutic. From a behavioral perspective, this is done by analyzing the performance of rodents up to 5 weeks post injury. Specifically, the horizontal ladder (HL) test and Basso, Beattie and Bresnahan (BBB) locomotor scale were used to quantify behavior. Our preliminary data (n=3) shows that behavior trends were positive with treatment. Unfortunately, no statistical significance was observed between treatment groups. The use of a larger cohort may reduce animal response variability, and hopefully provide statistically significant results.

PRESENTER(S): Legasse Remon
AUTHOR(S): Legasse Remon, Franco Sempio, Amber Heemskerk, Ziad Hakim, Natalie Ebner
FACULTY MENTOR(S): Natalie Ebner

High Contact Roles Predicts Susceptibility to Phishing Among Older Adults

Phishing emails present a major problem for the growing aging population, who show reduced phishing detection compared to young adults (Grilli et al., 2020). Prior research has found that older adults with greater social support were less vulnerable to financial fraud (Spreng et al.,2016). However, the association between social networks and phishing email detection ability has not yet been explored. The present study investigated the relationship between social network size and susceptibility to phishing emails among a sample of 73 older adults (61 - 90 years).

The social network size was determined based on the self-reported number of people that

participants interact with on a regular basis. Phishing email susceptibility was assessed using a field test where participants unknowingly received simulated and non-malicious phishing emails over the course of 30 days. We conducted a linear regression model to determine the effect of social network size on phishing email susceptibility. Results showed that a larger social network was associated with lower phishing email susceptibility among older adults. By highlighting the social network size as one of the psychosocial factors associated with phishing vulnerability, our findings have the potential to inform the design of future interventions tailored toward such susceptible groups.

PRESENTER(S): Hunter Hutchinson, Derek Breiner
AUTHOR(S): Hunter Hutchinson, Derek Breiner, Tiffany Nelson, Raela Ridley, W. Clay Smith
FACULTY MENTOR(S): Wesley Smith

Molecular Evolution to Improve the Binding of Arrestin1 to Enolase1 as a Tool to Enhance Glycolysis in the Retina

Regulating the metabolism of retinal photoreceptors is a possible method for the treatment of retinal degeneration without targeting the specific underlying defect. Photoreceptors have one of the highest energy demands of any cell in the body. This demand is primarily fulfilled through aerobic glycolysis. In photoreceptors, arrestin1 complexes with the key glycolytic enzyme enolase1, inhibiting the activity of enolase1 by up to 25 percent. Previously, we demonstrated that a modified arrestin1 with two residue changes (ArrGG) competitively disinhibits glycolysis in photoreceptors and can have a therapeutic effect. The purpose of this research is to find modifications to ArrGG which can increase its binding affinity, making it a stronger competitive dishinhibitor. Eighteen arrestin1 residues were identified in a high throughput screen that increased binding with enolase1 when mutated to alanine. Eight of these mutations have a lower enolase1 dissociation constant than wild-type arrestin1. A modified ArrGG with human analogs for these two mutations increased lactate secretion rate at a four-fold lower AAV titer in a mouse model. These findings offer evidence that the affinity of ArrGG for enolase1 can be improved, thus providing a more effective therapeutic that will be able to outcompete endogenous arrestin1 in patient photoreceptors.

PRESENTER(S): Lauren Hellwege
AUTHOR(S): Lauren Hellwege, Katelyn Raburn, Gianluca Medigovic, Jonathan D. Licht, Richard L. Bennett
FACULTY MENTOR(S): Richard Bennett

Targeting Proliferation of GNAQ-Mutant Uveal Melanoma

Uveal (eye) melanomas (UM) originate from the melanocytes within the uvea. The tumors resulting from uveal melanoma develop from normal melanocytes and often metastasize to the liver. Almost all UM harbor an initiating mutation in the G⍰ signaling pathway, most commonly in the GNAQ gene. Prior work has identified that GNAQ-mutant UM cells depend on growth mechanisms involving lipoic acid biosynthesis, mitochondria respiration, and the p300-CBP transcriptional coactivator protein to proliferate. We hypothesized that small molecule inhibitors targeting growth pathways specific for GNAQ mutant cells may disrupt UM growth. We, therefore, treated UM cell line Mel202 or 92.1 with either Metformin, a drug that targets mitochondria respiration and is also able to trigger autophagy, or SGC-CBP30, a compound that inhibits the transcriptional co-activator protein p300-CBP. We measured the proliferation and apoptosis of the cell lines following treatment with inhibitors by live cell imaging. We found that treatment with Metformin and SGC-CBP30 blocked the proliferation of UM cell lines. Metformin induced apoptosis of UM cells. Furthermore, SGC-CBP30 synergized with the MEK inhibitor trametinib to block the proliferation of UM cell lines. Inhibiting energy metabolism with metformin or transcription activation with SGC-CBP30 was cytotoxic to uveal melanoma cells.

PRESENTER(S): Tabatha Acosta
AUTHOR(S): Tabatha Acosta, Mary Jane Ice, Charlene Pringle CPNP/AC-PC, FCCM
FACULTY MENTOR(S): Charlene Pringle

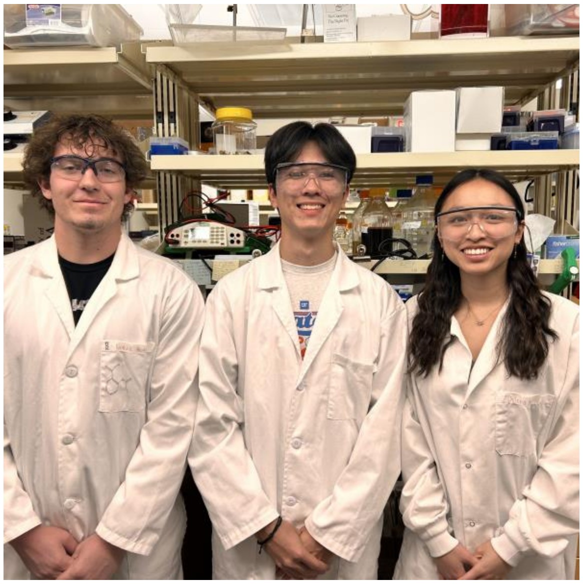
Pediatric Registry on Brain Death Practices (PROBE)

Introduction: The Pediatric Registry on Brain Death Practices (PROBE) is a multicenter retrospective observational study to evaluate characteristics surrounding pediatric brain death exams. The goal is to enhance the guidelines for pediatric brain death examinations by improving consistency, safety, and accuracy through the collection and analysis of data.

Methods: Pediatric patients who underwent formal brain death examinations at UF Health Shands Children's Hospital PICU between January 1, 2016, and December 31, 2022 (n=57) undergo EPIC chart review. All encounter notes, including physical exams, consultations, lab work, and organ donation, will be assessed. Additional evaluative tools utilized in this project include The Child Opportunity Index (2.0), CDC's Social Vulnerability Index, and FORHP's rural zip code designation. Initial data collection is on paper before entering the registry's REDCap database.

Results: Chart review is scheduled for completion by May 2024. National analysis and consolidation of PROBE data is ongoing.

Conclusion: This study provided research associates with extensive EPIC EMR experience and year-long specialization in an often overlooked area of critical care medicine. Documentation of medical management in pediatric brain injury allows insight into the collaborative strength of a closed intensive care unit system.



PRESENTER(S): Presenters: Alexander Kim, Delena Nguyen, Nathan Brusseau
AUTHOR(S): Nathan Brusseau, Alexander Kim, Delena Nguyen, Nidhi Kalia, Michael E. Harris*
FACULTY MENTOR(S): Michael Harris

Kinetic Analysis of RNA Cleavage by Coronavirus Nsp15 Endonuclease: Divalent Metal Ion Dependency

Following the challenges posed by the COVID-19 pandemic, understanding the mechanisms of coronaviridae gene expression and replication is key for developing treatments and preventing future outbreaks. This study aims to deepen our understanding of the functional properties of coronavirus nonstructural proteins (Nsps), particularly focusing on Nsp15. Nsp15 is a hexameric U-specific endonuclease that has been shown to play a crucial role in cleaving viral RNA to evade the host immune response. Past research demonstrated that manganese (Mn^{2+}) is not required for Nsp15 catalysis but nonetheless accelerates the rate of reaction. Additionally, the concentration of Mn^{2+} found to accelerate catalysis in previous studies would be toxic to humans. Thus, the mechanism and biological role of divalent metal ion activation are not well understood. By exploring the impact of other naturally occurring divalent metal ions in the human body we will determine the metal ion dependency of Nsp15. This study investigates the effects of divalent ions such as Mg^{2+}, Co^{2+}, Cu^{2+}, Zn^{2+}, Ni^{2+}, and Ca^{2+} on Nsp15 kinetics. By analyzing multiple turnover kinetics with various concentrations of these metal ions, this research aims to gain further insight into Nsp15's metal ion dependence and catalytic mechanism, laying the groundwork for targeted drug development.

PRESENTER(S): Christina Kohlbeck
AUTHOR(S): Christina Kohlbeck
FACULTY MENTOR(S): Cheryl Resch

Unveiling the Pedagogical Potential of Chat GPT: A Comprehensive Study in UF's CISE Department

This study delves into the pedagogical potential of Chat GPT within the University of Florida's Computer and Information Science and Engineering (CISE) department. Through a mixed-method approach, I explore students' attitudes towards Chat GPT, their usage patterns, and its impact on their comprehension of course material. Drawing from a survey administered via the UF Qualtrics platform and an experiment conducted within the COP 3530 (Data Structures and Algorithms) course, I uncover insights into students' interactions with Chat GPT. My findings reveal a multifaceted landscape where Chat GPT serves as both an aid and a challenge to students' academic journey. While initial perceptions are largely positive, further analysis uncovers nuances in comprehension and usage patterns, prompting considerations for enhancing academic integrity and fostering deeper engagement. I propose the integration of specialized AI education modules that encompass ethical considerations and practical application strategies, alongside revisions to the computer science curriculum to ensure relevance in an AI-driven world. The journey towards AI-focused computer science education has begun, and it is imperative for institutions to lead the charge in preparing students for the challenges and opportunities that lie ahead, as we propel UF into the forefront of academia in this transformative era.

PRESENTER(S): Matheus Kunzler Maldaner
AUTHOR(S): Matheus Kunzler Maldaner, Stephen Wormald, Olivia Dizon-Paradis, Damon L. Woodard
FACULTY MENTOR(S): Damon Woodard

The Neuro Symbolic AI Revolution

The advent of deep learning has significantly advanced the capabilities of artificial intelligence, yet the opaque nature of these models presents a "black box" dilemma, often rendering their decision-making processes incomprehensible. This opacity not only undermines user trust but also limits the practical deployment of AI, particularly in sectors where transparency is crucial.

The poster presents Neuro Symbolic AI as a revolutionary step towards resolving this issue. By fusing the clarity of symbolic reasoning with the dynamic learning prowess of neural networks, Neuro Symbolic AI fosters systems that are not only high-performing but also inherently more transparent and explainable. This integration enhances the understanding of the rationale behind AI decisions, reinforcing trust and broadening the scope of the technology's use.

Our focus is on illustrating how Neuro Symbolic AI not only illuminates the formerly obscure inner workings of complex AI models but also enhances their reliability and generalizability. By doing so, it lays the groundwork for robust, interpretable AI systems that can be effectively applied across various domains, ensuring that decisions made by AI are both understood and trusted by their human counterparts.

PRESENTER(S): Gene Pozas
AUTHOR(S): Gene Pozas, Julian Tobon, Reem Abdelghany, Arshee Badar, Emma Noel, Jacob Fingeret, Jana Opavska, and Rene Opavsky
FACULTY MENTOR(S): Rene Opavsky

TRIP13 is Critical for Proliferation of Peripheral T-Cell Lymphomas and Other Hematological Malignancies

Lymphomas, which originate from lymphocytes and are driven by oncogenic mutations, induce profound cellular transformation. The most common subset within Nodal Peripheral T Cell Lymphomas is the "not otherwise specified" (PTCL-NOS) subtype. T-cell lymphomas (TCLs), known for their aggressiveness and low survival rates, necessitate a deep understanding of the genes crucial for TCL progression.

Using gene expression of ten primary TCL samples, we highlighted around 80 genes critical to TCL proliferation. Based on existing literature, seven genes, including C17ORF58 and TRIP13, were pinpointed for their role in supporting tumor cell viability. We directed our attention to the Jurkat leukemia cell line, known for its high transduction efficiency and significance in hematological research.

For tracking the cell growth, Fluorescent Activated Cell Sorting (FACS) with co-expression of the red fluorescent protein mCherry was used. The effects of gene knockdown were gauged using cell count analyses, BrdU incorporation assays, Annexin V staining, and FACS analyses. Significantly, the knockdown of TRIP13 triggered apoptosis and cell cycle arrest in both cell lines, reinforcing its potential as a therapeutic target.

This in-depth research offers hope in identifying genes crucial for lymphoma cell survival, paving the way for potential drug development to reduce mortality rates in patients.

PRESENTER(S): Elizabeth Riotto
AUTHOR(S): Elizabeth Ritto, Dr. Ennes, Melanie Giangreco
FACULTY MENTOR(S): Megan Ennes

Exploring an Interactive Museum Exhibit Through Activity Theory

Research suggests that the use of natural history collections in museum education can be beneficial for science engagement and public education. This study expands on this extant research through an exploration of a natural history Live Lab exhibit, wherein museum faculty, staff, and volunteers prepared paleontological specimens for collection while engaging the public in science education in an interactive exhibit space. Using a framework of activity theory, a mixed-methods survey was distributed to individuals that participated in the Live Lab to explore the interactions of the subjects, objects, tools, outcomes, rules, and labor division in the exhibit. Twenty-two individuals responded, and their quantitative and qualitative responses were openly coded and analyzed. This analysis revealed that participants valued engaging the public with paleontology, believed themselves and the public benefited from the exhibit, and expressed enthusiasm for future interactive, collections-based exhibits. Conversely, some participants also experienced challenges with the space itself, feelings of unpreparedness, and hesitations about personal outreach skills. As such, future Live Lab or similar collections-based exhibits are recommended alongside greater preparation and training for participants. These findings can be applied in other museum spaces to promote innovative science engagement and museum education for the public while supporting exhibit participants.

PRESENTER(S): Hailey Maurer
AUTHOR(S): Hui Liu, Zachary Gorman, Hailey Maurer, Ariel Sorg, Gilles J. Basset, Anna K. Block
FACULTY MENTOR(S): Anna Block

Identification of a Maize Coumarate-coA Ligase Involved in the Production of Anti-herbivore Compound Chlorogenic Acid

Maize (Zea mays) uses chemical compounds such as chlorogenic acid to protect itself from insect herbivory. Knowledge of how these compounds are made can be used to guide molecular breeding of insect resistant crops. A key step in chlorogenic acid production is the activation of p-coumaric acid to p-coumaroyl CoA by a 4-coumarate CoA ligase (4CL). However, it is not known which of the five 4CL genes in maize are involved in chlorogenic acid biosynthesis. Gene expression analysis revealed that only one of these genes, Zm4CL5, is induced in response to fall armyworm (Spodoptera frugiperda) herbivory, indicating that it may be involved in chlorogenic acid production. To test this hypothesis, we isolated a mutant of Zm4CL5 that had reduced Zm4CL5 gene expression. Metabolite analysis showed chlorogenic acid is downregulated in the mutant plants, confirming the hypothesis that Zm4CL5 is involved in chlorogenic acid production. Chlorogenic acid when added at high concentrations to insect diet is toxic to fall armyworm, however, no significant difference was observed in larvae growth on wild type compared to mutant plants. These data suggest that Zm4CL5 is a potential candidate for increasing fall armyworm resistance in maize by enhancing chlorogenic acid production.

PRESENTER(S): Emilio Pedroza Lopez
AUTHOR(S): Emilio Pedroza Lopez, Dr. Vanessa Hull, Jin Hou, Dr. Jindong Zhang
FACULTY MENTOR(S): Vanessa Hull

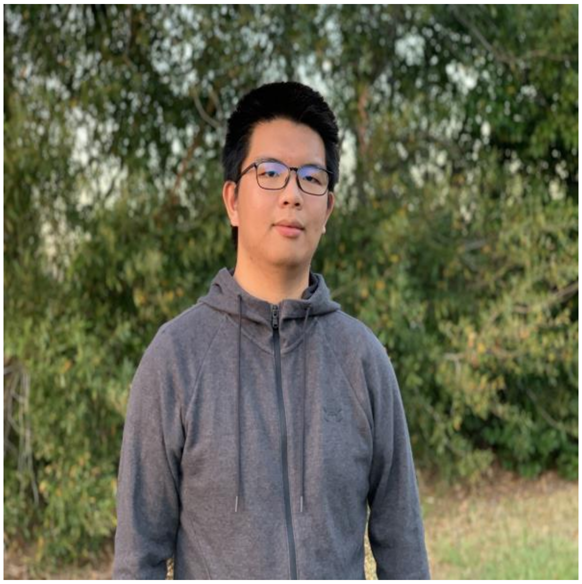
Interspecific Interactions of Mammals with Giant Panda Scent-Marks in Southwest China

Chemical communication is a relatively understudied means of communication among mammals, yet it is essential to the social functioning of several species. The giant panda (Ailuropoda melanoleuca) depends on scent marking behaviors to maintain social relationships with conspecifics as a result of their largely solitary lifestyle. Anogenital gland secretions and urine are known to convey information about the identity and condition of the signaler to other giant pandas, yet the potential for interspecific communication to occur through these same pathways with sympatric mammal species has not been studied. By analyzing infrared camera trap images and videos captured over three years by China West Normal University graduate students in Wolong National Nature Reserve in Sichuan, China positioned at known giant panda scent-marking sites, I sought to determine whether other mammals interacted with giant panda scent-marks and quantify any interactions detected. An analysis of all available data revealed that yellow-throated martens (Martes flavigula) and red pandas (Ailurus fulgens) were the two species that interacted the most frequently with giant panda scent-marking sites and were the only species to scent-mark on these sites themselves. These results suggest that these two species have the greatest potential of engaging in interspecific communication with giant pandas.

PRESENTER(S): Bailey McCracken
AUTHOR(S): Bailey McCracken, Emely A. Gazarov, Sabrina Zequeira, Jennifer L. Bizon, Barry Setlow
FACULTY MENTOR(S): Barry Setlow

Effects of Chronic Cannabis Smoke Exposure on Inflammatory Markers in Mice

Aging is associated with an increase in chronic low-grade neuroinflammation, which plays a role in a number of neurodegenerative diseases. Cannabinoids can reduce inflammatory markers and have neuroprotective properties; however, the effects of cannabis use on brain inflammatory markers have not been assessed. To address this, we exposed young adult (4 months old) and aged (22 months old) C57BL/6J mice (n = 40, half female) to smoke from burning either cannabis (5.9% THC) or placebo (0% THC) cigarettes daily for 30 days. Frozen brains were cryosectioned and tissue from both prefrontal cortex (PFC) and hippocampus (HPC) were collected from each brain. In brain lysates, 120 markers of inflammation were measured using Quantibody cytokine arrays and protein levels were analyzed using a 3-way ANOVA (Age x Sex x Drug) with multiple comparisons corrected with False Discovery Rate (5%). Results showed that aged mice had elevated levels of cytokines in PFC and HPC. In HPC, cannabis smoke exposure decreased OPN (q=0.0189) and PF4 (q=0.0468) levels in young males. In HPC, cannabis smoke exposure decreased P-Selectin (q=0.0025) levels in aged males and increased P-Selectin (q=0.0421) and Fcg RIIB (q=0.0171) levels in young females. Ongoing analyses of other brain inflammatory markers are being conducted.



PRESENTER(S): Weihao Tang
AUTHOR(S): Sydney Blimbaum, Can Zhang, Andrew Li, Weihao Tang, Sabrina Perna, Lei Zhou
FACULTY MENTOR(S): Lei Zhou

Genomic Response of Innate Immune Cells to Metastatic Cancers in Drosophila

Innate immunity is the primary sentinel against the infiltration of abnormal cells. However, tumor cells can also subvert innate immune cells, such as macrophages, to help evade the immune response and promote metastasis. Yet, it remains poorly understood how innate immune cells recognize cancer cells and launch distinctive responses. Studies with cancer samples or mouse models all point to complex and multifaceted relationships between the immune system and cancer. However, in these models, innate immunity is inevitably intertwined with adaptive immune response during the relatively long course of tumorigenesis. An alternative strategy is to work with fruit fly models as they have no adaptive immunityand thus allow us to focus exclusively on the response of innate immune cells. In addition to the relatively short span of tumorigenesis, the fruit fly model is relevant to human cancer because the conservation of important oncogenic genes (Ras, Myc, etc) and tumor suppressors (P53, Notch, etc.). The innate immunityin Drosophila, involving Toll-like receptors and NFkB, closely resemble that of mammals. Over 90% of the fruit fly's blood cells (hemocytes) are macrophages, which interact with tumor cells like their mammalian counterparts. The research aims to uncover the genomic changes in circulating macrophages in responseto cancer cells, especially metastatic cancer cells.

PRESENTER(S): Kian Ambrose
AUTHOR(S): Kian S. Ambrose, Olivia P. Dizon-Paradis, Stephen E. Wormald, Damon L. Woodard
FACULTY MENTOR(S): Damon Woodard

Causal AI: The Frontier of Cause and Effect in AI

In the realm of artificial intelligence (AI), causal inference has emerged as a pivotal area of research by addressing the fundamental question of 'what causes what?' My research delves into the field of causal AI, presenting a review that encapsulates foundational background information and recent developments in the field. It begins with an examination of the theoretical underpinnings of causal AI, highlighting its significance in understanding the dynamics of cause-and-effect relationships beyond mere correlations. It then transitions to an overview of treatment effect estimation methods, a critical aspect of causal inference that seeks to quantify the impact of interventions in various domains, including national security, healthcare, and economics.

This research also illuminates the cutting-edge methodologies employed in causal AI, such as counterfactual reasoning, structural causal models, and machine learning-based approaches. Furthermore, it discusses the challenges and opportunities associated with implementing these techniques, offering a forward-looking perspective on the potential implications and applications of causal AI in real-world scenarios. This poster presentation aims to provide attendees with an understanding of causal AI, fostering a deeper appreciation for its utility in paving the way for more informed decision-making processes across disciplines.

PRESENTER(S): Mia Morin and Suvanti Meraney
AUTHOR(S): Mia I. Morin, Suvanti S. Meraney, Meagan C. Michalik, and Julie A. Maupin-Furlow
FACULTY MENTOR(S): Julie Maupin-Furlow

DNA Binding Properties of TrmB: A Transcriptional Regulator Associated with Central Carbon Metabolism in Haloarchaea

TrmB is a transcriptional regulator associated with central carbon metabolism (glycolysis and gluconeogenesis) in halophilic archaea. In this study, Haloferax volcanii was used as a model organism to investigate the DNA binding properties of TrmB. Based on RNAseq and MEME mast analyses, TrmB DNA binding motifs were predicted in the promoter regions of the central carbon metabolism genes gapII, kdgA, and ppsA. These promoter regions were 5'-end labeled with biotin and isolated for use as DNA probes in electrophoretic mobility shift assays (EMSAs). TrmB protein was purified from H. volcanii using an affinity tag approach in which an H. volcanii trmB mutant was engineered to express trmB-strepII from a plasmid. This strain was grown on a glucose-rich medium and used to purify TrmB-StrepII by StrepTactin and Superdex 200 Increase size exclusion chromatography. TrmB-StrepII was purified to homogeneity as determined by SDS-PAGE and anti-StrepII Western blotting analysis. Further investigation by EMSA revealed TrmB-StrepII to bind the promoter regions of gapII, kdgA, and ppsA compared to a rad3B negative control. This information has furthered the understanding of glycolysis and gluconeogenesis regulation in the halophilic archaea.

PRESENTER(S): Jahiris Jauregui
AUTHOR(S): Jahiris Jauregui, Sara Elisha LePine, Erin Westgate
FACULTY MENTOR(S): Erin Westgate

Reducing Gender Bias in Student Evaluations of University Professors

Student evaluations of professors are crucial for assessing teaching effectiveness, but legislation targeting political indoctrination adds pressure on instructors, especially as biases disproportionately affect minorities. This study investigates how lecturer gender and subject influence perceptions in student evaluations of teaching (SETs) among 1143 University of Florida undergraduates. The aim was to reduce gender bias using an intervention that lowers the rating scale from 5 to 3 points and includes an implicit bias disclaimer. Participants watched one of four lecture videos with manipulated instructor gender and content. Analysis suggested lecture subject significantly influenced perceived political affiliation, with bias-related lectures seen as more liberal. Gender did not have a significant effect on perceived political affiliation, but it did impact perceptions of warmth, with male instructors rated warmer overall. Competency ratings were unaffected by gender or content. The intervention succeeded in decreasing bias effects in evaluations and had less pronounced mediation effects based on participant gender and political affiliation. This research underscores the complexity of gender and influence of lecture content in SETs as well as the potential of interventions to mitigate biased perceptions of professors among students.

PRESENTER(S): Eric Kunz
AUTHOR(S): Eric Kunz, Kyoungrae Kim, Samuel Alvarez, Qingping Yang, Pavel Mazirka, Kerri O'Malley, Scott Berceli, Terence Ryan, Salvatore Scali
FACULTY MENTOR(S): Terence Ryan

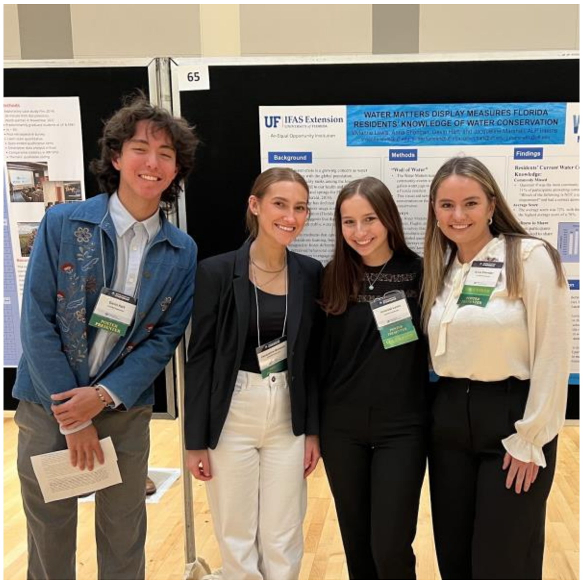
Exercise Preconditioning Mitigates Access-Related Limb Dysfunction in a Murine Model of Arteriovenous Fistula

Arteriovenous fistula (AVF) is the most durable hemoaccess procedure for end-stage renal patients, however, access-related hand dysfunction (ARHD) is prevalent following AVF placement. We hypothesized that a progressively overloading pre-operative exercise program would ameliorate hindlimb disability in a mouse model of ARHD. Adult male C57BL/6J mice (N=10-11/group) were fed adenine diet to induce chronic kidney disease. Animals were randomly allocated to exercise or control groups, beginning 14 days prior to the AVF surgery. After familiarization, exercising mice were subjected to progressively weighted running wheel exercise. Hindlimb perfusion was assessed post-operatively (POD) in vivo. Muscle contractile and mitochondrial function were also assessed. Laser Doppler perfusion to the ventral paw was decreased immediately after AVF creation on the left common iliac artery and recovered at POD13. In exercised mice, absolute force frequency was enhanced ($P=0.005$), although interestingly, peak forces and fatiguability remained unchanged. Exercised mice had significant improvements in maximal mitochondrial respiration ($P<0.05$) and oxidative phosphorylation conductance ($P<0.05$). Similarly, exercised mice demonstrated greater membrane potentials ($P<0.05$) when using both carbohydrate and fatty acid fuel sources. Pre-operative exercise has beneficial effects on muscle contractility and mitochondrial function in mice with AVF demonstrating a therapeutic strategy to attenuate ARHD.

PRESENTER(S): Carolina Cruz-Wegener
AUTHOR(S): Carolina Cruz-Wegener, Wonn S. Pyon, Mojdeh Faraji, Max S. Gotlin, Caitlin Orsini, Charles J. Frazier, Jennifer L. Bizon, Barry Setlow
FACULTY MENTOR(S): Barry Setlow

Temporally-specific inhibition of ventral tegmental area dopamine neurons reduces risk-seeking behavior

Risky decision-making involves the evaluation of choices and their potential outcomes to maximize rewards while minimizing potential losses. An inability to properly assess potential gains against their costs can greatly affect quality of life and can be observed in psychiatric disorders such as behavioral addictions, substance-use disorder or particular anxiety disorders. Foundational work has implicated dopaminergic neurons of the ventral tegmental area (VTA-DA) in the signaling of whether an outcome is better or worse than expected; however, the role of VTA-DA neurons in decision making under the risk of explicit punishment remains unclear. To explore this, transgenic rats expressing a light-sensitive chloride pump (halorhodopsin) within their VTA-DA neurons were trained on a risky decision-making task. Rats were given free choices between a small, “safe” reward or a larger reward that came with a chance of a mild footshock (probability of footshock began at 0% and increased to 25% then 75%, every 20 trials). Inhibition of VTA-DA neurons during risky Wins (large reward chosen but no footshock delivered) and Losses (large reward chosen and footshock was delivered) resulted in a significant reduction in future presses for the risky lever, indicating a causal link between VTA-DA neuron activity and risky decision making.



PRESENTER(S): Vivienne Lewis, Anna Sheridan, Gavin Hart, Jacqueline Marshall
AUTHOR(S): Vivienne Lewis, Anna Sheridan, Gavin Hart, Jacqueline Marshall
FACULTY MENTOR(S): Yilin Zhuang

Water Matters Display Measures Florida Residents' Knowledge of Water Conservation

Water Matters is an outreach project developed by the University of Florida Institute of Food and Agricultural Sciences Extension Central District. It aims to enhance Floridians' understanding of water quality protection and conservation. The team travels around the state with a "wall of water" displaying water jugs to depict average daily water usage by a Floridian with a quiz to gauge their baseline knowledge. As of July 2024, the project received 284 quiz responses from 4 counties. The quiz consisted of 12 questions and the average score was 72%. The most frequently missed question was "Which of the following is not identified as a cause of waterbody impairment?" with 11% answering correctly. 83% of respondents rated their likelihood of sharing the quiz information with friends or family as 8 or higher on a scale of 0 to 10. Many youths were interested in the quizzes, but they didn't suit their comprehension. Therefore, the team is developing quizzes and resources for K-12 students and teachers. Overall, this project has gained insight into public knowledge regarding water quality and conservation in Florida and is planning to expand to more counties and use this baseline to create impactful educational resources for Floridians.

PRESENTER(S): Janie Zhang
AUTHOR(S): Janie Zhang, Muhammad Abbas, Pharm-D, PhD, Haipeng Tao, MD, PhD, Nicole Petit, and Jianping Huang, MD, PhD
FACULTY MENTOR(S): Jianping Huang

SPDYE3, a novel cancer-testis antigen for cancer immunotherapy

Identifying tumor-specific antigens is crucial for developing effective therapies, like immunotherapy, which utilizes patients' immune cells to target tumors. However, few antigens with both prognostic value and therapeutic potential have been discovered. SPDYE3, a gene we investigated, shows promise as a cancer-testis antigen, overexpressed in various malignancies, including gliomas. Its expression is associated with poor survival in glioma patients. Moreover, SPDYE3 contains tandem repeat T cell epitopes with high binding affinity to common HLA haplotypes, making it an excellent candidate for TCR-engineered T cell therapy, which has shown promising clinical responses. Our study aims to understand SPDYE3's role in cancer progression and develop targeted therapies. Our immediate goal is to investigate its expression pattern and function, with the long-term objective of translating these findings into clinical applications using SPDYE3-specific TCR-modified T cells for gliomas and other cancers.

PRESENTER(S): Jahiris Jauregui
AUTHOR(S): Jahiris Jauregui, Sara Elisha LePine, Erin Westgate
FACULTY MENTOR(S): Erin Westgate

Reducing Gender Bias in Student Evaluations of University Professors

Student evaluations of professors are crucial for assessing teaching effectiveness, but evaluations may be biased by negative stereotypes based on the instructors' identities. This study investigates how gender stereotypes influence perceptions in student evaluations of teaching among 1143 University of Florida undergraduates. The aim was to reduce gender bias using an intervention that lowers the rating scale from 5 to 3 points and includes an implicit bias disclaimer. Participants watched one of four lecture videos with manipulated instructor gender and content. Analysis suggested lecture subject significantly influenced perceived political affiliation, with bias-related lectures seen as more liberal. Gender did not have a significant effect on perceived political affiliation, but it did impact perceptions of warmth, with male instructors rated warmer overall. Competency ratings were unaffected by gender or content. The intervention succeeded in decreasing bias effects in evaluations and had less pronounced mediation effects based on participant gender and political affiliation. This research underscores the complexity of gender and influence of lecture content in evaluations as well as the potential of measurement-based interventions to mitigate biased perceptions of professors among students.

PRESENTER(S): Yusra Ahmed
AUTHOR(S): Yusra Ahmed, Francisco Paneque, Christopher Martyniuk, and Joseph Bisesi
FACULTY MENTOR(S): Joeseph Bisesi

Examination of Polybrominated Diphenyl Ethers (PBDEs) Influence on Thyroid Hormone Synthesis Pathways via TRβ2

Polybrominated diphenyl ethers (PBDEs), once used as flame retardants, persist in the environment and linked to thyroid system toxicity due to their affinity for thyroid receptors. While prior studies focus on downstream processes of thyroid hormone synthesis, our investigation explores the interaction between OH-BDE metabolites and thyroid receptor beta 2 (TRβ2) in the hypothalamus and pituitary, which regulates thyroid hormone signaling and production. We established a luciferase-based reporter assay to assess OH-BDEs' potential to affect circulating hormone levels by agonizing and antagonizing TRβ2 transcription. Additionally, in vitro exposures of mouse hypothalamic cell lines to 6OH-BDE47 and 4OH-BDE68 metabolites examined their impact on thyroid hormone synthesis pathways. Then employing enzyme-linked immunosorbent assays (ELISAs) to quantify the levels of thyroid releasing hormone (TRH), regulated by TRβ2, in media samples from exposed cells, to measure the physiological impact of OH-BDE metabolite interactions on thyroid hormone regulation. Additionally, we measured preproTRH gene expression, which is the precursor to TRH. Our findings indicate that OH-BDE metabolites bind to TRβ2, diminishing TRH transcriptional activity in the hypothalamus. This decrease may lead to reduced circulating thyroid hormones in exposed organisms, suggesting a novel mechanism through which PBDEs directly influence thyroid hormone levels, supplementing epidemiological evidence of hypothyroidism.

PRESENTER(S): Alexandra Scott
AUTHOR(S): Alexandra Scott, Andrew Carlson
FACULTY MENTOR(S): Andrew Carlson

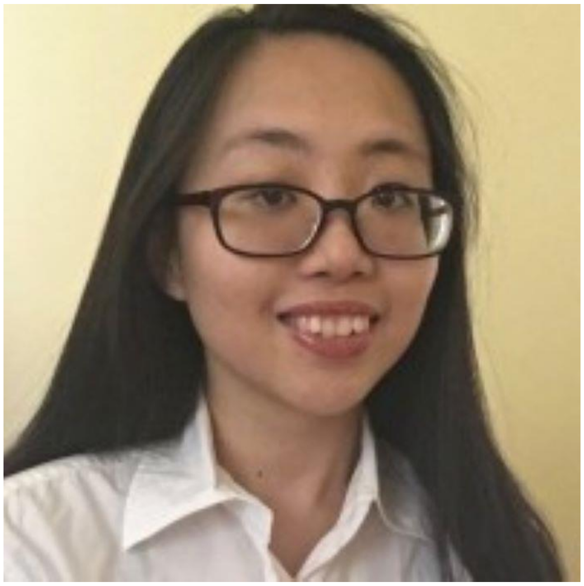
Predicting Thermal Habitat Suitability for Nonnative Cichlids in Florida Rivers Using a Novel Modeling Approach

As global temperatures increase, the spatiotemporal arrangement of thermal habitats in Florida rivers may shift, creating the potential for greater dispersal and establishment of nonnative tropical freshwater fishes. To understand how water temperature changes may affect the spatial distribution of these nonnative species, more effective water temperature prediction models are necessary. Currently, most models employ either a limited air–water temperature relationship or require expensive and complicated tools to measure hydrometeorological factors. Thus, we developed a novel modeling approach that is accurate, accessible, and cost-effective for fisheries managers to project water temperatures in rivers across North and Central Florida. To characterize the potential for nonnative fishes to disperse northward, we evaluated two hardy and abundant species found in South Florida: Mayan Cichlid (Mayaheros urophthalmus) and Oscar (Astronotus ocellatus). Our preliminary results show an increase in thermally suitable winter days for both species in 10 of the 11 rivers studied, consistent with predicted water temperature warming under 16 climate change scenarios. Considering resource limitations, fisheries managers can use the water temperature modeling approach described here to predict effects of climate change on Mayan Cichlid and Oscar growth, survival, and dispersal and take actions to manage potential northward movement of the species.

PRESENTER(S): Sophia Vellozzi
AUTHOR(S): Ratree Wayland, Kevin Tang, Sophia Vellozzi, Rachel Meyer, Rahul Sengupta
FACULTY MENTOR(S): Ratree; Kevin Wayland; Tang

Comparing Degree of Breathiness in Parkinson's Disease (PD) Patients Versus Healthy Control Subjects

Speech can be used as a non-invasive biomarker to capture fine changes in speech articulation patterns associated with linguistic phenomena in normal populations and individuals diagnosed with neuromotor disorders, such as Parkinson's Disease (PD). PD patients often exhibit a phonation characteristic known as breathy voice, in which the vocal folds vibrate, but let more air escape through the glottis during phonation, producing a whisper-like sound. This study uses a deep learning model known as Phonet, trained on Gujarati, a language characterized by a contrast between breathy and non-breathy vowels, to measure and compare the degree of breathiness observed in vowels produced by PD patients and healthy control subjects native to Colombian Spanish. Overall, understanding the degree of breathiness in Parkinson's Disease patients further contributes to the development of speech as a biomarker for clinical diagnoses of Parkinsonism and possibly other neurodegenerative disorders.



PRESENTER(S): Amy Wu
AUTHOR(S): Amy Wu, Morgan Cobb, Dr. Christan Grant, Dr. Jeremy A. Magruder Waisome
FACULTY MENTOR(S): Jeremy A. Magruder Waisome

Guided Undergraduate Training for Shark Segmentation (GUTSS)

As artificial intelligence (AI) becomes more used in education, need for instruction around AI skills will increase. Guided Undergraduate Training for Shark Segmentation (GUTSS) is a mobile application that enables students to develop image segmentation and manipulation skills while learning about marine anatomy. To connect between AI and sciences, in-service science teachers can use GUTSS inside and outside of the classroom to help students learn about shark anatomy. Through the application, teachers can enrich their classroom curriculum with technology, share materials, grade assignments, and view their students' work. GUTSS uses open-set object detection, image segmentation, and image manipulation to assist users with organ identification. Gamification in the application will make learning shark anatomy more engaging to students. Prior work indicates teachers' willingness to integrate AI concepts into classroom under state standards. Further application wireframing from instructor perspectives is ongoing, to incorporate teacher viewpoints from mixed-methods survey responses on AI usage and anatomy. Future work aims to supplement shark dissection images from AI generation of anatomical image data sets, by collecting data from students and teachers. Ultimately, the application will be able to identify non-aquatic organisms' anatomical features as a tool for students to learn.

PRESENTER(S): Grace Baker
AUTHOR(S): Grace Baker, Susan Nittrouer
FACULTY MENTOR(S): Susan Nittrouer

Early Otitis Media with Effusion as a Risk Factor for Spectral Processing and Phonological Deficits

Postnatal development of the central auditory pathways depends on appropriate, early auditory experiences. We hypothesized that otitis media with effusion (OME) can interfere with these experiences, hindering the timely development of auditory pathways, which would negatively impact the suprathreshold function of spectral modulation detection. We further hypothesize that a delay/deficit in this auditory function would critically impair acquisition of phonological sensitivity, and disproportionately so compared to lexical acquisition. To test these hypotheses, otherwise healthy 5-6-year-olds with and without significant OME histories were tested on three auditory and two language measures. Spectral modulation detection thresholds were obtained at three modulation rates (0.5, 1.0, and 2.0 cycles per octave). Language measures assessed vocabulary and phonological sensitivity. Results showed significant effects of OME histories on spectral modulation detection thresholds and poorer phonological sensitivity, but equivalent vocabularies. Correlational analyses revealed strong relationships between spectral modulation detection and phonological sensitivity, but not vocabulary. These findings are vital as difficulty with phonological sensitivity has been identified with impaired reading/language abilities.

PRESENTER(S): Nadia Yammoul
AUTHOR(S): Nadia Yammoul, Nuria Castañeda, Juan E. Andrade Laborde, PhD.
FACULTY MENTOR(S): Juan Andrade

Physicochemical Characterization of Lupinus mutabilis Protein Isolate from the Andes of Ecuador

This study assessed the physicochemical and functional characteristics of lupin seeds as well as their potential role in supporting population food demand. Extensively consumed among European and American populations, the seeds of Lupinus mutabilis, which is mostly cultivated in the Andean region, contain the highest protein and oil content among the Lupinus spp. Oil extraction from lupin flour (INIAP 450 Andino) was conducted, and free fatty acids (FFA) were analyzed. Lupin protein isolate (LPI) was obtained by alkaline water extraction and isoelectric precipitation, resulting in a material of ~ 90% purity. Gel electrophoresis, solubility, foaming, gelation, and emulsification capacity of LPI were assessed by comparing different factors, including pH and LPI concentrations. Solubility (5 mg/ml) increased in alkaline conditions to 80%, while foaming capacity (20 mg/ml) increased in more acidic buffer solutions. The emulsification ability of LPI showed dependency on protein concentration and pH, with the alkaline treatment achieving better emulsification at higher LPI concentrations. These findings suggest the great potential of LPI to act as a raw material for the creation of added-value food items in the alternative-protein, plant-based industry.

PRESENTER(S): Julia Jamieson
AUTHOR(S): Julia Jamieson, Lingbao Ai, Taqwa Naas, Hector Mendez-Gomez, Elias Sayour, Kristianna Fredenburg, Coy Heldermon
FACULTY MENTOR(S): Coy Heldermon

Immunologic and Transcriptome Analysis of Soft Tissue Sarcomas Treated with Total Tumor RNA Nanoparticle Vaccine

Soft tissue sarcoma is a rare cancer that can result from diverse tissue types of mesenchymal origin. The five-year survival rate is 65%, and immunotherapy has emerged as a promising treatment. We utilized mice modeling the spontaneous growth of sarcoma by harvesting sarcoma tumors grown on Trp53 null mice and subcutaneously implanting them into Trp53 wild type mice. The tumors were passaged through Trp53 wild type mice and the ttRNA from two tumor samples was extracted and coated in DOTAP multi-lamellar nanoparticles, then delivered via tail vein injection into mice implanted with the same tumor. The treated groups had significantly smaller whole tumor growth and smaller tumor wet weights ($p<0.05$) than the untreated groups. The expression of ten cytokines revealed that IL-6, IL-12, and CCL-4 in treated mice were significantly different ($p<0.05$) than untreated mice. Samples from both tumors and non-treated controls underwent RNA sequencing. The nanoparticle activated pathways in the treated tumors including humoral immune response, fatty acid metabolic processes, and immune effect processes while repressing DNA repair and chromatin organization pathways. The vaccine has repressed tumor growth by altering the immune response and gene expression, presenting a promising treatment for soft tissue sarcoma.

PRESENTER(S): Bailey Fawcett
AUTHOR(S): Bailey Fawcett
FACULTY MENTOR(S): Laurie Gauger

Phonological Memory: Does it Predict Sight Word Reading and Decoding Skills?

Phonological memory (PM) is reportedly involved in learning to read. We compared the performance of young struggling readers between the ages of 7 – 12 years on two single word reading tasks of PM, Memory for Digits and Nonword Repetition, to their performance on sight word reading and decoding tasks. The Memory for Digits and Nonword Repetition subtests of the Comprehensive Test of Phonological Processing-2 were administered to measure PM. The Test of Word Reading Efficiency-2 was used to measure sight word reading and decoding. Scaled scores from all tests were used to complete Pearson correlation coefficients. Neither digit span nor nonword repetition were significantly related to sight word reading and decoding in a sample of 242 children. Regardless of the children's ages, the two PM tasks were not related to either reading task, indicating that age was not a factor. If PM affects the rate individuals learn new sight words, then it is unclear why there was no association between PM and low-level reading skills. These results challenge the conventional understanding of the role of PM in reading acquisition, emphasizing the need for a reevaluation of current assessment methodologies and exploration of how PM performance affects children's responses to intervention.

PRESENTER(S): Merritt Reece
AUTHOR(S): Hannah E Phelps, Wonn S Pyon, Jennifer L Bizon, Matthew R Burns, Merritt R Reece, Barry Setlow
FACULTY MENTOR(S): Matthew Burns

Stereological Quantification of the Impact of Aging on Dopaminergic and Cholinergic Neurons

Parkinson's disease (PD), Dementia with Lewy Body (DLB) and Multiple System Atrophy (MSA) are common and rapidly growing neurodegenerative disorders, with age being the major risk factor. Loss of dopaminergic neurons in the substantia nigra is a pathological hallmark of PD, DLB, and MSA, but have also been associated with normal aging, making the use of aged animals for quantification of cell loss associated with disease potentially problematic. Comparing dopaminergic neurons in young and aged rat brains using unbiased stereological quantification has not been well studied. We aimed to quantify the dopaminergic neurons in the substantia nigra pars compacta (SNc) and ventral tegmental area (VTA) in young and aged rats. Using 5 month and 23-month-old Fischer 344 x Brown Norway F1 hybrid rats of both sexes, immunofluorescence and stereology was completed. Immunofluorescence was used to stain for tyrosine hydroxylase (TH) and dopaminergic cell bodies were quantified using Microbrightfield's Stereoinvestigator software. The number of dopaminergic cells in the SNc and VTA do not change with age (p=0.6380), indicating the aging process in rats is dissimilar to that in humans. In addition, there are no sex differences in dopaminergic cell bodies (p=0.83). These results inform future stereological studies in age-related disease models.

PRESENTER(S): Ilyssa Mann
AUTHOR(S): Ilyssa Mann and Myiah Hutchens
FACULTY MENTOR(S): Myiah Hutchens

Shift Happens: Fostering Third Places in a Transient College Town Through Communicative Strategies.

A "third place" is a term coined by Ray Oldenburg, which represents a location one frequents to connect with their local community outside their home and work (Oldenburg, 1999). Third places add immense value to the local community by creating social capital, increasing happiness, and fostering a sense of collectivity (Jeffres et al., 2009; Putnam, 2000). Unfortunately, third places have steadily declined over the past few decades, with a sharp reduction during the Great Recession (Finlay et al., 2019). Privately run organizations and food and beverage stores have especially felt the impacts of the recession, all places that often take the form of a third place. However, with such valuable places on the decline, it highlights the importance of nurturing them. This paper focuses on the communicative factors in fostering community, specifically in a transient college town. To examine this, focus groups took place at a local self-identified third place. The findings suggest that in order to expedite the integration process into the community despite the town's transient nature, organizations, third places, and the local media must employ communicative efforts that are overly welcoming.

PRESENTER(S): Mirabella Miranda
AUTHOR(S): Mirabella Miranda; Masoumipoor, M., Jameie, S. B., Janzadeh, A., Nasirinezhad, F., Soleimani, M., & Kerdary, M.; Vadalà, M., Morales-Medina, J. C., Vallelunga, A., Palmieri, B., Laurino, C., & Iannitti, T.
FACULTY MENTOR(S): N/A N/A

Biohacking as a Therapy: an exploration of light and frequency modulation

Alternative medicine strategies such as photobiomodulation and electromagnetic frequency devices provide a way to correct our body's imbalances without the use of surgery or pills. These various treatment pathways are becoming popularized in walk-in settings such as the one I explored in Orlando, Florida: Chill CryoSauna. I spoke with Curt Read, the mastermind behind the clinic, who explained that his clients reported a reduction in stress, anxiety levels, migraines, neuropathy, agitation, and overall pain/discomfort via the use of his biohacking techniques within just a handful of sessions. Brain caps helped aid headaches and migraines, sleeves provided pain relief, and Spooky2 realigned clients' chakras. Additionally, alkaline water supplementation reversed acidosis and helped with inflammation. Some of Curt's clients with chronic issues used a combination of therapy modalities. All of these techniques can shape the future of medicine, allowing us to move away from invasive treatments when solving biological issues. At the end of the day, "biohacking" comes down to making changes in our daily lives to rebalance and adopt healthier lifestyles. With the assistance of these not-so-new but less-studied technologies, we can find more natural ways to manage our symptoms and make impactful changes in our health prognoses.

PRESENTER(S): Brennen Sexton
AUTHOR(S): Brennen Sexton, Sahale Casebolt, Michal Kowalewski
FACULTY MENTOR(S): Michal Kowalewski

Breaking Bivalves: Valve Durability and its Effect on Fidelity

Paleontological analyses require high paleontological fidelity - a faithful archive of source biota in fossil assemblages. However, since species vary in size and skeletal durability, bias can be expected due to preferential preservation. To evaluate potential biases resulting from differences in size and thickness of bivalve mollusk shells, we used samples of surficial accumulations from seagrass habitats from the Gulf coast of Florida. A standing crushing device with a flat head was used to create relative force data, measured in Newtons, as a relative marker for how easy it is to destroy a shell. Even amongst specimens of the same species, there is considerable variability in shell strength, due to environmental factors like encrustation and prior breakage. Eighty-one shells across twenty-one species and four size classes were tested and displayed strong correlations between shell thickness and durability, with other morphological features having no significant affinities to the valve's relative sturdiness. There was no significant relation between abundance and mechanical strength of its skeleton, suggesting that shell strength is not a determining factor in the abundance of specimens. The lack of notable correlations between abundance and fragility suggests that relative abundance of fossil mollusks may archive ecological over taphonomic data.

PRESENTER(S): Meir Schochet
AUTHOR(S): Meir Schochet, Jamie Tayar
FACULTY MENTOR(S): Jamie Tayar

Searching for The Smallest Black Holes: An Analysis of Binary Systems with APOGEE DR17

The existence of the least massive black holes and most massive neutron stars are still debated, and with few objects identified between two to five solar masses, many believe in a “compact object mass gap”. Compact objects are dim and small, a consequence of being end of life stellar remnants. Therefore, our best chance to observe them is through influences on a close companion star in a binary system, where the objects orbit around a shared center of mass and can be detected by a radial velocity (RV) Doppler shift of the system’s spectral lines between observations. Using the Apache Point Observatory Galactic Evolution Experiment (APOGEE) we search for candidate host systems that have considerable evidence of binary interactions including RV variations, rapid rotation indicative of tidal interaction, and a single set of stellar spectral lines suggesting the secondary is compact. We find that only 0.7% of the APOGEE catalog possesses all these signatures, and we explore the 120 systems whose companion mass estimates are in the mass-gap regime. While previous efforts have identified individual systems, our work provides a more comprehensive search of a large sample that will help constrain the history and evolution of stellar-mass compact objects.

PRESENTER(S): Edison Tran
AUTHOR(S): Edison Tran, Muhammad Irfan, Ana Duran-Pinedo, Jorge Frias-Lopez
FACULTY MENTOR(S): Jorge Frias-Lopez

CRISPR-Cas system can Modulate PGN_1547: a New Hypothetical Virulence Factor in Porphyromonas gingivalis ATCC 33277

Porphyromonas gingivalis is a significant pathogen associated with severe adult periodontitis. The Clustered Regularly Interspaced Short Palindromic Repeats-Cas system (CRISPR-Cas) is a prokaryotic defense mechanism that protects against invading nucleic acids, including bacteriophages. Previously, we showed up-regulation of CRISPR-Cas-associated genes in P. gingivalis ATCC 33277 in clinical periodontitis samples. When it is inside eukaryotic cells, the Cas3 nuclease plays an essential role in controlling the virulence of P. gingivalis. In this project, we showed that the CRISPR-Cas system regulates a new virulence factor: adhesin protein PGN_1547. The role of PGN_1547 in pathogenesis was measured using a Galleria mellonella larvae infection model. The biofilm, hemagglutination, and growth curve were performed as previously described. Deletion of PGN_1547 resulted in a decrease in P. gingivalis' virulence, the ability to form biofilms, and hemagglutination, when compared to the wild-type, without affecting the growth rate. These results show that the Cas3 gene in P. gingivalis is part of the toolbox that this organism uses to modulate the host response, and the hypothetical protein PGN_1547 is most likely a new adhesin involved in the virulence of P. gingivalis.

PRESENTER(S): Kern, Faith; Pan, Cheng-Yen; Castellano, Ronald K.
AUTHOR(S): Kern, Faith; Pan, Cheng-Yen; Castellano, Ronald K.
FACULTY MENTOR(S): Ronald Castellano

Hydrogen Bonded, Pi-Conjugated Molecules for Organic Solar Cell Applications

Organic photovoltaics (OPVs) are an attractive source of electricity due to their environmental sustainability. Currently, the bulk heterojunction (BHJ) design is used which has an active layer formed by blending electron donor and acceptor organic materials. Well-designed molecular structures can help derive ideal structure-property relationships and control morphology in the active layer. Previous studies have proven that self-assembling pi-conjugated donor materials that utilize hydrogen bonding could enhance the efficiency of OPV devices. This research aims to improve upon this approach by developing a new donor-acceptor molecule, which improves pi-pi interactions, called QPH. Characterizing QPH with proton and carbon NMR and IR spectra confirms its structure and geometry. Additionally, QPMe, an important comparator molecule to QPH, was designed and synthesized. Here the PH functional group on QPMe is blocked by methyl groups, so the hydrogen-bonding interactions are "turned off". A new molecule, TQPH, is being synthesized as the next generation of QPH-based molecules. TQPH is characterized by its hydrogen bonding capabilities and extended pi-conjugation in comparison to QPH's smaller pi-conjugated system. The synthesis and testing of TQPH will help to determine if the extended pi-conjugation makes a more efficient molecule for organic solar cells in this context.

PRESENTER(S): Patrick Grey
AUTHOR(S): Patrick Grey
FACULTY MENTOR(S): Philip Janzen

“Reconceptualizing Resistance to Social Death: Anna Madgigine Jai Kingsley’s Journey Through the Atlantic World”

A challenge embraced by scholars studying the Black Atlantic is using microhistory to explore the limitations of the archive. In Domingos Álvares, James Sweet explored the development of intellectual history in the eighteenth-century African Diaspora through healing. While historiography on other Africans such as Olaudah Equiano, has even been debated as shown by Vincent Carretta’s Equiano, the African. In a compelling narrative, Daniel Schafer’s Anna Madgigine Jai Kingsley draws out a distinctive life in nineteenth-century Florida giving historians insight into how African women’s experiences of displacement and commodification in the Black Atlantic have gone silent. Anna Jai was born a royal princess in Senegal, and by thirteen, she was kidnapped and sold as an Atlantic commodity. Schafer’s inclusion of a transatlantic approach to understanding slavery under different geographic contexts is crucial, yet its scope excludes the links between resistance, slavery, and black slave-ownership in Florida. I investigate how Anna Jai resisted the social, economic, and legal systems in nineteenth-century Florida. Building on Schafer’s research, oral history interviews, and complementing her story with other microhistories of freedwomen, my investigations show that Anna Jai resisted commodification using the intersections of her identity and her knowledge of the Spanish and American sociopolitical systems.

PRESENTER(S): Victoria Karaluz
AUTHOR(S): Victoria Karaluz, Zina Uckeley, Josmar Polanco, Megan Stanifer, Steeve Boulant
FACULTY MENTOR(S): Megan Stanifer

The Impact of Hypoxia on Cryptosporidium parvum Infection of Intestinal Epithelial Cells

Cryptosporidium parvum (C. parvum) is a eukaryotic single-celled enteric pathogen that causes intestinal inflammation and diarrhea, and can cause potentially life-threatening disease in immunocompromised individuals. C. parvum enters the intestinal tract by ingestion and is activated by bile acids in the stomach of the host, allowing the parasite to invade intestinal epithelial cells (IECs). The gut epithelium consists of a thin layer of IECs that form invaginations (crypts) and protrusions (villi) to absorb nutrients. Within these structures exists an oxygen gradient, with low oxygen level (hypoxia) at the tip of the villi, and increasing oxygen level towards the crypts (normoxia). Thus, C. parvum infects IECs in a hypoxic environment, but in vitro research has mainly been done in normoxia. We have discovered that C. parvum replication is significantly increased in hypoxia. The aim of this project is to further investigate this phenomenon by exploring the mechanism by which hypoxia affects C. parvum replication. IECs largely sense hypoxia via the transcription factor hypoxia inducible factor 1 (HIF-1) and undergo a range of metabolic and structural changes. This project will provide a better understanding of how oxygen level in the gut epithelium contributes to parasite infection.

PRESENTER(S): Michael Guyot
AUTHOR(S): MICHAEL GUYOT, CLIVE WASSERFALL, KIERAN M. MCGRAIL, MARTHA CAMPBELL-THOMPSON, MICHAEL J. HALLER, BRITTANY S. BRUGGEMAN
FACULTY MENTOR(S): Brittany Bruggeman

Using Artificial Intelligence in Pancreatic Cell Classification

We developed Artificial Intelligence classification algorithms in QuPATH containing both supervised and unsupervised components to quantify and classify the pancreas cell types into their respective subtypes based on immunofluorescence (IF) data. The panel was performed in formalin-fixed paraffin embedded (FFPE) pancreatic tissue sections from an organ donor with no diabetes provided by nPOD. From the IF images, a training region was selected. This region was then segmented using a watershed algorithm and then an expert classified each cell in the region. In total, there were 6,899 cells, with an emphasis on the exocrine cell types. This training data was used to train a Random Trees (RT), K Nearest Neighbor (KNN) and Artificial Neural Network (ANN) algorithm. Another region was selected for a validation data set, and once again, each cell was manually classified by an expert in the field. The accuracy of each algorithm was then assessed on the validation set. The accuracy of each algorithm is as follows: RT (89.53%), KNN (85.55%) and ANN (82.97%). In the future, we will include multiple no diabetes pancreases as well as pancreases from the different stages of T1D progression to ensure diversity of the training and validation data.

PRESENTER(S): Sonny Russano
AUTHOR(S): Sonny Russano
FACULTY MENTOR(S): Seth Bernstein

Incompatible Justice: The Statement on Atrocities and the American Opinion of Soviet Justice

On November 1, 1943, the Grand Alliance released the communique from the Moscow Conference, which included the Statement on Atrocities, a rebuke of the inhumane crimes of Nazi Germany and a warning that perpetrators would be brought to justice. The Statement raised several questions: how would these criminals be brought to justice? When would they be brought to justice? Under what legal principles, if any, would the Allies employ? In the following months, the US and USSR would answer those questions in the context of their own policies, and in doing so, frustrate hopes of collaboration in justice. The USSR's answer manifested in the Kharkov trial, where it read its conception of justice into the Statement on Atrocities and led the US into an uncomfortable position: either attempt to enforce the American interpretation of the Statement on Atrocities onto the USSR or maintain good relations within the tripartite. Scholarship does not expound on how wartime events such as the Kharkov trial were the beginning of the dissension that would become the Cold War. This paper discusses how the US interpretation of the Kharkov trial exhibits another dimension of wartime Soviet-American relations that contextualize later disputes and the Cold War.

PRESENTER(S): Rishika Podarala
AUTHOR(S): Rishika Podarala, Keith Choe
FACULTY MENTOR(S): Keith Choe

C. elegans present density-dependent sex-bias in stress response to cold shock

Sexual dimorphism in health and aging is well documented, but investigations into underlying mechanisms have only recently begun. Exposure to environmental stress activates genetic response pathways that directly impact disease and aging, however, the role of biological sex is largely overlooked. The nematode Caenorhabditis elegans is a well-established genetic model for stress responses, aging, and sexual differentiation. C. elegans have males, however studies primarily focus on the more common hermaphrodites. We recently showed that male C. elegans have a greater resistance to high temperature and toxins. Here, we compared resistance to cold-shock, a distinct form of environmental stress experienced by free-living nematodes. To test if sex influences this process, we exposed males and hermaphrodites to cold-shock (4°C) in two conditions: mixed-sex populations on agar growth media and as individuals in liquid media. The mixed sex culture assay showed a clear male bias in survival. Alternatively, when cultured individually there was no clear difference between the sexes. These results suggest that pheromones, worm interactions within and between each sex, or differences in culture media might influence resistance. Identification of sex-specific processes that influence stress resistance can help researchers understand how they may contribute to disease, aging, and treatments.

PRESENTER(S): Eliana Duarte
AUTHOR(S): Eliana Duarte, Anran Zheng, Duanya Lyu, Ksenia Velichko, Louis Merlin, John Renne, Serena Hermann, Xiang Yan
FACULTY MENTOR(S): Xiang Yan

Developing and Validating an Analytical Tool for Identifying Multimodal Mobility Hubs

In recent years, mobility hubs (MHs) have emerged as a way to promote the seamless integration of various travel modes. MHs provide supporting infrastructure, amenities, and services for multimodal travelers at strategic locations. While many cities and transit agencies have planned to develop MHs, an established methodology for selecting candidate sites for MH implementation is still lacking. We have developed a multi-criteria MH identification tool to locate ideal sites for MH development. The method has five steps: (1) cluster transit stops, (2) determine site selection criteria and variable weights, (3) compute composite score for each selected criterion, (4) construct suitability indexes for different levels of MHs (neighborhood, district, and regional) under different planning scenarios, and (5) identify a network of MHs for each scenario. Using this tool, we can create multiple MH networks under various planning scenarios, prioritizing different criteria such as public transit, first-/last-mile connections, existing infrastructure, equity, and spatial accessibility. To validate the method, we have developed an innovative survey that leverages crowdsourced mapping to seek community feedback on the proposed MH locations. The combination of data-driven and citizen science methods ensures that the final MH network is strategically placed and reflects the needs of the potential users.

PRESENTER(S): Brianna McDonald
AUTHOR(S): Laura Falceto Font, Dan Jin, Bayli DiVita Dean, John W. Figg, Connor P. Francis, Alexandra Reid, Kaytora Long-James, Brianna McDonald, David Hilferty, Hector R. Mendez-Gomez, Fernanda Pohl-Guimarães, Duane A. Mitchell, Zubaidan Tuerdi, Evelyne Lauret, and
FACULTY MENTOR(S): Catherine Flores

Genetic Engineering of Hematopoietic Stem and Progenitor Cells

Hematopoietic stem and progenitor cells (HSPCs) are uniquely useful in clinical treatments of various diseases, including an array of cancers, due to their distinct capacities for multipotency and self-renewal. However, the effectiveness of pre-existing gene-editing techniques based on the use of murine and human HSPCs in preclinical and clinical settings, respectively, are limited by HSPCs' quiescent nature, scarcity in bone marrow, and innate immunity to gene therapy reagents. Furthermore, the briefness of their undifferentiated state in vitro obstructs the modification of these cells. This study explores and describes the efficacy of a variety of modification methods on both murine and human HPSCs. The techniques include shRNA lentiviral delivery, RNA electroporation, CRISPR, and adeno-associated viral delivery. Advances in understanding and harnessing of these methods wield promise in the improvement of immunotherapy outcomes in brain tumors.

PRESENTER(S): Caroline Rabideau
AUTHOR(S): Caroline Rabideau
FACULTY MENTOR(S): Conor O'Dwyer

Communist Legacy in the CEECs and its Impact on Women's Political Affiliation

The struggle of equal representation for women in European parliaments is affected by many factors. The historical impact of communism and the parties' women choose to align with are two underlying factors that are under explored in the existing literature. In this study, I ask the question, how does a communist legacy in the Central and Eastern European Countries (CEECs) impact the political affiliations of female legislatures in national parliaments? I will answer this question using a regression analysis and the interaction effect in order to compare East to West and women to men. I have found a significant correlation between the affiliation of men and women across the political spectrum in their national parties due to both their gender and their country's communist legacy. There is a significant division between the representation of women in the West and East, with a significant proportion of female representation in conservative parties in the CEECs. The factors behind these historical divisions has critical theoretical implications in the study of women in Europe. As women continue to make strides in the CEECs, their political affiliation will impact the future of politics and how feminist issues are discussed in the region.

PRESENTER(S): Tushar Desaraju
AUTHOR(S): Tushar Desaraju*, Syam Jeepipalli, Luz de Aquino Martins AR, Sandhya R. Nadakuditi, P. Gurusamy, Eduardo Colella, Edward K. L. Chan, and L. Kesavalu
FACULTY MENTOR(S): Kesavalu Lakshmyya

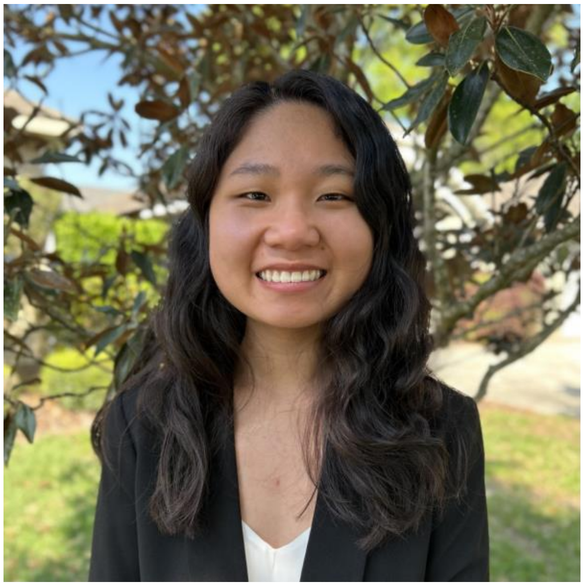
Exploring the Impact of TLR2 Signaling on Alveolar Bone Resorption after Ecological Time-sequential Polybacterial Periodontal Infection in the TLR2-/- mice

INTRODUCTION: Periodontitis (PD) is a polymicrobial dysbiotic chronic inflammatory disease caused by microbes interacting in the host subgingival sulcus/pocket. Streptococcus gordonii, Fusobacterium nucleatum, Porphyromonas gingivalis, Treponema denticola, and Tannerella forsythia are common co-colonizers of the supra- and subgingival sulcus/pockets in humans. Toll-like-receptor 2 (TLR2) signalling contributes to infection-induced inflammation in PD. The OBJECTIVE of this investigation was to determine alveolar bone resorption (ABR) after ecological time-sequential polybacterial periodontal infection (ETSPPI) with S. gordonii, F. nucleatum, P. gingivalis+T. denticola+T. forsythia in TLR2-/- mice. METHODS: Ten-week-old male and female TLR2-/- mice (n=16) were used for polymicrobial infection (Group I) and sham-infection in TLR2-/- mice (Group II). Both maxilla and mandible were harvested after 17 weeks of infection. The jaws were autoclaved, defleshed, immersed in hydrogen peroxide, and were stained with methylene blue. Two-dimensional molar teeth images were captured. The area between the cemento-enamel junction (CEJ) to the alveolar bone crest (ABC) of the jaws was measured. RESULTS: TLR2-/- mice exposed to 17-week-polymicrobial infection did not result in significantly enhanced ABR compared to sham infection. CONCLUSION: The bacteria colonized on the gingival surface in the polybacterial TLR2-/- infected mice but did not induce enhanced ABR may be due to lack of TLR2 receptor.

PRESENTER(S): Sydney Dick, Emma Heidelberg, Brianna Hiers, Michael Valuta, Gianna Degracia, Tyler Favier, Lindsey Rodriguez
AUTHOR(S): Sydney Dick, Emma Heidelberg, Brianna Hiers, Michael Valuta, Gianna Degracia, Tyler Favier, Lindsey Rodriguez
FACULTY MENTOR(S): Lindsey Rodriguez

Influence of Attachment Style on Perceptions and Reactions to Partner Drinking

This study explores the relationship between alcohol consumption within romantic relationships and the perception of a partner's drinking problem, considering the influence of differing attachment styles. Attachment theory identifies three primary attachment styles: secure, anxious, and avoidant. It was hypothesized that the quantity and frequency of a partner's drinking would be positively correlated with the perception of a drinking problem and that these perceptions and reactions would vary according to the individual's attachment style. Specifically, it was anticipated that anxiously attached individuals would be more sensitive to their partner's drinking behaviors, perceiving them more negatively and engaging in more punitive actions, whereas avoidantly attached individuals would minimize the significance of their partner's drinking issues. The results showed that partner drinking was related to perceiving a problem for both anxious and avoidant attachments. Additionally, partner drinking was associated with more punishment behaviors towards partner for both anxious and avoidant attachment. However, partner drinking was not differentially related to reward for non-drinking based on attachment style. Lastly, the perception of a partner's drinking mediates the relationship between actual partner drinking and punishment across all attachment types, with the effect being stronger for higher levels of insecure attachment.



PRESENTER(S): Hannah Strother
AUTHOR(S): Hannah Strother, Malú Gámez Tansey, Alfonso Martín-Peña
FACULTY MENTOR(S): Alfonso Martín-Peña

The Role of the Pro-inflammatory TNF Signaling Pathway in Prodromal Sleep Disturbances of Synucleinopathies

Neuroinflammation is a hallmark of most neurodegenerative disorders, including Parkinson's Disease (PD). In PD, alpha-synuclein accumulates and triggers neuroinflammation and dopaminergic neuron loss, while the tumor necrosis factor (TNF) induces neuroinflammation by promoting the expression of multiple pro-inflammatory genes. We then investigated the role of the fly TNF, eiger, and several other members of the Drosophila TNF signaling pathway in sleep and locomotion. Fly locomotion and sleep

were assessed using Drosophila Activity Monitors (DAM2). Flies were housed individually while an infrared laser beam detected their movement for a 24-hour period of 12h-light:12h-dark. Flies expressing human alpha-synuclein bearing the PD-associated mutation A53T did not show any motor deficiency until day 20, providing a period for investigating the prodromal mechanisms. During this period, flies expressing human alpha-synuclein showed day-time sleepiness and elevated eiger expression. Consistently with these findings, overexpression of eiger, misshapen, and jun-related antigen also led to an increased day-time sleepiness. In conclusion, alpha-synuclein expression in Drosophila dopaminergic neurons promotes day-time sleepiness and activates the TNF signaling pathway. Since only upstream components of the pathway mimicked this phenotype, this effect may activate an alternative to the canonical TNF signaling pathway.

PRESENTER(S): Charisse Sproha
AUTHOR(S): Charisse Sproha, Makenzie Mabry, Pam Soltis, Doug Soltis
FACULTY MENTOR(S): Pam Soltis

Ecological Niche Modeling of Endemic Plant Species in the Florida Scrub

The sand scrub habitat is a unique habitat in Florida with biodiversity that includes many species of endemic plants and wildlife. These areas are quickly contracting and disappearing due to residential and agricultural development. The Florida scrub habitat is now federally endangered with 34 % lost to development and only 34 % of the total habitat protected. The unique plant community of Florida scrub is vital to the ecosystem, many of the species are listed as endangered and some are endemic to Florida. This study aims to develop ecological niche models for 36 endemic plant species that occur in Florida scrub habitat. Additionally, models will be projected to future climate models to explore if species ranges expand, contract, or remain the same. We use the global databases iDigBio and GBIF to download occurrence points for the species and WorldClim for environmental variables. The models can then be used to help make predictions about the vulnerability of the Florida scrub resulting from climate change and how the plant community will shift and change as a result of climate change.

PRESENTER(S): Xinyue Wang
AUTHOR(S): Xinyue Wang, Clebson S. Tavares, Ruchir Mishra, Bryony C. Bonning
FACULTY MENTOR(S): Bryony Banning

Bacillus thuringiensis-Derived Pesticidal Proteins Toxic to the Whitefly, Bemisia tabaci

The sweet potato whitefly, Bemisia tabaci, is a highly destructive global agricultural pest. B. tabaci causes extensive damage to a wide range of host plants including field and ornamental crops. Current management strategies entailing extensive use of chemical pesticides, particularly neonicotinoids, have raised concerns about ecological and health risks. While pesticidal proteins from Bacillus thuringiensis (Bt) and other entomopathogenic bacteria could provide an environmentally friendly alternative for B. tabaci management, only one protein has previously been shown to be active against B. tabaci. Here we report on the toxicity of 11 Bt-derived pesticidal proteins from several different structural classes against B. tabaci Middle East-Asian Minor 1 (MEAM1). These proteins were either expressed in Bt and purified from crystals, or expressed in Escherichia coli and purified from inclusion bodies or His-tag affinity chromatography. The toxicity of purified proteins was first assessed by feeding adult whiteflies on a single dose followed by lethal concentration (LC50) determination for proteins with significant mortality relative to the buffer control. The proteins Tpp78Aa1, Tpp78Ba1, and Cry1Ca were toxic to B. tabaci with LC50 values of 99, 96, and 351 μg/mL, respectively. These proteins may provide valuable tools for the integrated management of B. tabaci populations.

PRESENTER(S): Ryan Hoffmann
AUTHOR(S): Ryan M. Hoffmann, Michael W. Dougherty, Yougant Airan, Raad Z. Gharaibeh, Seth B. Herzon, Ye Yang, and Christian Jobin
FACULTY MENTOR(S): Christian Jobin

PSMD4 facilitates cell-cycle arrest following colibactin-mediated DNA-damage

BACKGROUND: Colibactin is a secondary metabolite produced by members of Enterobacteriaceae that induces a genotoxic effect on intestinal epithelial cells. We identified the 26S proteasome ubiquitin receptor (PSMD4) as a colibactin-sensitizing gene using genome-wide CRISPR/Cas9 knockout screens. How PSMD4 regulates colibactin response remains unclear. METHODS: We transduced HT29 cells with two lentiviral delivered CRISPR/Cas9 guides targeting PSMD4 to generate knockout cells (PSMD4-/-) and quantified knockout efficiency using TIDE software to detect base pair changes and indel frequency along the expected break site. PSMD4 impact was measured on cell viability, cell cycle arrest, colony formation, and gH2AX foci after exposure of PSMD4-/- cell to synthetic colibactin 742. RESULTS: Lentiviral transduction showed 65.4% (guide 1) and 77.8% (guide 2) PSMD4 knockout efficiencies. Untreated PSMD4-/- cells grew slower than untreated not-target control (NTC) cells. PSMD4-/- HT29 cells showed reductions in G2/M arrest and higher viability after 24-hour treatment with 742. Moreover, higher relative colony formation rates and sizes were observed in PSMD4-/- HT29 cells compared to NTC cells. However, there was no change in gH2AX foci between cell lines following treatment. CONCLUSIONS: Our findings suggest PSMD4 is implicated in colibactin-induced cell-cycle arrest. PSMD4 defective cells may accumulate higher mutational load following colibactive exposure.

PRESENTER(S): Hafsa Ouaakki
AUTHOR(S): Hafsa Ouaakki
FACULTY MENTOR(S): Daiqing Liao

PROTAC-based HDAC 3/8 Degraders as a Cancer Therapeutic for Epithelial Cancers

Aberrant epigenetic modifications underpin oncogenic gene expression and contribute to tumorigenesis, therapeutic resistance, and cancer progression. Histone deacetylation results in a condensed chromatin state that is associated with gene silencing through transcriptional repression. Targeting histone deacetylase (HDAC) enzymes using highly selective proteolysis targeting chimeras (PROTACs) has been a focus of cancer therapeutic development due to downstream effects in cell-cycle regulation, DNA repair, and apoptosis. Here we demonstrate the efficacy of the PROTAC-based HDAC 3/8 degrader, YX22968 and the negative control YX24912-NC, on colony formation of four carcinoma cell lines: two non-small cell lung cancer cell lines H1299 and A549, the colorectal cancer cell line HCT116, and the triple-negative breast cancer cell line BT549. Our findings indicate that YX22968 is more effective in preventing growth of A549 and BT549 while YX24912-NC was able to limit growth of H1299 and HCT116. These results suggest that PROTAC-based HDAC 3/8 degraders can be used to restrict growth of carcinomas and highlight their ability as a potential clinical treatment for cancer.

PRESENTER(S): Simran Lamba
AUTHOR(S): Simran Lamba, Scott A. Teitelbaum, Apollonia E. Lysandrou, Ben Phalin, Jason Hunt, Laurie Solomon, Amanda Janner, Kent Mathias, & Ben Lewis
FACULTY MENTOR(S): Ben Lewis

Addiction and Patient Care: A Novel Instrument to Assess Attitudes Across Treatment Among Impaired Professionals

Treating substance use disorders (SUDs) among healthcare professionals (HCPs) encompasses unique challenges and measures of progress. For instance, workplace impairment can have potentially life-threatening consequences; thus, it is crucial to assess the improvement of such insight within the context of SUD recovery/treatment among HCPs. However, no standard measures adequately capture attitudes regarding the consequences of substance use to patient care. To address this limitation, we present a novel measure, the FRC Patient Care Impact Questionnaire (FRC-PCI), directed at capturing such insight and discuss preliminary longitudinal data describing how attitudes toward workplace function change across treatment. The FRC-PCI was administered to HCPs (N=40) at intake, ~30 days, and discharge. Longitudinal mixed models were used to capture changes over time. Results revealed that although HCPs reported low impact scores at intake (M=25.8/80), dramatic improvements were made at both the follow-up (M=42.8/80; p<.001) and discharge (M=52.0/80; p<.001) assessments. This highlights the utility of incorporating such metrics in SUD treatment to capture HCP's progress in understanding the serious consequences of substance use on patient care and workplace performance. Not only will this aid the recovery of HCPs, but it will also protect the lives of their patients.

PRESENTER(S): Angie M Cordova
AUTHOR(S): Angie M Cordova, Faith E Gilbert, Hannah M Engle, Caitlin M Traiser, Arash Mirifar, Christian Panitz, Jourdan Pouliot, Laura C Ahumada Hernandez, Ethan Smith, Ruogu Fang, Mingzhou Ding, Andreas Keil
FACULTY MENTOR(S): Andreas Keil

Using Ratings in Evaluative Affective Space as a Metric of Individual Differences

Introduction: Affective ratings are a robust index of emotional dispositions towards media such as pictures, sounds, or movies. Prior research suggests that there are strong effects of sex as well as emotional psychopathology status. The question arises regarding the usefulness of dimensional ratings as a marker of the emotional state of a given observer. Methods: The present study uses 60 original images from the International Affective Picture Set (IAPS), and 60 AI-generated matching emotional pictures, including pleasant (20), neutral (20), and unpleasant (20), for a total of 120 images. These are rated by 60 young and healthy observers, to span an affective space for each observer that was quantified as the correlation between valence (displeasure) and arousal (intensity). The resulting correlations were examined for retest reliability, sex differences, and their correlation with self-reported emotion psychopathology symptoms. Results: Results showed that retest reliability was 0.8, illustrating a strong correlation. Also, strong effects of sex and gender, with women showing evidence of greater aversive affect compared to men. However, there were no correlations between the affective space features and the self-reported symptoms. Discussion: Further investigation includes a larger sample size and psychophysiological methods of measuring emotional dispositions, such as electroencephalogram (EEG).

PRESENTER(S): Warren Boschen
AUTHOR(S): Warren Boschen, Rosalind Sadleir, and Thomas Mareci
FACULTY MENTOR(S): Thomas Mareci

Magnetic Resonance Electrical Impedance Tomography (MREIT) to Assess Distribution of Applied Current to the Brain

Transcranial electrical stimulation (tES) is a noninvasive therapeutic technique which involves passing current through the brain to alter function. tES is safe and has been used in such cases as stroke rehabilitation, epilepsy treatment, and cognitive/motor/linguistic/memory performance improvement. Nevertheless, little is known about the underlying mechanisms behind tES. Knowledge of the exact current distribution formed in the brain by the application of external current would clarify many contradictory study outcomes, and further linking such current distributions with functional brain activity may provide insight into the biological mechanisms surrounding tES. To this end, magnetic resonance electrical impedance tomography (MREIT) allows current density and conductivity imaging in vivo. MREIT data were acquired, and magnetic field maps from injected current were generated using MATLAB code developed in-house. Part of the magnetic field strength that was found is attributed to the current-injecting wires near the brain generating their own magnetic field as well. We are currently developing an algorithm to track the position of these wires and calculate their associated magnetic field, using the Biot-Savart law, to remove the magnetic field contribution from these wires. We show magnetic field maps and initial wire tracking results.

PRESENTER(S): Sydney Dick
AUTHOR(S): Sydney Dick, Emma Heidelberg, Brianna Hiers, Michael Valuta, Gianna Degracia, Tyler Favier, Dr. Lindsey Rodriguez
FACULTY MENTOR(S): Lindsey Rodriguez

Influence of Attachment Style on Perceptions and Reactions to Partner Drinking

This study explores the relationship between alcohol consumption within romantic relationships and the perception of a partner’s drinking problem, considering the influence of differing attachment styles. Attachment theory identifies three primary attachment styles: secure, anxious, and avoidant. It was hypothesized that the quantity and frequency of a partner’s drinking would be positively correlated with the perception of a drinking problem and that these perceptions and reactions would vary according to the individual's attachment style. Specifically, it was anticipated that anxiously attached individuals would be more sensitive to their partner's drinking behaviors, perceiving them more negatively and engaging in more punitive actions, whereas avoidantly attached individuals would minimize the significance of their partner's drinking issues. The results showed that partner drinking was related to perceiving a problem for both anxious and avoidant attachments. Additionally, partner drinking was associated with more punishment behaviors towards partner for both anxious and avoidant attachment. However, partner drinking was not differentially related to reward for non-drinking based on attachment style. Lastly, the perception of a partner’s drinking mediates the relationship between actual partner drinking and punishment across all attachment types, with the effect being stronger for higher levels of insecure attachment.

PRESENTER(S): Sabrina LaVopa
AUTHOR(S): Sabrina LaVopa
FACULTY MENTOR(S): Anna Peterson

Examining Ecofeminist Practices and Values in South and Southeast Asia

In this study, I explore the realm of ecofeminism within the context of the geographic regions of South and Southeast Asia, conveying the overlap between gender dynamics, environmental concerns, and social justice imperatives. Drawing upon a diverse range of established literature and empirical analyses, the research investigates the ways in which patriarchal structures intersect with environmental exploitation, impacting marginalized communities disproportionately. Through an intersectional lens, I examine how women in these regions navigate and resist ecological degradation, highlighting their agency and innovative practices in sustainable resource management, conservation efforts, and advocacy for environmental justice within their local communities. Furthermore, the research scrutinizes the role of indigenous knowledge systems, cultural practices, and grassroots movements in fostering ecological resilience and challenging dominant hegemonic systems of development. By synthesizing insights from diverse perspectives, this study contributes to a nuanced understanding of ecofeminist thought in the regions of South and Southeast Asia, offering valuable insights for advancing environmental sustainability, gender equality, and social justice agendas both regionally and globally.

PRESENTER(S): Katerina Anamisis, Noah Rakestraw, Dr. Piyush K. Jain
AUTHOR(S): Katerina Anamisis, Noah Rakestraw, Dr. Piyush K. Jain
FACULTY MENTOR(S): Piyush Jain

CRISPR-mediated genome editing tool development for targeting and addressing USH2A mutation for patients with Usher syndrome type II

Usher syndrome, a rare genetic disease affecting hearing and vision, is an autosomal recessive condition affecting 4 to 17 per 100,000 people and accounting for about 50 percent of hereditary deaf-blindness cases. There are three types of Usher syndrome, and type II is the most common. Usher syndrome type II is caused by mutations of the USH2A gene, a 15.7 kb gene encoding the protein usherin, which localizes to photoreceptor cilium and cochlear hair cells. This subtype of Usher syndrome includes hearing loss from birth and progressive loss of vision, prompting retinitis pigmentosa (RP). In RP, the photoreceptors progressively lose function, causing loss of peripheral vision that can lead to blindness by midlife and decreased night vision by adolescence. My objective is to develop a CRISPR-mediated prime editing tool to target and address the USH2A mutation of interest. My project consists of three steps: inducing the mutation in HEK293T cells and producing a cell line with this mutation, testing prime editing tools to target and address this mutation, and testing the prime editor on organoids and mouse models. My goal is to apply a CRISPR-mediated prime editing tool to correct USH2A gene mutations for future use in clinical trials.

PRESENTER(S): Lauren Roberts
AUTHOR(S): Lauren Roberts, Devan Rawn, Cameron Jack
FACULTY MENTOR(S): Cameron Jack

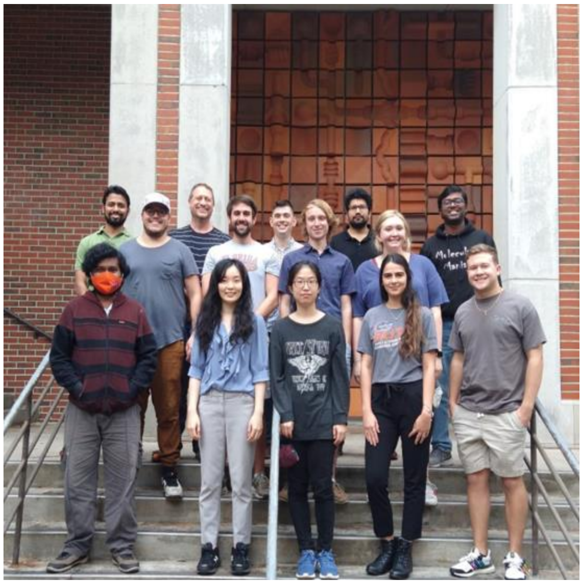
Evaluating the Impact of Oxalic Acid Vaporization on Honey Bee (Evaluating the Impact of Oxalic Acid Vaporization on Honey Bee (Apis mellifera) Drone Reproductive Health) Drone Reproductive Health

The annual Bee Informed Partnership national survey of U.S. beekeepers consistently identifies queen failure as a top three colony stressor. Although often overlooked, drone health directly impacts queen productivity and longevity. To date, there have not been any studies on the effects of oxalic acid vaporization on drone larvae. The purpose of this study is to evaluate the effect of oxalic acid, a widely used organic miticide, on drone reproductive health when applied via vaporization during the late larval stage. During May-August 2023, honey bee colonies were requeened with sister queens of European-derived honey bee stock. Groups were treated with varying oxalic acid doses at 1g, 2g, and 4g per brood chamber, and two groups served as the controls being treated with ice (negative control) and Apivar® (industry standard). Six to nine-day-old drone larvae were exposed to their respective treatments and were collected 20 d post-emergence for lab analysis. Data was collected on body mass, thorax mass, and sperm cell count and analyzed using traditional hemocytometry sperm counts. There was no correlation between sperm count and body mass in the 4g group, indicating the need for fluorescent staining kits in future work.

PRESENTER(S): Gianna Degracia
AUTHOR(S): Gianna Degracia, Brianna Hiers, Emma Heidelberg, Sydney Dick, Tyler Favier, Michael Valuta, Lindsey M. Rodriguez
FACULTY MENTOR(S): Lindsey Rodriguez

Unraveling the Web of Relationship Uncertainty, Electronic Intrusion, and Coping Mechanisms with Relationship Alcohol Problems

Individuals who feel more uncertain in their relationships tend to engage in electronic intrusion (EI), and in addition uncertainty in relationships causes drinking as a coping mechanism. The present study examines the dynamics between relationship uncertainty (RU), and relationship alcohol problems (RAP), with EI as a moderator and drinking to cope as a mediator. 1471 individuals across America (50% women) completed an online study through Qualtrics Panels. Measures included the Perpetration of Electronic Intrusion Scale, Relationship Uncertainty scale, and the Relationship Alcohol Problems scale. Regression models analyzing the dynamics revealed that higher levels of RU increase the likelihood of RAP. Additionally, these models revealed that higher levels of EI strengthened the relationship between RU and RAP. EI also strengthened the relationship between drinking to cope and RAP. RU and EI are significant predictors of drinking to cope, however an interplay of relationship uncertainty and electronic intrusion to predict drinking to cope is not significant. This suggests that relationship uncertainty and electronic intrusion both act independently from each other, which in turn mediates the impact on RAP. The findings highlight the need for these factors in interventions to ensure healthy relationships and to reduce the risk of interpersonal alcohol-related issues.



PRESENTER(S): Javier Hurst
AUTHOR(S): Javier Hurst, Rinku Yadav, Ion Ghiviriga, Christianna Brantley, Lukasz Dobrzycki, Adam Veige
FACULTY MENTOR(S): Adam Veige

Cyclooctyne Derivative of a Tungsten Cyclic Polymerization Catalyst

Cyclic polymers, which have unique physical properties compared to their straight-chain counterparts, are of great interest to researchers due to their potential applications in various industries like electronics, packaging, and coating. However, the efficient industrial-scale synthesis of cyclic polymers remains a challenge. Addressing this gap, Dr. Veige has developed a tungsten catalyst capable of rapidly and effectively polymerizing specific types of molecules containing triple bonds (alkynes). In this study, the focus lies on understanding the mechanism underlying this catalytic process and exploring the catalyst's interactions with small molecules. One such molecule under investigation is cyclooctyne, known for its high reactivity due to its ring strain. Upon reaction with the tungsten catalyst, two complexes are formed depending on the amount of cyclooctyne added. Upon further investigation, it has been observed that heating these complexes results in the formation of an isomer featuring a tether connecting the catalyst's active site to the growing polymer ring. Preliminary findings suggest that one of these complexes acts as a catalyst for cyclic polymerization. Ongoing research aims to ascertain if other complexes exhibit similar catalytic properties. Comprehensive characterization of all synthesized products is conducted using analytical techniques such as NMR spectroscopy, X-ray crystallography, and elemental analysis.

PRESENTER(S): Sadia Barua
AUTHOR(S): Sadia Barua, Elisha LePine, Erin Westgate
FACULTY MENTOR(S): Erin Westgate

Effect of Self-compassion intervention on negative outcomes associated with Social Comparison for College Students

Self-compassion can be promising to alleviate negative outcomes of social comparison. This study aims to test the efficacy of self-compassion interventions on the negative affect resulting from upward social comparison. Initial pilot study (800 participants) found a correlation between social comparison and self-compassion scales. An experimental study was conducted with 400 undergraduate participants in which all participants completed an intelligence test on which they were informed they would be evaluated. There was an experimental group who completed a self-compassion writing exercise and a non-intervention control group. Participants were shown their score on the intelligence test and of previous participants (manipulated feedback). Participants were able to view answers of one of these fictional participants. This choice served as a measure of social comparison preference. While it was expected that participants in the experimental group will have less negative affect and show lower preference for upward comparison compared to the control groups, there was no significant difference between the conditions in their upward social comparison preference. The experimental group experienced both heightened positive and negative affect compared to the non-intervention control group. This study gives crucial data on a population that experiences highest mental health issues related to social comparison.

PRESENTER(S): Logan Hoskins
AUTHOR(S): Logan Hoskins, Peter Jansen, Mimi Ghosh, Dr. Katelyn Swindle-Reilly
FACULTY MENTOR(S): Katelyn Swindle Reilly

silk fibroin bioinks for cornea scaffold printed in a soft matter gel medium

Over 48,000 surgeries are performed each year to replace damaged corneas, which has raised a need for ondemand replacements to reduce the need for donors. Silk Fibroin (SF) has gained attraction for its uses in biomedical applications and consistency as a biomaterial. However, the solution is of low viscosity, which creates an issue while 3D printing. At high concentrations the viscosity is improved but, beta sheets can form spontaneously causing irreversible gel formation, making it challenging to concentrate the SF solution. We plan to identify the ratios of different components that will provide the best properties for a bioink that can print a scaffold for anterior cornea tissue replacements. The aim for this project is to synthesize a bioink composed of concentrated SF with different ratios of gelatin methacrylate (GelMA), Agarose, and a photo crosslinking agent, Irgacure 2959. The GelMA and Agarose were tested separately and together with SF to improve viscosity while printing and structural integrity afterwards. The gels were printed in Carbopol, a soft granular gel, to maintain the 3D structure until the bioink was crosslinked with a UV light. The inks were evaluated for gelling temperature, shear rate and other properties using rheology to determine how they would be printed and their properties as a hydrogel. One hydrogel was chosen out of all 7 concentration and evaluated for printability. Results show that the combination of SF, GelMA, and Agarose in one ink can form a homogenous solution but further testing is needed to find optimal parameters. Further research can investigate cellular interaction with these scaffolds, as well transmittance and compressive strength once printed.

PRESENTER(S): Travis D. Truong
AUTHOR(S): Travis D. Truong, Marisa O. Pacheco, Whitney L. Stoppel
FACULTY MENTOR(S): Whitney Stoppel

3D Printed Scaffolds for the Proliferation of Rat Adult Cardiac Fibroblasts (rACFs)

3D printing technology is an advantageous tool in the production of biomaterials and field of tissue engineering. It provides flexibility in the development of scaffolds, hydrogels, and a variety of materials to fit an array of needs. The creation of scaffolds allows cells to grow in 3D space, an advantage for in vitro models in comparison to 2D counterparts (Duan et al., 2022). Digital light processing (DLP) is a form of 3D bioprinting involving the layer-by-layer ultraviolet (UV) photopolymerization of bio-inks. These bio-inks can come from a variety of sources, all offering their own unique properties (Su et al., 2022). We have designed scaffolds from some of these bio-inks using DLP printing to test the attachment and of rat adult cardiac fibroblasts (rACFs). Polyethylene Glycol Diacrylate (PEGDA), gelatin methacrylate (GelMA), and silk fibroin were all chosen to compare their efficacies as scaffolds for rACFs. Since many natural polymers are prone to physical crosslinking the 3D printed structures will be analyzed over time to characterize their dynamic behavior. Phenotypic responses of rACFs cultured within these scaffolds will be assessed via immunofluorescence microscopy and metabolic activity. Further research into these scaffolds offers promising value in the fields of regenerative medicine.

PRESENTER(S): Marianna Morales
AUTHOR(S): Marianna Morales, Branden Nguyen, Stephanie Lapierre-Nguyen, Dryden Baumfalk, Imtiaz Dowllah, and Ashley Smuder
FACULTY MENTOR(S): Thomas Clanton

Doxorubicin-induced Decreases in VO2Max and Adverse Changes to Body Composition are Prevented with Aerobic Exercise Training

Doxorubicin (DOX) is a chemotherapeutic agent known to cause unfavorable changes in aerobic capacity and body composition. Exercise is effective in counteracting these effects, yet the optimal exercise prescription is unclear. This study investigated the effects of moderate-intensity continuous training (MICT) and high-intensity interval training (HIIT) during DOX treatment and as a rehabilitation. DOX was administered to Sprague-Dawley rats every 3 weeks for 4 total cycles. MICT consisted of running at ~70% VO2max, 1 hour/day 3x/week. HIIT consisted of 10x1 minute running bouts at ~90% VO2max, 3x/week. Exercise groups trained during treatment and rehabilitation (CR) or only during rehabilitation (R). VO2max testing and dual x-ray absorptiometry were completed at: baseline, end of treatment, and end of rehabilitation. VO2max decreased and fat mass increased in sedentary rats after DOX treatment and was exacerbated through rehabilitation. Only HIIT-CR maintained VO2max in DOX-treated animals, while HIIT-R reversed decreases in VO2max during rehabilitation. MICT-CR and HIIT-CR prevented increases in fat mass and HIIT-R was able to reduce fat mass. These findings demonstrate that HIIT prevented DOX-induced adverse changes in aerobic capacity and body composition. In conclusion, HIIT may be a superior exercise compared to MICT for attenuating the effects of DOX.

PRESENTER(S): Michael Valuta
AUTHOR(S): Valuta, M., Degracia, G. , Dick, S., Favier T., Hiers, B., Heidelberg, E., & Rodriguez, L.
FACULTY MENTOR(S): Lindsey Rodriguez

Intrusion in Love: Conflict, Trust, Uncertainty & the Impulsive Factor

This study investigates the relationship between conflict in romantic relationships and electronic intrusion, considering the mediating roles of dyadic trust and relationship uncertainty and the moderating effect of impulsivity. In a sample of adult participants across the United States (n=754; 50% women) who completed a survey remotely on Qualtrics Panels, we found that high conflict in romantic relationships is associated with decreased dyadic trust and increased relationship uncertainty. Furthermore, the link between conflict and electronic intrusion is mediated by relationship uncertainty but not trust when impulsivity is not accounted for. Notably, the association between trust and electronic intrusion varies based on impulsivity, being significant only at average and higher levels of impulsivity. Similarly, the association between relationship uncertainty and electronic intrusion varies as a function of impulsivity, being significant only at average and high levels. These findings suggest that conflict in romantic relationships can lead to electronic intrusion, and that uncertainty and lack of trust in the relationship affect this outcome. Moreover, an impulsive person in a romantic relationship is more likely to perpetrate their partner's electronic devices. Overall, it is important to consider various factors of romantic relationships to understand and address electronic intrusiveness in relationships.

PRESENTER(S): Simone Schafer
AUTHOR(S): Simone Schafer
FACULTY MENTOR(S): Autumn McClellan

Mental Health stigmas and outreach behaviors within the Caribbean and Latin America diaspora.

This research analyzes the mental health stigmas held by college students who self-identify as Caribbean, Afro-Caribbean, and Latin American, as well as mental health outreach behaviors. Previous studies have analyzed some populations within the Latin American and Caribbean diaspora, and others have examined mental health stigmas and outreach behaviors of college students but not of this specific population. This study used a quantitative survey posted around the University of Florida campus and sent out to student groups with potential community members. Key distinctions that will be addressed in the study: 1. How familial values influence these mental health beliefs and help-seeking behaviors. 2. If immigration timing to the U.S, ex: whether an individual is born in the U.S. or another country plays a role in stigmatization and outreach. 3. If parental age, both the age of their parents when having children and what generation the parent is, factors into mental health attitudes and behaviors. I hypothesize that familial values influence mental health attitudes, with U.S.-born individuals showing lower stigma and increased help-seeking. Those born to teenage parents can struggle to recognize issues, while those with parents in their twenties experience less stigmatization than thirties-born individuals.

PRESENTER(S): Gretel Garcia
AUTHOR(S): Gretel Garcia, Sharon DiFino
FACULTY MENTOR(S): Sharon DiFino

Bilingual Spanish Healthcare Providers vs. Interpreters: Do Bilingual Healthcare Providers Offer Better Quality Of Care?

There are 25.7 million individuals ages five or older in the United States identified with limited English proficiency (LEP) with Hispanics accounting for 62% of this population (Haldar et al., 2023). LEP refers to individuals, who have limited language skills (reading, writing, listening comprehension, and speaking) that impact effective communication. Even though 19% of the US population is Hispanic, only 6% of physicians identify as Spanish speaking (Balch, 2023). A study of 25 participants revealed that Spanish-speaking healthcare providers attending to Hispanic patients led to notably higher levels of satisfaction and comfort as opposed to care provided by interpreters (Lopez Vera et al., 2023). Thus, the need to investigate the challenges language barriers have in healthcare and the necessity to implement strategies for effective communication and healthcare equity in diverse populations. Lack of professional interpreters or bilingual healthcare providers in the medical setting can lead to misdiagnoses, potentially fatal outcomes, and patient dissatisfaction with their healthcare experience. This study indicates the impact of bilingualism on quality of care, healthcare outcomes, and patient satisfaction as it investigates the advantages of direct communication between patients and healthcare providers, or interpreters, who share a common language.

PRESENTER(S): Maya Fives
AUTHOR(S): Maya Fives, Dr. Matthew Hallett
FACULTY MENTOR(S): Matthew Hallett

Wildlife Temporal Behaviors in Response to Human Activity Changes During and Following COVID-19 Park Closures

With urbanization reducing the amount of available wildlife habitat and outdoor recreation increasing the human activity within wildlife habitats, it is important to understand the effects of the interactions between wildlife and humans. This study examined how the reduction in human presence in urban parks affects the temporal behaviors of medium- and large-bodied mammals and ground birds. Camera-trap surveys were conducted during (2020) and following (2023) the COVID-19 closure of urban parks that are typically open to human recreation, with the shutdown providing a unique opportunity to study wildlife both with and without human activity. We detected biologically significant shifts in activity patterns that were consistent with avoidance of increased predator (bobcat, coyote, fox) activity during the COVID-19 shutdown and with avoidance of human activity (white-tailed deer) when the parks were re-opened. Temporal behavior pattern shifts can have significant effects on foraging/hunting, reproduction, and socialization as time of day is an important aspect to an animal's niche and can ultimately effect population dynamics at a species and community level. The data can inform regulations on public recreation and wildlife population management within urban parks and the Florida Wildlife Corridor—the state's best effort to offset increasing population and development.

PRESENTER(S): Maeve Barger
AUTHOR(S): Maeve Barger
FACULTY MENTOR(S): Kimberly Wiley

"---It Needs a Reboot": How Motivations Inform French and American Child Welfare Employee Experiences

Both the French and American child welfare systems struggle with employee turnover. To address this issue, more research is needed on child welfare employees' motivations to start and continue working in the child welfare system, as well as the factors that cause them to leave the field. This qualitative study examined the following research question: What are the differences and/or similarities between child welfare employee motivations in France and the United States? The research design analyzed twelve French videos about child welfare employees' career motivations and experiences, through a content analysis and twelve American child welfare employee interviews through thematic and open qualitative coding methods. The expected findings for this study are that French and American child welfare employees express similar motivations for working in the child welfare system, such as building relationships with children and families, as well as impacting the next generation. Yet, they may articulate their motivations differently, with American child welfare employees using more emotionally charged language when discussing their motivations and the French child welfare workers being more concise and discrete. Understanding child welfare employees' motivations in both countries will offer human resource policy implications to guide employers in retaining and supporting high-quality employees.

PRESENTER(S): Caleb Koresh
AUTHOR(S): Caleb Koresh, Emma MacKie, Michael Field
FACULTY MENTOR(S): Emma MacKie

Automatic Anisotropy Detection

The study of glaciers and modeling their effects on sea level often depends on sparse topographic datasets. Improving the accuracy of topographic modeling can provide tighter constraints and reduce uncertainty in climate change models. These topographies are frequently anisotropic, or directionally correlated, and knowledge about the direction of anisotropy can increase the accuracy of topographic modeling. Glaciology is still a relatively new field, and thus far there has been little development of methods to determine the direction of anisotropy automatically. We propose using simulated annealing to stochastically approximate the direction of anisotropy in sparse datasets. Simulated annealing is an optimization technique that can sample different directions of anisotropy and compute metrics indicating their degree of anisotropy in the given direction. This allows for intelligent sampling which converges on the angle of greatest anisotropy. We found the algorithm to be effective and efficient. We used this technique to develop a GitHub repository and applied it to the sparse topographic data from Greenland. These results can be visualized using quiver plots. The code for computing anisotropy locally or over a large dataset, and for its visualization is provided in the GitHub and will be applied to other locations in the future.

PRESENTER(S): Pierce Barron
AUTHOR(S): Pierce Barron, 2023 Fall CURE Class, Devin Rawn, Cameron Jack
FACULTY MENTOR(S): Cameron Jack

Exploring the Impact of Probiotics on Varroa destructor and Brood Levels in Apis mellifera Colonies

Honey bee (Apis mellifera) probiotics research is expanding as probiotics can alter the gut microbiome to defend against pathogens that are harmful to a colony, some of which can be vectored and transmitted by the parasitic mite: Varroa destructor. We are attempting to address the unknown effects of probiotics on the strength of honey bee colonies. We are utilizing a counting software called "dot dot goose" to quantify these data. This was used to count the number of eggs, larvae, and uncapped pupae on each frame of each colony. Capped brood cells were counted by another program, “Beestly.” This method was chosen because it gives exact counts of varying stages of brood throughout a colony. Alcohol washes were completed for each colony at three different times, and we saw no significant difference in Varroa infestation between the treatment groups. We are currently in the process of correlating those data to the amount of brood in a colony. The expected result is a positive correlation between mite counts and brood counts, showing as brood increases in a colony, mites also increase. Understanding the effects of probiotics will help beekeepers in their struggle to maintain healthy honey bees.

PRESENTER(S): Avery Goodman
AUTHOR(S): Avery Goodman
FACULTY MENTOR(S): Matthew Blake Strickland

African Religious Agency in the New World: A Case for the Afro-Atlantic Sacred Cosmos

Syncretic religions developing within the African diaspora during European colonialism are often analyzed by their deviations from imperial Christianity. These deviations, represented as either a deficiency or a misunderstanding of European conversion efforts, grossly misrepresent and undermine the importance of African agency in building new religious movements under a new diasporic paradigm. This paper expands upon Mechal Sobel's thesis in Trabelin On' — "that Africans brought their world views into North America, where, in an early phase of slavery, the core understandings, or Sacred Cosmos, at the heart of these world views coalesced into one neo-African consciousness"—and applies it to five syncretic Atlantic religions: Santeria, Vodou, Candomblé, Native Baptist, and Afro-Baptist. In expanding Sobel's original thesis, this investigation posits syncretic religions were an African creation, not a European one. Coming from similar worldviews, or Sacred Cosmoses, trafficked Africans across the New World similarly incorporated Christianity into the rebuilding of their native beliefs within the diaspora. In a cross-cultural and trans-Atlantic analysis of these five syncretic religions, I argue for the existence of an overarching and guiding worldview in the African diaspora, the Afro-Atlantic Sacred Cosmos, giving agency to those who were unwillingly brought to the Western Hemisphere.

PRESENTER(S): Olivia Frisone, Lily Frank
AUTHOR(S): Alexander P. Ligocki1*, Augustine V. Vinson1*, Anthony T. Yachnis2 , William A. Dunn, Jr.3 , Douglas E. Smith1 , Elizabeth A. Scott1 , Jimena V. Alvarez-Castanon1 , Daniel E. Baez Montalvo1 , Olivia G. Frisone$1 , Lily Frank$, Gary A.J. Brown1 , Joel E.
FACULTY MENTOR(S): Edward Scott

Cerebrospinal Fluid Flow Extends to Peripheral Nerves Further Unifying the Nervous System

Cerebrospinal fluid (CSF) is responsible for maintaining brain homeostasis through nutrient delivery and waste removal for the central nervous system (CNS). While the function of the CSF is defined for the CNS, we were unsure what performed these functions in the peripheral nervous system (PNS). Here we demonstrate CSF flow throughout the PNS by tracing distribution of 1.9nm-gold nanoparticles, roughly the size of CSF circulating proteins, infused within the lateral cerebral ventricle (a site of CSF production). CSF infused 1.9nm-gold transitions from CNS to PNS at root attachment/transition zones distributing through the perineurium and endoneurium with ultimate delivery to distal peripheral nerves. Larger 15 nm-nanogold fails to transit from CNS-PNS forming “dye-cuffs” originally described in studies establishing the current dogma of CSF restriction within CNS, identifying size restrictions in central to peripheral flow. Intravenous infusion of 1.9nm gold shows no ability to cross the blood brain/nerve barrier. This suggests the biological makeup of the barrier between the CNS and the PNS is different from the blood brain barrier. These findings suggest CSF plays a role in maintaining homeostasis throughout the nervous system, with implications for CNS and PNS drug delivery to the entire nervous system.

PRESENTER(S): Emma Heidelberg
AUTHOR(S): Emma Heidelberg, Sydney Dick, Tyler Favier, Brianna Hiers, Michael Valuta, Gianna Garcia, and Dr. Lindsey Rodriguez
FACULTY MENTOR(S): Lindsey Rodriguez

A Bitter Brew: Exploring Conflict Types as Mediators Between Partner Drinking Problems and Relationship Satisfaction

This poster presentation explores how Gottman's four conflict types (volatile, avoidant, validating, and hostile) mediate the relationship between partner drinking problems and overall relationship satisfaction, utilizing data collected by a University of Florida professor. The first part of the statistical analysis explores the relationship between each conflict type and relationship satisfaction, and the second half explores the mediation relationship of how one's own and partner drinking relate to conflict type, which in turn is related to satisfaction. It was hypothesized that relationship problems related to alcohol will be related to lower satisfaction, and that mediation will occur via volatile and hostile conflict types. Looking at conflict type and relationship satisfaction alone, results show a significant relationship between the variables; each conflict type affects relationship satisfaction differently. As for the mediation relationship, results reveal that only the hostile conflict type significantly mediates the relationship between partner drinking problems and overall relationship satisfaction. Therefore, neither one's own or partner drinking relates to conflict type and relationship satisfaction except for when it's the worst kind of drinking and worst kind of conflict, then there is a lower level of satisfaction. These findings promote future research on alcohol use, conflict types, and relationship satisfaction.

PRESENTER(S): Alexandra Fil
AUTHOR(S): Alexandra Fil, Heather Stark MD, MPH
FACULTY MENTOR(S): Heather Stark

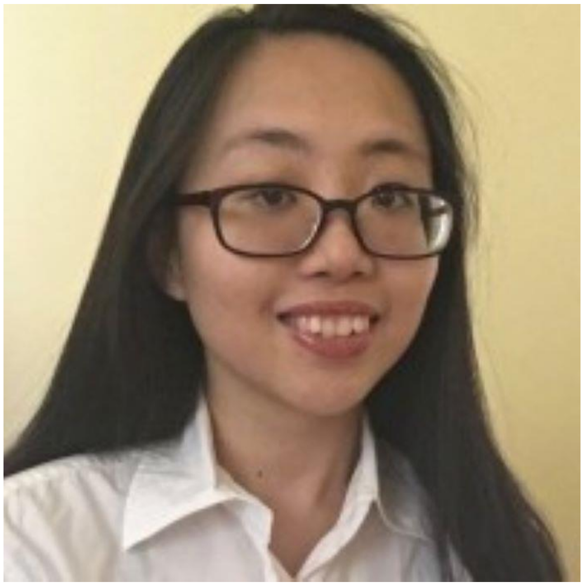
The Effectiveness of Family-Based Interventions in Preventing Early Childhood Dental Caries

Early childhood caries (ECC) is a common chronic disease with socioeconomic status and access to dental care being risk factors. As a public health issue, preventative care is important to address health disparities. The purpose of this study was to review evidence on family-based interventions and compare effectiveness in preventing childhood tooth decay. Methodology included searching for journal articles utilizing terms like "childhood caries". Over 50 publications were found that tested an intervention strategy. The studies were narrowed down to those that included children under age 8, and those that utilized only family-based interventions. Eight articles were chosen for this review due to time limitations. Results from each study were extracted and a descriptive comparison of their effectiveness in preventing ECC was performed. The family-based interventions that had a positive result in preventing ECC included home visits, diet education programs, and counseling. Motivational interviewing, educational pamphlets, and mobile apps all lead to positive behaviors but had insignificant results in preventing caries. Existing family-based interventions show promise for preventing ECC. A limitation of this research is that each intervention was only tested over 1-2 years. Testing over a longer period is suggested, which can be the basis of future research design.

PRESENTER(S): Walker Bensch
AUTHOR(S): Walker Bensch, Joanna J. Silva, Sarah Anderson, Rachel Mallinger
FACULTY MENTOR(S): Rachel Mallinger

Assessing the Impact of Landscape Context on the Wing Morphology of the Southeastern Blueberry Bee

Land-use change is one of the main drivers of bee decline globally. Urbanization and agriculture are major contributors to land-use change, though their impact on bees often differs in magnitude, direction, and variance, depending upon the taxa examined. An increasingly popular method to assess the complex effects of land-use change is through morphological analysis. Morphological analysis allows us to quantify the estimated fitness of a population, and thereby gain a better understanding of the effects of land-use change within a species. In this study, geometric morphometric technique (GMM) was used to assess how the wing morphology of the southeastern blueberry bee (Habropoda laboriosa, Hymenoptera: Apidae) differs between land-uses. Over one year, 300 H. laboriosa were collected from 19 sites across north central Florida consisting of agricultural, natural, and urban land-uses. The right wings of specimens were mounted and differences in wing morphology were assessed between agricultural, natural, and urban land-uses. I found weak evidence of differing wing geometry in females, driven by differences between agricultural and urban land-uses. I also found that wings are larger in agricultural land-uses. These results suggest varying intraspecific bee fitness between land-uses distinct in their resource quality and quantity.



PRESENTER(S): Amy Wu
AUTHOR(S): Amy Wu, Morgan Cobb, Natahja Graddy, Dr. Christan Grant, Dr. Jeremy A. Magruder Waisome
FACULTY MENTOR(S): Jeremy A. Magruder Waisome

Guided Undergraduate Training for Shark Segmentation (GUTSS)

As artificial intelligence (AI) becomes more used in education, need for instruction around AI skills will increase. Guided Undergraduate Training for Shark Segmentation (GUTSS) is a mobile application that enables students to develop image segmentation and manipulation skills while learning about marine anatomy. To connect between AI and sciences, in-service science teachers can use GUTSS inside and outside of the classroom to help students learn about shark anatomy. Through the application, teachers can enrich their classroom curriculum with technology, share materials, grade assignments, and view their students' work. GUTSS uses open-set object detection, image segmentation, and image manipulation to assist users with organ identification. Gamification in the application will make learning shark anatomy more engaging to students. Prior work indicates teachers' willingness to integrate AI concepts into classroom under state standards. Further application wireframing from instructor perspectives is ongoing, to incorporate teacher viewpoints from mixed-methods survey responses on AI usage and anatomy. Future work aims to supplement shark dissection images from AI generation of anatomical image data sets, by collecting data from students and teachers. Ultimately, the application will be able to identify non-aquatic organisms' anatomical features as a tool for students to learn.

PRESENTER(S): William Kratochvil
AUTHOR(S): William Kratochvil, Zijing Huang
FACULTY MENTOR(S): Won Suk Lee

Predicting Strawberry Yield with the Power of Machine Learning using Soil and Environment Data

With the increasing demand for agricultural productivity and sustainability, accurate yield prediction is crucial for efficient resource allocation and decision-making in strawberry farming. Forecasting crop yield remains to be a challenging task due to the complex interplay of various factors such as soil composition, climate conditions, and cultural practices. By harnessing the power of machine learning, this research aims to develop a model that can effectively predict strawberry yield based on a comprehensive dataset of soil pH, soil moisture, soil temperature, air humidity, average rainfall, air temperature, and average solar radiance from 800 plants across 40 subplots. The weekly data is preprocessed to handle missing values, normalize features, and mitigate outliers. Subsequently, various machine learning algorithms are employed, including multi-linear regression, to develop predictive models. The dataset is partitioned into training and testing sets to evaluate the performance of the models using metrics such as mean absolute error, root mean square error, coefficient of determination (R-squared), and k-fold cross validation. Additionally, feature importance analysis is conducted to identify the most influential variables affecting strawberry yield. Overall, this study highlights the potential of machine learning in improving yield prediction in strawberry farming, facilitating more informed decision-making and resource management practices.

PRESENTER(S): Madelyn Walk
AUTHOR(S): Madelyn E Walk, Mina Elhamiasl, Maeve R Boylan, Andreas Keil, Lisa S Scott
FACULTY MENTOR(S): Mina Elhamiasl

Fluctuations of Alpha Desynchronization in Response to Visual Stimuli Throughout Infancy

Fluctuations of brain alpha activity (6 to 9 Hz) can assess the development of visual attention in infants (Michel et al., 2015). Alpha waves are most noticeable during relaxed wakefulness when eyes are closed, but they diminish once the eyes open and the brain begins processing environmental stimuli, a phenomenon known as alpha desynchronization. However, current research does not fully explain how desynchronization develops across infancy or how different stimuli effect desynchronization level. To further explore desynchronization during the first year of life, we used longitudinal data from 19 infants who participated at ages 6, 9, and 12 months. The infants completed a sustained attention task where they viewed objects and women's faces in motion while their brain activity was recorded using EEG. The results showed that alpha desynchronized over the occipital region across all ages. Additionally, the repeated measure ANOVA results revealed that all infants showed greater occipital lobe desynchronization in response to faces than to objects [$F(1, 18) = 6.50$, $p = 0.020$]. The findings suggest that desynchronization occurs throughout infancy and fluctuates based on stimulant. Greater desynchronization in response to face stimuli demonstrates that infants pay closer attention to faces than to objects.

PRESENTER(S): John Glass
AUTHOR(S): John Glass
FACULTY MENTOR(S): Kyla McMullen

Museum Graphical User Interface for Spatial Audio Application

3D audio is becoming increasingly more accessible as consumer applications are integrating it into their systems. A graphical user interface (GUI) is necessary for spatial audio augmentation to create the most immersive experience possible. It allows for a non-technical user to operate the spatial audio application and oversee the museum. It displays location data of the user and museum environment, as well as controlling the sound rendering technology. For the application, we use an ultrasonic position system as a museum guide that is aware of both the user and their surroundings. This technology is built on two main systems for tracking and audio augmentation. The position of the user and environment bounds are tracked using Marvelmind, and the host system utilizes a Raspberry PI 4 to use location data and audio rendering scripts. The Marvelmind terminal, host system, and GUI connect using UDP connections. As previous approaches have suffered from design, technical, and cost limitations, we have developed a lowcost, lightweight, and scalable system we hope will further progress spatialized sound and allow people to experience it.

PRESENTER(S): Edward Kempa
AUTHOR(S): Edward Kempa, Ashish Aggarwal
FACULTY MENTOR(S): Ashish Aggarwal

Understanding Engineering Students' Ethical and Algorithmic Decision Preferences through a Consequentialist Framework

As developments in the field of artificial intelligence (AI) continue to rapidly advance its possible applications, it becomes increasingly crucial for those developing AI systems to understand how receptive the public will be to their work. With a goal of understanding human decision-making (HDM) and human perspectives on algorithmic decision-making based on varied payoffs and outcomes, we conducted a pair of surveys where the participants were asked about their understanding of AI, as well as their thoughts about the application of AI in the context of an autonomous vehicle placed in an ethically challenging situation. Our analysis focuses on participants' responses to two questions characterized by experimental variations, with additional variation in the consequences presented in those same questions between the two surveys. In total, we collected 284 responses from these surveys administered to engineering students of an introductory programming course for two consecutive semesters in 2022. We conducted a qualitative analysis using an inductive approach, identifying major themes related to the question asked. From this analysis, found that engineering students' perspectives on an ethically complex scenario were significantly impacted by the controlled variance in consequences, and have developed a framework for tracing their decision-making to their decisions and reasoning.

PRESENTER(S): Abbigail Renger
AUTHOR(S): Abby Renger, Alex Cantrell, Matthieu Colpaert, Ramon C. Sun, Matthew S. Gentry
FACULTY MENTOR(S): Matthew Gentry

Fucose Supplementation Impacts Brain Metabolism in Wild Type Mice

Glycosylation is a co-/post-translational addition of sugar moieties to proteins that directs protein folding and mediates cellular interactions and protein signaling. Interestingly, congenital disorders of glycosylation (CDGs) typically express abnormal neurological phenotypes. Surprisingly, neurological glycogen storage diseases (nGSDs), such as Lafora disease, have a glycosylation defect in addition to the accumulation of pathogenic glycogen and manifest similar symptoms to CDGs. Furthermore, monosaccharide supplementation, specifically L-fucose, is an effective strategy for alleviating some CDG symptoms. However, gaps remain in understanding the impact of dietary monosaccharides on neurological metabolism and their potential use in nGSD treatment. We report the effects of orally-administered supplementation of L-fucose on CNS glycogen metabolism in wild type mice. We performed gas chromatography-mass spectrometry (GC-MS) to identify central metabolic pathways impacted by L-fucose supplementation, while immuno-histochemistry (IHC) staining was utilized to quantify glycogen levels in different brain regions. Results indicate that L-fucose supplementation reduced glycogen accumulation and impacted fatty acid and lipid metabolism. This illustrates the exciting possibilities for using fucose supplementation in the treatment of CDG and nGSD patients. More rigorous characterization of monosaccharide-specific effects are underway to elucidate susceptible metabolic pathways for therapeutic modification in treating CDGs and nGSDs.

PRESENTER(S): Gabrielle Gonzalez
AUTHOR(S): Gabrielle F Gonzalez, Danielle N Meyer, Jonathan Cowart, Nancy Denslow, Tracie R Baker
FACULTY MENTOR(S): Tracie Baker

Developmental Exposure to TCDD Alters Sperm Motility and Whole-Body Hormone Parameters in a Zebrafish Model

2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD) is a global contaminant that is a known endocrine disruptor and reproductive toxicant in humans and model organisms. Previously, we reported that TCDD exposure to juvenile zebrafish (Danio rerio), an NIH-validated model for developmental and reproductive toxicology, led to transgenerational infertility. TCDD has been found to reduce sperm count and motility in rodent models and several case studies of high-dose exposure in humans. Therefore, we investigated sperm motility as a novel endpoint for sublethal TCDD exposure in zebrafish: to our knowledge, this is one of the first studies to do so using this model. We also examined the effects of TCDD exposure on specific markers of reproductive function through analyzing whole-body reproductive hormones. Preliminary results indicate significant decreases for six of eight ($p<0.001$) sperm motility parameters (VSL, VCL, VAP, LIN, STR, WOB). Decreases in sperm motility outcomes correspond with our findings of infertility, providing greater insight into the extent to which reproductive parameters are altered by TCDD exposure. As we previously determined male-mediated decreases in fertility to be transgenerational, our further goals are to understand both the mechanisms through which developmental TCDD exposure impairs sperm motility and disrupts hormone balance, and the persistence of these outcomes across generations.

PRESENTER(S): Caroline Pujol
AUTHOR(S): DJ Lemas, A Dobrowolski, C Pujol, M Francois, M Himadi, A Louis-Jacques, TJ Garrett, LA Thompson, MS Loop, H Jones
FACULTY MENTOR(S): Dominick Lemas

Impact of the 3rd Trimester Untargeted Plasma Metabolome on Infant Growth During the First Year of Life

Obesity during pregnancy is associated with birth complications, including delivering a large-for-gestational-age (LGA) newborn. Although the positive association of maternal pre-gestational BMI (pgBMI) with birthweight and infant growth is well known, the underlying mechanisms are not completely understood. Associations between pgBMI and plasma metabolites during the 3rd trimester will be examined. 3rd trimester plasma samples from 83 normal weight and overweight/obese pregnant moms will be cross compared to the birth weight at delivery. High Resolution Mass Spectrometry (HRMS) will be used to analyze untargeted plasma metabolites. Group comparisons were performed using R-statistical programming and T-tests. Linear regression models were used to perform group to test associations of birth weight with metabolite intensity. The metabolite, 3-hydroxyphenylacetate (3-HPAA), which is involved in tryptophan metabolism, had a significant association with both infant birthweight and maternal obesity. Given that 3-HPAA is associated with dietary fiber and the maternal gut microbiome, a hypothesized mechanism was created for this observed association. Maternal plasma 3-HPAA concentrations in the third trimester of pregnancy were associated with higher BMI in mothers and high birth weight in the child. This mechanism suggests that 3-HPAA impacts infant growth through interactions with placenta.

PRESENTER(S): Zachary Potter-Zimmerman
AUTHOR(S): Zachary Potter-Zimmerman
FACULTY MENTOR(S): Florin Curta

Retracing Their Steps: Pilgrimage by Women in 15th Century Lübeck

Pilgrimage for women in 15th century Lübeck was a significant undertaking that required them to leave their support systems. The present research examines the motivations and concerns of women who left Lübeck in the mid-1400s. It is primarily concerned with pilgrimage as a ritual that could liberate participants from earthly concerns and strengthen their relationship with God, the saints, and other people within their social bonds. Part of this is affirming that European Christians in the Late Middle Ages had a personal relationship with the divine characterized by bodily experiences, either through the consumption of the Eucharist (which to the laity was mainly limited to the Body of Christ), the physical movement toward cult sites that promised closer proximity to the divine, or the toll that a pious life of fasting and prayer had on the body. These dimensions are present in the 1441 case of Gese Westede, who declared her intention to pilgrimage to Jerusalem. Gese's decision to embark on a pilgrimage unfolds as a meticulous process involving legal negotiations, familial considerations, and religious aspirations. Her departure from the familiar became a transformative experience, allowing her to

navigate a liminal space, temporarily breaking free from societal expectations.

PRESENTER(S): Teagan Frazier
AUTHOR(S): Teagan Frazier, Mary Schneider, Carrie Adams, Christine Angelini, Joseph P. Morton
FACULTY MENTOR(S): Christine Angelini

Effects of Substrate Type and Nutrient Addition on the Growth of Two Foundational Dune Grasses

A common strategy for restoring coastal dunes involves adding sediment to create an elevated berm and then planting foundational grasses that mediate dune geomorphic evolution. The sediment used to build coastal dunes is often sourced locally from offshore deposits. In coastal Florida, the limited availability and high cost of dredged material has led to the use of alternative sediment sources taken from inland deposits. However, no studies have examined how different sediment sources contribute to the regrowth of transplanted dune vegetation or how different sediment types interact with nutrient addition on restored dunes. Here, we conducted a fully factorial greenhouse experiment to determine how the two most commonly deployed foundational dune grasses (sea oats and bitter panicum) performed in different restoration sediment types and under different nutrient addition scenarios. Nutrient addition generally increased plant growth, however, we found that sea oats, the most commonly deployed grass species in dune restoration projects, did not grow appreciably in mined sediments even when nutrients were added. Furthermore, bitter panicum consistently outperformed sea oats, producing significantly more biomass in treatments where nutrients were added. These findings suggest that dune restoration projects using mined sand may benefit from planting bitter panicum.

PRESENTER(S): Marian Pulgar
AUTHOR(S): Marian Pulgar, Samantha Martinusen, Ethan Slaton, Julia Besu, Cassidy Simas, & Carl Denard.
FACULTY MENTOR(S): Carl Denard

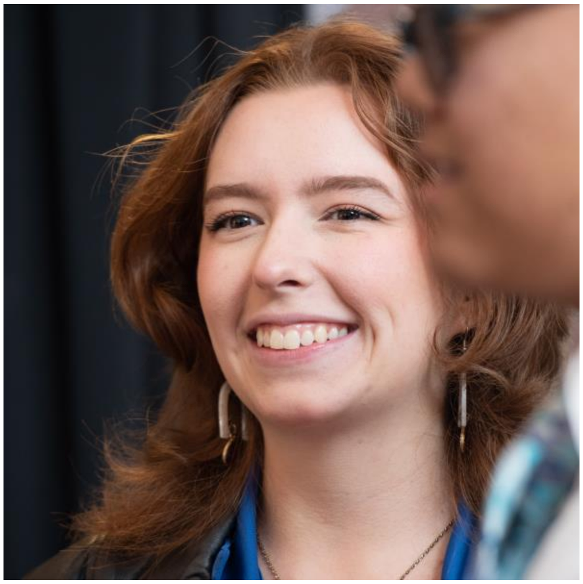
Characterization of Novel Protease Inhibitors Using HARP (High-Throughput Activity screen for the functional Reprogramming of Proteases)

The role of proteases in disease makes them attractive therapeutic targets. Usually, protease-targeting therapeutics are small-molecule inhibitors. However, these therapies often target protease active sites, which are conserved across protease families and can often lead to off-target toxicity effects. To remedy this, disease-specific proteases can be targeted using small, highly selective protein binders that can target and inhibit these proteases by potentially binding away from the active site. Our lab focuses on nanobodies as protein binders. Nanobodies are single-domain antibody fragments that are characterized by high specificity and selectivity for target proteases. To find protease-inhibiting nanobodies, we developed HARP, a High-throughput Activity screen for the functional Reprogramming of Proteases in Saccharomyces cerevisiae. Using this yeast surface display system, we discovered nanobodies against tobacco etch virus protease (TEVp) from large synthetic libraries. For the characterization of these selective protein modulators, we will complete biolayer interferometry and FRET inhibition assays to measure dissociation and inhibition constants and half maximal inhibitory concentrations. In future work, we hope to expand this technology to discover nanobodies for insulin-degrading enzyme (IDE) and beta-secretase 1 (BACE1), two enzymes that are known to be involved in the onset of Alzheimer's disease.

PRESENTER(S): Anita Beijer
AUTHOR(S): Anita Beijer, Apollonia E. Lysandrou, Ben Phalin, Jason Hunt, Laurie Solomon, Amanda Janner, Kent Mathias, Scott A. Teitelbaum, & Ben Lewis
FACULTY MENTOR(S): Ben Lewis

Elucidating the Relationship between Mindfulness and Readiness to Change among Individuals in Treatment for Substance Use Disorders

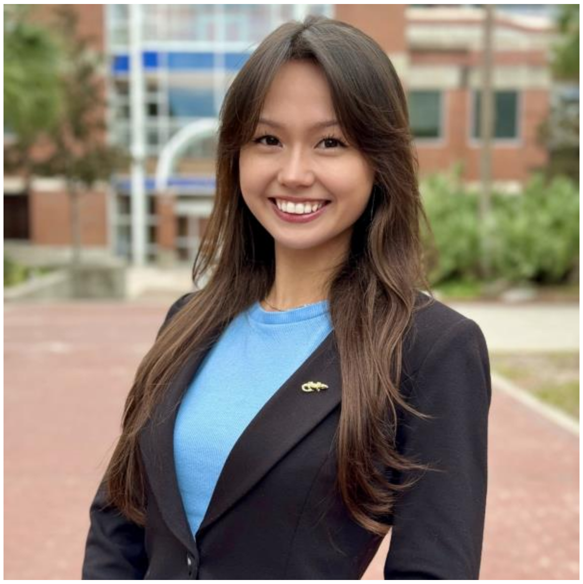
Although greater mindfulness is associated with improved substance use disorder (SUD) treatment outcomes (e.g., reduced craving and relapse), the behavioral mechanisms moderating the effectiveness of this relationship remain poorly characterized. Recent evidence suggests that mindfulness may be linked to increased readiness to change. However, no studies have examined this relationship among individuals in SUD treatment, or whether the relationship may change during treatment. To address this gap, we investigated the relationship between mindfulness and two measures indexing readiness to change during SUD treatment using a mixed longitudinal approach. SUD patients (N=1382) at a residential treatment facility completed questionnaires indexing thoughts about changing substance use, acceptance of the need for treatment, and mindfulness. Data were gathered at intake, after ~30 days, and at discharge. Results revealed that across treatment, mindfulness was positively associated with readiness to change ($p<.001$). Positive associations between mindfulness and treatment acceptance were observed, but only at 30 days ($p=.026$) and discharge ($p=.044$). These findings suggest a framework in which mindfulness may exert positive influence on treatment outcomes that is at least partially mediated by readiness to change. Although these results are novel, and contribute to conceptual models of mindfulness in SUD treatment, more nuanced analyses (i.e., mediation models) are required to establish causality. However, these data are consistent with contemporary literature identifying mindfulness as a potential intervention target in SUD treatment.



PRESENTER(S): Alana Rush
AUTHOR(S): Alana Rush, Kaitlin Allen, Walter Tapondjou, David Blackburn
FACULTY MENTOR(S): David Blackburn

Morphology Vomerine Teeth in African Night Frogs

Dental morphology in amphibians, particularly anurans, exhibits significant variability. While most species lack teeth on the bottom jaw, the presence and characteristics of maxillary, premaxillary, and vomerine teeth vary widely. This variability is often associated with dietary specialization and the evolution of alternative feeding mechanisms. This research project focuses on the Astylosternus genus of frogs native to western and central Africa, aiming to investigate the diversity of vomerine teeth within and between species. CT scans are employed to analyze the dentition of eight species with vomerine teeth segmented using VG Studio. By examining both interspecific and intraspecific variation, this study seeks to assess the morphological variability of vomerine teeth in these frogs. It is hypothesized that diet plays a crucial role in shaping the evolution of oral structures, with certain dietary preferences potentially driving the retention or reduction of vomerine teeth. Ultimately, this research aims to contribute to our understanding of the functional morphology and evolutionary adaptations of amphibian dentition.



PRESENTER(S): Shion Simms
AUTHOR(S): Shion S Simms, Marcus N Milani, Mi-Jung Kim, Ryan Husain, Laura Infante, Paul S Cooke, Shinichi Someya
FACULTY MENTOR(S): Shinichi Someya

Loss of Esr1 Does Not Affect Auditory or Vestibular Function in Mice

Background: Although estrogen affects the structure and function of the nervous system and has a number of effects on cognition and brain function, its roles in the auditory and vestibular systems remain unclear. Estrogen's actions are mediated through two classical nuclear estrogen receptors, estrogen receptor 1 (ESR1) and estrogen receptor 2 (ESR2). In this study, we investigated the roles of ESR1 in normal auditory function and balance performance using wildtype (Esr1+/+ or WT) and Esr1 knockout (Esr1-/- or Esr1 KO) mice on a normal-hearing CBA/CaJ mice background.

Methods: To investigate the roles of Esr1 in auditory function and balance performance, we performed auditory brainstem response (ABR) tests, distorted product otoacoustic emission (DPOAE) tests, and rotarod balance performance tests on female and male WT and Esr1 KO mice at 3 months of age.

Results: Contrary to our expectations, there were no differences in ABR thresholds, ABR waves I-V amplitudes, and ABR waves I-V latencies at 8, 16, 32, and 48 kHz, and DPOAE thresholds and amplitudes at 8, 16, and 32 kHz, and rotarod balance performance (latency to fall) between WT and Esr1 KO males or WT and Esr1 KO females

Conclusions: Esr1 deficiency does not affect auditory function or balance performance in normal hearing mice.

PRESENTER(S): Callie Alexiadis
AUTHOR(S): Callie E. Alexiadis, Young Seon Shin, Yenisel Cruz-Almeida, Stephen A. Coombes
FACULTY MENTOR(S): Stephen Coombes

Increased Working Memory Load in Older Adults Is Associated With Reduced Performance and Reduced Brain Activation in Parietal Cortex and Cerebellum

Working memory is the storing and manipulation of information over a short period of time. Working memory performance declines with age and with an increase in task difficulty, and this has been associated with more widespread brain activation (HAROLD: hemispheric asymmetry reduction in older adults) and with reduced activation (CRUNCH: Compensation-Related Utilization of Neural Circuits Hypothesis) in prefrontal cortex. To test these two hypotheses, eleven older adults completed a 1-back and a 2-back working memory task during fMRI (age: 72.25 +/- 6.93 yrs). Paired t-tests found that subjects were significantly less accurate (p=0.027) and slower (p=0.0004) during the 2-back compared to the 1-back. Subjects also had significantly less activation in bilateral cerebellum and left inferior parietal lobule (IPL) for the 2-back compared to the 1-back task (p's = 0.01). This was partially in line with the CRUNCH model that suggests older adults hyperactivate WM-related brain areas during 1-back tasks to compensate for age-related deficits, but compensation fails as task difficulty increases, resulting in decreases in activation in the same areas during the 2-back task.

PRESENTER(S): Lauren Ellis
AUTHOR(S): Lauren Ellis, Stefan Wehmeier, Bonnie President, John Aris, & Wesley Bolch
FACULTY MENTOR(S): Wesley Bolch

A Histology-Based 3D Microscale Model of the Salivary Gland

The Microscale Tissue Models Project aims to create a series of histology-based 3D polygon mesh models to accurately test the toxicity levels of various organs when dosed with alpha and beta-particle emitters for radiopharmaceutical cancer therapy. The organ being analyzed in this project is the salivary gland, specifically the parotid gland. The salivary glands are a pair of organs on either side of the jaw that are important for proper digestion and immune function. When radiopharmaceuticals or ionizing radiation are used too closely to the glands, the organs can be permanently damaged. Thus, providing doctors with accurate models of how salivary glands are affected by various dosages of both alpha and beta-emitters will allow them to treat cancer effectively without causing unnecessary organ toxicity. To create this model, a representative set of salivary gland histology slides were placed in order and imaged. Following imaging, the significant structures such as the striated ducts and blood vessels will be segmented and then reconstructed using CAD software. The model will then be validated against known anatomical values in literature. Finally, the model will undergo radiation simulation in PHITS to assess microscale damage due to various systemic radiation doses.

PRESENTER(S): Ava DiPaolo
AUTHOR(S): Ava DiPaolo, Zifan Zhao, Dev Paudel, Liping Wang, Jianping Wang
FACULTY MENTOR(S): Jianping Wang

Deep Sequencing Reveals the Plasmid Insertion into a Bradyrhizobium Strain Isolated from Peanut Nodules

The symbiotic relationship between Arachis hypogaea, or peanut, and Bradyrhizobium, a slow-growing and highly symbiotic rhizobia, shows promise in translating the mechanism of nitrogen fixation to non-legumes. To better study this symbiosis, a strain of Bradyrhizobium sp. Lb8 was genetically modified by insertion of the pRJPaph-bjGFP plasmid to express the green fluorescence protein (GFP) gene. This transformation allows for subsequent microscopic documentation of the pathway of crack entry. Whole genome sequencing and assembly of Lb8-GFP and subsequent annotation confirmed the presence of the plasmid insertion successfully integrated into the Lb8 genome. Results show the assembly of an 8.7Mbp bacterial genome with an insertion of the pRJPaph-bjGFP plasmid used in bacterial transformation. Genome annotation shows the presence of 8,921 protein-encoding genes. 4,957 of these were non-hypothetical, with 63 coding for genes essential in nitrogen fixation. These observations of successful integration demonstrate a promising method in fluorescent labeling for studying microscopic symbiotic relationships between rhizobia and legume species.

PRESENTER(S): Mariana Mikaela García
AUTHOR(S): Mariana Mikaela García
FACULTY MENTOR(S): Melissa Hyde

Examining the Self-Fashioning of Pompadour's Imagery Through the Guise of Diana the Huntress

Allegorical portraiture, a favored approach in eighteenth-century France, is a painterly method in which a person is depicted as a Greco-Roman mythological figure. Madame de Pompadour, mistress to the French monarch Louis XV, developed a strategic utilization of allegorical portraits as instruments of self presentation during her influential tenure at the French court. Rather than serving solely as decorative objects, Pompadour's portraits served as a tool to fashion and manage her image within the court. This essay analyzes how the 1745 portrait Mme de Pompadour in the Guise of the Goddess Diana by the artist

Jean-Marc Nattier functions as the first instance in which Pompadour began to shape her public persona through art.

PRESENTER(S): Anna LaMay, Allison Matsubara, Harper Miller, John Gracey, Krishna Shah, Mehak Sandhu, Riley Johnson, Sammy Li, Sophia Nesselroth
AUTHOR(S): Anna LaMay, Allison Matsubara, Harper Miller, John Gracey, Krishna Shah, Mehak Sandhu, Riley Johnson, Sammy Li, Sophia Nesselroth
FACULTY MENTOR(S): Craig Smith

Psychedelics in Expanded Mental Health

The United States is on the brink of beginning to legalize psychedelics for medical use with MDMA and psilocybin already granted breakthrough status by the FDA. Further emphasis needs to be placed on the specific chemical properties of psychedelics and the ability psychedelic drugs have to rewire the connections in the brain, which is crucial to promoting higher efficacy in therapeutic treatments. One of our research aims is to highlight potential motivations and guidelines for increased clinical consideration for the use of psychedelics, including studies of group therapy models through an economic, scientific, and sociocultural lens. Another aim is to consider and optimize a protocol for administering oral psilocybin while gaining an initial impression of treatment efficacy. Another aim is to study the effects of psilocybin based on the length of study through resource investigation into comparisons of multiple studies by the same researchers. A final aim is to analyze psilocybin consumption for its antidepressant properties in patients with major depressive disorder (MDD). These results were then compared against similar clinical trials of commonly prescribed selective serotonin reuptake inhibitor (SSRI) antidepressants.

PRESENTER(S): Kylie Fernandez
AUTHOR(S): Kylie Fernandez, Susan Nittrouer
FACULTY MENTOR(S): Susan Nittrouer

The Effects of Parental Language Input and Parental Knowledge of Child Development on Child Language Development

Past experiments showed that the amount and kind of parental language input affects language development, and poverty-related delays in language development have been attributed to poor parental language input. Concern has been raised, however, that parental language input may largely relate to how knowledgeable parents are about child development. This study addresses this concern by examining how parental language input is mediated by parental knowledge of child development. Twenty parent-child dyads across the socioeconomic spectrum participated in this study. Five measures were collected; (1) parental language input amount and style; (2) child's vocabulary knowledge; (3) child's auditory comprehension of language; (4) parental knowledge of general child development; and (5) knowledge of best parenting practices. Low socioeconomic status correlated with (1) less and poorer parental language input, (2) lower child vocabulary knowledge, (3) lower child auditory comprehension of language, (4) poorer parental knowledge of child development, and (5) poorer parental knowledge of best practices in parenting. Critically, parental language input style correlated with both measures of child language independently of parental knowledge of child development. This study shows that socioeconomic status explains parental language input, and this input accounts for child language development, but little variability is explained by parental knowledge.

PRESENTER(S): Chandana Karumanchi, Ashley Hamersma
AUTHOR(S): Chandana Karumanchi (1), Ashley Hamersma (2), Steven Manchester (2)
FACULTY MENTOR(S): Steven Manchester

Characterization of a flower of fossil genus Sahnianthus by micro-CT and placement in Lythraceae

The Deccan intertrappean beds of India are a series of sedimentary layers deposited between volcanic events from the Late Cretaceous (Maastrichtian) to Paleocene (Danian) as the Indian subcontinent drifted northward over a mantle plume or hotspot in the present-day location of Réunion Island. The intertrappean cherts exposed at sites scatter across central India of the locality produce abundant morphologically and anatomically preserved and fossil woods, as well as plant reproductive material including fruits, seeds, and flowers and pollen. Significant research has been conducted on the series, including studies of paleomagnetism, floral and faunal macro- and microfossils, paleosols, and geochemistry. Here we review the taxonomic relationships of several floral fossil taxa recovered from the locality, drawing conclusions based on use of methods like micro-computed tomography scanning (micro-CT) and scanning electron microscopy (SEM) that were not available at the time of original publication. Based on morphological and anatomical observations made with these techniques, we propose subsuming into synonymy with Sahnianthus several of the taxa currently indicated as belonging to other genera, and suggest an affiliation to Lythraceae.

PRESENTER(S): Jossie Sanchez
AUTHOR(S): Jossie Sanchez, Lei Zhou
FACULTY MENTOR(S): Lei Zhou

Sexual Dimorphic Expression of Innate Immunity Genes and Inflammaging

Inflammaging manifests as chronic inflammation and signifies a dysregulation in the innate immune system associated with aging. Most age-related diseases, such as arthritis and cancer, are linked to this form of inflammation but the mechanism behind inflammaging is still unknown. Despite this, there is an understanding that innate immunity and inflammation are linked to sex, with certain immune genes exhibiting female-specific inflammaging patterns, suggesting potential sexual dimorphism in the expression of innate-immunity genes. To understand inflammaging's role in the body, Drosophila models are utilized since they share human innate immune pathways while allowing for the observation of inflammaging in a short period of time.

Gene expression is monitored by tissue dissections, followed by RNA extraction, reverse transcription, QPCR, and RNA-Sequencing. Through this process, the significance of hemocytes and fat bodies in the inflammaging process are investigated where hemocytes function as blood cells and fat bodies function akin to the liver and adipose tissue of humans. By observing innate immune gene expression in these systems, we seek to identify the organs responsible for the female-specific inflammaging pattern observed at the whole-body level. Results of this investigation were inconclusive due to a lack of data from processing errors.

PRESENTER(S): Josmar Polanco
AUTHOR(S): Josmar Polanco, Zina M. Uckeley, Victoria Karaluz, Steeve Boulant, Megan Stanifer
FACULTY MENTOR(S): Steeve Boulant

Role of Physiological Hypoxia on Cryptosporidium parvum Replication

Cryptosporidium parvum (C. parvum) is an enteric parasite that causes diarrhea, stomach cramps, and dehydration. While not fatal to the general population, it is a major health issue in developing countries and is especially dangerous for immunocompromised individuals. In physiological conditions, the intestinal epithelium lining our gastrointestinal tract is exposed to the very low oxygen level milieu of the gut lumen (hypoxia). Hypoxia stabilizes the transcription factor hypoxia induced factor (HIF)-1α that drives cellular responses to low oxygen environments, including metabolic changes. How the physiological hypoxia in the gut impacts C. parvum infection and pathogenicity is not known and constitutes the central research question of this project. We found that hypoxia increases C. parvum replication in intestinal epithelial cells. To investigate whether HIF is directly responsible for this increase in C. parvum infection, we used drugs that either stabilize or inhibit HIF-1α. Our data demonstrated a slight increase in C. parvum replication when HIF was stabilized and a slight decrease in replication when HIF was inhibited. This suggests that other metabolic factors may play a role in the hypoxia-dependent increase of C. parvum replication. Understanding what affects C. parvum pathogenicity in hypoxic conditions will aid in developing novel anti-pathogen therapies.

PRESENTER(S): Cathrine Pacini
AUTHOR(S): Cathrine Pacini, Tiffany Nelson, Kimberly Paulsen, Amy Nguyen, Indigo Peterson, Zhe Ma
FACULTY MENTOR(S): Zhe Ma

Evaluating STING Agonist Impact on Kaposi's Sarcoma-Associated Virus-related Cancers

Kaposi's sarcoma-associated herpesvirus (KSHV) is an etiological agent of multiple malignancies associated with compromised immunity, such as Kaposi's sarcoma (KS) and Primary Effusion Lymphoma (PEL). KSHV infection is lifelong and there are no KSHV-specific effective treatments or vaccines. Critical to controlling KSHV infection is the cGAS-STING DNA-sensing pathway, which activates type I interferon response and induces cancer cell death or growth inhibition. This project aims to examine the in vitro effectiveness of STING agonists to inhibit KSHV oncogenesis through stimulation of the cGAS-STING pathway. We treated six patient-derived PEL cell lines with the STING agonist diaminobenzamidazole (diABZI) in a dose-dependent manner. Four of the PEL lines exhibited decreased cell growth and viability, while two were resistant to treatment, correlating with the presence or absence of STING expression. We performed RNA-sequencing and discovered upregulation of multiple interferon-stimulated genes in responsive cell lines. We plan to further explore STING agonists inhibition of PEL oncogenesis in vitro via colony formation and in vivo using a PEL xenograft model with NSG mice. This work contributes to building a foundation for STING agonists as a new approach to KSHV-driven cancers and expanding the current application to viral cancers.

PRESENTER(S): Jason Ang
AUTHOR(S): Jason B. Ang, Yu Tin Lin, David V. Donndelinger, Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

Enhancing Convolutional Neural Networks for for Spatial Clustering in Imaging Mass Spectrometry: A Case Study Using Mouse Brain

Imaging mass spectrometry is a powerful tool that enables label-free mapping of compounds in tissue samples with high specificity and spatial resolution. Untargeted imaging mass spectrometry can generate hundreds to thousands of molecular images per experiment, which challenges comprehensive interpretation to reveal biological significance. Clustering algorithms facilitate the analysis of imaging mass spectrometry data sets by compressing molecular images into a smaller number of groups of distinct spatial distributions. Convolutional Neural Networks (CNNs) outperform traditional methods like k-means in clustering by automatically learning complex, high-level features from data through a hierarchical process. Deeper layers abstract generalize these features into more complex recognizable representations, enabling accurate categorization based on feature similarity via an unsupervised learning approach. Herein, we perform transfer learning using a Keras-based convolutional neural network (CNN), EfficientNetV2L, to accurately cluster molecules of similar spatial distributions in sample mouse brain tissues. To optimize a pre-trained CNN for imaging mass spectrometry clustering, we fine-tune hyperparameters, apply regularization to prevent overfitting, and use the Adam optimizer for efficient weight adjustment, ensuring precise molecular pattern recognition and grouping. Future work aims to demonstrate that pre-trained CNN with fine tuning enhances clustering accuracy by tightening intra-cluster distances and increasing inter-cluster separation compared to conventional k-means clustering.

PRESENTER(S): John Dodd
AUTHOR(S): John Dodd, Mahtab Eskandar, Wayne Giang
FACULTY MENTOR(S): Wayne Giang

Examining Ecological Validity of Video-based Simulated Driving for Evaluating Automated Vehicle User Interfaces

Fully automated vehicles (FAV) may improve independence for individuals with cognitive impairment who can no longer drive. However, the in-vehicle experience must be tailored to their unique needs to ensure ease of use and acceptance. In this project we created a series of videos of simulated drives demonstrating different adverse events to test the design of user interfaces for FAV using UC-Win/Road simulation software. The objective of the current work is to examine the ecological validity of these videos, defined as their ability to produce real world results in a simulated setting. We will test this using a pilot study where participants will experience each simulated drive and be presented with a questionnaire and interview. The questions will cover the graphical fidelity, familiarity, and the participant's emotional response to the given videos and will be presented as a 7-point Likert scale. We anticipate that responses will indicate whether or not the recorded videos meet acceptable thresholds of ecological validity. These results will help further the study of how to properly use video simulations created in the UC-Win/Road software, and expand the knowledge of how to properly design video simulations with acceptable levels of ecological validity.

PRESENTER(S): Noelle Prouty
AUTHOR(S): Noelle Prouty, Aswaj Punnath, Jason L. Williams, John S. Lapolla, and Andrea Lucky
FACULTY MENTOR(S): Andrea Lucky

Evaluating a Geometric Morphometric Approach for Delimiting Species within the Nylanderia bourbonica species complex

Genus Nylanderia is a globally distributed and greatly diverse group of "crazy ants", with 125 known extant species, 25 subspecies, and 16 species found in non-native ranges. Due to their massive range, interspecific morphological convergence, and subtle intraspecific morphological differences, the genus has been historically misidentified, and difficulties in species delimitation persist. The Nylanderia bourbonica complex is the most widespread species in the Nylanderia genus, comprising multiple cryptic species with distinct distributions. As a longstanding globetrotter and invasive complex in many areas, N. bourbonica has the potential to significantly impact economics, agriculture, and conservation worldwide, yet there is a lack of accurate and up-to-date information on the complex's taxonomy that would aid in managing invasions. This study aids in delimiting species boundaries of the Nylanderia bourbonica species complex and nine morphologically similar "bourbonica-like" species through a taxonomic approach focusing on morphology. 2D and 3D geometric morphometrics were employed to find patterns in shape and size and distinct features that differentiate species. This will help determine the efficacy and reliability of morphological characters in classifying species, ultimately contributing to the refinement and enhancement of taxonomic methods for cryptic taxa and preventing future misidentification of invasive Nylanderia.

PRESENTER(S): Malena Diez, Julianna Gonzalez, Catalina Diez, Selene Hsu
AUTHOR(S): Malena Diez, Julianna Gonzalez, Catalina Diez, Selene Hsu, Kaitlyn McCarty, Izabela Zmirska, David Julian
FACULTY MENTOR(S): David Julian

Modeling Respiratory Mechanics and Pressure Differences: An Improved Lung Balloon Teaching Model

Simulation plays a key role in research, medical training, and student education. One mechanism that academics aim to simulate is the differences in pressure between the lungs and chest cavity during respiration. The Lung Balloon Model (LBM) is one example that serves as a visual representation of this mechanism. Traditionally, it has been fashioned from a water bottle and balloon, yet a drawback lies in its inability to reflect the actual pressure differences within the bottle or balloon, merely portraying respiratory mechanics. In our improved design, we utilize a large syringe and balloon to alter pressure through manipulation of the syringe plunger. This models the mechanical properties of lung tissue, replicating key respiratory parameters such as pressure, volume, resistance, and compliance. It also incorporates Arduino pressure sensors within the balloon and syringe, relaying continuous pressure values to a computer or display. Currently being used as an instructional tool in an undergraduate physiology course, this updated model aims for enhanced representation and long-term scalability. The model's simplicity and affordability make it easily accessible to educational institutions, medical training centers, and respiratory research organizations. Future validation and refinement of the model could lead to broader applications in medical education and clinical settings.

PRESENTER(S): Lauren Manso
AUTHOR(S): Lauren Manso
FACULTY MENTOR(S): Sandy Chang

Degrees of Desirability: Examining Racialized Sexuality in Late-Colonial Cuba

This paper explores how colonial discourses shaped understandings of racialized sexuality in late-colonial (19th century) Cuba. I suggest “degrees of desirability” as an analytical tool that implies that Cuban women are set against a hierarchy, foundational to which are culturally consumed stereotypes and tropes regarding sexuality as a racialized unit of observation. I invoke the language of “degrees” to posit a sort of quantifiable difference/’Other-ness’ conferred onto non-White Cuban women; “desirability” demonstrates how such colonial discourses position Cuban women as sexual objects. I examine, firstly, how colonial perspectives typify Cuban women along the axis of race and perceived exoticism in the context of colonial prostitution and conjugal relations. From these frameworks, I will present three distinct essays—each written by either a Cuban, American, or Spanish man—written contemporaneously, which converge at the mention of the mulatta as the most confounding example of racialized sexuality. The Mulatta is distinguished by simultaneous proximity to Blackness and whiteness, negotiating sexual stereotypes associated with the former with those of the latter. As such, she occupies a curious liminal space within "degrees of desirability" which I will examine.

PRESENTER(S): Daniil Fortuna, Mariangel Benejam, Andriana Detsis, Keith Khadar, Zachary Lyons, Ashni Zaverchand
AUTHOR(S): Daniil Fortuna, Mariangel Benejam, Andriana Detsis, Keith Khadar, Zachary Lyons, Ashni Zaverchand, Kaitlyn McCarty, Izabela Zmirska, David Julian
FACULTY MENTOR(S): David Julian

Functional, Scalable Electrocardiograms (ECGs) for Hands-On Learning in Undergraduate Physiology Courses

An electrocardiogram (ECG) serves as a visual representation of the heart's electrical activity through the attachment of electrodes placed on certain parts of the body. This is an important diagnostic modality for clinicians to detect problems with the heart's electrical conduction system. Learning how an ECG functions is a non-intuitive process that is limited by the learner's thorough understanding of abstract electrical fundamentals. We hypothesize that allowing students to have hands-on experiences interacting with an ECG device in the classroom would improve their understanding of how it works and how it is used in the medical field. A limitation of this idea is the lack of access to ECG devices in academia due to their price and external equipment associated with them. In this presentation, we propose a simple EKG model that costs under $30 to make, enabling it to be scalable and accessible to undergraduate classes across the world. So far, we have demonstrated the feasibility of our model in a local University of Florida physiology course. We hope to expand upon our model to make it simpler to build and easier to implement into coursework.

PRESENTER(S): Nelson A. Canales
AUTHOR(S): Nelson A. Canales
FACULTY MENTOR(S): Florin Curta

Reform or Pragmatism? Pope Innocent III, the German Lands, and the Iberian Peninsula

Medieval scholars have been repeatedly drawn to Pope Innocent III. He expanded papal influence into realms Church reformers of previous centuries only dreamt to, and exerted power over secular rulers like no other pope before. Historians, however, have largely disagreed in their attempts to explain the motivations and justifications for Pope Innocent's actions. Were they points on a reform agenda or the goals of a pragmatist? Through the analysis of Innocent's papal letters and actions, this paper seeks to contribute to the debate. By comparing the actions and justifications of Pope Innocent III in the Iberian Peninsula and the German lands—two areas located at a different distance, geographically and politically, from Rome—this paper investigates how Innocent acted in comparable situations and whether Church reform or pragmatism influenced his arguments and final decisions. I discovered that while in the Iberian Peninsula, Innocent disregarded temporal outcomes in favor of spiritual strictness, he paid comparatively greater attention to temporal matters and adopted a pragmatic approach in the German lands. While the severe threat the German Empire posed to Church independence explains his latter attitude, the concerns of the ongoing Reconquista in Iberia seem to have driven his actions in that area.

PRESENTER(S): Nicholas Cox
AUTHOR(S): Nicholas Cox, Karol Sanchez, Dr. Julie Maupin-Furlow
FACULTY MENTOR(S): Dr. Julie Maupin-Furlow

Understanding UreC's Role in a Halophilic Archaea: Gene Knock-out and Future Protein Expression Studies

Haloferax volcanii, an extremophile haloarchaeon found in hyper-saline environments, has become a model organism in archaeal genetics research due to several factors: a tolerance to wide ranges of salt concentrations (2 to 5 M NaCl), resistance to contamination, and selectable markers and plasmids for transformation. Due to these advances, more complex analysis has become possible, particularly regarding protein sub-units. We have chosen to focus on the gene ureC, which encodes for a subunit of the urease protein complex, to understand its essential role in H. volcanii through the protein's purification and characterization. This assay has two components, a gene 'knock-out' of ureC within the archaea's DNA utilizing a pyrE2-marked pTa131 plasmid, and a cloning of ureC for expression using the pTA963 + ureC plasmid. The former protocol aims to remove ureC from the H. volcanii wild type, enabling us to study the activity of the archaea without this protein, where the latter hopes to purify and isolate the halophilic protein for biotechnology and basic science applications. Through this research, the urease complex within H. volcanii will be explored regarding its necessity as a protein for the archaea's function and survival.

PRESENTER(S): Ethan Cockey
AUTHOR(S): Ethan Cockey, Michelle L. Gaynor, Douglas E. Soltis, and Pamela S. Soltis
FACULTY MENTOR(S): Pamela and Douglas Soltis

Comparing stomata size variation among diploid, triploid, and autotetraploid Galax urceolata (Diapensiaceae)

Galax urceolata (Poiret) Brummitt (Diapensiaceae) is native to the Southern Appalachians of the Southeastern USA and occurs variously as diploid, triploid, and tetraploid individuals. All three cytotypes occupy similar climatic niches and have overlapping ranges. Diploids tend to occupy sites with higher elevation and drier habitats, while tetraploids tend to occupy lower-elevation sites and more moist habitats. Triploids are common where diploids and tetraploids are sympatric. The frequency of cytotypes varies depending on the location at which they are found. To investigate stomata cell size variation among these cytotypes, we measured the length, width, and area of stomata from silica dried leaf specimens for which ploidy had been determined via standard methods (e.g., flow cytometry). Unlike previous studies, we found that stomata size is clearly not indicative of cytotype, and this measure alone cannot be used to infer ploidy. We determined that stomata size in this species is associated with various factors including annual mean temperature, isothermality, max temperature of warmest month, canopy coverage, longitude, and ploidal level. We also found that the geographic occurrence of ploidal variants in Galax urceolata in the Southeastern USA as determined here is similar to that reported in previous studies.

PRESENTER(S): Christopher Tressler
AUTHOR(S): Christopher Tressler, Jeremiah Blanchard
FACULTY MENTOR(S): Jeremiah Blanchard

Observing the Impact of Incentivized Peer-Teaching in Computer Science & Engineering

This study examines the effectiveness of incentivized peer-led teaching in core computer science courses. It investigates whether students teaching their peers, with the incentive of a grade boost, enhances academic performance and comprehension. The research aims to assess the impact of this approach across multiple courses, instructors, and topics, shedding light on its potential benefits for computer science education.

This study was performed after undergraduate students at UF found they learned content better after teaching it. Those undergraduates wanted to see if they could show similar results in other students, specifically in computer science and engineering.

The experiment consists of dividing students in computer science classrooms into one group per exam in the course. The groups rotate each exam, where one group of students per exam is required to create a short review video for a relevant topic before the exam. Thee experiment was done in two classes: Programming Fundamentals 2 where participation was mandatory for students and Data Structures & Algorithms where participation was optional but resulted in extra credit.

The experiment is still a work in progress. Data is yet to be collected and analyzed and thus there are no strict conclusions at this time.

PRESENTER(S): Charles O. Foster
AUTHOR(S): Charles O. Foster, Devan Rawn, Cameron J. Jack
FACULTY MENTOR(S): Cameron Jack

Survivability and Reproduction Rates between Unique Mite Colonies Reared In Vitro

Varroa destructor is a parasitic mite species that are a major honey bee pest affecting bees and beekeepers globally. Currently there is no effective way to study multigenerational Varroa raised in vitro. A successful method for raising multigenerational mites would allow researchers to study the pest year-round and explore topics such as genetic resistance to miticides. Our research attempts to aid in this rearing effort by measuring survivability and reproduction rates between in vitro raised mites collected from different honey bee colonies. Mites will be collected from five source colonies from five different apiary sites. Collected mites will be placed onto fifth instar honey bee larvae within gelatin capsules. These capsules will be placed into an incubator to simulate the environment of a caped cell. After twelve days, the capsules will be removed from the incubator and inspected for survival and reproduction rates. The life stages of mite offspring will also be recorded. Data obtained from this study are expected to show differences between individual mite populations reared in vitro. This knowledge will inform researchers interested in developing an optimal method for rearing multigenerational mites in vitro and may expand our ability to research this devastating honey bee pest.

PRESENTER(S): Alvaro Sabogal
AUTHOR(S): Alvaro C. Sabogal, Alyssa L. Berger, MPH, Amy R. Mobley, PhD, RD, FAND
FACULTY MENTOR(S): Amy Mobley

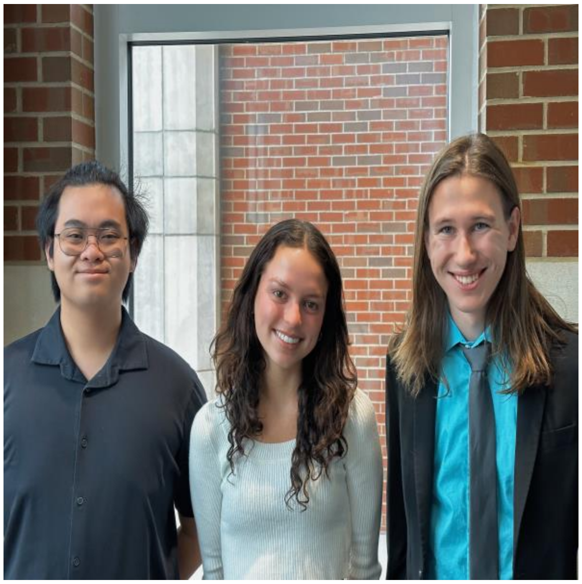
Assessing Infant Food Provision in Alachua County Food Pantries: Implications for Food Insecurity Mitigation

In 2022, 17.3 percent of households with children were food insecure in which access to adequate food was limited by a lack of money or other resources. While food pantries provide resources to families in need, many are not consistently able to provide foods appropriate for infants and toddlers. Because Florida ranks third highest in the projected number of children living in very low food insecure households, this study was aimed to assess the availability of foods appropriate for families with infants and toddlers within food pantries in Alachua County. Food pantries (n=5) were assessed using an adapted version of the Nutrition Environment Food Pantry Assessment Tool (NEFPAT). On average, 672 people, including 150 families with young children, received food monthly in these pantries. While most food pantries provided infant formula (80%) and some type of pureed food (60%) such as fruit, infant cereal (20%) and other items appropriate for young children were less likely available. Diapers were the most commonly available non-food item although only 40% of the sites had them available. These data suggest a lack of certain resources for families with young children and the need for new strategies to provide further support to reduce food insecurity.

PRESENTER(S): Danniel Pham
AUTHOR(S): Danniel Pham and Lin Zeng
FACULTY MENTOR(S): Lin Zeng

Genetic Characterization of the Glucose-PTS in Streptococcus sanguinis, examining competitive fitness.

Ecological shifts in dental microbiome from homeostasis to dysbiosis have been hypothesized to underly several oral diseases including dental caries. Streptococcus sanguinis, a commensal bacterium, is pivotal in maintaining oral health through its metabolic activities, including production of ammonia and hydrogen peroxide ($H2O2$). This study aims to elucidate the genetic underpinnings of the glucose: phosphotransferase system (PTS) in physiology and competitiveness fitness of S. sanguinis within the oral microbiome, by examining single nucleotide polymorphisms (SNPs) in the EIIABMan (manL) and HPr of PTS in S. sanguinis strain SK36. Employing genetic engineering, bioinformatic analysis, growth and metabolic assays, we recreated and characterized in SK36 several unique ManL SNPs that were identified among clinical strains of S. sanguinis. Mutations in ManL and HPr correlated with altered growth dynamics, $H2O2$ production, acid production, and pH homeostasis in a manner uncoupled from canonical regulators such as CcpA and Rex. These genetic variations likely contributed to S. sanguinis's competitiveness, although their ecological impact remains to be further elucidated. This research is part of the ongoing effort in understanding genetic mechanisms that contribute to microbial ecology in relation to health, knowledge from which may pave the way for enhanced diagnostics, pro-health formulations, and other microbial interventions.



PRESENTER(S): Payson M. Keown, Harrison Ngo, Raquel L. Rodriquez-Flores
AUTHOR(S): Payson M. Keown*, Harrison Ngo*, Raquel L. Rodriquez-Flores*, Weijie Xu, Rebecca A. Butcher *equal contributions
FACULTY MENTOR(S): Rebecca Butcher

Investigating the Allosteric Network of C. elegans Acyl-CoA Oxidase by Site-directed Mutagenesis and Kinetic Assays

Caenorhabditis elegans, a species of nematode, are microscopic worms that communicate using ascaroside pheromones to coordinate their development and behavior. Acyl-CoA oxidases (ACOXs) are enzymes involved in ascaroside biosynthesis. ACOXs oxidize the carbon-carbon single bond at the a-b position of ascaroside-CoA to a double bond, the first step of the β-oxidation cycles that shorten the side chains of the pheromone precursors. The crystal structure suggested that these ACOX enzymes bind to ascaroside-CoA substrates, ATP and FAD. FAD is a cofactor required for ACOX's enzymatic ability, while previous studies suggested that ATP does not participate in the enzymatic reaction directly. Here, we hypothesized that ATP serves as an allosteric regulator for these enzymes. Molecular dynamic simulations identified two residues, R343 and K391, as being significant in the communication between the FAD and ATP binding sites. In this project, we will mutate these residues by site-directed mutagenesis and characterize the activity of the mutant enzymes by a kinetic assay.

PRESENTER(S): Lauren Epstein
AUTHOR(S): Lauren Epstein; Brandon Crowther; Lauren Lamoutte; Mateus Rocha; Dayane Oliveira
FACULTY MENTOR(S): Dayane Oliveria

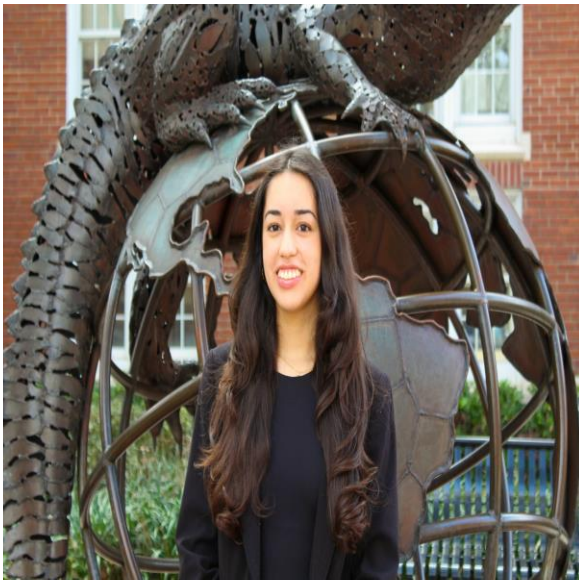
Curing efficiency of light-cured resin cements through lithium disilicate ceramics with different translucencies and thicknesses

Objective: To evaluate the effect of light attenuation through lithium disilicate ceramics with different translucencies and thicknesses on the curing efficiency of light-cured resin cements.

Methods: Lithium disilicate CAD/CAM blocks (Emax, Ivoclar Vivadent) with the same shade (A1) but different translucencies (HT and LT) were sectioned in different thicknesses (0.5, 1.0, 2.0, 2.5, and 3.0mm) and crystalized according to the manufacturer instructions (n=3). A commercial light-cured resin cement (PermaShade LC, Ultradent) was placed in the ATR FT-IR sensor (Nicolet iS20, ThermoFisher), covered with a transparent mylar strip and light-cured through each of the different ceramic specimens. The light-curing procedures were performed with pre-calibrated curing light (Valo Cordless, Ultradent) in the standard mode emitting approximately 1000 mW/cm2 and a time of exposure of 20 seconds. Data were analyzed using ANOVA and Tukey's test ($\alpha=0.05$; $\beta=0.2$).

Results: HT A1 specimens provided a similar degree of conversion regardless of the thickness ($p>0.05$). However, LT A1 specimens provided an indirect correlation between thickness and degree of conversion results ($p<0.001$).

Conclusions: There are clear limitations to use light-cured resin-based cements depending on the translucency and the thickness of the ceramic restoration. However, HT A1 restorations seem to allow adequate curing regardless of the thickness of the restoration.



PRESENTER(S): Melanie Moreno
AUTHOR(S): Melanie Moreno, Barbara Sousa, Stuart Case, Elizabeth Wood, Tara Wilfong, Heather Stark
FACULTY MENTOR(S): Heather Stark

Khat Use Among Pregnant Women in Haramaya, Ethiopia

Khat is a leafy green plant found in East Africa, chewed for its stimulant-like effects. It provides a primary source of income and holds a significant cultural role. In the Oromia region in Ethiopia, khat is heavily consumed and exported. Consumption is associated with mothers experiencing anemia, appetite suppression, and pre-term births. This cross-sectional study in the Oromia region of Haramaya, Ethiopia aims to assess khat use and influencing factors among pregnant women.Data was collected by trained health workers in Afan Oromo. The survey covered demographics, khat consumption, and khat perceptions. The quantitative data was analyzed through SPSS to include frequencies and logistic regression.444 pregnant women were enrolled with a median age of 25 years old. 66.9% of pregnant women reported consuming khat and 72.7% reported daily use. Khat chewing was significantly associated with women who lived in khat-producing households and women having an increased number of pregnancies.This recent study reveals a significant increase in khat consumption among pregnant mothers, rising from 15.5% in 2022 to 66.8% in 2023. This underscores concern that toxins may pass from pregnant women to infants during development, highlighting the potential health risks from khat consumption during pregnancy.

PRESENTER(S): Ethan Lantzy
AUTHOR(S): Ethan Lantzy, J. Barrett Carter, Eban Bean
FACULTY MENTOR(S): Eban Bean

Employing a Low-Cost Custom Spectrometer with Local Calibration Curve to Estimate Nitrate Concentrations in Streams

It is important to have real-time quantification of the chemical composition of water for regulatory, scientific, and ecological purposes. However, typical methods of water quality analysis are data-limited, expensive, and time-consuming. Spectroscopic techniques hold promise as a low-cost and accurate method of water quality analysis, especially when coupled with machine learning techniques. So, the Urban Water Resources Engineering laboratory within the University of Florida's Agricultural and Biological Engineering Department has developed a low-cost UV-Vis spectrophotometer (GatorSpec). Coupled with local calibration methods, GatorSpec has the potential to provide high frequency water quality information for a variety of parameters at a low cost. This presentation validates the accuracy of GatorSpec to measure nitrate levels in local streams through comparison with EPA analysis procedures. 50 filtered samples were collected from five sites along Hogtown Creek in Gainesville, Florida. Laboratory analysis of the samples were used to locally calibrate GatorSpec with a 70/30 train/test split and a Python program was developed to translate absorption spectra to concentration estimates. Results showed that a comparison of predicted and lab-measured nitrate values had a coefficient of determination of 0.787 with a Practical Quantitation Limit (PQL) of 0.131 mg/L.

PRESENTER(S): Yu Tin Lin
AUTHOR(S): Yu Tin Lin, Haohui Bao, David H. Chong, Jason B. Ang, Sophia A. Dadla, Ayisha Beauge, Jeris G. Gonzales, Yingchan Guo, Zhongling Liang, Ramon Alain Miranda Quintana, Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

iMSminer: A Data Processing and Machine Learning Package for Imaging Mass Spectrometry

Imaging mass spectrometry enables spatially-resolved, label-free measurements of hundreds to thousands of compounds in tissue samples. Each imaging mass spectrometry experiment generates a dataset of hyperdimensional molecular images over the number of molecules and x, y coordinate values. Computational preprocessing and analysis are crucial to unravel interpretable biological patterns in the hyperdimensional molecular and pixel space of imaging mass spectrometry datasets. Herein, we describe a user-friendly, open-source data processing pipeline written in Python and R to streamline preprocessing, statistical analysis, statistical learning, and machine learning of big imaging mass spectrometry datasets. Functions include raw data import, baseline corrections, mass calibration, mass alignment, peak picking, peak integration, normalization, chemical database searching, diagnostic molecular pattern recognition, biochemical pathway/network analysis, image processing, volcano plot visualization, heatmap visualization, dimensionality reduction, clustering, image segmentation, and transfer learning. This user-friendly, open-source data processing package for imaging mass spectrometry enables researchers without programming and statistical background to access resources for mining big imaging data sets. Untargeted analysis via imaging mass spectrometry holds promise for discovery-based mapping of characteristic in situ molecular profiles in diseases of interest to empower mechanistic or targeted therapeutic efforts.

PRESENTER(S): Lauren Dawson-Scully
AUTHOR(S): Lauren Dawson-Scully
FACULTY MENTOR(S): Scott Robinson

Effects of Urbanization on Community Composition and Phenotypes of Birds in Wetland Ecosystems

Urbanization in wetlands has negatively impacted bird species diversity and populations. It is important to be able to predict the consequences for avian biodiversity and to identify wetlands of special value to the maintenance of local wetland communities. This study involved conducting point counts across four permanent urban wetlands at the University of Florida and three retention ponds in the Gainesville, FL vicinity to observe patterns in wetland bird species diversity and populations. This study also utilized data from the Florida Museum of Natural History (FLMNH) to explore differences in phenotypes of wetland bird specimens. The local wetlands showed trends where specific species thrived in one type of area versus the other. Egrets were frequently observed in larger wetlands, and double-crested cormorants were observed more in smaller ones. Additionally, retention ponds showed promise as a conservation method but is dependent on their depth and size. The largest retention pond attracted many bird species in great numbers, showing promise for methods to negate negative the impact of human activity and climate change. Characterization for data collected at the FLMNH of both weight and species analyzed across numerous regional locations showed no clear pattern but may be of interest in future studies.

PRESENTER(S): Brian Blackwood
AUTHOR(S): Brian Blackwood, Seth Hale, Daiqing Liao
FACULTY MENTOR(S): Daiqing Liao

Phosphorylation Sites in the Oncogenic Lipogenesis and Epigenetic Regulator DAXX.

Death Domain Associated Protein (DAXX) is commonly overexpressed in many types of cancers and is involved in several cellular processes, including apoptosis and DNA repair. DAXX has context-dependent function as an oncogene and tumor suppressor and regulates transcription of several genes via association with various transcription factors, including the lipogenic transcription factors sterol regulatory element-binding proteins (SREBP1 and SREBP2). Cancer cells require increased levels of lipid synthesis for formation of new membranes and cell signaling during cell proliferation. It has been shown that DAXX's SUMO-binding activity is vital for oncogenic lipogenesis, and DAXX mutants deficient of SUMO-binding fail to activate SREBP1 and SREBP2 and lipogenesis. DAXX is a highly phosphorylated protein but how DAXX phosphorylation regulates function remain unknown. Using Proximity Ligation Assay (PLA) and immunofluorescence microscopy to target several DAXX mutants, we reveal that DAXX mutants deficient of phosphorylation sites appears to show decreased SUMO-binding activity in triple-negative breast cancer cell models. Here, we identify potential loss-of-function mutations in an oncogenic lipogenesis and epigenetic regulator and provide insight for future direction in studying DAXX interactions.

PRESENTER(S): Kurt Ramsey
AUTHOR(S): Kurt Ramsey
FACULTY MENTOR(S): John Biro

Kant and his Critique of Leibniz

According to one line of interpretation, in the Critique of Pure Reason, Kant argues that Leibniz conflated two kinds of cognitive capacities and their respective types of mental representations: (1) sensibility and sensible or spatiotemporal representations and (2) the understanding and intellectual or conceptual representations. According to this interpretation, Leibniz held that sensibility is not distinct from the understanding, and sensible representations are confused and reducible to distinct intellectual representations. However, this interpretation fails against the more charitable thesis that Leibniz believed the two cognitive capacities and their representations are distinct, yet all sensible representations are necessarily confused. Instead, I argue that Kant's criticism concerns a different distinction: general logic, the rules of thought in general, and transcendental logic, the rules governing thought of sensible representations. Additionally, I argue for a second part of Kant's criticism: the Copernican Revolution. By providing an account of mathematics that depends on objects of possible knowledge conforming to our cognitive capacities, Kant eliminates the possibility of a Leibnizian metaphysical project that allegedly aims beyond such objects. A Leibnizian would have to provide an account of the success of mathematics solely in terms of general logic or deny it altogether.

PRESENTER(S): Ryan Ames
AUTHOR(S): Ryan Ames, Sharon Chuah, Dr. Razieh Farzad
FACULTY MENTOR(S): Razieh Farzad

A Morphological and Nutritional Analysis of White Shrimp, Litopenaeus setiferus, Muscle

In response to the growing seafood demand and the environmental impact of traditional aquaculture and fishing methods, this study explored the potential of cellular agriculture for sustainable seafood production. Focusing on shrimp, the most consumed seafood in the United States, this study aimed to establish a comprehensive database of the morphological and physicochemical properties of shrimp muscle. This database is intended to support the development of cell-based seafood by providing a benchmark for texture, color, and nutritional content. To do so, thirty large white shrimp (Litopenaeus setiferus) were analyzed through texture analysis, colorimetry, hematoxylin and eosin staining, and proximate analysis. The findings indicate consistent texture profile analysis metrics across the shrimp's surface and cross-section, while colorimetry values showed significant differences. H&E staining revealed similar cellular patterns, affirming the uniformity of shrimp texture. The proximate analysis offers a nutritional target for developing shrimp analogs. The study concludes that while shrimp texture is consistent, addressing color variation is crucial for the development of cell-based shrimp analogs. Future research should include characteristics of cooked shrimp and other seafood products to expand the database for cellular agriculture applications.

PRESENTER(S): Tori Dew, Jacob Giacomini, Margot Joly, Anjali Khanna, Lucille Sinavsky, Ehren Towle
AUTHOR(S): Tori Dew, Jacob Giacomini, Anjali Khanna, Lucille Sinavsky, Margot Joly, Ehren Towle, Ana Martin-Ryals
FACULTY MENTOR(S): Ana Martin-Ryals

Investigating the Impact of Storage Temperature on Anaerobic Digestion of Food Waste

Approximately 30% of food is wasted, with most food waste (FW) in the U.S. ending up in landfills where it can potentially contribute to harmful emissions to the environment. FW also represents a resource that could be leveraged for energy and nutrient recovery via anaerobic digestion (AD). The objective of this study was to investigate the effects of storage temperature on methane production from AD of post-consumer FW. After reviewing the literature, a synthetic FW mixture was prepared, based on the reported composition of post-consumer FW. The FW was then stored at three temperatures, 4°C, 21°C and 33°C, representing low, average, and high temperatures for Gainesville, simulating storage in a trash can prior to AD. After one week, the FW was combined with anaerobic inoculum for biomethane potential (BMP) testing. The literature review revealed the largest component of FW is fruit/vegetables (42%), followed by leftovers (19%), and meat/fish (12%). Storage at 33°C led to the highest degradation and loss of FW. BMP testing resulted in methane production of 492.3, 447.7, and 413.4 mL/g VS, for FW stored at 4°C, 21°C, and 33°C, respectively. Thus, storage at higher temperatures leads to reduced methane production.

PRESENTER(S): Claudia Morales
AUTHOR(S): Claudia Morales, Dr. Nichole Scaglione, Taylor K. Rohleen, Abigail P. Masterson, Dr. Monica Webb, Dr. Shaun Boren, Dr. Liana Hone
FACULTY MENTOR(S): Liana Hone

Sexual Assault Experiences among UF Undergraduate Students: Differences by Gender and Greek Affiliation

1 in 4 women and 1 in 10 men experience sexual assault (SA) during college (Abbey, 2001; Forsman, 2017). Students in Greek Life face a disproportionate risk of experiencing SA (Mellins, 2017). Here, we examined differences in SA prevalence between (N = 829) undergraduate men and women associated and not associated with Greek Life at the University of Florida via secondary analysis of the American College Health Association's National College Health Assessment (ACHA-NCHA) data. We hypothesized women would report SA more frequently than men, and that both men and women in Greek Life would report SA more frequently than non-affiliated peers. The results confirmed the hypothesis that women reported more SA than men, $t(600) = 3.245$, $p = .001$, and women were 2.065 more likely to experience SA. There was no significant difference between Greek Life and non-Greek Life students' reports of SA, $t(600) = .92$, $p = .358$. Within-group t-tests (i.e., within Greek and non-Greek students) revealed no differences between Greek and non-Greek men and women ($ps > .24$). These results show a difference in SA experiences among men and women at UF, which can help inform future research evaluating risk factors associated with SA.

PRESENTER(S): Alyssa Holmquist
AUTHOR(S): Alyssa Holmquist
FACULTY MENTOR(S): Joni Splett

Investigating the Effects of the Parental Rights in Education Act

The Parental Rights in Education Act has limited the ability of schools in Florida to implement LGBTQ+-friendly policies and practices. These policies and practices have been shown to benefit mental health, reduce victimization, and increase school belonging for LGBTQ+ students (who already experience worse outcomes) and cisgender-heterosexual students. Therefore, this project analyzed changes in student mental health, victimization, and school belonging before and after the implementation of the Parental Rights in Education Act. Additionally, it examined changes in perceptions of inclusive and enumerated policies, professional development and training for school staff, student-led clubs, and inclusive curricula before and after implementation of the act. Analysis showed significant improvements for the overall sample for two out of five mental health measures, four out of six victimization measures, and the school belonging measure, as well as a significant increase in two out of five staff support measures (and no other practice measures). These differences may be influenced by the impact of COVID-19 on mental health and school environments, which would have worsened the outcomes the year before the act was enacted. However, when analyzing outcomes for LGBTQ+ students, these improvements are no longer observed, warranting further research into the effects of the legislation on LGBTQ+ students.

PRESENTER(S): Arabella Readey
AUTHOR(S): Arabella Readey, Sandra Ferreira, Edward Phelps
FACULTY MENTOR(S): Edward Phelps

Evaluation of GABA-A and GABA-B Receptor Expression in Pancreatic Islet Cells

Gamma-aminobutyric acid (GABA) is an inhibitory neurotransmitter that controls nervous cells' excitability. Pancreatic beta-cells have the largest concentration of GABA outside the brain, suggesting it greatly contributes to pancreatic islet function. Furthermore, islets from donors with diabetes have reduced GABA content in beta-cells. Studies showing the effect of exogenous GABA on insulin secretion are contradictory: GABA can be stimulatory or inhibitory depending on glucose concentrations. Our previous results using islets from conditional knockout mice lacking the GABA-synthesizing enzymes in pancreatic beta-cells (β-Gad1,2-/-) indicate that endogenous GABA can be inhibitory. We believe GABA's role in paracrine signaling may cause these different effects. Pancreatic islets express two types of GABA receptors, GABA-A-R (a ligand-gated Cl- channel) and GABA-B-R (a G Protein-coupled receptor). Our results using both agonists and antagonists of these receptor classes suggest GABA-A-R is inhibitory while GABA-B-R is stimulatory. Yet, further studies on the expression of GABA-A-R and GABA-B-R are needed to understand GABA's full effect on pancreatic islet function. Our objective is to identify the level of expression of GABA-A-R and GABA-B-R subunits in pancreatic alpha-, beta-, and delta-cells with available single-cell RNA sequencing transcriptomes, and to additionally compare their prevalence in β-Gad1,2-/- mice and wild-type mice via immunofluorescence.

PRESENTER(S): Anh Hao Dang
AUTHOR(S): Anh Hao Dang, Hong Huang, Jia Chang
FACULTY MENTOR(S): Jia Chang

Reposition of FDA-approved antidepressant, 2-PCPA, to treat periodontitis.

Trans-2-Phenylcyclopropylamin (2-PCPA) is the first generation of antidepressants. Recently, our lab found it may enhance osteogenic differentiation.This study explores the local application of 2-PCPA to treat periodontitis in a ligature-induced periodontitis mouse model. The periodontitis lesions were induced in 10-11 weeks-old C57BL/6 mice by placing 5-0 silk sutures between the 1st and 2nd maxillary molars for 12 days. Periodontal delivery of 30 µl methylcellulose gel (Sigma-Aldrich, St. Louis, MO) containing 10 mg/kg 2-PCPA or PBS control was administered by 1) during ligature placement or 2) after ligature removal. The intervention frequency is every other day (a total of six times). By the end of the experiment, all mice were euthanized, and the gingival tissue from the treatment sites was collected. Total RNAs were extracted, and the proinflammatory cytokine genes, including IL-1b, IL-6, TNF-α, and extracellular matrix degradation enzymes, were examined through real-time RT-PCR. 2-PCPA treatment significantly reduced inflammatory cytokine gene IL-1b, IL-6, TNF-α, and tissue extracellular matrix degradation enzyme MMP8 and MMP9 gene expression in periodontitis gingival lesions in early-stage and advanced lesions.The local oral administration of the epigenetic drug 2-PCPA could reduce inflammatory tissue breakdown in periodontitis.

PRESENTER(S): Amber Lopez
AUTHOR(S): Amber Lopez, Jonathan Judy
FACULTY MENTOR(S): Jonathan Judy

Microplastic Identification and Quantification in Drinking Water Treatment Residuals

Drinking water treatment residuals (DWTRs) are waste products generated during drinking water treatment. The composition of DWTRs varies by site, and most are primarily composed of Al, Ca, or Fe due to coagulants dominated by compounds containing these elements. DWTRs are typically disposed in landfills, leaving a high demand for removal strategies to minimize cost and waste. Potential reuse strategies include utilizing DWTRs as soil amendments, construction materials, and chemical and heavy metal sorbents. However, potential beneficial reuse applications are complicated by negative perceptions associated with contaminants, including microplastics (MPs), associated with waste residuals such as DWTRs. Currently, little is known about the occurrence and concentration of MPs in DWTRs. Clarifying this knowledge gap will provide useful information to operators, regulators, and the public regarding the degree to which land application of DWTRs could be a pathway of MP contamination of terrestrial ecosystems. Here, the relative concentration of MPs in representative Al, Ca, and Fe DWTRs was determined by implementing oxidation and density separation methods to extract MPs from DWTR samples. Collected MPs were quantified via fluorescent staining and characterized with FTIR analysis, and these findings allow for the determination of the extent of MP contamination in DWTRs.

PRESENTER(S): Brianna Tran, Ty Schrumpf
AUTHOR(S): Brianna C. Tran, Ty K. Schrumpf, Alex R. Cantrell, Matthieu C. Colpaert, Abbigail Renger, Ramon C. Sun, Matthew S. Gentry
FACULTY MENTOR(S): Matthew Gentry

The Impact of Dietary D-Galactose Supplementation on Brain Metabolism and Behavior in Wild-Type Mice

Protein glycosylation, an essential post-translational modification, plays a vital role in biological processes such as protein folding, targeted transport, and intercellular communication. Errors in this process lead to severe complications. For example, congenital disorders of glycosylation (CDGs) are characterized by neurological issues such as epilepsy and cognitive decline. Current research indicates a positive impact of monosaccharide dietary supplementation on CDGs. However, there is little known about the impact of supplementation of monosaccharides on normal brain physiology and metabolism. Therefore, we hypothesize dietary supplementation of monosaccharides, specifically D-galactose, may induce changes in brain chemistry and, consequently, behavior in healthy mice. This study explores the effects of dietary D-galactose on brain metabolism and behavior in wild-type mice. Utilizing western and Lectin blots, we quantified O-glycosylation, surprisingly revealing no changes. However, significant alterations in central carbon metabolic pathways, including glycolysis and the TCA cycle, were observed through gas chromatography-mass spectrometry (GC-MS) analysis. These metabolic changes correlated with behavioral shifts, suggesting that while D-galactose supplementation has no impact on glycosylation in healthy mice, it significantly affects metabolism and behavior. This research underlines the potential of dietary monosaccharides to alter brain chemistry, opening avenues for further investigation into their role in treating neurological metabolic disorders.

PRESENTER(S): Cec Wood-Barron
AUTHOR(S): Cec Wood-Barron
FACULTY MENTOR(S): Xan Burley

Merging Mediums: An Iterative Translatory Creative Process Blending the Compositional Styles of Poetry and Dance

Poetry and dance, as expressive art forms, are crafted with words and gestures, respectively, to convey different meanings.The integration of these two different creative mediums in the process of composition can offer an expansive understanding of the resulting poems and dance works. This paper and project explores the overlap of the creative processes of choreography and poetry and how the composition of both can influence each other. The project features choreography translated from poetry and vice versa, poetry written in response to choreography and dance improvisation, in an effort to create an interdisciplinary performance, and an iterative translatory process. The paper will chronicle the creative process as it merges compositional tools from poetry and choreography to determine how each process mirrors and enhances the other. This project will be performed, filmed, and seen by an audience. It will impact the artists involved, poets and dancers, as they figure out how to collaborate across the disciplines, contributing to the literature that already exists by adding a new voice and contributing a work of art in the form of choreography and poetry. The process will impact both fields, collaborations, teaching and learning, and poetry as a creative archive of the dance.

PRESENTER(S): Authors: Morrigan Baxter, Charlee Childers, Ryder Dickinson, Adaora Edeoga, Dacoda Mavarez, Amulya Ravipati
AUTHOR(S): Morrigan Baxter, Charlee Childers, Ryder Dickinson, Adaora Edeoga, Dacoda Mavarez, Amulya Ravipati, Kaylyn Koons, and Wendy Dahl
FACULTY MENTOR(S): Wendy Dahl

Got Choline?

Choline is an essential nutrient that is naturally present in animal-based foods and is available as a dietary supplement. Choline is needed to synthesize acetylcholine, an important neurotransmitter for memory, mood, muscle control, and other brain and nervous system functions. Recent epidemiological research suggests that low choline intake is associated with risk of neurological disease. The aim of this study was to develop and validate a diet screener that can quickly determine adults with low choline intake. A cross-sectional study will be conducted. We are recruiting 100 participants between the ages of 18 and 99 years. Participants will take the choline screener as well as a Diet History Questionnaire III (DHQIII). The choline screener, including 12 questions on weekly consumption of choline rich foods tailored to the American population, will be administered through Qualtrics. Choline intake, as assessed through the National Cancer Institutes' DHQIII, will be compared to the results of the choline screener. We hypothesize that our prototype choline screener will be a valid tool for determining inadequate choline intake in adults. If found valid, the choline screener could be used to help individuals determine if they have low intake of choline and possibly at risk for neurological disease.

PRESENTER(S): Avery Teman
AUTHOR(S): Avery L. Teman, Seanna C. Clark, Tatiana T. Vu, Zaraith S. Oviol, Maximo J. Marin
FACULTY MENTOR(S): Maximo Marin

Leveraging Machine Learning to Aid in the Utilization of Diagnostic Testing in Thrombotic Thrombocytopenic Purpura

Artificial intelligence (AI) has the potential to revolutionize the medical field with machine learning utilization improving patient outcomes. Thrombotic thrombocytopenic purpura (TTP) is a life-threatening, blood clotting disorder which is confirmed by the ADAMTS13 activity assay. The improper usage of ADAMTS13 and constrained resources in laboratories leads to inefficient patient care. This research project will result in a decision tree (DT) algorithm, aiding efficiently diagnosing TTP. This machine learning (ML) support tool would reduce the over-utilization of ADAMTS13 testing and save lives. In Phase 1, the principal investigator coded the ML algorithm which was developed by training and testing with preliminary data, producing an overall accuracy of 81%. Phase 2 curates a collection of patient data using the UF Health electronic health record for validation of the algorithm. Phase 3 includes additional testing with new data, while Phase 4 requires review of guidelines for implementation into the laboratory. This knowledge will help close the mortality gap for TTP, and provide the framework to advance the development of AI support tools for various diseases. The overarching mission is to create the lab of the future where AI-generated decision support tools guide better diagnostic testing to aid clinicians in improving patient care.

PRESENTER(S): Olivia Maule
AUTHOR(S): Olivia Maule, Dr. Keith Willmott
FACULTY MENTOR(S): Keith Willmott

Andean Uplift and Neotropical Butterfly Species Divergence

In my project, the primary hypothesis is that elevation correlates with DNA divergence, specifically that higher divergence is present at lower elevations. To test this, I am examining divergence in DNA sequences from museum specimens and existing sequences of related species on either Andean slope. Additionally, I hypothesize that DNA divergence among species at the same elevation could depend on differences in traits. I would expect more dispersive species to show less divergence than sedentary species occurring at the same elevations. Variables such as wing length as a measure of dispersal ability and flight height/speed will help model whether increasing elevation results in decreased divergence, and identify traits associated with species divergence and potential speciation. This study is the first to examine Lepidoptera DNA divergence and trait differences between east and west Andean populations at different elevations. Sequences drawn from specimens are offering insights into genetic differences between Lepidoptera on both Andean slopes at unique elevations. Knowing that 65% of insects may be extinct in a century, understanding biogeographical elements of lepidoptera divergence augments insights of climatic effects upon ecosystems. With my research, scientists can more accurately fabricate insights into reducing anthropogenic impacts to reduce rate of species extinction.

PRESENTER(S): Alyssa Suarez
AUTHOR(S): Alyssa Suarez, Marta Hansen, Gabriela Sanchez, Dr. Matthew Gurka, Dr. Lindsay Thompson, Dr. Carma Bylund, Dr. Stephanie Staras
FACULTY MENTOR(S): Stephanie Staras

Predictors of Parental Intent to Initiate HPV Vaccination for 11- to 12-year-olds

The human papillomavirus (HPV) is the most pervasive sexually transmitted infection in the United States, and the Gardasil 9 vaccine protects against six HPV-associated cancers. This study evaluates the relationship between parents' intent to vaccinate their child against HPV and their attitudes, perceived norms, personal agency, habits, and knowledge of the vaccine. Parents of 11- to 12-year-olds (n = 750) unvaccinated against HPV were surveyed as a part of a larger multi-level intervention among 30 Florida primary care clinic locations. Survey questions were adopted or adapted from prior surveys to measure the constructs from the Integrated Behavior Model. Parents completed the survey online or over the phone between March 2022 and October 2023. The survey responses were analyzed with bivariable and multivariable logistic regression models using SPSS Statistics 29 software. In adjusted models, parental attitude, habits, and perceived norms were significantly associated with parents' intention to have their children vaccinated within the next twelve months. The results of this study guide interventions that seek to reduce parental hesitancy for their children to receive the HPV vaccine.

PRESENTER(S): Ivy Fitzsimons
AUTHOR(S): Ivy Fitzsimons, Andrew Moore, Sara Jo Nixon PhD
FACULTY MENTOR(S): Sara Jo Nixon

An Early Exploration into Individuals in Treatment who Co-Use Alcohol and Hallucinogens

There is renewed interest in the therapeutic properties of hallucinogens in the treatment of psychiatric disorders including alcohol use disorder (AUD). Interestingly, however, there is little data regarding the comorbid use of hallucinogens and alcohol among persons with AUD. The paucity of such data constrains both scientific interpretation and treatment development. This analysis, which leverages data collected from individuals seeking treatment in facilities in North Central Florida, aims to address this gap by first characterizing the use of hallucinogens among treatment-seekers who report alcohol problems. Second, by focusing on use patterns among those who report recent and regular use of both alcohol and hallucinogens, we provide a precursory description of correlates of potential clinical utility.

Analyses revealed that recent and regular users of hallucinogens and alcohol were significantly younger than those who did not use hallucinogens in treatment ($p < 0.001$). Additionally, treatment seekers who reported regular use experienced more negative life consequences than those who were not regular users ($p < 0.01$). Results suggest that trends in age and life consequences of those who use alcohol and hallucinogens in treatment may contain clinically valuable information and should be interrogated by future investigations.

PRESENTER(S): Isabela Esin
AUTHOR(S): Isabela Esin
FACULTY MENTOR(S): Anna Peterson

Forest conservation programs in Amazonia: Comparing programs and outcomes in Brazil, Ecuador, and Peru

The Amazon Rainforest is facing a pressing deforestation crisis, posing grave threats to Earth's biodiversity, exacerbating carbon emissions, and imperiling the livelihoods of the indigenous groups that reside in the forest. Despite the Amazon's current predicament, indigenous groups living in the Amazon have historically maintained a sustainable and harmonious relationship with the land and advocated for its conservation. This relationship has fostered strong conversationalist values among the indigenous people which has influenced the eight Amazonian countries, notably Brazil, Ecuador, and Peru, to take independent action to attempt to limit this deforestation. However, the efficacy of these policies is questioned as deforestation continues to plague the Amazon. My paper will analyze the approaches employed by Brazil, Ecuador, and Peru in order to shed light on the strengths, weaknesses, and potential areas for improvement within their respective conservation programs. Each program's analysis will analyze the extent to which it adheres to the environmental values of its people and practical concerns such as financing the programs. Through this examination, I will shed light on the ongoing battle to conserve the Amazon rainforest, along with the communities that depend on it for their survival.

PRESENTER(S): Emile Karam
AUTHOR(S): Emile Karam, Jose Solbiati, Zavier Eure, Nicole Fiallos, Frank Nichols, Frank Gibson III
FACULTY MENTOR(S): Frank Gibson

Defining the Contribution of the galE Gene in the Virulence Potential of Porphyromonas gingivalis

Porphyromonas gingivalis is a Gram-negative anaerobic bacterium that is closely associated with periodontal disease. P. gingivalis can synthesize sphingolipids (SL) which our lab previously reported can modulate the host immune response to this organism. It is presumed that the mechanism by which P. gingivalis delivers its SLs to host cells involves outer membrane vesicles (OMVs). The galE gene in P. gingivalis encodes a UDP-galactose 4-epimerase and previous research using an unencapsulated strain indicates a galE mutant failed to produce OMVs. We generated a galE knockout in an encapsulated P. gingivalis strain W83 to understand if OMVs serve as the platform for SL transfer to host cells. Our galE knockout exhibits a delayed logarithmic phase of growth in planktonic culture, produces more biofilm, and fails to grow on 1% galactose. Further, the galE mutant did not produce OMVs and its SL profile resembled wildtype. Preliminary experiments measuring cytokine and chemokine levels in cell culture supernatant fluids from THP-1 macrophage-like cells cultured with wildtype P. gingivalis or the galE mutant unexpectedly revealed similar or elevated expression of inflammatory mediators compared to wildtype. Ongoing studies aim to determine if the galE mutant is able to transfer its SLs to host cells.

PRESENTER(S): Morgan Yacoe, Mary Kim, Saylor Scharf, Mia Rhodes, Alice Gastiaburo, Jake Wooley, Kristi Biswas, Mackenzie Smith, Breanna Grandison-Hinnant, Taryn Shein
AUTHOR(S): Kristi Biswas, Alice Gastiaburo, Breanna Grandison-Hinnant, Mary Kim, Mia Rhodes, Saylor Scharf, Taryn Shein, Mackenzie Smith, Jake Wooley, Morgan Yacoe
FACULTY MENTOR(S): Morgan Yacoe

Findings from the Creation and Implementation of Racially Inclusive Surgical Simulation Models in Medical Education

We seek to address the lack of diversity in surgical training tools within medical education. This project aims to improve training outcomes and patient safety for underrepresented populations. In order to achieve this, the team created hyperrealistic multi-layered suture pads of various skin tones and implemented them into several surgical training sessions for third-year medical students at the University of Florida College of Medicine. We conducted a mixed methods survey to collect feedback on the intervention. Our group analyzed the resulting qualitative data to determine themes in their feedback and general attitude toward the project. Coding and analysis of the qualitative data characterized the suture pads as a novel approach to address the lack of diversity in surgical training. Additionally, the collected qualitative data reflected an appreciation for the overall construction and quality of the suture pads. In terms of practical application, the majority of students stated that the suture pads provided them with an opportunity to practice and visualize a variety of suturing techniques. We conclude that the implementation of these inclusive surgical simulation models prove both educationally and experientially beneficial.

PRESENTER(S): Alejandro Ramirez, Melanie Gonzalez
AUTHOR(S): Alejandro Ramirez, Melanie Gonzalez, Sharon DiFini, PhD, CCC-SLP
FACULTY MENTOR(S): Sharon DiFino

Bridging Language Divides: Evaluating Bilingual Speech Therapy Interventions for Children with Speech Disorders

Language acquisition is crucial for any child's academic, social, and emotional development. However, bilingual children who present with speech and language disorders are often faced with distinct challenges that warrant specially crafted, evidence-based therapeutic interventions. Even with the heightened awareness amongst the field of speech and language rehabilitation for the importance of culturally competent services, there is still a prevailing gap in the literature for understanding the relative efficacy of both bilingual and monolingual speech therapy approaches for bilingual children; as a result, speech-language pathologists have to rely on their own interpretations due to the lack of randomized-controlled trials and meta-analyses on bilingual speech interventions. This is especially relevant considering that Latino children are increasingly misdiagnosed with speech disorders. As such, this literature review seeks to find and evaluate existing bilingual speech therapy interventions by considering a variety of methodological factors including assessment tools, target demographics, and general patient outcomes. Through a critical analysis of our findings, the goal of this literature review is to provide a better understanding of the benefits, disadvantages, risks, and opportunities that the bilingual interventions offer so they can be implemented accordingly to bilingual clients.

PRESENTER(S): Oscar Barrera
AUTHOR(S): Oscar Barrera, Imre Bartos
FACULTY MENTOR(S): Imre Bartos

Ancestral spin information in gravitational waves from black hole mergers

The heaviest black holes discovered through gravitational waves have masses that are difficult to explain with current standard stellar models. This discrepancy may be due to a series of hierarchical mergers, where the observed black holes are themselves the products of previous mergers. Here we present a method to estimate the masses and spins of previous generations of black holes based on the masses and spins of black holes in a binary. Examining the merger GW190521, we find that assuming black hole spins that are consistent with those of merger remnants will alter the reconstructed ancestral spins when compared to results with uninformed priors. At the same time, the inclusion of black hole spins does not significantly affect the mass distributions of the ancestral black holes.

PRESENTER(S): Pavithra Ramachandria
AUTHOR(S): Pavithra Ramachandria, Larissa C. Laforest, Michelle A. Kuntz, Abhisheak Sharma, Christopher R. McCurdy, and Satya Swathi Nadakuduti*
FACULTY MENTOR(S): Satya Swathi Nadakaduti

Characterization of Pharmaceutical Monoterpene Indole Alkaloids in Mitragyna speciosa

Mitragyna speciosa (kratom) is a tropical tree native to Southeast Asia. Kratom is ethnobotanically used for pain management and combating fatigue. Leaves of kratom accumulate over 50 Monoterpene indole alkaloids (MIAs) and oxindole alkaloids of pharmaceutical importance. Mitragynine is the most predominant alkaloid in kratom leaves that is a partial human μ-opioid receptor agonist. Variations in alkaloid content and composition have been reported in M. speciosa trees originating from varied geographical regions and varieties. In this study, we have characterized eight varieties of kratom originating from Tangkwa and Rentong regions of Thailand. Phenotypic differences in leaf morphology were observed in these varieties. Therefore, we performed DNA barcoding using nuclear ribosomal internal transcribed spacers (ITS) to confirm their identity. Ten targeted MIAs and oxindole alkaloids were quantified from young and mature leaves to distinguish chemotype variations. Mitragynine was the predominant alkaloid in mature leaves ranging from 0.22 - 0.90% followed by its stereoisomer speciociliatine from 0.07 – 0.48% illustrating a range of alkaloid profiles in these varieties. In juvenile leaves however, speciociliatine (0.52 – 0.88%) and corynantheidine (0.14 – 0.90%), are the dominating alkaloids indicating developmental variation in alkaloid accumulation. Future work will leverage this diversity to elucidate the biosynthesis of alkaloids in M. speciosa.

PRESENTER(S): Katherine Canev, Lily Carlson
AUTHOR(S): Austin L. Thomas, Katherine D. Canev, Lily A. Carlson, Alex D. Lacerna, Matthew J. Traum
FACULTY MENTOR(S): Matthew Traum

Live Baby Gators! Mailable Kits to Introduce 12 Engineering Majors to Online Learners

A poster presentation showcasing mailable 3D-printed educational laboratory kits. The presentation will outline how the kits are used for in-person, hybrid, and remote instruction with students enrolled in UF's EGS1006 Introduction to Engineering course. The short- and long-term goals of the project will be highlighted, including plans to branch out to other universities with similar introductory engineering courses. The history of the project, from its conception to the present day, will be highlighted. A hands-on demo of the "live" baby gators will showcase the features of the kit and their utility in facilitating remote engineering education. Attendees will have the opportunity to engage with the lab kits in much the same way as EGS1006 students do. The presentation will also discuss the growing need for remote engineering education in an increasingly virtual academic environment, which is the core motivation for this project.

PRESENTER(S): Benjamin S. Koppman
AUTHOR(S): Benjamin S. Koppman, Cole D. Stearns, Ronald K. Castellano
FACULTY MENTOR(S): Ronald Castellano

Design and Synthesis of Chain-Growth Initiators for [2.2]Paracyclophane Supramolecular Polymerization

Supramolecular polymers are self-assembled groups of monomer units held together by reversible, non-covalent interactions. Since 2016, our group has explored supramolecular polymers based on a variety of [n.n]paracyclophane ([n.n]pCp) monomer units, most notably [2.2]pCp-tetracarboxamides ([2.2]pCpTAs) and [2.2]pCp-tetraanilides ([2.2]pCpNTAs). Self-assembly of these monomers proceed via an isodesmic mechanism driven by intra- and intermolecular H-bonding and π-π stacking interactions allowing for strong, yet reversible supramolecular polymerization. In this work, we optimize the mechanism of assembly specifically targeting chain-growth. Compared with isodesmic self-assembly, chain-growth supramolecular polymerization affords robust assemblies with lower dispersities and better kinetic and thermodynamic control. Thus, we target non-complementary terephthalamide initiators for chain-growth copolymerization with [2.2]pCpTA and [2.2]pCpNTA monomers. Realization of chain-growth affords better tunability of physical properties, solubility, assembly mechanism, and functional group tolerance. A variety of 1H NMR techniques, density functional theory (DFT) computation as well as static and dynamic light scattering (SLS/DLS) are used to characterize these systems.

PRESENTER(S): Joshua K. Selvan, Irina M. Stoica, Xiuting Wei, Jeffrey D. Rudolf
AUTHOR(S): Joshua K. Selvan, Irina M. Stoica, Xiuting Wei, Jeffrey D. Rudolf
FACULTY MENTOR(S): Jeffrey D. Rudolf

Exploring the biosynthetic pathway of Sal, a novel bacterial diterpene synthase from Streptomyces albireticuli via mutagenesis

Terpenoids are the structurally diverse family of natural products. They are usually produced by plants and fungi, but can also be produced by bacteria. The diverse structure of bacterial terpenes and their biosynthesis pathway are understudied. Diterpene synthases catalyze the formation of a diterpene product ($C_{20}H_{32}$) skeleton from a linear 20 carbon geranylgeranyl diphosphate (GGPP). We discovered a novel bacterial diterpene synthase from Streptomyces albireticuli, Sal, and elucidated its novel 7-5-6 tricyclic diterpene alcohol albireticul-1-en-3-ol structure. Then, we investigated the aromatic residues around Sal active site for its catalytic role via mutagenesis. We found the aromatic side chain at W196 is important for forming albireticul-1-en-3-ol. These mutants also increase the activity for producing some intermediates compared to the wild-type Sal. We hypothesize that the modified residues will damage the stabilization for some key cation intermediates resulting in the formation of shunt products. All this points to the fact that mutagenesis is important in exploring the enzyme mechanism for formation of terpene, and suggests the need to design more mutants around the active pocket to support our proposed mechanism.

PRESENTER(S): John Moore
AUTHOR(S): Doug Soltis, Pam Soltis, Mackenzie Mabry, and John Moore
FACULTY MENTOR(S): Doug and Pam Soltis

Make like a Tree and Leave: Creating Ecological Niche Models for Fagus grandifolia and Fraxinus americana

Florida hardwood forests, also known as hammocks, are a biodiverse habitat in Florida, with the largest forests occurring in the Brooksville, Ocala, and Gainesville areas. However, in 2022, the state of Florida lost 38,600 hectares of forest due to widespread deforestation to make way for farming and development. Therefore, it is critical to understand the future of these important ecosystems. Using global databases of digitized herbaria records and environmental variables, we developed environmental niche models to create predictions about the vulnerability of the Florida hardwood forests to climate change. Two important species in Florida hardwood forests are the American beech (Fagus grandifolia) and the white ash (Fraxinus americana), two large tree species whose southernmost populations occur in northern Florida. While we can't possibly account for everything that will affect these forests, these models are projected to future climate models to explore how habitat suitability of these two tree species will expand, contract, or remain the same over the next several decades.

PRESENTER(S): Sydney Barfus
AUTHOR(S): Sydney Barfus, Douglas E. Soltis, Pamela S. Soltis, Makenzie E. Mabry
FACULTY MENTOR(S): Pam Soltis

Predicting the Effects of Climate Change on Celtis laevigata and Parthenocissus quinquefolia

Florida hardwood forests are diverse ecosystems that provide resources for a wide variety of plants and animals. As the effects of climate change continue to threaten biodiversity worldwide, it is more important than ever to study these deciduous forests as climate change threatens their ecosystems. This project aims to predict how the distribution of deciduous plant species will change by creating ecological niche models and connecting them to future climate predictions. This project focuses on two plant species: Sugarberry (Celtis laevigata) and Virginia Creeper (Parthenocissus quinquefolia). Both species were selected because they are native and prevalent in Florida forests. Using RStudio and the GatoRs package to access the iDigBio and GBIF databases, we obtained occurrence points that were cleaned and filtered to remove low-quality data. These data can then be used to create niche models that anticipate shifts in species distribution due to changing environmental factors. The project aims to determine how the ongoing climate crisis will impact deciduous hardwood forests, and therefore inform future decisions to protect natural habitats and the species within them. This research can then be expanded upon to include more species to further explore how climate changes are impacting and changing ecosystems.

PRESENTER(S): Catherine Medina Jimenez
AUTHOR(S): Catherine Medina Jimenez, Cameron J. Shedlock, Terrymar Medina, Roberto Ribas, Ramon C. Sun
FACULTY MENTOR(S): Ramon Sun

Experimental Optimization of Sample Preparations for Integrated Spatial Biology

Traditional pooled omics analyses lack spatial resolution and integrated analyses of multiomics datasets, thus limiting our understanding of the spatial heterogeneity and pathway coverage of metabolic landscapes. How we chose to come about these answers will depend on the reliability and reproducibility of the protocols developed. To overcome these challenges, we have developed the Spatial Augmented Multiomics Interface (SAMI), a novel experimental and computational workflow for the simultaneous analysis of spatial metabolomics, lipidomics, and glycomics datasets using matrix-assisted laser desorption/ionization (MALDI) mass spectrometry imaging (MSI). In this project we perform SAMI pathway analysis on both biological and technical replicates to experimentally determine the optimal section thickness and organ freezing protocol for reproducible MALDI MSI. Utilizing a mouse brain for proof of concept, SAMI revealed distinct metabolic classifiers which could impact how we come about conclusions. These conclusions are only as robust as the underlying reproducibility of the sample preparation leading to the data processing pipeline. By experimentally determining optimal sample preparation parameters, we improve the methodology for targeting disease research that could have major impacts in the field of medicine, leading to better and fresh avenues for hypothesis-driven research in the complex biological systems.

PRESENTER(S): Miriam Girgis
AUTHOR(S): Miriam Girgis*, Rachel Moor*, Frances Weidert, Hector Mendez-Gomez, Dingpeng Zhang, James McGuiness, Jonathan Chardon-Robles, Nagheme Thomas, Sadeem Qdaisat, Anna DeVries, Matthew Sarkisian, John A. Ligon*, and Elias J. Sayour* (*Contributed Equally)
FACULTY MENTOR(S): John Ligon

Increasing H3K27M Expression in DMG Neural Stem Cell Line

Diffuse Midline Glioma (DMG) is a highly aggressive tumor found in the pons of the brainstem in pediatric patients. Current standard of care, including chemotherapy and radiation therapy, is minimally effective and results in less than 10% 2-year overall survival from diagnosis. Previous work in the Sayour laboratory (RNA-LPA, IND19304—Sayour) has established a method for inducing anti-tumor efficacy and eliciting long-term survivor benefits through the use of ttRNA-LPA vaccines. Thus, an "off the shelf" mRNA vaccine could be beneficial, and developing a cell line with a highly preserved H3K27M mutation can be useful in further testing of vaccine efficacy. Neural stem cells were extracted from P2 neonatal mice and expanded in culture. These cells were electroporated under various conditions to load the H3K27M mutation, passaged, and assessed with daily fluoroscopy. Flow cytometry was performed to quantify H3K27M expression. Transduction of the H3K27M mutation was most successful at conditions E1(H3K27M plasmid concentration of 2.5ug/uL and FLP-Cre concentration of 4ug/uL at 125V for 5ms). This produced a population of cells that were GFP positive (8.98% of total population). This population will subsequently be cultured and flow cytometry repeated, and cell line sequencing will confirm H3K27M expression.

PRESENTER(S): Morgan Smith
AUTHOR(S): Morgan Smith
FACULTY MENTOR(S): Gemma Casadesus

Cellular and Regional Colocalization of LH and LHR in the CNS

The link between menopause and neurodegenerative diseases has been previously identified, but the exact mechanism underlying this interrelationship remains unknown. Specifically, in postmenopausal women, there is an increased level of peripheral LH but a drastic decrease in central nervous system (CNS) LH. The loss of CNS LH signaling is thought to be involved in menopausal cognitive changes and increased risk of AD. A first step toward understanding this mechanism is to evaluate the regional and cellular location of this hormone and its receptor, the LH/CG receptor (LHCGR). Therefore, to address this, we curated and validated custom-designed RNA probes to visualize and measure transcripts for LHb and the LHCGR within the brain. These probes were multiplexed with GAD1 (neuronal), and GFAP (astrocyte) probes to determine the cellular types expressing LH and LHCGR. To further validate the localization of LHb and LHCGR we also performed immunohistochemistry with a GFAP antibody and performed out work in CX3CR1GFP/+ mice which have a fluorescent marker for microglia. Our data show differential regional and cellular localization of this hormone-receptor complex and advances our understanding of their role in the CNS.

PRESENTER(S): Karen Siena Villancio-Wolter
AUTHOR(S): K. Siena Villancio-Wolter, Sofia Arvelo Rojas, Daniel Ferris, Chang Liu
FACULTY MENTOR(S): Daniel Ferris

Evaluating the Effects of Walking Speed and IMU Placement on Joint Angles during Gait

Inertial measurement units (IMUs) are wearable sensors that can be used for portable human gait analysis (e.g. joint angles). This has many potential applications, from clinical gait assessments to outdoor research studies. Our study aims to investigate how walking speed and IMU placement on the body effects joint angle calculations during gait. In this study, 3 healthy young adults wore 13 IMUs (APDM Opals) on their lower body and full-body motion capture markers. The participants walked on a treadmill at 6 different speeds for 2 minutes each. We calculated their joint angles (hip, knee, and ankle) with the motion capture data (Visual 3D) and IMU data (OpenSense inverse kinematics). We compared the calculated joint angles in the sagittal plane at different walking speeds and IMU placement configurations. From preliminary results, we observed that IMU placement does not have a significant effect on joint angle calculations. In addition, the joint angle consistency increased as the walking speed increased. Moving forward, we will compare the IMU and motion capture joint angles to evaluate IMU gait analysis performance against the current gold standard. We will also process IMU data from a stroke study to investigate IMU gait analysis with a clinical population.

PRESENTER(S): Sionika Thayagabalu
AUTHOR(S): Sionika Thayagabalu, Nicole Cacho, Sandra Sullivan, John Smulian, Adetola Louis-Jacques, Marie Bourgeois, Henian Chen, Wasana Weerasuriya, Dominick J Lemas
FACULTY MENTOR(S): Dominick Lemas

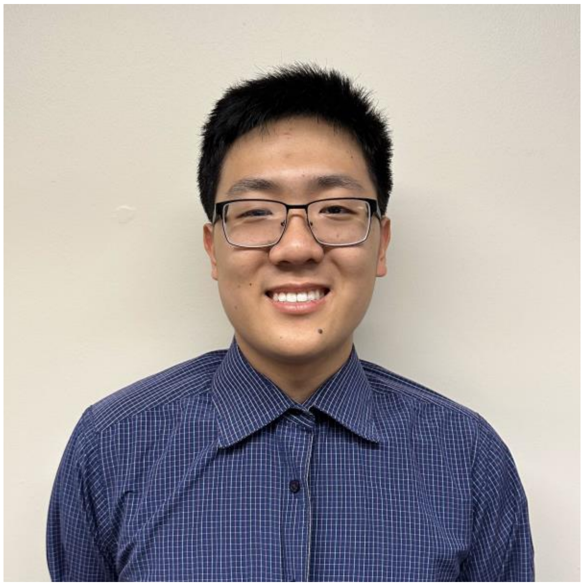
A systematic review of contaminants in donor human milk

Donor human milk (DHM) from a milk bank is the recommended feeding method for preterm infants when the mother's own milk (MOM) is not available. Despite this recommendation, information on the possible contamination of donor human milk and its impact on infant health outcomes is poorly characterized. The aim of this systematic review is to assess contaminants present in DHM samples that preterm and critically ill infants consume. A search of PubMed, EMBASE, CINAHL and Web of Science yielded 26 papers following screening. Primary contaminants in donor human milk included bacterial species and environmental pollutants. We found that bacterial contaminants were identified in 100% of the papers in which bacterial contamination was sought (16 papers) and 61.5% of the full data set (26 papers), with the most frequently identified genera being Staphylococcus (e.g., Staphylococcus aureus and coagulase-negative Staphylococcus) and Bacillus (e.g., Bacillus cereus). Chemical pollutants were discovered in 100% of the papers in which chemical contamination was sought (eight papers) and 30.8% of the full data set (26 papers). The most frequently identified chemical pollutants included perfluoroalkyl substances (six papers), toxic metal (one paper) and caffeine (one paper). Viral and fungal contamination were identified in one paper each. Our results highlight the importance of establishing standardization in assessing DHM contamination and future studies are needed to clarify the impact of DHM contaminants on health outcomes.

PRESENTER(S): Angela Philistin
AUTHOR(S): Angela Philistin, Folly Patterson, Kyle D. Allen
FACULTY MENTOR(S): Kyle Allen

Rat Synovial Fluid Protein Extraction and Quantification in Relation to Osteoarthritis

In the detection of Osteoarthritis (OA), biomarker presence in synovial fluid (SF) can be analyzed for changes related to trauma and inflammation to joints. For OA, there are higher SF protein concentrations in early stages compared to later stages. In this study the SF of rats with OA was collected using Schirmer strips. With minute amounts of SF in rats, a protocol was created to maximize protein yield in BCA assays by first running the assay on known protein concentrations. Average yield over 400% indicated the presence of proteins or interfering agents in Schirmer strips used. Performance of a linearity of dilution on Schirmer strips showed a positive relationship between mass and protein concentration, as well as interfering agent presence. Running an ELISA showed an undetectable amount of inflammatory cytokine rat TNF-α in samples. Use of different protein assays to diminish the effect of interfering agents on Schirmer strips may prove more effective in accurate protein concentration determination. Future ELISA runs of another inflammatory cytokine, IL-6, may result in detectable amounts that can demonstrate a relationship between concentration and OA progression.



PRESENTER(S): Jonathan Zheng
AUTHOR(S): Jonathan Zheng, Makenzie Mabry, Pamela Soltis, Douglas Soltis
FACULTY MENTOR(S): Douglas Soltis

Modeling the Future of Endemic Shrubs in Florida's Mixed Hardwood Forests

The Southern Mixed Hardwood Forests in Florida contain the southernmost reaches for many plants endemic to the eastern United States. As such, the ecosystem is crucial to protect biodiversity and conservation efforts on the Eastern seaboard. Two native plants of Florida Hardwood Forests are Calycanthus floridus and Chionanthus virginicus. They are understory shrubs with showy flowers and are commonly used for decoration. This study uses ecological niche modeling and climate models to determine the distribution of these two species over the course of the next 50 years. Occurrence data is downloaded from iDigBio and GBIF and models are projected to future climate scenarios to test habitat suitability. This research on the future distribution of Calycanthus floridus and Chionanthus virginicus in the Southern Mixed Hardwood Forests of Florida is vital for guiding effective conservation efforts, ensuring the continued protection of these endemic species, and maintaining the ecological integrity of the Eastern U.S. seaboard.

PRESENTER(S): Alexandra Martinez
AUTHOR(S): Alexandra Martinez, Soamy Montesino-Goicolea, M.D, Kristina Bell, Julia Cochran, Yenisel Cruz-Almeida, MSPH, Ph.D Larissa J. Strath, Ph.D
FACULTY MENTOR(S): Larissa J. Strath. Ph.D

Exploring Sex Differences on the Impact of Carbohydrates on Chronic Pain and Physical Function in Adults with Knee Osteoarthritis: Preliminary Results from the PANDA Study

Osteoarthritis-related chronic musculoskeletal pain stands as the most prevalent cause of disability in the United States and disproportionately affects the female sex. Evidence suggests that there is a relationship between diet quality and pain/physical function outcomes, specifically carbohydrate consumption.A preliminary, cross-sectional analysis of 34 community dwelling adults aged 45–85 who reported knee pain and osteoarthritis was completed. Self-reported pain, a 24-hour food log, and relevant demographic information were collected. T-tests and correlation analyses were used to assess relationships between carbohydrates and self-reported pain in both sexes. There were differences in the amounts and types of carbohydrates consumed in relation to pain and physical function between males and females. Taken together, these data suggest an association between not only amount of carbohydrates consumed, but also type of carbohydrate with pain and physical function in a sex-dependent manner.

PRESENTER(S): Caroline Eggers
AUTHOR(S): Caroline M. Eggers1, Shainnel O. Eans1, Bowen Tsai1, Ariana C. Brice-Tutt1, Dmitry Yakovlev2, Brian I. Knapp3, Jean M. Bidlack3, Jane V. Aldrich2 and Jay P. McLaughlin1
FACULTY MENTOR(S): Jay McLaughlin

Developing orally-active kappa opioid receptor antagonists as therapeutics to prevent stress-induced cocaine reinstatement

The macrocyclic tetrapeptide (MTP) cyclo[Phe-D-Pro-Phe-D-Trp] ([D-Trp]CJ-15,208) demonstrates kappa opioid receptor (KOR) antagonist activity following oral administration, preventing stress-induced reinstatement of cocaine-seeking behavior. To enhance KOR antagonism for the treatment of cocaine use disorder, we examined 55 MTP analogs in vitro with competition binding assays using the KOR-selective radioligand [3H]U69,593, identifying 25 that possessed KOR affinity with a Ki value of 50 nM or less. Of these, analog BPN-37088 demonstrated a KOR Ki value of 3.2±0.5 nM and antagonized KOR inhibition of cAMP production with an IC50 value of 23±7.7 nM. Screening results were confirmed in vivo with mice administered analogs orally (at 30 mg/kg, p.o.) and tested for their ability to antagonize the antinociception of the KOR-selective agonist U50,488 (10 mg/kg, i.p.) in the 55oC warm-water tail-withdrawal test. BPN-37088 produced dose-dependent and selective antagonism lasting at least 2.5 h after U50,488 was administered either peripherally (10 mg/kg, i.p.) or centrally (100 nmol, i.c.v.) with doses as low as 1 mg/kg, p.o. Pretreatment with BPN-37088 (3 mg/kg, p.o.) prevented stress-induced reinstatement of extinguished cocaine conditioned place preference. Collectively, these data demonstrate the therapeutic potential of novel MTP KOR antagonists to prevent stress-induced relapse to cocaine-seeking behavior in abstinent subjects.

PRESENTER(S): Hanley Renney
AUTHOR(S): Hanley Renney, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Pamela Soltis

Habitat Suitability Predictions for Acer saccharum subsp. floridanum and Sabal palmetto Using Ecological Niche Models

Due to Florida's near-tropical latitude, it is experiencing the effects of climate change at an increasing rate, many of which are yet to be determined for certain species and ecosystems. As a primary ecosystem in Northern Florida, the upland hardwood forest provides habitat to many species of large mammals, birds, and reptiles. In this study, ecological niche models are made for two upland hardwood forest species, the Florida maple (Acer saccharum subsp. floridanum) and the Sabal palmetto (Sabal palmetto), to determine whether their niches will expand or contract based on established climate predictions. Acer saccharum subsp. floridanum is a large deciduous hardwood tree, while S. palmetto is a monocot palm exhibiting multiple fan-shaped leaves. To model the ecological niches for each of these species, occurrence data are downloaded from GBIF and iDigBio. It is predicted that A. saccharum subsp. floridanum may shift northward, decreasing its population within Florida, while S. palmetto may expand northward as temperatures increase but still maintain and perhaps even increase populations throughout Florida. These shifts are integral to predicting the future of Southern hardwood forests, and results will impact current conservation practices by indicating if species are at risk of endangerment.

PRESENTER(S): Esha Chakraborti, Atheena Kurikose
AUTHOR(S): Esha Chakraborti, Atheena Kurikose, Aryanna Pabon, Melissa Vilaro, PhD, MPH
FACULTY MENTOR(S): Melissa Vilaro

Communal Coping for Cardiovascular Health in African American Colorectal Cancer Survivors

Cardiovascular Disease (CVD) is one of the most prevalent concerns for American cancer survivors, with 54% of survivors experiencing heart failure in their lifetime. One popular approach to addressing CVD is the DASH Diet, which uses balanced, heart-healthy food to reduce hypertension, inflammation, and mortality. However, adherence to dietary guidelines for cancer survivors is often hard, especially for African Americans (AA) who face a higher burden of disease. One theory of how to increase adherence to CVD treatment guidelines is through "communal coping" strategies. In this project, we are studying the correlation between communal coping and adherence behaviors among AA colorectal cancer survivors, with a focus on dietary and medication adherence. Data collected from focus groups and interviews will be analyzed to explore insights of cancer survivors, their family members, cardiologists, and oncologists on several topics including communal coping strategies, adherence, and the challenges of managing CVD as patients and physicians. Data collection is ongoing, however, we have preliminary findings from the physician interviews and patient focus groups which will be analyzed to see the degree that physicians and patients feel empowered to continue cardiac surveillance during survivorship. This project will provide valuable strategies to address racial health disparities in cardio-oncology outcomes.

PRESENTER(S): Kelsey Cooper
AUTHOR(S): Kelsey Cooper, Daniel Gal, Julie Maupin-Furlow
FACULTY MENTOR(S): Julie Maupin-Furlow

DUF1119 Family Membrane Peptidase Gene hvo_1107 and its Impact on Growth of Haloferax volcanii

Haloferax volcanii is a halophilic archaeon used as a model organism given its ability to be easily grown and genetically modified. Growth of a H. volcanii mutant strain featuring deletion of the DUF1119 family membrane protease gene hvo_1107 was examined in different media. This gene deletion affected growth relative to the parent strain in minimal media with glycerol as the carbon source as well as Casamino Acid media (Hv-Ca) and ATCC974 complex medium, each with different carbon sources. We are able to compare the growth of this strain on various media with different components to understand how this gene effects growth under different carbon sources. Further experiments will continue testing the effects of this mutation on growth of the organism in different environmental conditions such as varying carbon sources and stresses. By examining the effect of different media and media additives on the growth of the deletion strain relative to the parent strain, we hope to be better able to pinpoint the exact function of the protease gene, hvo_1107, and be able to apply these findings to eukaryotic organisms. This project will advance our understanding of how halophilic archaea, such as H. volcanii, interact with their environment and available nutrients.

PRESENTER(S): Miguel Celi
AUTHOR(S): Miguel Celi, Benjamin Johnson
FACULTY MENTOR(S): Benjamin Johnson

Meditation App Athletes

This research explores the potential relationship between the usage time of meditation apps on smartphones and the frequency and durability of the flow state experienced by American adults who play sports during gameplay. The study aims to address important questions regarding the influence of meditation on achieving flow, comparing media meditation apps to traditional meditation approaches. Additionally, the study analyzes the role of mindfulness in preventing mental burnout in sports while analyzing different factors that may affect the occurrence of the flow stage and its duration during the game. Data collection is underway in mid-March 2024. American adults who play sports complete a questionnaire that measures meditation experiences, mindfulness, burnout, flow during sports, and sports performance satisfaction. Correlational and regression analyses will test for relationships between practicing mindfulness and sports performance and achieving a flow state. Athletes and coaches can use these findings to include mindfulness in their training schedules.

PRESENTER(S): Eli Zemach
AUTHOR(S): Eli Zemach, Benjamin Johnson
FACULTY MENTOR(S): None None

Athletics and Authenticity: A Correlational Study Examining Instagram User Perceptions of Athlete-Related Brands and Influencers

This consumer psychology study investigates the relationship between social media content production techniques and consumer perceptions of authenticity, trustworthiness, expertise, and persuasive intent for athletic brands' posts on Instagram (IG). This study attempts to understand how consumers perceive athletic brands when it originates through advertising, influencer content, or organic word-of-mouth. We are collecting participant responses to a purposive sample of IG posts, in order to assess relationships between specific post components (e.g., production quality, source type, brand type) and consumer perceptions of post factors, specifically perceived authenticity, expertise, trustworthiness, production quality, and persuasive intent. This online experiment is currently in data collection with undergraduate students, and the target sample size is N = 400. The stimulus sample consists of a conventional IG posts pulled from dominant hashtags for two brands, On Cloud shoes (durable product) and Optimum Nutrition protein powder (non-durable product). Potential implications of these findings include the potential for differentiating brand abilities to appear the way they would like on IG through marketing. Ultimately, this study has the ability to indicate the importance of perceptually authentic or inauthentic posts on consumer behavior.

PRESENTER(S): Salomon Bibas, Sydney Downey, Cassidy Martin, Madalena Meeker, Campbell Scharer, Rylan Soriano
AUTHOR(S): Salomon Bibas, Sydney R. Downey, Cassidy Martin, Madalena Meeker, Campbell M. Scharer, Rylan J. Soriano, Charles W. Martin, Laura K. Reynolds, Adam R. Searles
FACULTY MENTOR(S): Adam Searles

Seagrass and Macroalgae Relative Dominance Influences Faunal Biodiversity and Biomass

Macroalgae are replacing seagrasses in marine ecosystems across the globe. Macroalgae beds can support unique faunal assemblages compared to seagrasses and can therefore drive changes in community structure and ecological function as they increase in abundance. However, large changes in the relative abundance of marine macrophytes often occur as a result of anthropogenic impacts such as eutrophication and associated light limitation. These background environmental conditions often hamper attempts at isolating the effects of seagrass replacement by macroalgae on ecological communities. To understand how changes in macrophyte abundance may affect ecological communities, we sampled Thalassia testudinum, Caulerpa prolifera, and Caulerpa paspaloides monocultures as well as mixed habitats for benthic invertebrates and fishes in a low-nutrient and minimally-impacted system: Crystal Bay, Florida. We assessed the impact of shifting macrophytes on ecological communities by comparing biodiversity metrics and faunal biomass along a macrophyte dominance matrix. Preliminary results suggest that differences in macrophyte abundance and habitat complexity influence biodiversity and faunal biomass. Our research suggests that differences in species diversity and biomass may contribute to broad, community-level differences previously observed in seagrass and macroalgae habitats.

PRESENTER(S): Neeley Delamata
AUTHOR(S): Neeley Delamata
FACULTY MENTOR(S): Matthew Schiefer

Validation and Verification of Functional Electrical Stimulation (FES) Rodent Bicycle

The experiments described herein are part of a larger study to develop and operationalize a "humanized" functional electrical stimulation (FES) bicycle system for rats. The long-term goal of that study is to optimize FES parameters to minimize bone loss and/or promote bone recovery in a rat spinal cord injury (SCI) model. The experiments targeted four hindlimb muscle groups (quadriceps, hamstrings, gluteals, and plantar flexors) bilaterally. The goal of this study was to create and control pedaling motion in anesthetized and/or spinalized rats while on the bicycle. The objectives were to 1) determine optimal placement of surface electrodes to restore and control motion; 2) determine the input-output response between electrical stimulation (ES) parameters and multiple motions, including knee extension and flexion, hip extension and flexion, and plantar flexion; and 3) validate the crankshaft angles in which ES should be applied to these specific muscles in comparison with a previously developed mathematical modeling approach that predicted ideal crankshaft angles for ES in each muscle.

PRESENTER(S): Achyudhan Kutuva
AUTHOR(S): Achyudhan Kutuva, Reinhard Laubenbacher, and Henrique de Assis Lopes Ribeiro
FACULTY MENTOR(S): Henrique de Assis Lopes Ribeiro

A Qualitative Network of Airway Epithelial Cells Infected with SARS-Coronavirus: Construction and Validation

SARS-CoV-2 is a viral respiratory illness that causes COVID-19, which was first detected in December 2019. Based on the public health crisis involving this disease and with current knowledge of the various biological mechanisms that COVID-19 employs, we developed an integrative Qualitative Network model. This model discretely represents actions that take place continuously in the human body, specifically focusing on viral effects on pneumocytes. This model incorporates elements of various cellular processes, including AKT-mTOR, ACE 2-Angiotensin, and other major immunological pathways. The model consists of an ensemble of 500 asynchronous networks ran independently, providing insight into potential attractors. To validate this model, we collect literature data regarding in-vitro experiments on Calu-3 and A549 cells infected with SARS-CoV-2 or non-infected (controls). This data contains levels of proteins and phospho-proteins measured 24 hours post-infection. The model reproduces 19 of 23 of these measurements. However, we found the model correctly predicted Calu-3 in all cases (12/12), while having mostly correct prediction for A549 (7/11). We are working to understand the cell-specific factors that contribute to these differences. This work can help uncover the molecular mechanisms behind different COVID phenotypes. Many of these mechanisms also overlap in responses to other major viruses and diseases, providing motivation to generalize this model while maintaining relative simplicity and high accuracy.

PRESENTER(S): Tanmayee Kolli
AUTHOR(S): Samanvitha Deepthi Sudi, Tanmayee Kolli, Dr. Ana Maria Porras
FACULTY MENTOR(S): Ana Maria Porras

Investigating the Impact of a Gut Metabolite on Valvular Interstitial Cell Activation

Calcified Aortic Valve Disease (CAVD) affects up to 13% of the U.S. population and is linked to diet-induced changes. Recent studies suggest that the gut metabolite TMAO may be a biomarker for atherosclerosis. Given the shared risk factors between atherosclerosis and CAVD, we hypothesize that TMAO may contribute to CAVD by activating valve interstitial cells (VIC). VICs isolated from porcine aortic valves exhibited spontaneous activation in traditional culture, contrasting the quiescent phenotype in healthy valves. Our lab-engineered protocol generated quiescent VICs (qVICs). TMAO treatments, alongside controls (untreated qVICs, activated VICs, and TGF-β-treated qVICs), increased αSMA expression, proliferation, and cytokine secretion after 3 days, elucidating TMAO's effects on VIC activation toward a myofibroblast phenotype. Sex-specific responses showed no significant differences. These results demonstrate that TMAO, a gut microbiome-derived metabolite, promotes the activation of quiescent VICs toward a myofibroblastic phenotype in vitro, contributing to the initiation of CAVD. Overall, these findings underscore the significance of host-microbe interactions in the progression of cardiovascular disease.

PRESENTER(S): Allyson Carlos, Daesha Holmes, Rishika Podarala
AUTHOR(S): Carolyn M. Tucker, Kirsten Klein, Lakeshia Cousin, Guillermo Wippold, Kelly Folsom, Shruti Kolli, Juanita Miles-Hamilton
FACULTY MENTOR(S): Carolyn Tucker

Determinants of HRQoL in Low-Income Black Populations with Excess Weight and Comorbid Chronic Conditions

This study examines levels of cognitive behaviors, stress, depression, engagement in healthy eating and physical activity, and body mass index (BMI) as predictors of physical and psychological health-related quality of life (HRQoL) using a sample of lower income Black adults that are overweight or have obesity and have at least one chronic condition. The study participants (N=243) ranged from 40-88 years old, most of whom identified as women (76.1%); additionally, nearly half the sample (49.8%) reported having only completed high school and one-third (33.7%) reported <$25,000 annual household income. Notably, 72% were classified as having obesity and 28% as being overweight. These participants also had at least one chronic condition with most having high blood pressure (61.7%) and nearly one-third having chronic pain (27.6%), high cholesterol (30.9%), and/or type 2 diabetes (27.2%). Results showed (a) levels of physical activity, stress, and depression were statistically significant predictors of physical HRQoL, and (b) only depression was a statistically significant predictor of psychological HRQoL. Interventions need to promote the intersectionality between physical and psychological HRQoL and include culturally tailored psychological counseling addressing depression and stress, while promoting physical activity and reduction of BMI.

PRESENTER(S): Mia Stewart
AUTHOR(S): Mia Stewart, Adeel Manzoor, Isabel Ribeiro, Laurent Lagos Mendoza, Karina Vestergaard, Mia Nunez, Jason Scheffler
FACULTY MENTOR(S): Jason Scheffler

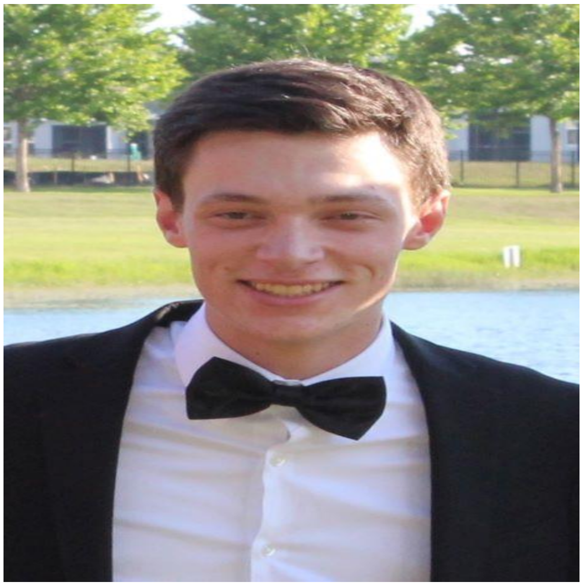
Control of Staphylococcus aureus During Biltong Production

Biltong is a jerky-like meat product native to South Africa. Unlike jerky, biltong is dried at ambient temperatures and relies on salt concentration and pH to control pathogen growth. Staphylococcus aureus is commonly found in foods exposed to ambient or higher temperatures and with frequent handling. Staph is associated with dried meat products due to a tolerance for low water activity (aw) and high salt concentrations. The objective of this study is to 1) evaluate effectiveness of acid marination and drying of biltong to control Staph, and 2) determine if prior adaption to acid stress increased resiliency. Biltong strips (100 ± 5.0g; 2cm ×6cm ×8cm) were cut from beef round, inoculated with stationary phase Staph. Strips were dipped in 5% lactic acid, marinated overnight in vinegar, and dried for 7d at 27°C and 55% humidity. Samples were collected before and after dipping, marination, and each day of drying for enumeration and aw assessment. Combined lactic acid dip, marination, and 7d of drying resulted in 3.5±0.24 log cfu/g reduction (P<0.0001) of Staph which concludes that treatments are sufficient during processing. Stress adapted Staph were less resilient (5.1±2.5 log cfu/g, P<0.001) therefore would not be the best culture choice in future studies.

PRESENTER(S): Katelyn Disler
AUTHOR(S): Katelyn Disler, Alexandra van den Ochtend, Carolina Rosales, Catherine Striley, Linda B Cottler
FACULTY MENTOR(S): Catherine Striley

How does insurance status affect barriers to getting COVID tests?

Understanding barriers that people experience accessing COVID tests in relation to insurance status can help create targeted campaigns to reach those with varying levels of coverage. The CDC-funded, UF-led Program to Alleviate National Disparities in Ethnic and Minority Immunizations in the Community (PANDEMIC) surveyed community members in seven states. This Survey of Perceptions (SoP) collected anonymous opinions on the COVID-19 pandemic, including insurance status and barriers respondents experienced getting COVID tests. Of the 2,842 participants taking the survey from September 18, 2023 through January 31, 2024, 68% were fully insured, 11% were underinsured, and 21% were uninsured. Underinsured respondents were significantly more likely to have experienced barriers getting COVID tests (37%) than fully insured (20%) or uninsured (22%) respondents. Of those who experienced barriers, the top barrier for fully insured and uninsured respondents was test kits not being free (32%, 35%), while for underinsured respondents, it was costs of in-person testing (28%). Underinsured respondents were significantly more likely to list costs of in-person testing as a barrier compared to fully insured (12%) and uninsured respondents (10%). While many programs looking to reduce insurance-based disparities focus on uninsured groups, it's also important to create programs to increase access for underinsured populations.



PRESENTER(S): Ethan Slaton
AUTHOR(S): Ethan W. Slaton, Samantha G. Martinusen, Marian A Pulgar, & Carl A. Denard
FACULTY MENTOR(S): Carl Denard

Discovering DARPin Inhibitors Against Disease-Relevant Targets for Potential Therapeutic Development

Proteases are involved in several biological processes. Upon dysregulation, proteases often contribute to disease, making them critical therapeutic targets for inhibition. However, current protease inhibitors lack selectivity because they target active sites that are often conserved across proteases. Moreover, an unmet need is to inhibit a protease only on its disease-relevant substrates. To address this problem, our lab has developed a High-throughput Activity screen for the functional Reprogramming of Proteases (HARP). HARP is a yeast surface display system that allows us to engineer and discover protein binders that can reprogram proteases, leading to novel therapeutic targets. In this work, we used HARP to engineer protease inhibitory Designed Ankyrin Repeat Proteins (DARPins) from a large error-prone library for the first time. DARPins are synthetic protein binders with exceptionally high binding affinity and specificity. Our functional screen circumvents the limitations of high-throughput affinity binding assays such as ribosome display. As an extension of this approach, we will be able to identify DARPins that are substrate-selective against disease-relevant proteases for new therapeutics.

PRESENTER(S): Mai-Ly Thompson
AUTHOR(S): Mai-Ly Thompson, W. Sebastian Barrutia, Daniel Ferris
FACULTY MENTOR(S): Daniel Ferris

Design and Validation of an Electromechanical Clutch for a Lightweight Knee Exoskeleton Designed for Children with Cerebral Palsy

Lower-limb exoskeletons are important rehabilitation aids for clinical populations with gait impairments caused by neuromuscular diseases such as cerebral palsy. This condition causes crouch gait, which is characterized by increased knee flexion during gait. We have previously designed a knee exoskeleton that provides knee assistance to children with cerebral palsy during the gait cycle. However, the current exoskeleton engagement method is actuated by heel strike at early stance phase, which may be unreliable for individuals with toe-walking. We aimed to develop and test an electromechanical clutch for integration into a knee exoskeleton that: (1) engaged with both toe-walking and normal walking, (2) had a total mass less than 500g, (3) engaged quicker than 10ms, (4) was untethered, (5) and had an adjustable and easily integrable footswitch. To validate the clutch design, we recruited five participants to walk for 5 minutes toe-walking and 5 minutes normal walking. We plan to use ground reaction force data to capture foot falls (heel-strike or toe-strike) and motion capture data to measure the timing of and to validate spring engagement.

PRESENTER(S): Bari Weiner
AUTHOR(S): Bari Weiner, Zhihang Shen, Chen Zhou, Chenglong Li
FACULTY MENTOR(S): Chenglong Li

Inhibitor Design to Disrupt PRMT5/PICln Interaction for Cancer Therapeutics

Protein arginine methyltransferase 5 (PRMT5) modifies proteins in cells by arginine methylation and is oncogenic. PICln is a protein that binds to the N-terminal domain of PRMT5 to allow PRMT5 to methylate a substrate. If binding is prevented, substrate methylation can be inhibited. This research aims to synthesize an organic compound that fits into the N-terminal docking site of PRMT5, thereby preventing PICln binding and preventing cancer cell proliferation. The structures that are synthesized in this project are derived from a compound previously found to bind to PRMT5, but weakly. Computational methods were then used to design similar compounds that might have stronger binding. This poster presents the organic chemistry reactions of the synthetic routes for these analogs and their purifications. Our initial two compounds produced did not bind to PRMT5 based on one of the proposed binding models, so the new experiments presently being conducted aim to materialize new structures that are based on a new model with a different orientation of the lead compound binding. New synthetic routes and experimental results will be shown.

PRESENTER(S): Gina Fimiano
AUTHOR(S): Gina Fimiano, Katlyn Nau, Charles Sims and Razieh Farzad
FACULTY MENTOR(S): Razieh Farzad

Sensory Evaluation of Local Versus Imported Shrimp to Develop Marketing Strategies for United States Shrimp Producers

Shrimp is considered a high-value seafood product and the most consumed seafood in the Unites States. The US is heavily dependent on seafood imports, including shrimp. The imported shrimp products are often treated with preservatives, such as phosphate, to maintain the quality and undergo multiple rounds of freezing and thawing, which can affect their organoleptic characteristics. Therefore, this study aimed to compare the sensory characteristics and nutritional composition of imported to US-based shrimp products. Four samples were used, including wild and farmed-raised shrimp from the US and, two imported samples from Indonesia and India. A sensory panel of 100 adults was conducted. The sensory panel revealed distinct opinions on farmed-raise shrimp in US versus the imported product; some adore it, while others are less enthusiastic. Interestingly, consumers showed a preference for imported products that included salt as a preservative. This divergence in preferences presents an opportunity for a marketing approach focused on highlighting the unique qualities of US-based farmed-raised shrimp such as “fresh never frozen” and “no added preservatives”. To advance this project, the next step is the development of educational materials for consumers, emphasizing the production methods and benefits of locally produced shrimp.

PRESENTER(S): Nicholas Wallis-Mauro
AUTHOR(S): Nicholas Wallis-Mauro, Leah D. Rubin, Elizabeth C. Sibert
FACULTY MENTOR(S): Gareth Fraser

Building a Modern Denticle Morphological and Taxonomic Database

Sharks and rays are covered in skin made up of dermal denticles which serve a multitude of functions, such as physical protection, enhanced thermoregulation, and predator defense. Denticles found in the fossil record show a great amount of diversity in terms of morphology, but fossil denticles look vastly different from anything observed today on modern sharks. Furthermore, there is not a great record of modern denticles or of how they have changed through time. In this study we are building a modern denticle database which can ultimately answer questions we may have; such as how denticle morphology varies with ecology or across the body of sharks. Preliminary results suggest that different ecological niches correlate to differences in denticle morphology, which may also confer a phylogenetic correlation that we will continue to explore. Further, we have found that certain areas of the shark, such as the snout, have similar denticles across nearly all sampled eco-groups, despite significant differences in denticle morphologies across the body. This database, alongside other efforts in denticle morphology, will allow for study of shark communities in the fossil record, and how shark communities have changed over time and how they may continue to change into the future.

PRESENTER(S): Madison Halcomb
AUTHOR(S): Madison Halcomb2, Katherine M. Gonzalez1,3, Mojdeh Faraji1,3, Anna Haymov2, Vicky S. Kelley1, Barry Setlow2,3, Jennifer L. Bizon1,3
FACULTY MENTOR(S): Barry Setlow

Sex differences in the effects of age on prefrontal cortex-mediated cognition in Fischer 344 x Brown Norway F1 hybrid rats

Aging is associated with changes in prefrontal cortex-mediated executive functions; however, most rodent models have investigated such cognitive alterations only in males. In this study, we utilized the recent availability of aged female rats to evaluate young adult (6 mo.) and aged (22 mo.) Fischer 344 x Brown Norway F1 hybrid rats of both sexes on intertemporal choice and working memory tasks, on both of which young and aged males have been shown to differ. In the intertemporal choice task, rats chose between an immediately available small food reward and a large food reward delivered after a variable delay. Only males demonstrated an age difference, with aged males preferring the large delayed reward more than young males. In the working memory task, rats had to recall the location of a lever following a short delay period. Again, only males exhibited an age difference, with aged males performing less accurately than young males. Together, this suggests that aging has different effects on executive functions in males and females, with aged females performing similarly to young females. To evaluate the effects of estropause on executive functions, we are currently testing a cohort of aged ovariectomized and sham females on the same tasks.

PRESENTER(S): Sabrina Khanam Yeahia
AUTHOR(S): Sabrina Khanam Yeahia
FACULTY MENTOR(S): Gabriel Prieto

Virú Ceramics: Exploring Ceramics from Domestic and Burial Contexts with Consideration of Morphology and Decoration

The Virú, also known as the Gallinazo, constituted a pre-Columbian and pre-Incan culture that wielded significant power and political influence across the northern coast of Peru. Despite the abundance of ceramic artifacts left behind by the Virú, these wares had yet to undergo comprehensive study in relation to their archeological context. This study aims to address this gap by presenting the first in-depth morphological comparative analysis of ceramic wares excavated from Virú occupations in archaeological sites located in modern Huanchaco. The focus is primarily on the ceramic vessels and fragments excavated from the domestic contexts at the site of Pampa La Cruz (PLC), comparing them with those from burial contexts at the José Olaya-Iglesia Colonial site (JO-IG). This study delves into distinctions in ceramic use and decoration, providing valuable insights into the social and cultural values of the Virú society. Notably, the relatively straightforward and complex designs of domestic ceramic ware stand in contrast to the more elaborate and sculptural nature of funerary ceramics. These differences suggest distinct spheres of processing, production, and consumption for Virú ceramic wares, providing insight to the social dynamics and multifaceted aspects of the overall Virú society.

PRESENTER(S): Keren Asghede, Samantha Smith
AUTHOR(S): Taryrn T.C. Brown, Ph.D. (Assistant Professor School of Teaching and Learning), Keren Asghede (Undergraduate Student), Samantha Smith (Undergraduate Student)
FACULTY MENTOR(S): Taryrn Brown

Lift as we Climb: Examining the Influence of Digital Academic Community Building in Black Girlhood Studies

In academia, safe spaces for marginalized groups, especially Black women, are scarce, leading to feelings of isolation, gendered racism, and hypercritical evaluations (Robinson, Commodore, & Johnson, 2022). While traditional mentoring spaces exist on campus, there's a growing trend of seeking support and community through digital platforms. Digital community building is highly beneficial for Black women, offering connection, support, and empowerment. Online platforms provide spaces for sharing experiences, discussing challenges, and accessing resources not readily available offline. Additionally, these spaces serve as platforms for activism and amplifying Black women's voices. The Black Girlhood Collaborative (BGC) is a digital community dedicated to connecting Black women in academia and fostering discussions on literature and Black girlhood. As an e-mentoring and digital community space, BGC facilitates conversations on research, goal-setting, and collaboration. This study aims to assess the effectiveness of BGC by gathering feedback and perceptions on members' experiences. Through surveying participants, we explore intersecting identities, institutional environments, e-mentoring perceptions, resource utilization, and suggestions for improvement. Our goal is to deepen understanding of online community spaces for Black women in academia and identify strategies for effective implementation. By analyzing collected data, universities can enhance digital platforms for e-mentoring and community building, particularly for marginalized groups.

PRESENTER(S): Adam Sardouk
AUTHOR(S): Adam Sardouk, Christopher Petersen
FACULTY MENTOR(S): Christopher Petersen

Exploring the Feasibility of Electromagnetic Attitude Control Systems for Small Satellites

Electromagnetically driven attitude control devices could be the key to reducing mechanical disturbances, mass, and volume requirements for fuel reserves on satellites. Enabled by the low temperature of space, superconductivity can be leveraged to sustain a current through a conductor for effectively no power cost. The electrons moving through the conductor as a result of the current contribute to the angular momentum of the satellite, allowing the control of the satellite's attitude as a function of applied voltage without mechanically interacting subsystems or chemical propellant. Although the scarcity of experimental data on superconductive quantum dynamics in space reduces the confidence in the assumptions and models presented, the theory and results developed in this paper suggest that further testing of the proposed concept could lead to an electromagnetic solution to attitude control.

PRESENTER(S): Aspen Swart
AUTHOR(S): Aspen Swart, Dianna Nord, ZhenXiao Tu, Carl Atkinson
FACULTY MENTOR(S): Carl Atkinson

Human Neutrophils Have an Exogenous Complement C3 Uptake Pathway

Complement is a family of proteins that aids the innate immune system in the detection and destruction of pathogens. The traditional study of complement focuses on its extracellular role. However, local or intracellular complement may also serve a significant function of the immune system. In regards to this non-canonical role, there is still much to be explored about intracellular complement, and very little has been done to explore the presence of intracellular complement in innate immune cells. Here, we hypothesized that neutrophils contain a source of intracellular complement C3 protein that is absorbed from their extracellular space. To test this hypothesis, we treated promyelocytic HL-60 cells with stimulating agents (ATRA, DMSO, and DMF) to differentiate them into neutrophils. Once we successfully obtained neutrophil morphology, we cultured the cells in media containing Normal Human Serum (NHS), which contains active C3, or heat-inactivated Fetal Bovine Serum (FBS). Western blotting revealed that neutrophils plated in NHS only contain native C3, while neutrophils cultured in FBS did not. These results suggest that neutrophils take up complement C3 from their exogenous surroundings. Our findings contribute novel information to the study of non-canonical roles of complement.

PRESENTER(S): Dahlia Salman
AUTHOR(S): Alan Franck, Dahlia Salman
FACULTY MENTOR(S): Alan Franck

Resurrecting a Florida Blueberry Species: Vaccinium elliottii (Elliott's Blueberry)

Within the Vaccinium genus there are a number of taxonomic discrepancies. Vaccinium elliottii has appeared as a distinct species in some research, but many have grouped the species under Vaccinium corymbosum too. However, previous studies demonstrate the failed hybridization of tetraploid V. corymbosum and diploid V. elliottii, which offers some evidence that the two are independent species. To further clarify what makes V. elliottii a separate species and assist future scientists in utilizing the name, an in-depth analysis was performed on specimens dating from 1929 to 2022. Approximately 98 specimens from the University of Florida Herbarium (FLAS) were examined and details about their leaf, stem, flower, and berry sizes were reported. Statistical analysis was performed on the data collected to provide clear morphological characteristics of Vaccinium elliottii.

PRESENTER(S): David Tran
AUTHOR(S): David Tran, William Gross, Dr. Whitney Stoppel
FACULTY MENTOR(S): Whitney Stoppel

Investigating the Incorporation of Plastic in Plodia Interpunctella Silk Fibroin

Plastic pollution of the environment is a global challenge caused by increasing commercial plastic production. Current attempts to mitigate plastic pollution through recycling are often ineffective. First, the cost of producing new plastic products economically outcompetes the cost of collecting, sorting, and upcycling post-consumer plastics. Second, quick degradation and increasing toxicity of plastic after repeated use make chemical upcycling unviable. Consequently, an overwhelming percentage of post-consumer plastic products are landfilled or combusted, contributing to plastic accumulation and contamination of ecosystems globally. We hypothesize that Plodia interpunctella (Pi) larvae can incorporate consumer plastic products as part of their diet. We investigate the weight of eggs, total weight of food, and mass percentage of plastic to optimize plastic ingestion and use as a carbon source. A visible examination of the plastic products and microscopic detection of microplastics in Pi silk fibroin and larvae will reveal the ability of Pi larvae to ingest plastic. Future research will investigate the upcycling of plastic integrated into Pi silk fibroin, as well as the properties and biomedical applications of the material as compared to control Pi silk fibroin.

PRESENTER(S): Yasmine Mohseni
AUTHOR(S): Yasmine Mohseni, David E. Winchester MD MS
FACULTY MENTOR(S): David Winchester

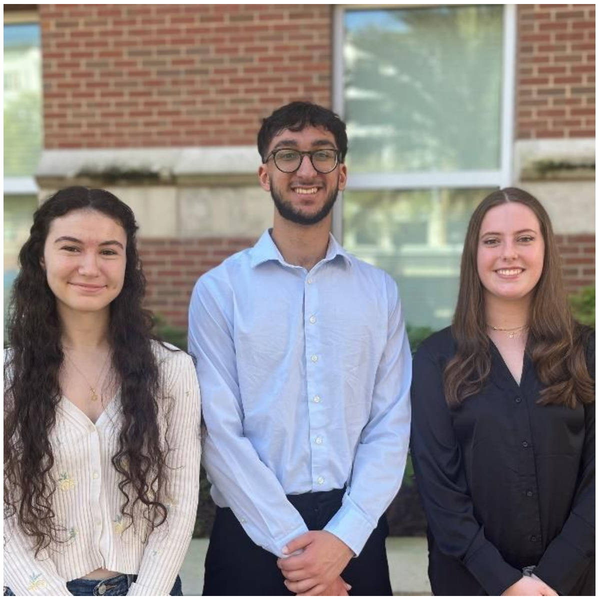
Food Insecurity and Self-Actualization in a Low Income Population

Approximately 42 million Americans experience food insecurity, leading directly to poor nutrition and indirectly to mental health and self-actualization. We conducted a survey of patients in Equal Access and UF Health Clinics to assess their food security and outcomes. Results were compared between participants that were low income (<$50,000 annually) versus non-low income. A total of 98 participants over age 18 participated. Participants were racially diverse, with approximately 14.3% identifying as Black/African American, 1.0% as multiracial, and the remaining 77.5% as White/Caucasian. 25.5% of participants identified as Hispanic/Latino. The median food insecurity score for low income is 0 and non-low income is 2 (p = 4.8e-9). The median SISA score for low income is 11 and non-low income is 14 (p = 0.077). We can conclude a significant difference in food insecurity between the groups, but an insignificant difference in self-actualization. This may be due to the small sample size obtained or that participants were recruited from solely two local sites. Therefore, these results may only apply to residents in the Gainesville area. Future research should examine the difference on a greater scale with participants from a variety of locations.

PRESENTER(S): Isabelle DiGuilio, Steven Beck, Laxmi Rathor, Julia Baile, Taylor McElroy, Sung Min Han
AUTHOR(S): Isabelle DiGiulio, Steven Beck, Laxmi Rathor, Sung Min Han
FACULTY MENTOR(S): Sung Min Han

Toxicological Effects of Synthetic Compound of 6PPD on the Nervous System of C. elegans

N-(1,3-Dimethylbutyl)-N'-phenyl-p-phenylenediamine (6PPD) is a synthetic antioxidant commonly used in rubber-based products, such as tires. The release of 6PPD into the environment during tire wear has been shown to pose a threat to wild salmon populations. However, its underlying action mechanism is poorly understood. Here, we evaluated the potential toxicity and targets of 6PPD using the nematode C. elegans as an in vivo model. Exposure to 0.5 mM 6PPD in C. elegans resulted in various adverse effects, including shortened lifespan and delayed development. Moreover, we observed alteration in the nervous system with axonal beading and branching, phenotypes indicative of neuronal stress and damage. By observing the physical outcomes in neuronal structure over time, exposure to 6PPD elucidates its negative impacts on healthspan. These findings shed light on the potentially toxic effects of 6PPD on development, health, and aging processes. Understanding the mechanisms underlying the toxic effects of 6PPD is crucial for developing strategies to mitigate its environmental impact and protect vulnerable species.



PRESENTER(S): Rayyan Randhawa, Lydia Tovbis, Hannah Woodside
AUTHOR(S): Dr. Valerie Paul, Dr. Hendrik Luesch, Dr. Mohamed Donia, Dr. Yousong Ding, Dr. Steven Bruner, Dr. Yanjun Li, Dr. Keith Choe
FACULTY MENTOR(S): Nicole Colon-Rosa

Anticancer Anaenamides: A Deep Dive into Marine Enzymes and Their Pathways

Marine coral sponges and associated cyanobacteria are an underexplored source of natural products. High throughput DNA sequencing of associated metagenomes samples demonstrated the presence of a cytotoxic natural product called anaenamides. In this research we are interested in determining the enzymes predicted to install the unique chlorine atoms of this natural product by using AI-based genome mining approaches such as antiSMASH and Big-Scape. We identified a BGC that contained PKS/NRPS pathways that allow a multi enzymatic pathway in which the anaenamide product is formed in the assembly line. Within the BGC we have found four polyketide synthase, three non-ribosomal peptide synthetase, and three genes that could not be annotated by Big-Scape. In order to determine the function of these three genes we ran a BLAST and found two hydrolases and one is methyl transferase. However, we hypothesize that one of these genes is not a hydrolase, but rather a halogenase since a chlorine must be added onto the final product of anaenamide. To gain some insight on whether this BGC is the anaenamide pathway we will be testing this hypothesis through X-Ray Crystallography, to determine the structure and function of these proteins.

PRESENTER(S): Kayleigh Ballas
AUTHOR(S): K. Ballas; T. Bian; C. Xing
FACULTY MENTOR(S): Chengguo Xing

Kava's Potential to Neutralize the Effects of NNK-Induced Changes in STING Expression on Lung Cancer Tumorigenesis

Lung cancer is the leading cause of cancer-related deaths worldwide and is closely linked to the smoking of tobacco products. NNK [4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone] is a major lung carcinogen in tobacco. NNK-induced DNA damage is well-documented. Although not well characterized, NNK has also been reported to negatively alter the lung immune response. Suppression of the host immune response has been shown to increase poor patient prognosis by initiating cancer cell proliferation, enhancing cancer anti-apoptotic pathways, stimulating epigenetic modifications, and promoting immunotherapy resistance, among others. Stimulator of interferon genes (STING) is an important modulator of the innate immune response. STING in STING expression modulate lung cancer tumorigenesis and kava's potential to neutralize it. activation follows cellular recognition of double-stranded DNA via cGAS and leads to a strong type 1 interferon response. In addition to immune response suppression, STING expression has been shown to modulate other noncanonical pathways, such as cellular senescence, autophagy, and cell death. As such, STING has wide-ranging effects on lung cancer tumorigenesis and progression. Kava, a plant native to the South Pacific region, has been shown to block NNK-induced lung carcinogenesis in animals by enhancing the detoxification it its main metabolite, NNAL [4-(methylnitrosamino)-1-(3-pyridyl)-1-butanol]. The interaction of NNK, STING, and kava are not yet clear. However, our preliminary data suggests that NNK potentially modulates STING expression and cGAS/STING pathway signaling in human non-small cell lung cancer (NSCLC) cells. Additionally, it shows kava has the potential to neutralize NNK-induced modulation. This study aims to elucidate the potential mechanisms by which NNK-induced changes.

PRESENTER(S): Leah Dublino
AUTHOR(S): Leah S. Dublino*, Heather Judd, Karol Sanchez, and Julie A. Maupin-Furlow
FACULTY MENTOR(S): Julie Maupin-Furlow

Homology Modeling and Molecular Docking to Identify Active Site Residues in the Archaeal Lysine Acetyltransferase Pat2

Activity of enzymes involved in central metabolic processes are tightly regulated by various mechanisms, including post-translational modification: the attachment of a chemical group or protein to a target (substrate) protein. One PTM mechanism conserved in all domains of life is lysine acetylation, where a lysine acetyltransferase enzyme transfers an acetyl group from acetyl-coenzyme A or acetyl-phosphate to the substrate protein, thereby modulating essential biological processes. Although lysine acetyltransferases and their targets are well-characterized in bacterial and eukaryotic species, our knowledge of the pathways and proteins impacted by these enzymes are more limited in archaea. In this study, we employed computational modeling techniques to elucidate the three-dimensional structure of the lysine acetyltransferase Pat2 from the halophilic archaeon Haloferax volcanii. Our analysis focused on understanding its enzymatic activity by identifying potential catalytic residues within the Pat2 active site. By integrating homology modeling and molecular docking, we reveal insights into the spatial arrangement of Pat2 and potential sites of interaction with acetyl-coenzyme A and the lysine acetylated substrate GlpK. This investigation lays a foundation for further experimental validation and functional characterization of Pat2, shedding light on its role in diversifying the proteome of Haloferax volcanii.

PRESENTER(S): Madison Daire
AUTHOR(S): Madison Daire, Folly Patterson, Blanka Sharma, Kyle D. Allen
FACULTY MENTOR(S): Kyle Allen

CD200 Treatment Effects on Macrophage Gene Expression in the Synovial Joint

Osteoarthritis (OA) is a joint disease characterized by the degradation of articular cartilage, inflammation of the synovium, and alterations in bone structure. Despite the many etiologies of OA, it is accepted that synovial inflammation plays a major role in the onset and progression of OA. CD200 is a treatment commonly used to target inflammation. PLGA microparticles are used for a sustained drug release. In this study, we are testing CD200 effects on the progression of acute inflammation in the knee joint by encapsulating it in PLGA. We created five groups with 40 mice injected in the knee with Saline or LPS, then treated the following day: Saline, LPS+Saline, LPS+Blank MPs, LPS+(free) CD200, and LPS+CD200 MPs. We measured the presence of four pro-inflammatory and two anti-inflammatory genes in synovial tissue using PCR. CCL2, IL-10, IL-1b, and Arg-1 expression had an overall significant change based on the ANOVA test. We did further evaluation of joint synovitis through H&E and found that immune cell infiltration significantly increased with both MP groups. We can conclude that the injection of MPs induced inflammation and that other genes are needed to evaluate inflammation.

PRESENTER(S): Abigail Lin
AUTHOR(S): Abigail Lin, Lianna Larson, Moni Qiande, Catalin Voiniciuc
FACULTY MENTOR(S): Catalin Voiniciuc

Automating Molecular Biology Procedures Using Liquid-Handling Robots

Common molecular biology techniques such as DNA assembly, plasmid extraction and bacterial transformation involve labor-intensive manual processes and are currently difficult to scale. These processes become tedious and more error-prone when handling many samples at once. To address these notable challenges and accelerate discoveries in plant synthetic biology and related disciplines, we are deploying Opentrons OT-2 liquid-handling robots to automate these procedures. The Designer Glycans lab is developing Python protocols to adapt various experimental steps for the OT-2 system. Specifically, I designed a small volume transfer protocol for DNA manipulations and amplifications allowing biologists to customize sample volumes, positions, and pipetting parameters in a user-friendly table, catering to diverse scientific needs. Moreover, the OT-2 robots can also facilitate more intricate processes like plasmid extraction using 96-well plates and modular equipment such as programmable magnetic blocks. Overall, our implementation of liquid handling robots into otherwise artisanal procedures will reduce scientific barriers and minimize errors for biological research and product development.

PRESENTER(S): Charlotte Maloney, Jonathan Brito, Dr. Sharon DiFino, PhD, CCC-SLP
AUTHOR(S): Charlotte Maloney, Jonathan Brito, Dr. Sharon DiFino, PhD, CCC-SLP
FACULTY MENTOR(S): Sharon DiFino

Can Bilingual Intervention Bridge the Language Gap for Children with PLI?

Primary language impairment (PLI) refers to a developmental language disorder that results in language delays and sociolinguistic weaknesses. Bilinguals typically acquire and favor their first language (L1) until Kindergarten, where they transition to using their second language (L2), which is more dominant in the majority culture. In bilingual children, PLI impacts linguistic skills in both their L1 and L2, which cannot be sufficiently addressed through a monolingual speech-language intervention. The purpose of this poster is to evaluate the efficacy of a bilingual language intervention for children with PLI, particularly in regard to its advantages. Searches across three databases, PubMed, Scopus, and Linguistics and Language Behavior Abstracts, were used to evaluate relevant literature on bilingual speech-language intervention for children with PLI from the past two decades. The literature revealed expressive and receptive language growth in the L1 and L2, receptive language growth in the L1, cross-linguistic gains, and improvement in social-emotional well-being. Clinicians and public health officials should prioritize supporting bilingual intervention for children with PLI and their families to best support the urgent cultural and linguistic needs of this population.

PRESENTER(S): Madelyn Hotaling
AUTHOR(S): Madelyn Hotaling, Sungyoon Jung
FACULTY MENTOR(S): Sungyoon Jung

Development of Standard Methods for Microplastic Extraction from Environmental Samples

Recent testing has increasingly shown environmental contamination by microplastics. While varieties of extraction methods exist, insufficient information is provided on recovery rates and the effect of separation chemicals on the physical and chemical properties of microplastics. Therefore, it is crucial to form standard methods to develop accurate and reliable data on microplastic quantification. In this study, Sodium Chloride, Potassium Iodide, Zinc Chloride, Sodium Bromide, and Filtered Water were tested for their abilities to separate microplastics by density, both alone and in combination. Standard microplastic samples of Polystyrene Beads, Polymethylmethacrylate Beads, Polystyrene Suspension, and Polymethylmethacrylate Suspension were used. Each of the different microplastic samples were placed into the different chemical types, and left to sit for around 40 hours to allow for total density separation. After filtration and rinsing to remove any remaining chemicals, advanced analytical instruments were used to analyze the samples, including a stereomicroscope and pyrolysis coupled gas-chromatography and mass-spectroscopy. This study aims to provide a guideline for efficient standard extraction of microplastics from environmental samples, with the goal of quantification.

PRESENTER(S): Isabella Colosimo, Jolie Thellab, Yasemin Kocyigit, Isabel Bequer, Melissa L. Moreno, S. Parrish Winesett
AUTHOR(S): Isabella Colosimo, Jolie Thellab, Yasemin Kocyigit, Isabel Bequer, Melissa L. Moreno, S. Parrish Winesett, Peggy R. Borum
FACULTY MENTOR(S): Peggy Borum

Commercial Ketogenic Diet Products for Tube Feeding and Ketogenic Therapy

Patients with an epilepsy diagnosis who do not respond to current medical treatment often respond to Precision Ketogenic Therapy (PKT) that lowers the carbohydrate in the diet. For many of these patients, nutrition must be administered via a feeding tube. PKT recipes that are provided to families can use regular food blended to flow through the tube. Alternatively, commercial feeding products designed for low carbohydrate diets reduce the family's time needed to prepare the recipe and are available by prescription through durable medical equipment organizations (DME). During periods of product shortages, the DME may send the family a different brand, or the same brand with a slightly different name. To address the question of how using these substitute products affects the therapy being administered, we created a database of frequently used products. Our data documents that the macronutrient composition of the products is not the same and will be used to demonstrate to families and DMEs the variability introduced in the therapy when a specified PKT diet prescription is prepared with the different products. These data will be used to support preparation of PKT recipes brand specific for all ingredients.

PRESENTER(S): Jennyca Moiseau
AUTHOR(S): Jennyca Moiseau
FACULTY MENTOR(S): Sharon DiFino

Underrepresentation of Minorities in the Field of Communication Science Disorders: A Call to Action

The field of communication science disorders (speech-language pathology and audiology) has historically been dominated by white females, significantly outnumbering people of color (American Speech Language and Hearing Association). This disparity persists despite the pioneering efforts of Hallie Quinn Brown (1845-1949), who became the first African American speech-language pathologist (SLP) over a century ago (ASHA). In 2019, only 5.0% of practicing physicians identified as Black or African American, compared to 56.2% of white physicians in the United States (Association of American Medical Colleges). Factors contributing to this ongoing underrepresentation include limited exposure to CSD professions, minimal interest in the field, and fewer admissions offers from graduate programs. The importance of diversity in healthcare cannot be overstated, given the variety in the populations served, spanning differences in race, ethnicity, gender, and age. Diverse healthcare professionals lead to better health outcomes for minority patients and improved access for underserved communities. Literature on the underrepresentation of minorities in speech-language pathology and audiology was reviewed through searches in databases such as Google Scholar, PubMed, and NIH. This study aims to highlight the importance of increasing diversity in the field of communication science disorders and foster strategies for meaningful change.

PRESENTER(S): Dylan Smurlick
AUTHOR(S): Dylan Smurlick, Mollie Huber, Edward A. Phelps
FACULTY MENTOR(S): Edward Phelps

Generation of Live Pancreatic Tissue Slices to Investigate Beta Cell Function and T-Cell Infiltration

Type 1 Diabetes (T1D) is an autoimmune disease characterized by the destruction of insulin-producing beta cells. Dysfunctional beta cells exhibit glucose intolerance. Current T1D research aims to elucidate the involvement of T-cells in beta cell dysfunction. Here we use live pancreas tissue slices (LPTS) from human organ donor tissue to investigate this relationship. LPTS were evaluated to study immune infiltration's impact on beta cell functionality. Slices from donors without diabetes (ND), with autoantibodies against islet antigens (AAb+), and with diabetes (T1D+) were stained with Calbryte (Ca2+), ENTPD3 (beta cells), and CD3 (T-cells). Simultaneous Ca2+ imaging and T-cell tracking were conducted through confocal microscopy during low glucose (LG), high glucose (HG), and KCl stimulations. Max intensity projections of 3-D Z-stacks were generated to quantify T-cell infiltration with insulitis being defined as six or more infiltrating T-cells. Results demonstrated typical Ca2+ responses to HG and KCl in ND and AAb+ cases. T1D+ islets exhibited reduced Ca2+ responses to HG but had typical LG and KCl activity. No correlation was found between the dysfunctional HG response and T-cell count in T1D+ islets, implying that beta cell dysfunction occurs independently of T-cells. Future directions are to further optimize slice culture conditions and viability assessments.

PRESENTER(S): Danielle Haddad
AUTHOR(S): Danielle Haddad; Ariana E. Stratton; Katherine Gegoutchadze; Julia R. Bonney; Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

Absolute Quantification of Endogenous Lipids in Mouse Brain via Imaging Mass Spectrometry Using Standard Addition

Matrix-assisted laser desorption/ionization (MALDI) imaging mass spectrometry (IMS) is a label-free analytical technique that can map a wide range of biomolecules in thin tissue sections; however, absolute quantification using this technique remains challenging. Current approaches to quantification in IMS rely on the construction of calibration curves using mimetic tissue models and precise application of internal standards, which require extensive sample preparation. Conversely, standard addition is widely utilized in analytical chemistry due to its ability to enable quantification in complex mixtures without the use of internal standards. This process involves adding known quantities of target analyte to the sample. In this study, we implement standard addition in IMS for the absolute quantification of two phosphatidylcholine (PC) lipids in mouse brain tissue. Fresh-frozen mouse brain tissue was serially sectioned onto an indium tin oxide-coated slide and a standard mixture of PC 18:1/16:0 and PC 18:1/18:0 at concentrations of 200 μM was sprayed onto tissue using a robotic sprayer. A 1,5-diaminonaphthalene MALDI matrix layer was applied to the tissue and IMS was then performed. Mass spectra were collected from the white matter, cerebral cortex, and molecular layer of brain sections. Absolute PC lipid concentrations have been determined for each of the three regions.

PRESENTER(S): Donna Nesselroth
AUTHOR(S): Donna Nesselroth, Edward Braun, Rebecca Kimball
FACULTY MENTOR(S): Edward Braun

Characterization of Homopolymer Amino Acid Runs Present in Avian Proteomes

Correlation has been found between presence of tandem amino acid repeats in a protein and phenotypic expression. In humans, Huntington's disease is related to expansion of a polyglutamine homopolymer in the huntingtin protein, and oculopharyngeal muscular dystrophy reflects a polyalanine expansion. Despite this significance, much remains to be understood about the prevalence of homopolymer amino acid runs in other organisms. Recombination occurs within exons in avian species, making birds more prone to homopolymers than mammals. This project aims to characterize trends in avian proteomes pertaining to these homopolymerizations. We identified homopolymer runs of 5 or more amino acids in Gallus gallus, Calypte anna, and Taeniopygia guttata proteomes. In G. gallus, 5624 homopolymer repeats of at least 5 amino acids were found in 3576 out of 18113 proteins. Also in G. gallus, polyglutamate runs were most prevalent, consisting of 14.04% of all homopolymers, followed by alanine, 11.82% and proline, 11.18%. Across all species, 3 of the 4 GC rich amino acids were within the top 5 most common homopolymer types and 6 of the 7 GC poor amino acids in the 10 least common types, suggesting a positive correlation between GC content and likelihood of homopolymer formation.

PRESENTER(S): Abigail Leon
AUTHOR(S): Abigail Leon, James Gillooly
FACULTY MENTOR(S): James Gillooly

What is Stress Really? Reimagining "Fight or Flight" in Mammals

The concept of physiological stress is widely used, but poorly understood. Physiological stress is typically measured based on the concentration of glucocorticoid hormones (cortisol and corticosterone), but it remains unclear if this captures the whole body “fight or flight” response. Recent work has suggested that glucocorticoid hormone levels simply reflect a species’ metabolic rate, but the relationship between metabolic rate and stress has not been thoroughly examined. Here we test a mathematical model that relates cortisol and corticosterone levels to metabolic rate using fecal hormone concentrations in a diverse array of mammals. Results show that both cortisol and corticosterone levels in mammals are positively correlated with metabolic rate, and show the same body mass-dependence as metabolic rate. Together, these results suggest that physiological stress might be more appropriately viewed as a whole body energetic rate process. Redefining physiological stress in this way may be particularly helpful for providing a baseline for cross-species comparisons given our understanding of how metabolic rate varies across species.

PRESENTER(S): Fatima Gutierrez
AUTHOR(S): Fatima Gutierrez
FACULTY MENTOR(S): Peter Collings

Representing the Yanomami & Researcher Responsibility: A Cross-Comparative Analysis of Anthropologists' Influence on Indigenous Rights in Brazil and Venezuela

During the mid to late 20th century, anthropologists and Latin American governments focused highly extractivist efforts on the Indigenous populations in the Amazon. These efforts, whether searching for universal human truths or natural resources, fueled the growth of Indigenous rights movements. In response, both the discipline of anthropology and national governments were forced into a transformative process, aiming to reconcile the power imbalances that exist between them and their Indigenous subjects. As anthropology shifted moral frameworks to reconsider its roles and responsibilities, Latin American constitutions also became more conscientious and inclusive of indigenous groups.

This research analyzes the relationship between anthropologists and the political sector as it pertains to Indigenous policy in Latin America. Accordingly, the following is a cross-comparative analysis between the influence of anthropologists on government policies in Brazil and Venezuela. To draw direct comparisons, this work highlights the experiences of the Yanomami, who live on the Brazilian-Venezuelan border and have been extensively studied by anthropologists. Additionally, broader conclusions are drawn from the colonial roots that Brazil, Venezuela, and anthropology all share. This literature review suggests that anthropologists hold a moderate degree of influential power over Indigenous governmental policies, either via publications or active political participation.

PRESENTER(S): Gautham Amaravadi
AUTHOR(S): Gautham Amaravadi, Dipesh Dhakal, Yousong Ding
FACULTY MENTOR(S): Yousong Ding

Bioactivity guided isolation and characterization of natural products from Nidularia pulvinata.

Fungal infections contribute to more than 1.5 million deaths each year globally. While there are a few antifungal agents currently used to treat Candida albicans, there is an alarming rise in drug resistant strains which demand the discovery of new drugs. Nidularia pulvinata is a common bird nest fungus that grows throughout North America and has not been well explored in the discovery of bioactive natural products. This study will focus on the isolation and characterization of anti-Candida natural products from N. pulvinata using bioactivity guided fractionation. N. pulvinata was cultured in PDB broth and crude extract was obtained through extraction with ethyl acetate. The crude extract was then fractionized through column chromatography, utilizing silica resin and varying fractions of ethyl acetate in hexane. The 40% ethyl acetate in hexane fraction showed the most promising anti-Candida potential. Structural characterization of the bioactive molecule was performed with mass spectroscopy and nuclear magnetic resonance. We found that N. pulvinata produces a known compound pulvinatal, which displays a high antifungal capability against Candida, while demonstrating relatively low cytotoxicity against human cells. Further studies will focus on identifying the biosynthetic gene cluster of pulvinatal.

PRESENTER(S): Trevor Yates, Joshua Holler, Shawn Zhudro
AUTHOR(S): Nikolai Abraimov, Trevor Yates, Joshua Holler, Shawn Zhudro, Matthew Traum
FACULTY MENTOR(S): Matthew Traum

Benchtop Tensile Tester for Hands-On Remote Mechanics of Materials Learning

The relationship between normal stress and strain is foundational to engineering analysis of mechanical systems. This relationship is quantified with a universal testing machine. However, such machines are prohibitively expensive for educational settings and too large to mail as kits to remote learners. An affordable, small universal tensile tester was created for material mechanics education. To reduce weight and cost, 80-20 aluminum frames the device and repeatable non-linear errors introduced by the frame's deformation are corrected by calibration, allowing the machine to be constructed from off-the-shelf parts. For calibration, a rigid specimen is stressed in the machine and recorded strain is quantified as the non-linear error. This error is then removed from follow-on materials tests. This device is small enough to be shipped to remote engineering students, assembled, and used for material analysis learning. This device is planned for use as a teaching aid in Mechanics of Materials and other UF classes that require material characterization via tensile testing.

PRESENTER(S): Harmony Gibaldi
AUTHOR(S): Harmony Gibaldi, Xiaoya Zhang, Roberto Abreu, Gloria Grady, Julia Graber, Sarah Lynne
FACULTY MENTOR(S): Xiaoya Zhang

Investigating Barriers to Undergraduate Students' Mental Health Support Using AI Methods

This project presents a novel approach to understanding college students' mental health needs and barriers using Natural Language Processing (NLP), a machine learning technique to conduct quantitative text analysis. College students' mental health has been declining, despite university efforts to improve outreach and programming. Though a variety of resources are available, students, especially those who experience marginalization, often do not engage in them. To work to address this crisis locally, we conducted ten focus groups with undergraduate students identifying with a marginalized identity, later recording and transcribing them verbatim. We analyzed the transcripts using two approaches: qualitative open coding, and quantitative analysis using NLP. Using open coding, we identified 20 preliminary themes encompassing students' mental health support. Using NLP, we conducted sentiment analysis with respect to students' responses on interview questions (i.e., mental health needs, how needs are met/not met) among LGBTQ and other minority groups. Overall, LGBTQ students yielded a more negative sentiment than the other groups by a marginally significant difference. This project aims to: 1) provide deeper understanding of the mental-health-related needs of marginalized college students; 2) develop practical implications for prevention and intervention efforts to promote students' mental health; and 3) demonstrate the utility of NLP.

PRESENTER(S): Austin Thomas, Eve Maramba, Thomas Brown
AUTHOR(S): Austin Thomas
FACULTY MENTOR(S): Matthew Traum

Accelerating Additive Manufacturing Using 3D Printers with Automatic Part Ejection

3D printers are emerging as a fabrication technology with applications far beyond rapid prototyping: 3D-printed parts are being now being incorporated into finished commercial products. This shift drives demand for 3D printers capable of efficient mass-manufacturing. Though conventional 3D printers offer an quick and economical alternative to traditional plastics manufacturing, they nonetheless require human operators to remove finished parts and begin the next print. In response to these demands, a 3D printer capable of automatically ejecting finished parts without operator interaction was designed and is being built and tested in UF's GatorKits Lab. This novel design replaces the conventional rigid printing surface with a conveyor belt, and a delta configuration enables three dimensions of print head motion, allowing the belt to remain stationary during printing. Computer control facilitates completed part ejection and commencement of subsequent prints without human intervention. This configuration increases the efficiency of 3D-printing farms, reduces the person-hours required for 3D-printing manufacturing, and allows for continuous operation of print farms.

PRESENTER(S): Rosenna Chan
AUTHOR(S): Rosenna Chan, Kimberly Paulsen, Zhe Ma
FACULTY MENTOR(S): Zhe Ma

Exploring the Role of KSHV miRNAs in the cGAS-STING Pathway

Kaposi's Sarcoma Associated Herpes Virus (KSHV) is the etiological agent of several malignancies including Kaposi's Sarcoma (KS), Primary Effusion Lymphoma (PEL), and Multicentric Castleman's Disease (MCD). KSHV establishes lifelong infection by suppressing the host immune response. The cGAS-STING pathway senses abnormal cytosolic DNA and is essential in stimulating host innate immunity. Previous qCLASH data identified several KSHV miRNA binding sites on the STING mRNA transcript, which were confirmed by Luciferase assay. The effect of KSHV miRNAs on STING expression was studied in-vitro using mammalian epithelial cells. In KSHV-negative cells, overexpression of KSHV miRNAs using miRNA mimics resulted in decreased expression of endogenous STING. When KSHV-positive cells were treated with KSHV miRNA inhibitors, STING expression was rescued. Moreover, STING expression was restored in KSHV-positive cells where STING-targeting miRNAs were deleted from the viral genome, which suggests the function of these miRNAs to repress STING. Relative expression of downstream cGAS-STING targets was quantified using quantitative polymerase chain reaction (qPCR) to understand the effects of KSHV miRNAs on cGAS-STING signaling. The use of viral miRNAs by KSHV represents a novel mechanism for evading the host immune system and could be a potential target for development of RNA-based therapeutics in treating the associated malignancies.

PRESENTER(S): Ashley Peters
AUTHOR(S): Ashley Peter, Kelsey Vought, Ying Zhang, Ana Martin-Ryals
FACULTY MENTOR(S): Ana Martin-Ryals

Nutrient Recovery and Reuse in Controlled Environment Agriculture via Anaerobic Digestion

Controlled environment agriculture (CEA), including hydroponics, indoor growing systems, and high-tech greenhouses, are becoming increasingly popular due to their ability to produce high yields in hostile or highly developed environments. However, CEA typically relies on inorganic fertilizers and has high energy requirements that reduce its sustainability. This research investigated the application of an organic nutrient solution generated from anaerobic digestion of lettuce waste as a means for incorporating nutrient and energy recovery in CEA. Anaerobic digestion effluent (ADE) was combined with hydroponic nutrient solution (5% v v-1) and nitrified using a membrane bioreactor. Application of the nitrified ADE (nADE) was compared with conventional inorganic nutrient solution in terms of yield and resource use efficiency in a greenhouse and hydroponic system. In both systems, lettuce receiving nADE had similar or higher yields and more leaves than the conventional inorganic nutrient solution. Additionally, nADE improved nutrient use efficiency for nitrogen and phosphorus in both systems. By supplementing nADE into traditional nutrient solution, farmers could produce larger yields or reduce fertilizer costs. Further work is needed to streamline the process of nitrifying ADE for commercial integration; however, these results are promising for transitioning to more sustainable nutrient sources in CEA.

PRESENTER(S): Olivia Cederquist
AUTHOR(S): Olivia Cederquist, Shabboo Valipoor
FACULTY MENTOR(S): Shabboo Valipoor

Home Modifications for Aging in Place: Practical Solutions by Community-Living Older Adults

The number of Americans aged 65 and older is projected to nearly double from 52 million in

2018 to 95 million by 2060. A significant 76% of older adults express a desire to age in their own homes, with research highlighting numerous benefits of aging in place. Home modifications are crucial to enabling individuals to age in place. This study explored older adults' approaches and barriers to home modifications. A questionnaire was developed to (1) identify practical home modification solutions among community dwellers, along with their attitudes and barriers towards adoption; (2) assess the clarity, comprehensibility, and effectiveness of the questions to capture the intended information. An online survey was distributed among community dwellers in South Florida. The findings revealed that out of 65 respondents, the majority (77.55%) "definitely" or "probably" plan to continue living in their current home as they grow older. The primary environmental barriers in their home are in the bathroom and related to a lack of smart-home devices and unreachable spaces. The most significant barrier preventing home modifications is not knowing the modifications they need. Insights from this survey will inform the design of a larger-scale study on home modifications for older adults in the future.

PRESENTER(S): Tyler Bui
AUTHOR(S): Limin Shi, Jinying Yang, Zhipeng Tao, Louise Zheng, Tyler Bui, Lucas Alonso, Feng Yue, Zhiyong Cheng
FACULTY MENTOR(S): Zhiyong Cheng

Loss of FoxO1 activates an alternate mechanism of mitochondrial quality control for healthy adipose browning

Browning of white adipose tissue is hallmarked by increased mitochondrial density and metabolic improvements. However, it remains largely unknown how mitochondrial turnover and quality control are regulated during adipose browning. We found that mice lacking adipocyte FoxO1, a transcription factor that regulates autophagy, adopted an alternate mechanism of mitophagy to maintain mitochondrial turnover and quality control during adipose browning. Post-developmental deletion of adipocyte FoxO1 (adO1KO) suppressed Bnip3 but activated Fundc1/Drp1/OPA1 cascade, concurrent with upregulation of Atg7 and CTSL. Furthermore, mitochondrial biogenesis was stimulated via Pgc1a Tfam pathway in adO1KO mice. These changes were associated with enhanced mitochondrial homeostasis and metabolic health (e.g., improved glucose tolerance and insulin sensitivity). By contrast, silencing Fundc1 or Pgc1a reversed the changes induced by silencing FoxO1, impairing mitochondrial quality control and function. Ablation of Atg7 suppressed mitochondrial turnover and function, causing metabolic disorder, regardless of elevated markers of adipose browning. Consistently, suppression of autophagy via CTSL by high fat diet was associated with a reversal of adO1KO-induced benefits. Our data reveal a unique role of FoxO1 in coordinating mitophagy receptors (Bnip3 and Fundc1) for a fine-tuned mitochondrial turnover and quality control, underscoring autophagic clearance of mitochondria as a prerequisite for healthy browning of adipose tissue.

PRESENTER(S): Ben Sherwin
AUTHOR(S): Ben Sherwin, Zachary Slepian, Jiamin Hou, Hubert Wagner
FACULTY MENTOR(S): Zachary Slepian

Searching for Parity Violation Using Topological Data Analysis on the Galaxy 4-Point Correlation Function

I built on previous work that computed the thousands of coefficients needed to describe the 4-Point Correlation Function (4PCF), the lowest-order statistic sensitive to parity breaking. Fundamentally, the 4PCF describes the number of tetrahedra formed by quadruplets of galaxies in 3D within a sky survey. These coefficients have been computed from the BOSS survey using a GPU-based algorithm. However, the 4PCF is high-dimensional: there are about 10,000 different coefficients that capture all relevant information. To find a parity-violation detection in the coefficients, we combined them weighted by the inverse covariance, which measures how independent each measured coefficient is from the others. Unfortunately, the covariance matrix is then enormous and unfeasible to compute. An AI-based compression scheme was needed to capture the impact of parity violation in the 4PCF yet reduce the dimensionality significantly. Therefore, I used Topological Data Analysis (TDA) to identify the key "invariants" in the space of 4PCF coefficients. TDA was used as a machine learning technique and helped isolate and remove systematic errors that were present in the data. I was able to reduce each parity-breaking inflation model's signature in the 4PCF down to unique values of just a few topological invariants.

PRESENTER(S): Amanda Lopez
AUTHOR(S): Amanda Lopez, Guilian Xu, Susan Fromholt, Kristy Dillon, David R. Borchelt
FACULTY MENTOR(S): David Borchelt

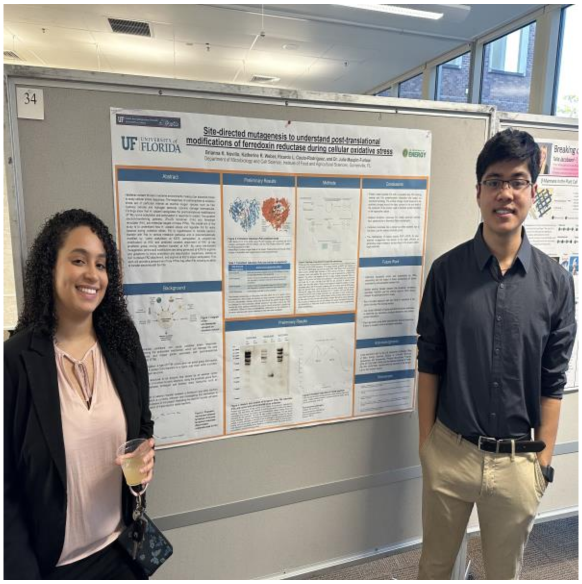
Comparison of Disease and Pathological Phenotypes in a Prion-like Model of ALS Using Two Different Routes of Transmission

Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease that results in paralysis and death. Mutations in the superoxide dismutase 1 gene (SOD1) lead to aggregate formation that has been heavily linked to familial ALS (fALS). In order to visualize these aggregates, yellow fluorescent protein (YFP) is fused to SOD1. In a process known as prion-like transmission, G85R SOD1-YFP transgenic mice models are injected with homogenate from paralyzed mice with the same transgene to induce a more rapidly progressing paralysis. Previous studies have injected homogenates into the sciatic nerve of adult mice. This study utilized intraventricular injections in the brains of newborn mice. We compared the time to develop paralysis and the distribution of aggregate pathology across these different routes of disease transmission. We visualized the aggregates using direct fluorescence of YFP and confirmed by silver staining, and then used a heat map to compare the distribution of aggregates between the two models.

PRESENTER(S): Sydney Antal
AUTHOR(S): Sydney G. Antal, Briana L.M. Pizzano, Santosh R. Rananaware, Lilia G. Yang, Anne Fang, Zoe R. Fang, Long T. Nguyen, Noah R. Rakestraw, Victor Vargas, Piyush Jain
FACULTY MENTOR(S): Piyush Jain

Hot/Cold Multiplexing of Cas Orthologs for Disease Detection

Various diseases display similar symptoms, but typically, CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) diagnostics and more traditional forms of diagnostics only test for the presence of a single type of pathogen. During the COVID-19 pandemic, the overlapping of symptoms between SARS-CoV-2, Respiratory Syncytial Virus (RSV), and the flu demonstrated a need for a single diagnostic test that could differentiate between multiple targets. We explored the feasibility of combining multiple Cas (CRISPR-associated protein) orthologs and Cas predecessors based on temperature of activity, allowing for the detection of two to three targets without the need for expensive equipment such as a thermocycler or multiple fluorescent channels. Based on structures predicted using AlphaFold, DeepDDG analysis, and rational reasoning, we also explored introducing mutations to narrow the activity ranges of the Cas proteins as well as incorporating sequences on the guide RNAs that unlock at higher temperatures in order to limit cross-activity between the two different Cas systems. With the increasing threat of emergent pathogens, we believe that the multiplexing of Cas orthologs for disease detection can have a broad impact on diagnostics for human health as well as diagnostics of plant and animal pathogens within the agricultural industry.



PRESENTER(S): Brianna Novillo, Peter Huynh
AUTHOR(S): Brianna K. Novillo, Peter Q. Huynh, Katherine R. Weber, Ricardo Couto-Rodriguez, Julie A. Maupin-Furlow University of Florida, Microbiology and Cell Science
FACULTY MENTOR(S): Julie Maupin-Furlow

Characterizing Flavin Binding and Lysine Acetylation of a Flavin-based Oxidoreductase in Haloferax Volcanii

Haloferax volcanii thrives in extreme environments making it an attractive model to study cellular stress responses. The responses of extremophiles to oxidative stress are of particular interest as reactive oxygen species, such as free hydroxyl radicals, typically damage biomolecules. Findings show that H. volcanii upregulates the post-translational modifications (PTMs) lysine acetylation and sampylation in response to oxidant. Two putative electron-transferring partners, 2Fe-2S ferredoxin (Fdx) and ferredoxin reductase (Fdr), are molecular targets of these PTMs. The overall aim of this study is to understand how H. volcanii utilizes and regulates Fdr for redox balance during oxidative stress. Fdr is hypothesized to mediate electron transfer with Fdx in various metabolic pathways and is post-translationally modified by: lysine acetylation at K378, sampylation (a ubiquitin-like modification) at K53, and predicted covalent attachment of FAD (key prosthetic group driving electron transfer) at K47. By using site-directed mutagenesis, amino acid substitutions are being generated at K378 for arginine and glutamine, to mimic acetylation and deacetylation respectively, alanine at K47 to disrupt FAD attachment, and arginine at K53 to impair sampylation. This work will provide a perspective of how PTMs may affect Fdr including its ability to transfer electrons with the Fdx.

PRESENTER(S): Emilio Pedroza Lopez
AUTHOR(S): Emilio Pedroza Lopez, Zuania Colón-Piñeiro, Orlando Acevedo-Charry, Junángel Alemán-Ríos, Arik Hartmann, Ana V. Longo
FACULTY MENTOR(S): Ana Longo

It's quiet at the top: differential acoustic activity of the common coqui frog (Eleutherodactylus coqui) across an elevational gradient

Acoustic communication is an essential component of anuran intraspecific signaling. Signalers compete with environmental acoustic factors to communicate messages to recipients as efficiently as possible, potentially leading to differences in the timing and frequency of calls across environments. Particularly, frog acoustic activity varies with environmental conditions due to differences in individual physical condition, evidenced by larger individuals at higher elevations calling at lower frequencies. We analyzed the calling activity of common coqui (Eleutherodactylus coqui), a frog species that inhabits El Yunque National Forest, Puerto Rico, across an elevational gradient. Differences in frog density and community composition, relative humidity, and temperature are among the factors that could lead to variation in E. coqui acoustic activity periods. Analysis of passive acoustic recordings from five different elevations (200, 400, 600, 800, and 1000 m) using the Arbimon pattern-matching platform revealed longer activity periods at lower elevations, encompassing a larger portion of the day and displaying increased calling rates than at higher elevations. These differences could be attributed to changes in the biotic and abiotic environmental conditions across the elevation gradient, revealing a complex relationship between E. coqui and their physical and acoustic environments.

PRESENTER(S): Adriana Rivas
AUTHOR(S): Adriana C. Rivas, Meryl J. Alappattu, Nichole E. Stetten, Harvey W. M. Chim, Mark D. Bishop
FACULTY MENTOR(S): Meryl Alappattu

A Survey Of Pain And Musculoskeletal Dysfunction Prevalence after Gender-Confirming Surgery

The purpose of this study was to explore the rates of pain and physical impairments reported by transgender and gender diverse (TGD) individuals following gender-confirming surgery (GCS). A survey was created and distributed to US-based LGBTQIA+ organizations to disseminate to their members electronically. The survey collected demographic information; types of surgery; post-surgical impairments and activity limitations; and providers seen and interventions provided. Summary statics were calculated and associations between post-surgical care, gender identity, and geographic location were also tested. 584 responses (247 identifying as women, 293 as men, and 41 as nonbinary) were included. The most common surgery was breast augmentation, followed by phalloplasty and reduction mammoplasty. 70% of respondents reported pain, 25% difficulty moving, 23% bowel/bladder dysfunction, and 9% dyspareunia. Significantly more respondents who had feminizing procedures reported dyspareunia and difficulty moving, while participants who had masculinizing procedures reported higher rates of incontinence. Less than half of our sample were referred to a physical therapist or occupational therapist after surgery, which is surprising given that these issues are commonly addressed by rehabilitation providers in patients with similar surgeries (e.g. cancer resection). Future work in this area should examine the feasibility of including standardized rehabilitative services before and after GCS.

PRESENTER(S): Kaitlyn Campbell
AUTHOR(S): Kaitlyn Campbell, Andre Archer, Douglas Spearot
FACULTY MENTOR(S): Douglas Spearot

Characterization of Microstructural Effects of Pre-Existing Screw Dislocation Dipoles in Shocked Single Crystal Aluminum

The effect of shock wave propagation on a metal's microstructure is well-studied in the context of understanding the plastic response of materials under high strain rate loading. In defect-free systems, shock intensities that are above the Hugoniot elastic limit (HEL) cause dislocation nucleation which results in a dislocation network behind the front. Molecular dynamics (MD) simulations are a useful simulation technique for modelling dislocation evolution by capturing time-dependent atomistic behavior that is unobservable in experiments. In this work, dislocation network development in shock-compressed single crystal aluminum due to the presence of pre-existing screw dislocation dipoles—which are pairs of oppositely oriented screw dislocations spaced along the shock direction—is studied using MD. The objective of this work is to analyze the effects of a dislocation dipole on the plastic response of aluminum by focusing on shock intensities below the HEL for homogeneous systems. Pressure profiles are related to dislocation density analysis to show that the presence of a dipole initiates dislocation network development at shock intensities that would otherwise lead to purely elastic responses. Furthermore, different dipole spacings are studied to provide insight into dislocation nucleation caused by shock wave interaction with each of the screw dislocations within the dipole.

PRESENTER(S): Rodrigo Mello Medina; Claire Kuntz
AUTHOR(S): Rodrigo Mello Medina, Guadalupe Diaz, Kirthana Sane, Savannah Chandler, Matt Neitz, Claire Kuntz, Souad Kheder, Edith Kaan
FACULTY MENTOR(S): Edith Kaan

an Some Types of Code-Switching Make You Better at Cognitive Control?

Code-switching is the act of alternating between multiple languages within a conversation, common amongst bilingual speakers. The Control Process Model proposed by Green & Wei (2014) claims that different types of language contexts like code-switching involve different levels of engagement of cognitive control. In studying this phenomenon, prior research has demonstrated that reading code-switched sentences enhanced cognitive control (conflict resolution) on non-verbal trials compared to one-language contexts (Adler et al., 2020). The current study investigates how code-switching affects conflict resolution similar to that of the previous study but using more ecologically valid auditory stimuli (speech). Participants are Spanish-English bilinguals in the US who learned both before the age of 12. The experiment alternates one-language spoken sentences and Spanish-English sentences. Sentences are interleaved with Flanker trials, congruent (<<<<< or >>>>>) or incongruent (<<><< or >><>>). Participants respond to the direction of the middle arrow. We predict that the both the presence of a code-switch and the type of code-switch modulates the conflict effect. Preliminary results show that the presence of a switch and the type of switch matters in modulating cognitive control in bilingual individuals.

PRESENTER(S): Douglas Natoce Jr
AUTHOR(S): Douglas Natoce Jr, Dr. Vinicius Lima, Dr. Roy Curtiss III, Soo-Young Wanda
FACULTY MENTOR(S): Roy Curtiss III

Recombinant Salmonella Strains to Induce Protective Immunity in Poultry.

We evaluated self-destructing attenuated adjuvant Salmonella strains (SDAAS) which undergo regulated cell lysis when administered to chicken embryos in ovo. These strains show superior attributes in delivering pathogen and damage associated molecular patterns (PAMPs and DAMPs) to induce protective immunity in poultry. Novogen brown chicken embryos were inoculated in the amniotic fluid on day 18 of incubation with either a regulated lysis phenotype (family A) or a delayed lysis phenotype (family B) SDAAS Salmonella strain. At day of hatch chicks were orally challenged with 1x10^3 CFU of wild-type S. Typhimurium strain χ3761. Additionally, day of hatch chicks were challenged with Avian pathogenic E. coli (APEC) strain χ7122 by subcutaneous inoculation. Chicks are euthanized in consecutive order for collection of liver, spleen, bursa of fabricius, and ceaca content. Tissues samples are homogenized, serially diluted, and plated on Salmonella-Shigella agar for the determination of bacterial titer. Inoculation of SDAAS Salmonella strains in ovo resulted in lower Salmonella and APEC titers. This study has demonstrated that SDAAS strains are indeed safe and effective in inducing a long lasting protective immune response with no impact to chick health or hatchability.

PRESENTER(S): Jonathan Kahn
AUTHOR(S): Jonathan Kahn, Zachary Greenberg, Kiley Graim
FACULTY MENTOR(S): Kiley Graim

Toward advanced precision medicine by assembling tissue-specificity into peptide generative modelling

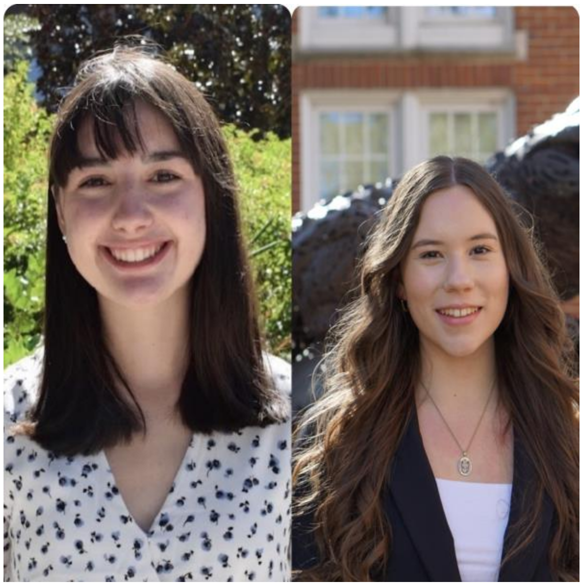
Designing patient-specific targeting peptides for drug delivery systems is an emergent strategy to maximize cancer therapeutic outcomes. While experimentally designing and validating these peptides is cost-prohibitive and carries significant systematic error, artificial intelligence (AI) can drastically reduce these barriers. However, knowing which molecular features drive peptide-tissue interactions remains unclear, hindering AI peptide design. Herein, we aim to expand an existing generative model, ExoGAN, which generates MHC-I targeting peptides to multiple tissue systems, aiming to identify previously undetectable molecular patterns relevant to tissue specificity for advanced precision drug delivery. To expand ExoGAN, we first curated a large-scale, tissue-specific peptide dataset from multiple peptide databases, collating known protein targets and relevant experiment assay and augmenting with peptide molecular features defined by the ORCA tool suite. Next, we performed exploratory data analysis to investigate molecular feature co-correlation, redundancy, predictor sensitivity, and their impact on tissue-specific binding. Results showed peptide molecular features correlate with binding affinity within specific tissues, suggesting a peptide's molecular features may explain the expected molecular interaction for targeting peptide design. Finally, we applied ExoGAN, a generative adversarial network, to generate new tissue-targeting peptides. Overall, we demonstrate how investigating peptide molecular features may lead to AI-driven tissue-specific peptides for precision medicine.

PRESENTER(S): Dahlia Fabregat
AUTHOR(S): Dahlia Fabregat, Erica McCray, Ph.D., Taryrn Brown, Ph.D.
FACULTY MENTOR(S): Erica McCray

They've Got the Power: Leveraging Servant Leader Intern and Scholar Cultural Match to Shape the Freedom School Experience

Persistent inequity continues to plague students of color within educational environments. Colorblind policies and disproportionate discipline exemplify how minoritized students are overly affected. While interventions including pre-service partnerships with community groups have been recognized as potential mediators, there remain limitations to their effectiveness in addressing the representation of people of color.

Some enrichment spaces are responding to these limitations during out-of-school-time, creating pathways for youth to engage experiences and materials not available during school. Children's Defense Fund's Freedom Schools, which aim to support underserved minority students, are academic environments that hope to build students' reading abilities and prevent summer learning loss while offering culturally relevant representations. Sites are staffed by Servant Leader Interns (SLIs), typically college students who work closely with students. This phenomenological research study aims to delve into the lived experiences of an SLI at a Freedom School in the Southeast US to gain insights on how their background uniquely informs and enhances their interactions with scholars and their overall contributions within the program. By better understanding the lived experiences of SLIs, and the role of representation across various educational contexts, community stakeholders can better unlock their potential to create frameworks of representation and support for underrepresented students.



PRESENTER(S): Sarah Newcomb, Cecilia Rodriguez
AUTHOR(S): Cecilia Z. Rodriguez, Sarah B. Newcomb, Jasmine B. McTyler, Whitney L. Stoppel
FACULTY MENTOR(S): Whitney Stoppel

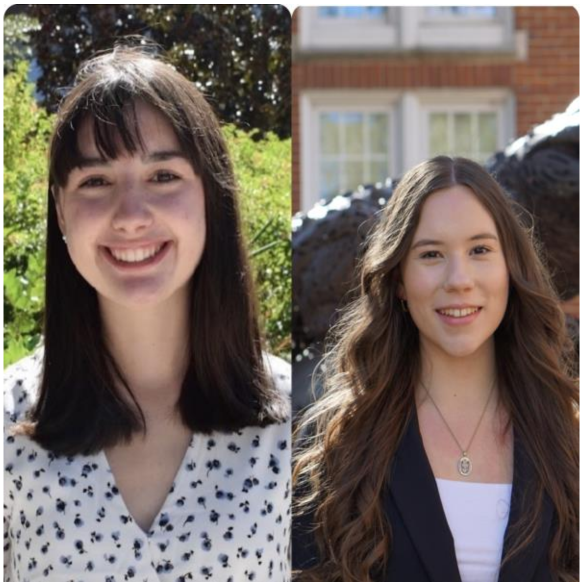
Assessing Plodia interpunctella as an Alternative Silk Source Through Cell-Material Interactions

Silk fibroin has been utilized as a biomaterial in regenerative medicine due to its biocompatibility, controlled biodegradability, low immunogenicity, and adaptive mechanical properties.1 One of the most abundant sources of silk fibroin is the Bombyx mori domestic silkworms. This source has been previously established as a functional bioinert material.1 We are looking to expand the field of silk biomaterials to include Plodia interpunctella, which is an insect native to North America. We are investigating this alternative silk source because of our ability to rear this insect in the laboratory.2 Utilizing silk fibers and films as a cell culture substrate, we investigated cell-material interactions through metabolic activity, cell spreading, and viability studies. We have studied how fibroblasts adhere and spread on silk fibers and films of both Bombyx mori and Plodia interpunctella to assess if Plodia interpunctella is a viable alternative silk source for biomedical applications. Our analysis included the use of CellProfiler® to quantify viability and cell spread area. Preliminary results show that Plodia interpunctella requires similar processing to Bombyx mori to improve immunogenicity necessary for an effective biomaterial. Future work will include immunofluorescence staining visualize integrin expression and rtPCR to quantify gene expression of key markers for cell adhesion.

PRESENTER(S): Pedro Cintron Baerga
AUTHOR(S): Pedro Cintron Baerga, Luis Lopez de la Maza, Zarha Ghiasi, Carl Denard
FACULTY MENTOR(S): Carl Denard

Exploring Substrate Profiling for Sortase-Mediated Ligation

Sortase enzymes, originating from Gram-positive bacteria, catalyze a sequence-specific transpeptidation reaction between a C-terminal sort signal (typically LPXTG) and an N-terminal nucleophilic sequence (usually NH2-GGG). Sortase-mediated ligation (SML) is prized for its precision, finding extensive utility in biomolecular engineering and synthetic biology for generating protein nanocomplexes. Exploring the substrate scope of SML is crucial for expanding its engineering applications. This work presents a novel high-throughput platform for exploring the sort signal and nucleophile specificity of sortase enzymes. High-throughput substrate profiling of S. pyogenes sortase A reveals that a seven-amino-acid sort signal motif significantly enhances SML reaction rates, contrary to prior knowledge prescribing a five-amino-acid motif. The expanded sort signal recognition allows one to discover and design highly active sortase substrate and guide the evolution of sortases with novel specificities. Expanding the substrate scope of SML will empower diverse applications in protein engineering, bioconjugation, and biomaterial synthesis, enabling precise control over site-specific modifications.



PRESENTER(S): Sarah Newcomb, Cecilia Rodriguez
AUTHOR(S): Cecilia Z. Rodriguez, Sarah B. Newcomb, Jasmine B. McTyler, Whitney L. Stoppel
FACULTY MENTOR(S): Whitney Stoppel

Assessing Plodia interpunctella as an Alternative Silk Source Through Cell-Material Interactions

Silk fibroin has been utilized as a biomaterial in regenerative medicine due to its biocompatibility, controlled biodegradability, low immunogenicity, and adaptive mechanical properties. One of the most abundant sources of silk fibroin is the Bombyx mori domestic silkworms. This source has been established as a functional bioinert material. We are looking to expand the field of silk biomaterials to include Plodia interpunctella, which is an insect native to North America. We are investigating this alternative silk source because of our ability to rear this insect in the laboratory. Utilizing silk fibers and films as a cell culture substrate, we investigated cell-material interactions through metabolic activity, cell spreading, and viability studies. We have studied how fibroblasts adhere and spread on silk fibers and films of both Bombyx mori and Plodia interpunctella to assess if Plodia interpunctella is a viable alternative silk source for biomedical applications. Our analysis included the use of CellProfiler® to quantify viability and cell spread area. Preliminary results show that Plodia interpunctella requires similar processing to Bombyx mori to improve immunogenicity necessary for an effective biomaterial. Future work will include immunofluorescence staining to visualize integrin expression and rtPCR to quantify gene expression of key markers for cell adhesion.

PRESENTER(S): Caitlyn Hodges
AUTHOR(S): Caitlyn Hodges, Gregory P. Takacs, Julia Garcia, Isabel Sewiol, Christian Kreiger, Alexandra Sherman, Jeffrey K. Harrison
FACULTY MENTOR(S): Jeffrey Harrison

Glioma-derived M-CSF and IL-34 license M-MDSCs

Glioblastoma is an aggressive primary brain tumor. Monocytic myeloid-derived suppressor cells (M-MDSCs) are expanded in GBM and contribute to glioma immune evasion through T cell suppression. We used murine preclinical models to investigate glioma derived factors that mediate M-MDSC expansion. To determine driving factors of M-MDSC differentiation in glioma, KR158 tumors were screened for an array of cytokines. Upregulated cytokines were further analyzed for their capacity to expand M-MDSCs from whole bone marrow. Exogenous GM-CSF and M-CSF both expanded M-MDSCs, however the M-CSF condition most closely resembled KR158 mediated expansion. Protein expression of GM-CSF, M-CSF, and IL-34 in KR158 conditioned media revealed higher expression of M-CSF and IL-34 compared to GM-CSF. These findings aligned with human data extracted from TCGA. To further explore the impact of CSF1R ligands on M-MDSC differentiation, neutralizing antibodies were used to block glioma-secreted M-CSF and IL-34. Combination blocking resulted in stronger inhibition of M-MDSC differentiation compared to mono treatment. To substantiate these results, we titrated a potent CSF1R antagonist, Pexidartinib, on whole bone marrow in KR158 conditioned media. Pexidartinib resulted in a dose-dependent decrease in M-MDSCs. Taken together, we show glioma-secreted M-CSF and IL-34 regulate the differentiation of naïve monocytes into M-MDSCs.

PRESENTER(S): Caleb Faison, Chloe Van Horn, Joseph Tebou
AUTHOR(S): Joseph Tebou, Chloe Van Horn, Caleb Faison
FACULTY MENTOR(S): Dominick Lemas

Analyzing the Mechanistic Impact of Plasma Metabolomics on Cytotrophoblast Proliferation

Maternal obesity is associated with an increased risk of pediatric obesity; however, the molecular mechanisms that account for these observations remain poorly characterized. Preliminary data from our lab has identified 3rd trimester plasma metabolites that vary according to obesity status and are associated with infant outcomes. Based on these observations, we hypothesize that these obesity-associated plasma metabolites may influence infant outcomes through interactions with the placenta. Cell culture studies provide a unique opportunity to investigate the mechanisms of cell signaling and cell-cell interactions. The goal of this study is to leverage cell culture techniques to understand how obesity-associated plasma metabolites impact placental function and cell signaling in trophoblast cells. We tested the impact of two obesity-associated metabolites (GlcNAc and 3-HPAA) on cell proliferation and extracellular vesicle formation. After multiple rounds of experimentation, we did not find significant associations between metabolite concentration and cell proliferation. We are currently testing how metabolite concentration impacts extracellular vesicle production in trophoblast cells. Our long-term goal is to extend our investigation to include 3D-printed organoids to better simulate the conditions found during fetal development.

PRESENTER(S): Hannah Bagnis
AUTHOR(S): Hannah K. Bagnis, Marisa O. Pacheco, Elizabeth L. Aikman, Whitney L. Stoppel
FACULTY MENTOR(S): Whitney Stoppel

Dynamics of Chemical and Physical Crosslinking of Methacrylated Silk Fibroin Hydrogels for Applications in 3D Printing

Silk fibroin (SF) derived from Bombyx mori silk is a useful material in the biomedical field. Its biocompatible and tunable characteristics allow for applications in drug delivery, tissue engineering, and regenerative medicine. SF on its own is inert, therefore the addition of photocrosslinkable active sites via methacrylation (SilkMA) allows for interactions with Lithium phenyl-2,4,6-trimethylbenzoylphosphinate (LAP), a photoinitiator. Using ultraviolet (UV) light (405 nm), SilkMA can be crosslinked to form a hydrogel. SF hydrogels created via chemical crosslinking can be tuned to increase their load bearing capacity to mimic the mechanical properties of different tissues. However, a significant challenge lies in maintaining these properties for extended periods, as silk hydrogels tend to lose elasticity due to the formation of beta sheet crystals. This physical crosslinking is irreversible as the hydrogel has reached its thermal equilibrium. Therefore, to mitigate the formation of these physical crosslinks, which are formed by hydrogen bonding leading to beta sheet formation and a more crystalline polymer network. We investigate variables that contribute to the chemical crosslinking of SF hydrogels to hopefully interfere with beta sheet formation. Namely, we hypothesize that decreasing SF molecular weight and increasing chemical crosslinking density will slow crystalline growth.

PRESENTER(S): Michael Yencik, Olivia Rodriguez, Annastasia Wilson, Lorenza Marchi, Melissa Moreno, S Parrish Winesett
AUTHOR(S): Michael Yencik, Olivia Rodriguez, Lorenza Marchi, Annastasia Wilson, Melissa Moreno, S Parrish Winesett, Peggy Borum
FACULTY MENTOR(S): Peggy Borum

Commercially Available Products Used for Parenteral Precision Ketogenic Therapy

Many patients in the intensive care unit (ICU) require parenteral nutrition for a variety of issues. Patients with seizures receiving Precision Ketogenic Therapy (PKT) based on a low carbohydrate dietary intake may consume it orally or via an enterally feeding tube. Patients admitted to the ICU on PKT need to continue PKT and other patients may need to begin PKT for new seizures. We created a nutrient composition database of parenteral nutrition food products. There are no parenteral products designed for a ketogenic diet. The macronutrient composition of pure amino acid solutions, pure fat emulsions, and pure dextrose solutions were included in the database and can be used in PKT recipes. Intravenous medications based on dextrose or a lipid emulsion are frequently used in the ICU. The parenteral PKT database can be used to illustrate the effect of using these medications on PKT and the need to include the medication solution macronutrient in the calculation of the PKT recipes for that specific patient. Amino acid solutions or fat emulsions of different brands have different compositions of individual nutrients. Extending our database to individual nutrients will facilitate testing published suggestions that individual amino acids and fatty acids affect seizure control differently.

PRESENTER(S): Adrian Herrera; Co-presenters: Emily Scoufis, Matthew Finkelstein, Kaden Seeks
AUTHOR(S): Adrian Herrera, Emily Scoufis, Matthew Finkelstein, Kaden Seeks, Feihong Wang
FACULTY MENTOR(S): Feihong Wang

Use of Engagement Strategies by Students of Different Academic Years During the COVID-19 Pandemic

Student engagement is essential to absorb material and participate in classroom activities (Banna et al, 2015). The Covid-19 pandemic forced students to adjust their learning styles and utilize varied engagement strategies to engage with online material (Razzaqul, 2021). Research has suggested differences in engagement strategy use between academic years (Zhong et al., 2023). The aim of this study is to determine differences in quantity and type of engagement strategies used by different academic years. Our sample (n=182 students) included 25 freshman, 85 sophomores, 56 juniors, and 16 seniors. Engagement strategies were categorized as behavioral, emotional, and cognitive (Fredricks et al., 2004). Kruskal-Wallis analysis revealed no significant difference in the number of total engagement strategies used across academic years ($H(3) = 3.95$, $P = 0.267$). Furthermore, there was no significant difference in the number of engagement strategies used among academic years for both behavioral ($H(3) = 5.46$, $P = 0.141$) and non-behavioral ($H(3) = 1.92$, $P = 0.590$) engagement strategies. A Mann-Whitney test revealed no significant difference between the number of strategies employed by upperclassmen and underclassmen ($W = 3599$, p-value = 0.2826). Our findings indicate that regardless of academic level in college, similar engagement strategies are used.

PRESENTER(S): Sarah J. Murphy
AUTHOR(S): Sarah J. Murphy, Jacob M. Samuel, Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

High Spatial Resolution Lipid Imaging Mass Spectrometry Analysis Enabled by Hydrogel Expansion

Imaging mass spectrometry is a label-free technique that enables the mapping of a variety of biomolecules in tissues with high spatial fidelity. However, the spatial resolution of imaging mass spectrometry is limited to approximately 10 μm. Current solutions for high spatial resolution analysis leverage expensive and complex instrumentation setups that minimize the diameter of the incident laser beam. Rather than shrink the size of the laser probe, we instead here seek to physically magnify the tissue substrate using a swellable hydrogel network. Briefly, sections of mouse brain tissue are physically expanded, allowing for improved spatial resolution without additional focusing of the laser. This workflow is performed by first thaw mounting 30 μm sections of mouse brain to microscope slides and then polymerizing a hydrogel throughout the tissue. The tissue hydrogel is subjected to proteinase K digestion to homogenize mechanical properties and then submerged in water to effect isotropic expansion. The hydrogels then undergo desiccation and matrix application for downstream lipid imaging mass spectrometry analysis using a Fourier transform ion cyclotron resonance (FTICR) mass spectrometer (solariX, Bruker Daltonics) in positive ion mode. Nine lipids were identified in expanded brain samples, which were determined to have an approximate 2.5-fold linear expansion factor.

PRESENTER(S): Emily Maynard
AUTHOR(S): Emily F. Maynard, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Douglas Soltis

Prunus Caroliniana and Quercus Michauxii in a Changing Climate

The Hardwood Forested Uplands endemic to Florida are present throughout the southeastern United States but reach the southernmost point of their distribution in or near Alachua County. Given the climate change anticipated in the coming decades, this study examines the current distribution of suitable niche space of the Carolina Laurel cherry (Prunus caroliniana) and Swamp Chestnut Oak (Quercus michauxii) – two prominent species in Floridian Hardwood Forested Uplands – and estimates where these species may be located in the future. Prunus caroliniana is a chiefly understory tree with small white buds, black berries, and fragrant, evergreen leaves, and Quercus michauxii is a large overstory tree with obovate leaves that have a distinctive crenate margin. We used the databases iDigBio and GBIF to download occurrence records, and with georeferencing, we reconstructed the species' current niche space. After analyzing the environmental variables associated with this niche space, we used climate projections to predict the geographic area that corresponds to future suitable niche space for both Prunus caroliniana and Quercus michauxii. Additionally, we combined these results with projections for other angiosperm species characteristic of the Hardwood Forested Uplands to better understand the response of this ecosystem to projected climate change.

PRESENTER(S): Alisha Bhatia
AUTHOR(S): Alisha Bhatia, Jeet Patel, Savannah Carpenter, Amanda Acevedo, Oleg Yegorov, Changlin Yang, Bently Doonan, Todd Golde, Duane Mitchell, Christina von Roemeling
FACULTY MENTOR(S): Christina Von Roemeling

Chemotactic recombinant adeno-associated virus (rAAV) virotherapy improves lymphocyte recruitment in glioblastoma (GBM)

Glioblastoma (GBM) is notably difficult to durably cure, due in part to the immunosuppressive GBM tumor microenvironment (TME). The long-range chemokine-mediated recruitment of cytotoxic T lymphocytes (CTL) is impaired by the glioma's production of immune-suppressive chemokines, preventing CTLs from infiltrating the tumor. To compensate for the CTL recruitment signal, we employ recombinant adeno-associated virus 6 (AAV6) expressing the lymphocyte trafficking chemokine C-X-C motif ligand 9 (CXCL9). We hypothesized this will transduce cells in the TME and enhance the call-and-receive signal for CTL recruitment, rendering GBMs more susceptible to anti-PD1 immune checkpoint blockade (ICB). AAV6's transduction was measured in vivo with 3D tissue and whole brain immunofluorescent imaging of tumor-bearing mice following intratumoral delivery of AAV6 encoding a fluorescent reporter. Cells from GL261 tumors treated with AAV6-CXCL9 were assessed with single cell RNA sequencing (scRNAseq) to examine lymphocyte infiltration. The therapeutic effect of AAV6-CXCL9 was assessed through survival studies of tumor model mice both treated and controlled. AAV6 transduction of tumor-associated astrocytes in the GBM TME was shown through tissue imaging. ScRNAseq data showed greater infiltration of CD8 T lymphocytes and T regulatory. In both KR158 and GL261 cell models, treatment with both AAV6-CXCL9 and aPD-1 demonstrated a significant survival benefit.

PRESENTER(S): Sara Rottink, Peyton Trent
AUTHOR(S): Sara Rottink, Peyton Trent, Kourtney Guthrie, MD
FACULTY MENTOR(S): Kourtney Guthrie

Multimodal Approach to Pediatric Traumatic Brain Injury: Establishing a Comprehensive Database for Standardized Clinical Care

The clinical presentation of pediatric traumatic brain injury (pTBI) exhibits significant variability, contingent upon the age, severity, mechanism of injury, and location of the head trauma, among other factors. pTBI is a heterogeneous condition characterized by several modes of injury and a range of mechanisms by which neuronal damage may occur and represents a significant health burden for pediatric mortality and morbidity. To date, data remains elusive for factors that improve prognostication for said mortality and morbidity. This prospective, observational study aims to establish a comprehensive, multidisciplinary web-based database dedicated to pTBI, including standardized clinical information with neuroimaging, neurocognitive outcomes via GOS-E peds scoring, and a bio-sample repository. Taken together, this data will serve as a platform for a systemic, multimodal evaluation of pTBI severity and outcomes in comparison to a multitude of factors that can be extracted from the database to better standardize clinical care and promote accurate neurocognitive outcome prognostication. 78 patients have been enrolled with data collected via blood sampling, chart review, and follow up calls or appointments for neurocognitive evaluations.

PRESENTER(S): Austin Thomas, Eve Maramba, Thomas Brown
AUTHOR(S): Austin L. Thomas, Eve M. Maramba, Thomas W. Brown, Alexander D. Lacerna, Matthew J. Traum
FACULTY MENTOR(S): Matthew Traum

Accelerating Additive Manufacturing Using 3D Printers with Automatic Part Ejection

3D printers are emerging as a fabrication technology with applications far beyond rapid prototyping: 3D-printed parts are being now being incorporated into finished commercial products. This shift drives demand for 3D printers capable of efficient mass-manufacturing. Though conventional 3D printers offer an quick and economical alternative to traditional plastics manufacturing, they nonetheless require human operators to remove finished parts and begin the next print. In response to these demands, a 3D printer capable of automatically ejecting finished parts without operator interaction was designed and is being built and tested in UF's GatorKits Lab. This novel design replaces the conventional rigid printing surface with a conveyor belt, and a delta configuration enables three dimensions of print head motion, allowing the belt to remain stationary during printing. Computer control facilitates completed part ejection and commencement of subsequent prints without human intervention. This configuration increases the efficiency of 3D-printing farms, reduces the person-hours required for 3D-printing manufacturing, and allows for continuous operation of print farms.

PRESENTER(S): John Cabrera, Makenna Myrick, Claudia Klejc
AUTHOR(S): John Cabrera, Makenna Myrick, Claudia Klejc
FACULTY MENTOR(S): Morgan Yacoe

Evaluation of 3D-training systems to test surgical resident efficacy in kidney transplants and laparoscopic cholecystectomies

There is a lack of consistency in the training of surgical residents for kidney transplantations (KTs) and laparoscopic cholecystectomies (LCs). Rising costs and decreasing availability of cadavers has led to a decline in confidence and technical skills of surgeons exiting residency. 3D box model trainers present an appealing alternative to these traditional methods given their affordability and availability. However, there is a lack of research on the effectiveness of such models in training. The aim of this study is to determine if box model trainers for KTs and LCs can be used to supplement the training of surgical residents. Methods include a qualitative survey to test trainee confidence and procedural knowledge. If results prove satisfactory, this model could lead to an improvement in resident technical knowledge and confidence for KTs and LCs.

PRESENTER(S): Valentina Baredes, Hannah Connell
AUTHOR(S): Valentina Baredes*, Hannah Connell*, Weijie Xu, David H. Pérez, Rebecca A. Butcher
FACULTY MENTOR(S): Rebecca Butcher

Characterization of Mutants of Caenorhabditis elegans Acyl-CoA Oxidase by FAD and ATP

The nematode C. elegans secretes pheromones known as ascarosides, which consist of an ascarylose core structure and a fatty acid-derived side chain. These side chains are shortened by peroxisomal β-oxidation cycles, during which a double bond is installed at the α-β position of the ascaroside-CoA. Previously, the crystal structure of C. elegans Acyl-CoA Oxidase 1.1 (ACOX-1.1) revealed the catalytic mutant was bound to FAD and ATP, and ATP regulates the activity of ACOX-1.1. We hypothesized that ATP acts as an allosteric regulator, impacting enzyme conformation and FAD affinity. Computational prediction suggests that R295 and Y581 may be critical for the allosteric communication between FAD and ATP binding sites. We are studying the effect of the mutations on ACOX-1.1 using mutagenesis and an HRP-coupled kinetic assay. Specifically, we chose to generate R295A, R295Q, and Y581F. R295A and R295Q had extremely low activities and no ATP effect, indicating no involvement in ATP regulation. Y581F responds to ATP but loses cofactors during protein purification, suggesting its potential role as a gatekeeper in the ATP entry/exit tunnel. These findings deepen our understanding of the ATP regulation in C. elegans acyl-CoA oxidases, potentially aiding targeted therapy development in higher organisms.

PRESENTER(S): John Cabrera
AUTHOR(S): John Cabrera, Llia Byron, Elizabeth Aikman, Dr. Whitney Stoppel
FACULTY MENTOR(S): Whitney Stoppel

Exploring Electrospun Silk Fibroin Composites for Myoblast Differentiation

Electrospinning is a technique used to produce mats composed of fibers in the micro to nanometer range. Electrospun mats have very high fiber length to diameter ratios, which yields high mechanical strength. Electrospun fibers are also highly tunable in terms of the size and orientation of their fibers and pore size (Li, et al., 2021; Rnjak-Kovacina & Weiss, 2011). These properties make electrospun fibers useful for creation of 3D scaffolds for tissue engineering. Silk fibroin from Bombyx mori is a biocompatible, polymeric protein with a variety of biomedical applications (Rockwood et al., 2013). Electrospinning silk fibroin takes advantage of the biocompatible nature of silk fibroin to produce mats that can support cell growth. These mats allow for the seeding of sensitive cells, like those associated with muscles and tendons. In cells that require electroactivity to develop, such as myoblasts, silk fibroin must be combined with more electrically active components to best stimulate cell differentiation. Several composites have been developed to address this need, each with slightly different material properties. This study aims to guide future research in composite electrospun silk fibroin mats by determining how various composites affect the differentiation of myoblasts.

PRESENTER(S): Madysen Wiley
AUTHOR(S): Madysen Wiley
FACULTY MENTOR(S): Youping Chen

Optimization of Weight of L-bracket Without Plastic Deformation

Stress localization is the main cause of failure in engineering material and structures. This study uses the finite element method to develop a mechanistic and quantitative understanding of the stress localization problem. The finite element method is a numerical method that approximates exact solutions at discrete points. A complete solution is then obtained by connecting individual solutions to produce a continuous distribution of stresses and strains. The student edition of MSC Nastran/Patran is used in this study as the finite element simulation tool for all the simulations. Finite element simulation results clearly demonstrate the phenomenon of stress localization and the geometries and loading conditions that cause it. The simulation results have also provided insights into ways to remove high stress localization so as to avoid materials failure. An optimal design of a structure is then demonstrated through iterations of the designs of a engineering structure. The mass and stress distribution of each iteration is recorded, and a von Mises stress is utilized to determine failure in each iteration. A final structure that is lightweight while satisfies the strength requirements is obtained and demonstrated in this computational study.

PRESENTER(S): Wilermine Previlon, Alice Rozet
AUTHOR(S): Wilermine Previlon, Alice Rozet, Jotsna Gowda, Alexis Davis, Sarah Moeller, & Kevin Tang
FACULTY MENTOR(S): Sarah Moeller

Leveraging Linguistic Information to Automatically Annotate African American English

Recently, there has been a growing interest in African American English (AAE) within the field of natural language processing (NLP). Efforts to address bias against AAE in NLP systems often focus on minimizing the differences between AAE and Mainstream American English (MAE). This research utilizes our understanding of these unique linguistic structures to enhance the automatic identification of habitual and non-habitual meanings of "be" in transcribed AAE speech. While both meanings are present in AAE, examples of habitual "be" are scarce in the already limited AAE data. Generally, incorporating additional syntactic information improves our ability to distinguish between these meanings. By using a combination of classical machine learning models that incorporate the unique part-of-speech (POS) and dependency patterns of habitual "be," we demonstrate a significant improvement in identifying habitual uses of "be" compared to a basic model that only considers n-grams. This success underscores the importance of embracing rather than disregarding the structural distinctiveness of African American English.

Keywords: African American English, habitual be, syntactic dependencies, semantic disambiguation

PRESENTER(S): Julia Quinones
AUTHOR(S): Julia Quinones, Wendy Dahl, Diana Taft
FACULTY MENTOR(S): Diana Taft

Antimicrobial Resistance Gene Carriage Not Associated with Uremic Toxin Levels in Chronic Kidney Disease Patients

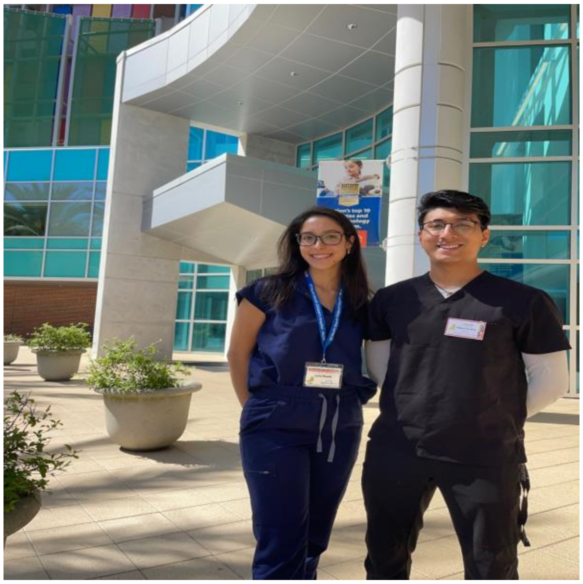
In chronic kidney disease (CKD), uremic toxin molecules build up and risk of infection increase overtime, making the presence of antimicrobial resistant (AMR) bacteria in the gut more problematic with advancing disease. This study assessed if serum levels of uremic toxins and gut carriage of AMR genes are correlated in individuals with CKD. Whole metagenomic sequencing of stool samples and measured levels of 5 uremic toxins from 21 individuals with CKD were obtained. Multiple linear regression was performed with total abundance of AMR genes and abundance of specific drug classes of AMR genes as outcome variables and serum levels of 5 uremic toxins as predictor variables. Beta diversity differences of AMR genes were visualized using non-metric multidimensional scaling (NMDS) based on robust Aitchison distances and tested using PERMANOVA. There were no significant associations between uremic toxin levels and AMR gene abundance, or with any of the drug classes of AMR genes. There were no significant differences in beta-diversity of AMR genes. These null findings suggest that increased uremic toxin levels are not associated with an increase in AMR carriage, and therefore uremia does not appear to be a direct cause of increased resistant bacteria in patients with more severe CKD.

PRESENTER(S): Amaya Fong
AUTHOR(S): Amaya Fong, Mackenzie L Davenport, Maurice S Swanson
FACULTY MENTOR(S): Maurice Swanson

Analysis of Different Muscles in Mouse Models of Myotonic Dystrophy (DM)

Myotonic Dystrophy (DM) is the most common form of adult-onset muscular dystrophy. There are two subtypes of DM: Type I (DM1) caused by a CTG repeat expansion in the 3'UTR of the DMPK gene and Type 2 (DM2) caused by a CCTG repeat expansion in intron 1 of the CNBP gene. The leading pathogenic mechanism of DM is that of RNA mediated toxicity whereby expansion of the (C)CUG sequences leads to sequestration of the muscleblind-like (MBNL) family of RNA binding proteins. A key difference between DM1 and DM2 is the muscle groups affected - with distal muscles more severely affected in DM1 and proximal muscles more affected in DM2. The cause of the disparately affected muscles between

the diseases is unknown, as well as if genetically engineered mouse models recapitulate these differences. To address this, we collected an array of muscles from wild-type mice and examined expression of Dmpk and Cnbp as well as specific proteins sequestered by the repeat expansions. We also collected a series of muscles from MBNL knockout mice and evaluated them for characteristic histological and molecular features of DM pathology. Our results indicate that some mouse muscles better recapitulate specific disease phenotypes than others.



PRESENTER(S): Sofia Pereda, Miguel Arrasco
AUTHOR(S): Sofia Pereda, Miguel Arrasco, Torrey Baines, MD
FACULTY MENTOR(S): Torrey Baines

Genomic Analysis of Pediatric Systemic Inflammatory Response Syndrome (SIRS)

Systemic Inflammatory Response Syndrome (SIRS) is a septic shock case that largely influences the progression of comorbidities, such as bleeding or Multiple Organ Dysfunction Syndrome (MODS), that ultimately lead to death. This study aims to further understand the relationship between the human genome and SIRS, its progression to septic shock and other life-threatening conditions. This is an ongoing multi-centric national study that is working towards enrolling 1,000 patients that meet inclusion criteria and will have clinical data collected over a period of seven days or until the patient is discharged from the PICU. The inclusion criteria includes the patient being younger than ten years of age, parental consent, being SIRS proven, pending/positive cultures, two distinct measures of hypotension, and having certain lab results fall under certain percentiles/numbers. 7.5 milliliters of blood will be taken from the SIRS patients on day one and three which will be used to analyze the relationship between the human genome and SIRS. Clinical data will also be taken from patients that are not diagnosed with SIRS or septic shock which will serve as the control group.

PRESENTER(S): Tyler Favier
AUTHOR(S): Tyler Favier, Michael Valuta, Gianna Degracia, Emma Heidelberg, Sydney Dick, Brianna Hiers, and Lindsey Rodriguez, Ph.D.
FACULTY MENTOR(S): Lindsey Rodriguez

Gender Differences in Marital Commitment and Its Role as a Protective Factor Against Physical Illness

Extensive research has demonstrated that being married is associated with better physical health compared to being unmarried. However, there is a distinct lack of research examining the specific role of marital commitment as a protective factor against physical illness. This research project addresses the gap in the literature by investigating how commitment in married couples correlates to their symptoms of illness, and if this relationship differs based on gender. We leveraged data previously collected by Dr. Rodriguez (2013). Participants included married couples (n=123 dyads) who completed a web-based baseline assessment and two web-based follow-up assessments. Participants' physical health was measured by employing the Symptoms of Illness (SOI) scale, and commitment level was measured using the Investment Model Scale (IMS). Analyses revealed that the husbands' commitment levels significantly affected their own symptoms of illness (actor effect: p=0.0166) and significantly affected their spouses' symptoms of illness (partner effect: p=0.0013). Wives' commitment levels did not significantly impact their own health or their spouses' health (all ps>.05). These results provide novel and rich insight into the marriage and health relationship. Future work is necessary to understand the role of marital commitment further.

PRESENTER(S): Julia Ball, Brooke DeMoor, Cooper Johnson
AUTHOR(S): Julia Ball, Brooke DeMoor, Cooper Johnson, Bella Gonzalez, Victor Remley, Dr. Miguel Acevedo
FACULTY MENTOR(S): Miguel Acevedo

Analysis of Phenotypic Alterations in A Trunk-Crown Caribbean Anole Following Hurricane Disturbance

Hurricanes, as extreme climatic events (ECEs), are hypothesized to drive natural selection among Anolis lizards. Previous research in Turks and Caicos demonstrated morphological adaptations in trunk-crown anoles favoring traits such as smaller bodies and longer forelimbs following ECEs. However, recent studies on trunk-ground anoles presented conflicting evidence challenging the generalizability of this hypothesis. To address this discrepancy, we conducted a comparative study on Anolis stratulus, a trunk-crown ecomorph native to closed-canopy forests in Puerto Rico, following Hurricanes Irma and Maria in 2017. We collected morphological data, including body size, weight, and body condition from A. stratulus at El Verde Field Station in El Yunque National Forest, before the hurricanes in the summer of 2017, shortly after in the winter of 2017, and a year after the event. This study contributes to the understanding of hurricane-driven natural selection by investigating the phenotypic traits of A. stratulus. Because A. stratulus dwells higher in the canopy than trunk-ground species used previously to study hurricane-driven adaptations, this species may face stronger selection pressures during hurricane disturbances. We hypothesize that harsher selection pressures experienced by A. stratulus during ECEs will drive significant adaptations of body size, weight, and body condition in this trunk-dwelling species.

PRESENTER(S): Nicholas Sherwin
AUTHOR(S): Nicholas Sherwin, Yulia Strekalova
FACULTY MENTOR(S): N/A N/A

Knowledge Needs Around the Functional Unit State Identification & Navigation with Whole Slide Images (FUSION)

Background: As emerging technology continues to drive medical education forward, there lies a challenge to translate innovative advancements into practical tools that meet the needs of healthcare professionals. This study explores the usability of one such piece of AI-powered technology: the Functional Unit State Identification & Navigation with Whole Slide Images (FUSION). This study aimed to answer the following research questions: RQ1: What are the domains of knowledge and perceived value of FUSION among undergraduate students? RQ2: What are the areas of consensus and divergence of FUSION usability and value among undergraduate students?

Methods: Cultural consensus analysis (CCA), a method within anthropology, was employed to identify shared values among undergraduate FUSION user groups. Using elicitation-style interviews, we identified the domains of knowledge, perceived value, and areas of consensus/divergence amongst undergraduate students.

Results: Twenty participants were interviewed, with 6 interviews randomly chosen to be further analyzed to develop the CCA instrument. Overall, ten recurring themes amongst participant responses were identified.

Conclusions: Overall, the CCA instrument provides an opportunity to identify trainee expectations and learning objectives for the use of FUSION. Interviews with instructors and comparison of trainee and instructor perceived uses of FUSION are the future steps of this project.

PRESENTER(S): Benedict Andal
AUTHOR(S): Benedict Andal, Bradley Musselman, and Leslie J. Murray
FACULTY MENTOR(S): Leslie Murray

Ligand effects on the CO_2 reduction catalysis of diiron di(μ-sulfido) complexes.

The utilization of CO_2 as a chemical feedstock is one method for tackling the ongoing climate crisis. Diiron di(μ-sulfido) [Fe_2S_2] cluster complexes are a class of catalyst that may prove useful for working toward that goal. Previous results reported in our group have suggested that ligand character carries influence over the catalytic abilities of Fe_2S_2 cyclophane complexes. The previously studied complexes are Fe_2S_2Lbis and Fe_2S_2LEt/Me, where Lbis is a bis(β-diketiminate) cyclophane and LEt/Me is a tris(β-diketiminate) cyclophane. Despite their structural similarities, only Fe_2S_2LEt/Me is recovered after catalyzing CO¬2 reduction while Fe_2S_2Lbis decays under catalytic conditions. These results motivate the current project to determine effects of ligand character on CO_2 reduction catalysis for Fe_2S_2 cyclophane complexes. Specifically, the proposed and ongoing ligand syntheses set out to isolate the importance of the structural rigidity of a ligand versus its ability to hydrogen bond with the Fe_2S_2 cluster. Here, experimental results from these ongoing syntheses and future directions are presented.

PRESENTER(S): Natalia Madrid, Morgan Davidson
AUTHOR(S): Morgan Davidson, Natalia Madrid, Walter Tapondjou, Kaitlin Allen, David Blackburn
FACULTY MENTOR(S): David Blackburn

Assessment Of The Biogeography Of The Hairy Frog (Trichobatrachus robustus, Boulenger, 1900)

Located in western equatorial Africa, the Congo Basin is one of Africa's most biodiverse landscapes. Landforms in the region such as the Cameroon volcanic line, and the Sanaga river act as barriers between populations and provide habitat variation. A few studies have hypothesized past climatic events as the cause of diversification in terrestrial organisms. The species Trichobatrachus robustus, also known as hairy frog, is one group that is thought to be affected by the topography of the region, but little is known about them aside from certain morphological characteristics such as "hair" and claws. This study aims to revisit the phylogenetic structure, morphology, and biogeography of the hairy frog clade. We used the mitochondrial gene (16S) of 14 individuals and obtained 44 body morphological measurements of 21 individuals. Finally, using the program Wallace, we generated suitable habitat distribution for the identified subclades within Trichobatrachus. Our results reveal that the hairy frog clade is composed of three phylogenetically well-supported populations (a lowland, a mountain, and a population restricted to the Mt Nlonako area). The ecological niche model supports that the populations inhabit different geographic regions and ecological niches, with the Sanaga river identified as a distributional barrier for the montane clades.

PRESENTER(S): Viswa Naik and Amba Ganesh
AUTHOR(S): Tyler Favier, Viswa Naik, Amba Ganesh, and Anita Anantharam, Ph.D.
FACULTY MENTOR(S): Anita Anantharam

An Ecofeminist Perspective for Understanding Eating Disorders Prevalence, Innovative Treatments, and Implications for Case Conceptualizations

Eating disorders pose a pressing national health concern, with the National Eating Disorders Association estimating a 9% lifetime prevalence for these conditions in the United States. This research project aims to investigate how an ecofeminist perspective may provide novel insights into the causes of eating disorders and innovations in treatments. We leveraged data from the Global Burden of Disease (GBD) study by the Institute for Health Metrics and Evaluation, examining eating disorders prevalence from 1990 to 2019. This dataset reaffirmed the high national prevalence of eating disorders and revealed an alarmingly high prevalence for those aged 20-29 (1.07%). In addition to analyzing this quantitative data, we completed a concise literature review of relevant articles that explored the societal causes of eating disorders and their ecofeminist treatments. Our literature review yielded various factors that may contribute to the high prevalence of eating disorders, such as corporate consumer culture, national food distribution, and body shape concerns due to peer pressure. Innovations in ecofeminist treatments will also be presented. Overall, these results demonstrate how eating disorders can be an ecofeminist concern when viewing the pathology as a result of societal attitudes toward women's bodies, gender roles, and the distribution of earth's resources.

PRESENTER(S): Emerson Parks
AUTHOR(S): Emerson L. Parks, Leeana D. Peters, Wen-I Yeh, Matthew E. Brown, Todd M. Brusko
FACULTY MENTOR(S): Todd Brusko

Assessing the Impact of T1D Associated Molecules CD226 and TIGIT on CD8 Cell Phenotype

CD226 is a costimulatory molecule that competes with inhibitory receptors TIGIT and CD96 for binding of ligand CD155 to promote T cell activation and differentiation. A single nucleotide polymorphism (SNP) in the intracellular signaling domain (rs763361) of CD226 is associated with Type 1 Diabetes (T1D). We sought to investigate the impact of CD226 and TIGIT to CD8 T cell phenotype, as these cells may be important mediators of β-cell destruction in T1D. We performed transcriptional profiling of CD8 T cells sorted based on CD226 or TIGIT expression and conducted flow cytometric phenotyping of donor PBMCs, CD226 KOs, or SNP edited CD8 T cells. We observed upregulation of CD96 and downregulation of granzyme B (GZMB) in CD226-TIGIT+ compared to CD226+TIGIT- cells, confirmed by flow cytometry in CD226 KO CD8 T cells. SNP editing resulted in increased CD69 expression in CD8 T cells edited to the risk SNP (T) relative to the wild type SNP (C) after TCR stimulation. This data suggests that CD226 promotes effector function and TIGIT promotes memory differentiation in CD8 T cells. The balance of these activating and inhibitory receptors is important for mediating CD8 T cell phenotype and may serve as a potential therapeutic target for T1D.

PRESENTER(S): Olivia Gust
AUTHOR(S): Olivia L. Gust, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Douglas Soltis

Assessing Florida's Hardwoods' Response to Climate Change: Ecological Niche Modeling of Cornus florida and Sabal minor

The hardwood forested upland is home to many dominant canopy trees as well as to endemics. These areas are under threat due to urbanization, other land use modifications, as well as climate change. Two species of interest within these forests are flowering dogwood (Cornus florida) and dwarf palmetto (Sabal minor). Cornus florida is an understory tree in eastern North America; Sabal minor is an understory palm found in the southeastern U.S. and Mexico. In this study, ecological niche models for these species were constructed to examine the availability of suitable niche space now and in the future given the potential impact of projected changes in climate. Also examined were differences in niche space and species distribution based on various environmental variables. To accomplish these goals, species occurrence data were collected from biodiversity databases, including GBIF and iDigBio, and scrubbed using RStudio. Environmental variable layers were acquired from WorldClim and ecological niche models were developed using maximum entropy (MaxEnt) modeling. The resulting models will be combined with similar analyses for other forest upland species to better understand the potential response of hardwood forested uplands to climate change; the results will have important implications for conservation efforts.

PRESENTER(S): Anjani Patel
AUTHOR(S): Anjani Patel, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Pam Soltis

Predicting the Distribution of Florida Hardwood Forest Species Based on Climate Change Modeling

Florida's hardwood forests, a crucial ecosystem in north Florida, are characterized by deciduous and evergreen trees. They play a vital role in maintaining biodiversity, however, plant species within hardwood forests are rapidly vanishing due to urban and agricultural development. Therefore, there is an urgent need to preserve these species to safeguard the health of ecosystems. Unique plant species such as Carpinus caroliniana and Gelsemium sempervirens are important to the health of these hardwood forests. Carpinus caroliniana, the American Hornbeam, is a deciduous, understory tree found throughout the eastern United States, including the southernmost parts of Canada. Gelsemium sempervirens, Carolina Jessamine, is a flowering evergreen vine that extends from Virginia to Florida, Texas, and down to Guatemala. In this study, we developed ecological niche models for these plant species to assess habitat suitability. We projected our models to various future climate predictions to evaluate how these species might respond. Locality information from digitized herbarium specimens were downloaded from iDigBio and GBIF and environmental data from Soil Grids and BioClim. Through this research, we aim to provide insight into the fate of Florida's hardwood forests in hopes of spreading awareness about the importance of conservation efforts.

PRESENTER(S): Tyler Irby
AUTHOR(S): Tyler Irby, Daniel Ferris, Chang Liu
FACULTY MENTOR(S): Daniel Ferris

Investigating Changes in Mobility, Cognition, and EEG Recording Quality During Gait of Older Adults After 6+ Months.

Aging adults often face challenges in mobility linked to cognitive health, impacting both finances and independence. Understanding the mechanisms behind age-related cognitive and mobility decline and quantifying its impact is necessary. While past research focused on changes in brain activity during rest, recent studies have utilized electroencephalography (EEG) to measure brain activity during walking activities. This study investigates changes in mobility and cognition in 33 participants, aged 65-91, who attended two sessions over 6+ months. Sessions included a 400-meter walking assessment, Short Physical Performance Battery (SPPB), and Montreal Cognitive Assessment (MoCA), assessing the mobility and cognitive function of participants. Results revealed that the SPPB (first visit vs. second visit: 9 vs. 9), MoCA (28 vs. 27), overground walking speed (0.98 vs. 1.01 m/s), and treadmill walking speed (0.36 vs. 0.35 m/s) are similar between both visits. We also computed the displacement of EEG electrodes between EEG analyses and showed an average displacement of electrodes of 17.5 mm. Future studies should conduct more longitudinal follow-ups, examining the variables investigated in this study in order to better quantify significant changes.

PRESENTER(S): Hunter Black
AUTHOR(S): Robert Singiser, Zach Karpinski, Hunter Black, Brody Gommier, Thomas Corbin, Jason Livesay, and Ranga Narayanan
FACULTY MENTOR(S): Ranga Narayanan

Characterizing Faraday Instability Waveforms through Mechanical Forcing

This study aims to experimentally explore the initiation of resonant patterns in fluid bilayers under parametric oscillatory forcing. The findings are employed to validate theoretical predictions grounded in Newton's laws of motion as applied to fluid dynamics. When fluid bilayers undergo parametric forcing, instability arises at critical forcing amplitudes, contingent upon the oscillation frequency. This instability, termed Faraday instability, manifests when the assigned parametric frequency aligns with the system's natural frequency – the frequency at which the fluid bilayer oscillates momentarily after disturbance. Faraday instability is accompanied by distinct patterns or waveforms, theoretically predictable and subject to experimental validation in this project. Our current experiments exhibit a narrow error range, ranging from 1.4% to approximately 7.6% across a frequency spectrum of 3 to 4 Hz. This remarkably close correspondence between theoretical predictions and experimental observations presents encouraging data for further waveform characterization. All modes from conducted experiments align with theoretically derived ones in a right-circular cylindrical cell. However, future investigations involve testing cells with diverse geometries to assess the impact of varying parameters on the experimental-theoretical correlation. This comprehensive approach contributes to refining our understanding of resonant patterns in fluid bilayers and their sensitivity to different system configurations.

PRESENTER(S): Paola J. Sullivan
AUTHOR(S): Paola Jaramillo Sullivan, Dr. Ana Puig, Dr. Jorge Ruiz-Menjivar
FACULTY MENTOR(S): Ana Puig

The Efficacy of a Sensory Processing Intervention on Children's Spirituality, Happiness and Resilience: A Pilot Study

This research project explores the intricate connections between spirituality, happiness, and resilience in children in grades 3, 4 and 5. Despite extensive studies in adults and adolescents, there is a notable research gap concerning children's spirituality. The study aims to investigate the effectiveness of a sensory processing intervention, using a children's book, on self-reported spirituality, happiness, and resilience.

The research has three objectives: 1) Provide children with a mindfulness and sensory development children's book to impact sensory awareness, spirituality, happiness, and resilience; 2) Analyze children's attitudes and practices related to spirituality; 3) Support children in developing sensory awareness, spirituality, happiness, and resilience.

The study's research questions focus on the relationships among children's spirituality, happiness, and resilience and whether a spiritual intervention involving a mindfulness and sensory processing children's book can enhance these aspects.

The study is in the recruitment phase and will give an overview of the necessity and challenges in recruiting children.

PRESENTER(S): Roshni Sawlani
AUTHOR(S): Roshni Sawlani, Josephine M. Pasche, Victor Buttros, Samuel J. Martins
FACULTY MENTOR(S): Samuel Martins

Rooted in Resistance: Evaluating Collagen and Chitin Amendments for Controlling Root Knot Nematode Infections

Meloidogyne enterolobii, also known as the Guava Root-Knot Nematode (GRKN), is an emergent sedentary endoparasite causing stunted growth and yield loss in crops worldwide. Juveniles hatch in the soil then migrate into the roots, forming galls that impose on absorption of essential nutrients. This study assessed whether amending the soil of infected tomato plants with chitin or collagen, important components of the eggshells and the cuticle bodies of nematodes respectively, would have an alleviating effect on plant health, measured by concentrations of photosynthetic pigments in the leaves, biomass, and number of eggs isolated per gram of root 60 days following inoculation with eggs. Data was analyzed between 8 experimental groups with 5 repetitions. A native soil group (N), an agricultural soil group (A), with 4 treatment groups: nematode eggs alone (N), control with no treatments added (O), 0.2% collagen and eggs (Co), and 1% chitin and eggs (Ch). Overall, plants with either soil amendment had a 35% higher total pigment concentration than the NN or NA groups. Infected plants amended with collagen showed 86% higher biomass and 75% less eggs per gram of root, while chitin amended plants showed 93% higher biomass and 78% less eggs per gram of root.

PRESENTER(S): Mya Maybank
AUTHOR(S): Mya Maybank, Sarah Johnson, Razieh Sadat Mirmahdi, Naim Montazeri
FACULTY MENTOR(S): Naim Montazeri

Enhancing Agricultural Water Safety Against Norovirus Through the Utilization of Hypochlorite-Based Sanitizer

Human norovirus remains the predominant cause of foodborne illnesses in the United

States, posing a substantial threat to food safety and public health. This study investigates the antiviral effectiveness of a widely used calcium hypochlorite-based sanitizer in irrigation water samples (Ag1 and Ag2) sourced from Florida farms. Samples were inoculated with 6 log10 PFU/mL, followed by exposure to free chlorine ranging from 2 to 40 ppm for 5 or 10 minutes. After treatment, the samples were neutralized, then infectious virus particles were quantified using a plaque (infectivity) assay. Significant reductions ($p<0.05$), were achieved at 20 and 10 ppm free chlorine concentrations for Ag2 and Ag1 samples, respectively. In both sample sets, a 30-ppm of free chlorine resulted in near-complete to complete virus inactivation within 5 min, exceeding a 4.3-log10 PFU/mL reduction. The results of our study demonstrated that increasing contact time from 5 to 10 min did not significantly enhance the efficacy of chlorine in any of the samples ($p>0.05$). This research provides practical insights for mitigating norovirus contamination in agricultural water. Future studies will explore the efficacy of chlorine inactivation using clinical human norovirus.

PRESENTER(S): Ada Liu, Salini Pattanayek
AUTHOR(S): Ada Liu, Salini Pattanayek, Monica F. Torrez Lamberti, and Graciela L. Lorca
FACULTY MENTOR(S): Graciela Lorca

Human Milk as a Source of Antibiotic Resistant Genes

Human milk contains critical nutrients as well as a diverse microbiota that support growth and immune development for infants. The microbiota in human milk is a source of commensal bacteria for the infant which aid in metabolism and protection against pathogens. However, these commensals can also be a reservoir for antibiotic resistance genes (ARGs). Infants have a vast array of ARGs in their gut microbiota from mom's milk. The goal of this study is to identify antibiotic-resistant bacteria and determine the magnitude of their resistance. In our study, we isolated 91 bacterial strains from human milk and characterize the antimicrobial resistance profile. Antibiotic susceptibility tests revealed that most of the isolates were susceptible to ciprofloxacin and gentamicin, while up to 79% showed resistance to others, including ampicillin and vancomycin. Staphylococcus and Klebsiella were the most common bacteria found. Notably, 23% of strains were resistant to up to 3 antibiotics, 45% were resistant to 4 to 7 antibiotics, and 32% were resistant to more than 8 antibiotics. Acinetobacter defluvii emerged as a prevalent multi-drug resistant strain. These results highlight the critical need for monitoring the presence of microorganisms carrying out antibiotic resistance in the human milk microbiome to safeguard infant health.

PRESENTER(S): Ania M. Granadino
AUTHOR(S): Ania Granadino, Logan Spicer, Catalin Voiniciuc
FACULTY MENTOR(S): Catalin Voiniciuc

Unveiling the Impact of Mucilage Polysaccharides on Germination

Mucilage is a viscous substance secreted by the Golgi apparatus that contains various polysaccharides and proteins and is present in multiple crops such as basil, chia, arugula, okra, and flax. Different crops employ various mechanisms to utilize mucilage and its polysaccharides located in different parts of the plant to either facilitate or limit their germination in adverse conditions. The mucilage serves several functions in the seed processes such as water absorption, water holding capacity, protecting the seed, enhancing adhesion, facilitating germination and long-distance dispersal. This study investigates the effect of mucilage on germination in Lepidium sativum, which is sold as garden cress microgreens. Lepidium seeds that have intact mucilage, and seeds with the mucilage extracted were evaluated with different concentrations of sodium chloride and calcium chloride to elucidate the effects of different osmotic stress conditions. Our results will shed light on roles of gelatinous polysaccharides on seed performance in saline environments that are predicted to become more prevalent as sea levels rise in Florida and in other coastal regions of the world.

PRESENTER(S): Zoe Golomb
AUTHOR(S): Zoe Golomb
FACULTY MENTOR(S): Sheryl Kroen

Gisele Halimi and the Fight for Abortion in France and Europe

In an era where Roe v. Wade has recently been overturned in the United States while France becomes the first Western country to enshrine the right to abortion in its constitution, it is fitting to revisit the time when abortion first became a legalized right. This paper will trace the process of the legalization of abortion in France and Europe through examining the life and work of Gisele Halimi, a Tunisian-French lawyer. Through Halimi's involvement in French politics and her work with the European Union, she became a central figure in liberalizing abortion policy both in France and across Europe. This study will include an examination of the role that supranational European institutions play in liberalizing abortion policies across the member states of the European Union.

PRESENTER(S): Morgan Himes
AUTHOR(S): Morgan Himes, Adam Ginsburg, Brice Tingle
FACULTY MENTOR(S): Adam Ginsburg

High-Mass Star Formation: SPICY Sources in ALMA-IMF

Young stellar objects (YSOs) are stars in the earliest stages of their formation. The Spitzer/IRAC Candidate YSO (SPICY) catalog contains about 120,000 candidate YSOs in the Galactic midplane, the most common location in our Galaxy to find massive star-forming regions. The ALMA-IMF large program has surveyed 15 nearby regions with the ALMA telescope to probe the origin of the initial mass function (IMF) which describes the distribution of stellar masses in a star cluster. We obtained data from various space and ground telescopes for the SPICY sources located within the 15 regions. We fitted spectral energy distributions (plots of energy versus frequency of light) to the multi-wavelength data to place constraints on YSO physical properties (temperature, luminosity, radius, and mass). By measuring the properties of individual YSOs, we aim to learn about the origin, stellar IMF, age, and star formation rate of the clusters. We can also compare Galactic star formation to extragalactic sources by summing the light contributed by YSOs in a cluster to estimate the number of YSOs in extragalactic star-forming regions where we cannot resolve individual sources.

PRESENTER(S): Benjamin Liberles
AUTHOR(S): Benjamin Liberles, Jason Dittmann, Stephen Elardo, Sarah Ballard
FACULTY MENTOR(S): Jason Dittmann

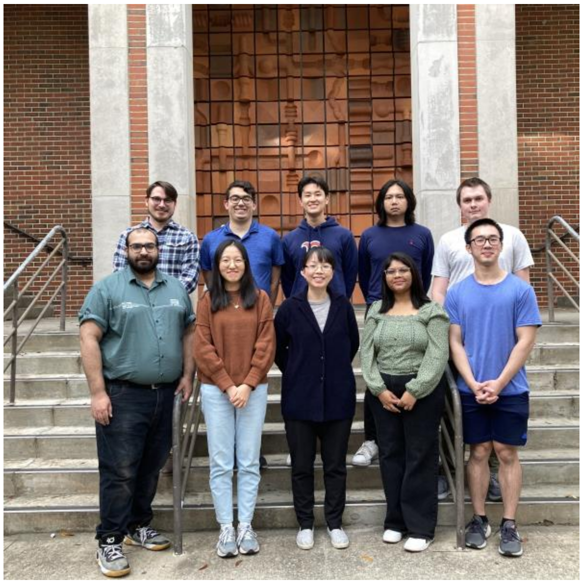
Variations in the Radius Distribution of Single and Compact Multiple Transiting Planets

Previous work has established the enhanced occurrence of compact systems of multiple small exoplanets around metal-poor stars. We investigate whether the radii distribution between single- and multi-transiting planets are consistent with being drawn from the same underlying planetary population. We construct a planetary sample of 290 Kepler-derived planets orbiting late-K and M-dwarfs containing 149 planets from single-transiting planetary systems and 141 planets from multi-transiting compact multiple planetary systems (54 compact multiples). We perform two sample Kolmogorov-Smirnov tests, Mann-Whitney U tests, and Anderson-Darling K-Sampling tests on the radius distributions of our two samples and find statistical evidence ($p < 0.0026$) that planets in compact multiple systems are larger, on average, than their single-transiting counterparts. We also discuss whether this effect could originate via more efficient outgassing of a secondary atmosphere in compact multiple systems due to the stress and strain forces of interplanetary tides, and the amounts of volatiles required in the bulk mantle to account for this result. We discuss the implications that our result has on planet formation theories, including the possibility that the planet formation channels for single-transiting and compact multiple planets are different and result in different interior compositions of these planetary populations.

PRESENTER(S): Monique Kubovsky
AUTHOR(S): Monique Kubovsky, Amlan Biswas
FACULTY MENTOR(S): Amlan Biswas

Preparation of Atomically Smooth SrTiO3 Substrates

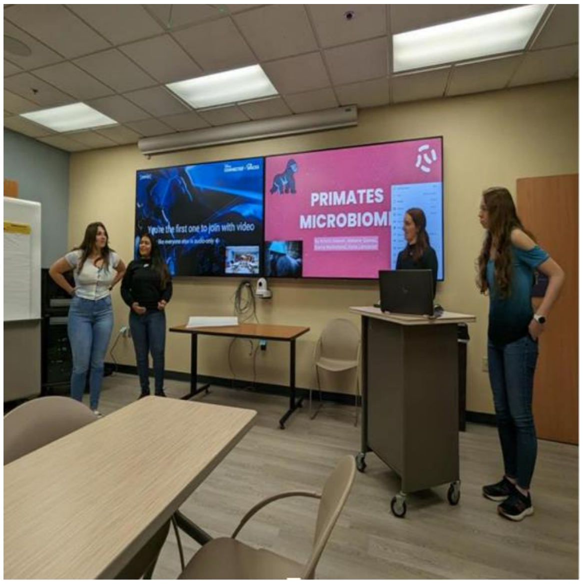
Using Atomic Force Microscopy (AFM), the surface of $SrTiO_3$ (STO) has been observed and studied. Aside from STO having unique properties, such as superconductivity, the study of STO is also important because its perovskite structure makes it a suitable substrate for thin film deposition. To use it as such, the material needs to have an atomically smooth, singly-terminated surface for optimal thin film growth. $SrTiO_3$ can have either a TiO_2-terminated surface or an SrO-terminated substrate, where either the TiO_2 or SrO layer is exposed at the surface, which determines the order in which the atoms of thin films are deposited on the substrate and the film's composition and properties. The main aim of this project is to use an annealing process to produce an atomically smooth, TiO_2-terminated $SrTiO_3$ surface that has a terraced structure with steps that are the height of STO's unit cells. The experimental procedure includes ultrasonic cleaning, thermal annealing, and AFM. Looking forward, we will use these substrates for thin film growth using pulsed laser deposition. This project is significant because it focuses on perfecting the two-dimensional interface between the substrate and thin film, which plays an important role in the properties of oxide thin films.



PRESENTER(S): Brian Zhi
AUTHOR(S): Brian Zhi, Pranshu Puri, Chenjie Zeng
FACULTY MENTOR(S): Chenjie Zeng

Synthesis of Highly Monodisperse PbSe Magic-sized Clusters

Quantum dots (QDs) exhibit the quantum confinement effect, which can drastically cause a material's properties to deviate from those of the bulk material. These altered properties allow them to be used to fabricate optoelectronic devices, such as photodiodes, phototransistors, photomultipliers, etc. Although QDs have been investigated over the past four decades, their synthesis requires harsh conditions to achieve high monodispersity levels such as high temperatures, 200-300°C. Recently, another class of nanomaterials, magic-sized clusters (MSCs), has become popular due to their monodispersed sizes and enhanced stability. Through UV-Vis-NIR spectroscopy, MSCs and QDs can be easily differentiated since MSCs exhibit discrete growth patterns, unlike the continuous growth pattern shown in regular QDs. Lead selenide (PbSe) QDs have a narrow bandgap and experience strong quantum confinement, which is important for applications in solar cells and infrared detectors. However, studies on lead selenide (PbSe) MSCs are limited. Here, we are seeking to expand the knowledge/library of PbSe MSCs. Altering the conventional synthetic route, we are trying to gain control over the nucleation and growth of nanoclusters to achieve highly monodisperse PbSe MSCs.



PRESENTER(S): Kristin Deaver, Sierra Mulholland, Katelyn Lancaster
AUTHOR(S): Kristin Deaver, Sierra Mulholland, Katelyn Lancaster, Melanie Gomez, Christopher Dutton
FACULTY MENTOR(S): Christopher Dutton

Comparing Primate Microbiomes: Insights from Disney's Animal Kingdom

An animal's microbiome consists of trillions of microorganisms living inside of an animal's gut. Microbiomes influence various aspects of an organism's health, ranging from obesity, heart disease, inflammatory bowel disease and other chronic illnesses. Here, we focus on the microbiomes of three distinct primate species living in captivity at Disney's Animal Kingdom: Gibbons, Siamangs, and Gorillas. We analyzed fecal samples collected by staff and compared them to previously known information. DNA was extracted and cleaned from fecal samples. We then sequenced the 16S gene using a Nanopore MinION to characterize the microbiome. We found that siamangs and gorillas had more similar microbiomes than each did compared to gibbons. The microbiomes of individuals were variable by date, but different individuals had more similar microbiomes on the same date. Within the gorillas, we found a stronger correlation of microbial status between individuals who were socially connected versus those who were genetically similar. According to our DNA analysis, the Disney Gorillas had much lower levels of Spirochaetes in their microbiomes, which in other studies has been linked to negative health effects.

PRESENTER(S): Marcus Mynatt
AUTHOR(S): M. Mynatt 1, C. Jia 1, M. Zhu 2, J. Yao 3, H. Pugzlys 1, S. Li 1, Q. Zhao 2
FACULTY MENTOR(S): Chunjing Jia

Creating Skyrmion phase diagrams in Heisenberg Model Lattice Configurations With Dzyaloshinskii-Moriya Interactions

Skyrmions or skyrmion phases are magnetic quasiparticle-like configurations characterized by swirling vertices with non-trivial topological charge (Mohylna M. and Zukovic M., 2019). Magnetic skyrmions are promising in device applications such as memory storage, due to their atomic-scale and manipulability in changing charge and swirl direction. We study the phase diagrams of topological magnetic skyrmions on a triangle or honeycomb lattice Heisenberg model with Dzyaloshinskii-Moriya (DMI) interaction. Using the atomistic simulation software Vampire (Evans R., 2018), we describe these two-dimensional skyrmion lattices by a simple Hamiltonian with classical spin. The spin Hamiltonians were used to recover the lattice arrangement's spin interactions; required for building the input unit cell file required for Vampire simulations. For computation, we used the University of Florida's HiPerGator supercomputer used to process interactions for lattices of ~1000 atoms. The simulation output was visualized via Gnuplot. We were able to create skyrmion phase diagrams for the triangle and honeycomb lattices using Landau-Lifshitz-Gilbert (LLG) integration with an applied magnetic field.

PRESENTER(S): Rhett Hoke
AUTHOR(S): Rhett Hoke, Amlan Biswas
FACULTY MENTOR(S): Amlan Biswas

Implementing Capacitance-Based Angle Measurement Techniques to Investigate Anisotropic Magnetoresistance

Anisotropic magnetoresistance (AMR) in perovskite thin-films like (La1-yPry)1-xCa1-xMnO3 (LPCMO) has been a focus of study in the field of spintronics because of their potential applications in data storage devices. AMR is defined as a change in electrical resistance as a function of the angle (θ) between the applied current and magnetic field of a material. Precise measurement of θ is a difficult task when studying AMR in samples at temperatures down to 4K. A commercial Hall bar can be used to measure θ since the Hall voltage (V_H) is a function of θ. However, this technique suffers from a notable drawback when the applied magnetic field is less than 1 tesla; the data loses precision due to the non-linear relation between V_H and θ. A capacitance-based technique would solve this issue of precision by completely removing any dependency on the magnetic field strength. Using a half-cylindrical double-plate capacitor with one plate fixed and another that can rotate in tandem with the sample, θ can be expressed as a function of capacitance. We have designed a low temperature cryostat to implement a capacitance-based angle measurement technique for AMR measurements in thin films and microstructures.

PRESENTER(S): Benjamin Siew
AUTHOR(S): Benjamin J. Siew (1), Jacob J. Buffo (2), Mark G. Fox-Powell (3), Tara C. Tomlinson (2)
FACULTY MENTOR(S): Jacob Buffo

Geochemical and Habitability Characterization of Enceladus, Europa, and Earth Analog Brines Across Temperatures and Salinities.

A key component of assessing the habitability of ice-ocean worlds is determining solution properties such as water activity, pH, dissolved oxygen (DO), and oxidation reduction potential (ORP). Studies suggest that interstitial brines may be present in shallow, accessible region of icy planetary shells. However, as these brines lose heat and freeze, they become increasingly concentrated, which can cause the above described solution properties to vary dramatically. Currently our understanding of how these brine properties vary under planetary relevant compositions, concentrations, and temperatures is limited to theoretical predictions, as chemically diverse natural ice-brine analogues are limited and a suite of analysis instrumentation is needed. To test the accuracy of these theoretical predictions and create a unique reference data set, we created brines of different chemistries that have been suggested as possible ocean world endmembers and measured their above described solution properties at a range of temperatures and concentrations. Furthermore, we conducted this investigation using a suite of affordable, compact, over-the-counter probe sensors to test their capabilities as an accurate, small form factor, low-cost option that could be deployed in natural analogue field work settings.

PRESENTER(S): Angela Liang, Georgios Glynatsis
AUTHOR(S): Chenyu Liang, Andrea Noy, Angela Liang, Georgios Glynatsis, Xin Tang
FACULTY MENTOR(S): Xin Tang

Probing the Mechanical Regulation of Cancer Cell Interactions

Long-distance cell-cell interactions in human cancer cells play a vital role in tumor progression and growth, using processes including calcium and mechanical signaling to complete their processes. It is important to highlight the importance of studying such interactions, in conjunction to the mechanical interactions in the biophysical tumor microenvironments, as these communication networks are responsible for the maintenance, functioning, and proliferation of tumors on both microscopic and macroscopic scales. Hence, through the understanding of the intricacies of these processes and how they function, we may be able to gain an insight into how these pathways can be blocked, regulated, or modulated in such a way that would regulate the properties of tumors that make them malignant and harmful to human patients. This project focuses on Ca+ and mechanical signaling and their relationship to human tumor development.

PRESENTER(S): Brianna Hiers
AUTHOR(S): Hiers, B., Favier, T., Valuta, M., Degracia, G., Heidelberg, E., Dick, S., Rodriguez, L.
FACULTY MENTOR(S): Lindsey Rodriguez

Perceptions of Partner's Drinking Habits Affecting one's Need Fulfillment, and the Mediating Role of Loneliness.

Past research has shown that perceptions that one's partner has an issue with alcohol contribute to negative relationship outcomes (Rodriguez et al., 2013). This poster presentation analyzes the impact of the perceptions of a partner's drinking habits, and how that affects need fulfillment in relationships, along with the ways in which loneliness can impact this. Our hypothesis is that perceptions that a partner has a drinking problem are associated with greater loneliness, and in turn, lower need fulfillment. 192 participants were used to complete the study. Regression and process analyses were used to test for the association between perceptions of partner drinking problems, loneliness and need satisfaction in relationships. Measures included the Daily Drinking Questionnaire (DDQ), Thinking About your Partner's Drinking Scales (TPD and PPP), need fulfillment, and loneliness. Results showed that perceptions that a partner has a drinking problem are associated with reduced need fulfillment. Perceptions that a partner has a drinking problem were also found to be related to greater loneliness, and therefore, lower need fulfillment.

PRESENTER(S): Shrinath Shah
AUTHOR(S): Shrinath Shah, Raghuveer Chandrashekhar, Dr. Hongwu Wang
FACULTY MENTOR(S): Hongwu Wang

Usability of a Robotic Companion to Promote Mobility and Independence of Users

The United States has approximately 12.1% of adults living with mobility impairments. The Gita robot, a human-following robot, can carry personal belongings and has the potential to improve the mobility and independence of older adults. Our objective was to explore user’s opinions toward Gita via a focus group study. A focus group study included nine community-dwelling older adults with different impairments and two physical therapists from a senior living community. Data was analyzed with the thematic analysis method. The authors introduced GitaPlus, a 50-pound robot with a 40-pound payload, 6-hour battery life, and an 18-mile range on a single charge. Its dimensions are 25 x 22 x 25.8 inches. They demonstrated the existing features of the Gita robot to the participants. After testing, the participants provided suggestions to improve the device and cater to individuals with different impairments. Three themes were identified from the discussions: 1) physical robot design, 2) safety of users and their surroundings, and 3) additional features that could enhance the user's experience. Future studies will use a task analysis approach to assess how older adults could use the robot for different daily activities and identify areas of improvement and strategies for deployment.

PRESENTER(S): Caitlin Brennan
AUTHOR(S): Caitlin Brennan, Alyssa Mickle, Jesús D. Peñaloza-Aponte, Erica Dale
FACULTY MENTOR(S): Erica Dale

c-Fos Distribution in the Thoracic Spinal Cord after Cervical Spinal Cord Stimulation and Injury

Epidural stimulation (ES) can restore motor functions after spinal cord injury. Our lab has shown that ES restores diaphragm EMG activity in C2-hemisected rats. Here we explore if C4 stimulation activates spinal reflex pathways using c-Fos as a marker of increased neuronal activity. C2-hemisected Sprague-Dawley rats were implanted with electrodes on C4 to stimulate and bilaterally on the diaphragm to record EMG. Rats received stimulation (n = 3) or an equivalent sham period (n = 4). 1 hour after the start of stimulation rats were perfused and T4 spinal tissue stained for ChAT and c-Fos mRNA. Images were quantified using an automated pipeline. c-Fos expression was present in both groups with significantly more cells positive in sham. No significant differences were observed in the percentage of ChAT positive neurons that were also co-positive for c-Fos, or in the total number of c-Fos positive cells in the gray matter. However, there was a significant increase in the total number of c-Fos positive cells detected within the white matter of the sham animals. Future directions will include identifying the c-Fos positive cells in the white matter that are downregulated with stimulation, evaluating c-Fos expression at T1, and colocalizing with other neural markers.

PRESENTER(S): Phúc Phan
AUTHOR(S): Phúc Phan, Shimei Nelapati, Joy Gabrielli
FACULTY MENTOR(S): Joy Gabrielli

What are the alcohol-related peer norms and drinker prototypes reported by Asian American youth?

Understanding of drinking norms remains limited in culturally minoritized adolescents, like Asian Americans, despite increased recognition of their alcohol use. As such, the current study describes youth-reported, peer norms in a cross-sectional sample of Asian Americans (N=79, Mage=15.29, SD=0.82) participating in a study examining alcohol content exposure in media. Surveyed participants identified as 48% female, 14% minoritized gender, and 15% Hispanic/Latine. Most youth reported that the majority of their friends did not drink alcohol (81.01%) or get drunk (88.01%). Additionally, most youth expected friends to disapprove of getting drunk (60.76%) or consuming 5+ drinks over a weekend (79.75%), though only 32.91% of participants expected disapproval for consuming 1-2 drinks. Mann-Whitney U testing indicated that youth rated drinkers as similarly popular (M=3.52, SD=1.00) and immature (M=3.34, SD=1.30) but less attractive (M=2.78, SD=1.20), cool (M=2.90, SD=1.18), confused (M=2.73, SD=1.27), and careless (M=2.68, SD=1.21). Future research examining associations between youth-reported peer norms and alcohol use in Asian Americans could inform culturally responsive prevention efforts.

PRESENTER(S): Lucas Pereira
AUTHOR(S): Lucas Pereira, Leslie Smith, Kiley Graim, James Cahill
FACULTY MENTOR(S): Kiley Graim

Understanding the Genomic Landscape of Sepsis and the Impact of Ancestry on its Outcomes

While modern developments in precision medicine have pushed to equitably address ancestral variation, many gold-standard genomic databases are largely Eurocentric. Individuals of other ancestries, especially those of admixed ancestry, are frequently excluded from genomic studies as a result, making it difficult to develop applicable treatments and draw conclusions about the effects of ancestry on disease. In order to better understand the impact of ancestry on sepsis patient outcomes, it must first be accurately labeled in sepsis patients. Sepsis patients may not have ancestry information attached to their data, and using self-reported ancestry information is often unreliable. We used global data from the 1000 Genomes Project in order to build ancestry assignment models with ADMIXTURE and apply them to a cohort of sepsis patients from UF Shands Hospital. We then conducted a genomic analysis to see if any ancestry-specific genetic variants involved in lipidomic processes were present, as sepsis is known to impact lipid metabolism. The discovery of such variants may allow researchers to add ancestral dimensionality when studying the genomic landscape of sepsis and equitably approach precision medicine treatments for the disease.

PRESENTER(S): Karina Lewin
AUTHOR(S): Karina Lewin, Lindsay Lloveras, Ph.D., BCBA-D, & Kerri Peters, Ph.D., BCBA-D
FACULTY MENTOR(S): Lindsay Lloveras

Evaluating Some Barriers to Healthcare in Individuals with Autism Spectrum Disorder

Patients with Autism Spectrum Disorder (ASD) and other neurodevelopmental disorders are a historically underserved population who experience many barriers to comprehensive healthcare. The purpose of this study was to gather information regarding potential barriers to healthcare that individuals with ASD may experience. A survey was conducted to evaluate the different barriers to healthcare that individuals with ASD may experience. Surveys were distributed to parents of children with ASD. Survey respondents were asked questions related to challenging behavior in the context of both medical procedures involving needles and dental procedures. Basic demographic information was also collected. Results indicate that children with autism who have challenging behavior in the context of needles also have challenging behavior in the context of dental procedures. These results suggest that research targeting interventions to increase cooperation in these settings is warranted.

PRESENTER(S): Ansley Burtch
AUTHOR(S): Ansley Burtch, Douglas E. Soltis, Pamela S. Soltis, Mackenzie E. Mabry
FACULTY MENTOR(S): Pamela Soltis

Ilex vomitoria and Morus rubra: Ecological Niche Modelling of Endemic Species in Florida

Florida Hardwood Uplands are a dynamic and interesting habitat in Florida, boasting the Southernmost distribution of many temperate species, as well as the Northernmost distribution of some tropical species. These forests also contain several locally endemic species. Given the precarious positioning of these temperate mixed-hardwood forests, which straddle climatically different regions, it is important to study how projected changes to the climate will affect the distributions of the plants there. Two species that thrive in Hardwood Uplands are Ilex vomitoria and Morus rubra. Both have rich ethnobotanical histories and rely on the Hardwood Uplands habitat to survive. Ilex vomitoria in particular is protected in its wild habitat due to its historical use by Native Americans. The goal of this study is to develop ecological niche models for I. vomitoria and M. rubra and to project how their distribution ranges will change as the environment continues to change in the coming years. To address these goals, I generated niche models and projected the results onto a map of the eastern United States, while considering current and predicted future climate data, to allow me to make predictions about the susceptibility of Florida Hardwood Uplands to temperature and precipitation changes in the future.

PRESENTER(S): Caeli Benyacko
AUTHOR(S): Caeli Benyacko, Alan Sherman, Raven Rawson, Quinton Wiebe, Garrett Hauser, Krittin Poottafai, Daniel Talham, Mark Meisel
FACULTY MENTOR(S): Mark Meisel

Characterization of the Low Temperature Static Magnetic Properties of Cryogel

While searching for a “new age” cryogenic insulating material for use in magnetic fields, the silica aerogel known as Cryogel®x201 was identified for its performance at low temperatures [1]. The thermal conductivity of Cryogel® has been reported [2], but the magnetic properties have not been characterized to date. Applications in high magnetic field instrumentation establish a necessity to fingerprint the

magnetic properties of Cryogel®. Using a commercial magnetometer, magnetization data, $M(2\ K \leq T \leq 300\ K, B = 100\ mT)$ and $M(T = 2\ K, -1\ T \leq B \leq 7\ T)$, were collected. These data sets were fit to a Brillouin function with a Curie-like background contribution to extract parameters, namely the spin value and the concentration of magnetic entities. Ultimately, this unexpected magnetic signal is conjectured to be associated with Fe_2O_3 nanoparticles.

[1] https://www.pacorinc.com/wp-content/uploads/Cryogel-x201-Datasheet.pdf

[2] V. Ilardi et al., IOP Conf. Ser.: Mater. Sci. Eng. 756 (2020) 012005, doi:10.1088/1757-

899X/756/1/012005

PRESENTER(S): Jillian Campbell, Rhea Pitale
AUTHOR(S): Jillian Campbell, Rhea Pitale
FACULTY MENTOR(S): Daniel Kopinke

Duchenne Muscular Dystrophy Pathology Simulation in Mdx Model

Duchenne muscular dystrophy (DMD) is one of the severe forms of muscular dystrophies, leading to an approximately 75% reduction of lifespan in affected individuals. Trials are underway to alleviate the severity of DMD by delivering a truncated version of the dystrophin gene but more work is needed to completely cure this disease. In the Kopinke Lab, we are using the Mdx mouse as a preclinical model to simulate human DMD pathology of different muscle groups, including the tibialis anterior (TA), gastrocnemius (Gastroc), and diaphragm. We have previously investigated the differentiation of fibro-adipogenic progenitors (FAPs) that may result in fatty fibrosis. However, blocked FAP ciliation enhanced myofiber regeneration after injury and reduced myofiber size decline in Mdx mice. We and others have found that the Mdx mouse on the classic C57BL/10 genetic background lacks the intense infiltration of muscles with intramuscular fat, a hallmark of dystrophic human muscle. To determine if a different genetic background will result in more IMAT, we have crossed Mdx micro onto a different strain. We will investigate the myofiber size, fibroblast growth, and adipogenesis in specified muscles groups at 6 month and 8 month time points in Mdx mice.

PRESENTER(S): Andrea Noy
AUTHOR(S): Andrea Noy, Chenyu Liang, Xin Tang
FACULTY MENTOR(S): Xin Tang

Shedding light on the inner life of cancer cells

Calcium signaling plays a pivotal role in the growth, progression, invasion, and metastasis of human cancer cells, but its biophysical mechanisms remain largely elusive. In particular, the relationship between calcium dynamics and mechanical microenvironments (e.g., stiffness) is not understood yet. Hence, to decode this relationship, we studied spontaneous intra- and inter-cellular calcium waves in human colon cancer cells (HCT-8) that are cultured on biomaterial substrates of a wide range of physiologically relevant stiffnesses. We found that the spatial-temporal calcium dynamics are indeed sensitive to mechanical stiffness and that calcium released from the endoplasmic reticulum (ER) is associated with activation of the Gq-PLC-IP3-R pathway. To further elucidate the intercellular communication pathway, we studied release of other calcium-associated molecules from HCT-8 cells cultured on substrates of the same mechanical stiffnesses, and we are dissecting a directly proportional relationship between frequency of biochemical wave propagations and substrate stiffness.

PRESENTER(S): Erica Rand
AUTHOR(S): Erica K. Rand, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Pamela Soltis

Predicting the Future of Florida's Forests: Ecological Niche Modeling of Arisaema triphyllum and Arisaema dracontium

Florida hardwood forests are home to many diverse plant species. Many of these species are specialized to the unique ecological conditions found within these forests. Understanding these ecosystems helps in conserving biodiversity and protecting endangered species. Two species, Arisaema triphyllum, commonly known as the Jack-in-the-pulpit, and Arisaema dracontium, commonly known as Green Dragon, are native herbaceous perennial plants found in hardwood forests throughout much of eastern North America, including Florida. In this study, we develop ecological niche models to explore how species ranges will expand, contract, or remain the same under future climate change predictions. We use computational methods along with historical specimen data, to gain insight into the environmental preferences of these species under different climate scenarios. The goal of this project is to determine where these species might occur under different possible climate scenarios and to determine if they will occur in protected areas. Protecting and conserving populations of A. triphyllum and A. dracontium is essential for maintaining the ecological health of these valuable forest ecosystems and contributes to the forest's biodiversity. Understanding how these forests react to climate change will help scientists better formulate conservation strategies to implement in the future.

PRESENTER(S): Chaitra Peddireddy
AUTHOR(S): Nikita Soni, Oluwatomisin Obajemu, Katarina Jurczyk, Chaitra Peddireddy, Maeson Vallee, Ailish Tierney, Niloufar Saririan, Cameron John Zuck, Kathryn A. Stofer, Lisa Anthony
FACULTY MENTOR(S): Lisa Anthony, Ph.D.

A Comparative Usability Study of Physical Multi-touch versus Virtual Desktop-Based Spherical Interfaces

Physical multi-touch spherical displays can provide a direct, hands- on, embodied interaction experience with global visualization data like ocean temperatures and currents. However, current commercially available displays may be cost-prohibitive for educational institutions and/or non-profits to acquire. Virtual globe-based visualizations like Google Earth are a potential alternative, but it is not clear how well the interactive affordances of physical spheres may transfer to the virtual. We conducted a within-subjects comparative study with 21 participants who completed similar tasks on a physical and a virtual spherical interface platform, which were designed to be as similar as possible, in order to allow us to compare the interaction experiences. Our results overall showed no significant difference be- tween usability or task time on the two platforms. In their qualitative feedback, participants noticed the differences between the physical sphere and virtual sphere in terms of effort and motor demand. Our research implies that, in resource-constrained environments, a virtual globe can be a sufficient substitute for a physical sphere from a usability perspective.

PRESENTER(S): Aidan Keenan
AUTHOR(S): Aidan Keenan, Joseph W. Rivera, Adam W. Stern
FACULTY MENTOR(S): Adam Stern

Risk Factors for Animal Abuse in Dogs and Cats

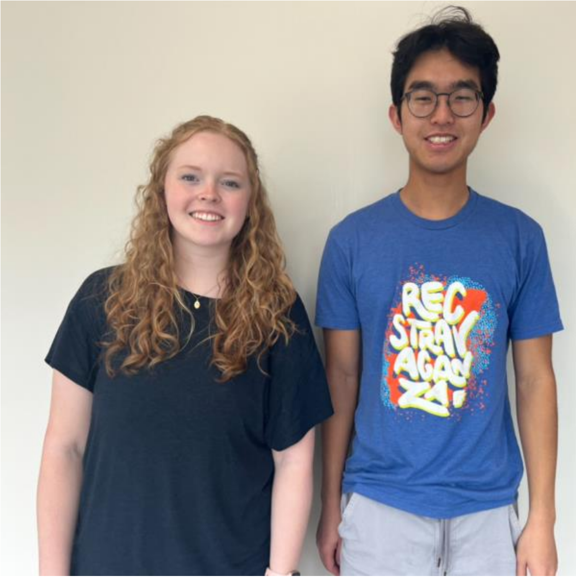
Dogs and cats are commonly subjected to animal abuse, ranging from neglect to intentional acts of violence. Limited studies have shown that intact male and young dogs are at risk for animal abuse. The purpose of this study was to review animal abuse fatalities in cats and dogs submitted to the Veterinary Forensic Sciences Laboratory (VFSL) by examining by the animal's signalment and the cause of death. The autopsy reports and submission forms of 273 animal abuse cases submitted to the VFSL (October 2018 to October 2023) were retrospectively examined. The species, breed, neuter status, sex, age, and cause of death were statistically analyzed. Results show that 221/273 were dogs, 135/254 were male, and 154/230 were intact. The cause of death was consistent with intentional abuse (101 cases), neglect (147 cases), and undetermined (25 cases). Statistically significant differences ($p < .05$) included that an individual would intentionally harm a cat over a dog, a male dog over a female dog, and a neutered cat (female only) or a dog (male and female) over an intact animal. Unexpectedly, we found that neutered animals are at risk for intentional abuse. Additional studies are needed to further understand the risk factors of animal abuse.

PRESENTER(S): Grace Adams
AUTHOR(S): Grace Adams, Louise Dornelas-Figueira, Callahan Katrak, Dayane Oliveira, Marcelle Nascimento, Jacqueline Abranches, Bruna Garcia
FACULTY MENTOR(S): Bruna Garcia

Association of Cbp+ Streptococcus mutans with Root Caries in Older Adults

Root caries is an oral condition that disproportionately affects older adults. Streptococcus mutans is a pathogen directly associated with the initiation and development of root caries when accompanied with increased gum recession in older populations. Collagen-binding proteins (Cbps), specifically Cnm and Cbm, mediate binding of bacteria to collagen-rich surfaces. The purpose of this study is to investigate the association of the Cbps in S. mutans with the presence of root caries. In this cross-sectional clinical study (IRB202100916), subjects aged 65 years and older were grouped as healthy(H) or root caries(RC) based on their oral health status. H subjects presented exposed root surfaces with no presence of active caries lesions and RC subjects presented at least one non-carious, exposed root surface and one active, cavitated root caries lesion. Saliva and supragingival plaque samples were collected from each subject and screened for presence of S. mutans using PCR as well as for collagen binding proteins, Cnm and Cbm. RC subjects presented higher prevalence of Cbp+ S. mutans (34%) compared to H subjects (16.2%)

(p=0.05). Based on prediction models, individuals infected with Cbp+ S. mutans have 2.6 times the odds of developing root caries compared to those infected with Cbp- S. mutans(p=0.05).



PRESENTER(S): Grace Schlichting, George Wu
AUTHOR(S): George Wu, Grace Schlichting, Peter Yang, Steven Bruner
FACULTY MENTOR(S): Steven Bruner

Functional Role of SRP54 in Pediatric Leukemia and Bone Marrow Failure Syndromes

The signal recognition particle 54 (SRP54) is a key component in the signal recognition particle, which is a critical complex that allows for the translocation of polypeptides. Dominant negative mutations in SRP54 have been implicated in disruptions in protein trafficking to the endoplasmic reticulum, which result in inherited neutropenia that resemble Shwachman-Diamond Syndrome and severe congenital neutropenia(1,2) The goals of this project are the investigation of SRP54 dysfunction, the development of small molecule effectors that have the potential to act as therapeutic leads, and discovery of rescue mutants. The dysfunction of SRP54 is investigated using X-ray crystallography and structural analysis, while the small molecule effectors are developed through screening of libraries. Furthermore, the project will use proteolysis targeting chimeras (PROTACs) to allow the degradation of dominant-negative mutants via cellular proteasome machinery. We have determined the structures of several SRP54 mutants using the bacteria P. furiosus as a model system. The structures provide a molecular basis for mutant dysfunction and provide a starting point for further investigation. Overall, this project aims to understand the role SRP54 plays in congenital disorders and provide leads for therapeutic intervention.

PRESENTER(S): Sasha Farid, Noelle Behar, Ryan Athay
AUTHOR(S): Sasha Farid, Noelle Behar, Ryan Athay, Anna Wang, Nae Y. Won, MPH, Linda B., Cottler, PhD, MPH, FACE
FACULTY MENTOR(S): Linda Cottler

Socioeconomic Factors Related to the Definition of Polysubstance Use: A Scoping Review

This scoping review explored polysubstance use definitions, socioeconomic status (SES) factors related to polysubstance use, and treatment options among adults in literature. Following PRISMA guidelines, we identified 7,994 articles to screen. Polysubstance use encompassed non-prescribed concurrent, simultaneous, or sequential use of two or more substances, excluding caffeine. SES was defined as status within social and economic strata (e.g., income, education, and employment). Studies involving adults (age 18+) addressing polysubstance use and SES were included. Studies involving youth, not peer-reviewed nor in English, were excluded. In total, 89 studies were included. Most articles (N=51) defined polysubstance use as concurrent, 38 as sequential, and 24 as simultaneous. The three most common indicators to measure SES were education (n=55), income (n=33), and employment status (n=29). Common themes regarding SES influence on polysubstance use included limited access to treatment, high levels of peer influence, low educational attainment, availability and affordability of care, and mental health disparities. Out of 89, 31 articles made recommendations for polysubstance use treatment.This scoping review highlights varying definitions of polysubstance use and how SES was assessed as a risk factor related to polysubstance use. Despite varied definitions, articles underscored the need for effective treatment strategies.

PRESENTER(S): Mariam Ahmed
AUTHOR(S): Mariam Ahmed, Taylor Rohleen, Caroline Eaton, Ashley Kung, Abigail Masterson, Yeting Wu, Liana Hone
FACULTY MENTOR(S): Liana Hone

The Role of Drinking Contexts in Sexual Violence among Sex and Gender Diverse Women

Sexual violence (SV) affects more than 50% of women, and sex-gender diverse women (SGDW) are at especially high risk. Drinking is associated with SV, and SGDW drink more than non-SGDW. Drinking at parties/bars is associated with SV among non-SGDW. Given non-SGDW drink more in public and SGDW more in private contexts, yet SGDW drink more overall and experience more SV, here, we evaluated whether relationships between drinking in public versus private and SV among SGDW exist.

Self-identified women (166 SGD; 192 non-SGD) aged 18-34 completed the Sexual Experiences Survey, NIAAA's drinking questions, and items regarding past-year drinking frequency, including context.

Replicating prior research, SGDW reported more past-year SV, past-year drinking was associated with SV (however, SGDW did not report more drinking), non-SGDW reported more drinking at parties/bars, and drinking at parties was related to SV among non-SGDW. Drinking context was not related to SV among SGDW. Exploratory analyses revealed that SV since age 14 was related to past-year drinking at home among both groups.

Here, we did not find a relationship between drinking context and past-year SV among SGDW. This has implications for interventions for SGDW who do not drink in high-risk venues yet still experience more SV.

PRESENTER(S): Phillipe Fernandes
AUTHOR(S): Phillipe Fernandes, Nesmine Maptue, Anastasia Chambers, Qingyang Shen, Nguyen Tri, Ali Zarrinpar, Sergio Duarte, Chalermchai Khemtong
FACULTY MENTOR(S): Chalermchai Khemtong

Metabolism of 13C-enriched glucose in HepG2 human hepatoma cells

Cancer cells exhibit altered metabolic pathways compared to normal cells, presenting a promising avenue for cancer detection and treatment. In this study, we aimed to establish gas chromatography-mass spectrometry (GC-MS) protocols for measuring metabolism in cancer cells. HepG2 human hepatoma cells were cultured with either glucose uniformly labeled with 13C isotope ([U-13C6]glucose) or glucose with 13C labeling at carbon 1 and 2 positions ([1,2-13C2]glucose), GC-MS analyses of cell extracts revealed hyperactive glycolysis in HepG2 as shown by high fractional enrichments of [U-13C3]lactate (M+3) and [1,2-13C2]lactate (M+2) in cells treated with [U-13C6]glucose and [1,2-13C2]glucose, respectively. Metabolism of [U-13C6]glucose and [1,2-13C2]glucose into the TCA cycle was also detected in HepG2 cells. Oxidation of both tracers into the TCA cycle produces citrate with 13C-labeling at carbon 4 and carbon 5 positions (M+2). Finally, metabolism of [1,2-13C2]glucose through the pentose phosphate pathway (PPP) produces lactate with 13C labeling at a single carbon (M+1), this was clearly detectable in HepG2 cells cultured with [1,2-13C2]glucose. In conclusion, we have established an accurate protocol for analyzing glucose metabolism in human hepatoma cells using GC-MS combined with 13C tracers. This study enhances our comprehension of cancer metabolism and aids in the development of improved diagnosis and treatment approaches.

PRESENTER(S): Camil Coss Flores
AUTHOR(S): Camil Coss Flores, Jithran Ekanayake, Alison Donald, Nikolay Bliznyuk, Ana Martin-Ryals
FACULTY MENTOR(S): Ana Martin-Ryals

Understanding the Variability and Predictability of Anaerobic Digestion of Food Waste

One-third of food produced globally is wasted, contributing to greenhouse gas emissions as it decomposes in landfills. Anaerobic digestion (AD) is an alternative to landfilling that can provide energy recovery from food waste (FW) in the form of biomethane. However, FW composition, (e.g., carbohydrate, protein, and liquid content) and operating conditions will impact AD performance. The objectives of this research were to understand the variability of AD methane production as a function of food waste composition, and to evaluate statistical machine-learning approaches in terms of accuracy for predicting AD outcomes. An extensive literature review was conducted, and a comprehensive database comprising over 300 data points and 12 predictor variables was compiled. In addition, two bench-scale digesters were started up using dairy digester inoculum and a prepared food waste mixture. Literature values for methane production from FW ranged from 45 to 801 mL/g VS. Initial analysis of the data using Random Forest algorithms revealed that protein content and organic loading rate may be key predictor variables. Bench-scale digester data will be used to validate the machine-learning model results and compared to existing AD models to demonstrate the potential for improving AD of FW predictability.

PRESENTER(S): Andy Chavez
AUTHOR(S): Andy Chavez, Sarah Sniffen, Sang Eun Ryu, Natalie Johnson, Daniel Wesson
FACULTY MENTOR(S): Daniel Wesson

Fear-induced Immobility Prediction with Mouse Respiration Using Supervised Machine Learning

Breathing is often strongly affected by emotional state, though the mechanism for how this occurs is poorly understood. Mice are a useful model for studying said breathing dynamics in response to fear-inducing stimuli. Intranasal pressure recording is the traditional approach for this and provides highly faithful signals but requires invasive surgery. Non-invasive whole-body plethysmography (WBP) offers researchers an opportunity to collect more data in less time and reduce the number of surgeries. The aim of this study was to use mouse WBP respiratory data to predict fear-induced immobility (freezing). Using ezTrack, an open-source automated video analysis pipeline, the proportion of trial time spent freezing was calculated for video recordings of mice subjected to intermittent shocks. Trials were binned into high (67-100%) or low-middle freezing (less than 67%) classes based on the percent of time spent freezing. Analysis of the Fourier spectra of mouse respiratory traces grouped by freezing classes showed distinct frequency distributions. K-nearest neighbors classification using the spectral data were used to classify said trials. When tested on unseen data, the algorithm's accuracy for predicting high-freezing and low-middle freezing data were 87.4% and 94.2%, respectively. These results highlight the potential of non-invasive WBP to generate behavioral insights.

PRESENTER(S): Sebastian Fernandez
AUTHOR(S): Sebastian Fernandez, Makenzie E. Mabry,Tyler Radtke, Tori M. Ford, Jonathan C. Barz, Douglas E. Soltis & Pamela S. Soltis
FACULTY MENTOR(S): Pamela Soltis

Modeling Tomato Wild Relatives Distributions to Uncover Climate-Ready Traits

Densely nutritious and with a near-global popularity, tomatoes (Solanum lycopersicum) stand as a universally appealing vegetable crop with great potential to address the growing demand for food. However, the effects of climate change threaten to upend the production of most tomato varieties. Therefore, prioritizing the development of climate-ready tomato crops is a must. Studying the wild relatives of other crops has already yielded promising results, particularly in cultivating blight-resistant potato varieties. This success emphasizes the importance of evaluating wild species of tomatoes for climate-ready genes that can be introduced into S. lycopersicum. Using environmental niche modeling (ENMs), we predict the responses of wild tomato species to climate change by identifying the factors that influence their habitat suitability. Locality information for 12 different tomato crop wild relatives (CWRs) was sourced from the records of natural history collections. Combining this data with environmental variables (soil pH, carbon, etc.) and 19 layers of the current (1970-2000) bioclimatic variables from the WorldClim v2.0 database yielded ENMs for each of the species. Models are then projected to future climate conditions to predict how species' distributions might change in the future. Those that demonstrated a growth in their habitat range indicated climate-ready adaptations.

PRESENTER(S): Serene Cheon
AUTHOR(S): Serene Cheon, Erica Yu
FACULTY MENTOR(S): Hyo Kang

Quiet Asian and Spicy Latino? Designing to Address Racial Microaggression

Racial microaggressions are subtle, often unintentional discriminatory comments that convey negative assumptions about a person's race or ethnicity. It is crucial to address these microaggressions in the design of future technologies, especially speech-based interfaces, as they are known to significantly impact users' acceptance of the technology. However, prior studies in natural language processing (NLP) have highlighted the challenge of detecting microaggressions due to their subtlety. To tackle this, we conducted a survey with 43 individuals to gather insights on microaggressive comments experienced by people of different races. Based on survey findings, we designed an app called "Inclusify." "Inclusify" encompasses three key features. Firstly, it encourages users to report racist statements and assess their offensiveness, collecting valuable datasets for future speech-based interface design. Secondly, it visualizes common discriminatory expressions through word clouds and showcases trending discussions to raise public awareness. Lastly, the app fosters social belonging by offering a digital space where marginalized individuals can share their stories. We evaluated the effectiveness of "Inclusify" in increasing awareness, comparing users' awareness levels with a pre-post test. Usability was assessed using key task performance metrics and the system usability scale. Based on the results, we discuss design implications and suggest future research directions.

PRESENTER(S): Tyler Radtke
AUTHOR(S): Tyler Radtke, Makenzie E. Mabry, Sebastian Fernandez, Tori M. Ford, Jonathan C. Barz, Douglas E. Soltis & Pamela S. Soltis
FACULTY MENTOR(S): Douglas Soltis

Projecting the future distribution of wild relatives of the domesticated pepper, Capsicum annuum, using ecological niche models

As climate change worsens in the coming decades, agricultural systems will be put under immense pressure, and crops will need to be more resilient to withstand the rapid changes to weather patterns. This project aims to identify which wild relatives of Capsicum annuum, the domesticated pepper, may be likely to withstand the threat of climate change and become target species to engineer hardier varieties. Occurrence records from natural history collections were downloaded from online repositories and cleaned to ensure high-quality data points were used. From there, a subset of environmental variables were utilized to create ecological niche models (ENMs). ENMs, a machine learning algorithm, are trained on known occurrence points of a species to create correlative models of the environmental conditions that meet a species' ecological requirements and predict the relative suitability of habitat. These models are then projected to various maps to assess the areas in which a species is most likely to occur. Additionally, we combined our ENMs with future climate projections to predict how these species' distributions may shift in the future. Understanding how climate instability and rising temperatures will impact economically important crop families will be critical in managing the response to climate change.

PRESENTER(S): Maximus Chou
AUTHOR(S): Maximus Chou, Pam Soltis, Doug Soltis, Makenzie Mabry
FACULTY MENTOR(S): Doug Soltis

Using Niche Modeling to Predict Ranges of Liquidambar styraciflua and Vitis rotundifolia Facing Climate Change

The upland hardwood forests of Florida are invaluable assets to our society and culture, home to numerous unique species that range from the eastern seaboard to being endemic in the southeastern U.S. It is therefore important that we understand the current ranges of species and the potential impacts they face due to environmental changes. Climate change poses a major threat to many plants' already shrinking ranges; thus, this project aims to generate predictive niche models for the future to inform us of the possible loss in territory. The two species selected for this study are Liquidambar styraciflua and Vitis rotundifolia, and while neither is by any means an endangered species, both species are invaluable to their ecosystems. We used the "gatoRs" program to pull occurrence records from GBIF and iDigBio and to clean and filter the data, removing low-quality data points. We constructed ecological niche models using environmental factors like climate and topography and identified suitable habitats based on current climatic conditions. We then applied climate change predictions to visualize future distributions. By combining our results with others' research on various species within the same forest type, we hope to inform preventative management and risk mitigation.

PRESENTER(S): Viktoria Marcus
AUTHOR(S): Viktoria Marcus, Joseph Muldoon, Sanaz Motamedi
FACULTY MENTOR(S): Sanaz Motamedi

Pedestrian Interaction with Automated Driving Systems: Acceptance Model and Design of External Communication Interface

In 2021, almost 70,000 pedestrians were injured or killed in traffic accidents in the United States [1]. Level-5 Automated Driving Systems (ADSs) have the potential to create safer roads by eliminating human errors [2]. While the development of level-5 ADSs has been improved, their interactions with pedestrians are not fully understood. This study investigated factors that affect pedestrians' acceptance of level-5 ADSs and design features for external human-machine interfaces (eHMIs). A survey was conducted with 37 participants to investigate the impact of pedestrians' background, behaviors, and personal innovativeness on ADS acceptance. A follow-up lab study was performed with 70 participants to determine effective eHMI features. It was found that there was no effect of background information on acceptance factors or intention to cross in front of level-5 ADSs, though pedestrian behaviors and personal innovativeness had significant effects. In the lab study, both visual and auditory features were used, including external speedometers, audio cues, and indicators that the vehicle was a level-5 ADSs. This study gives recommendations about the effect of pedestrians' background, behaviors, and personal innovativeness on acceptance and intention to cross the street in front of level-5 ADSs, as well as several key features pedestrians wanted included in eHMIs.

PRESENTER(S): Claire Pierce
AUTHOR(S): Claire Pierce
FACULTY MENTOR(S): Kimberly Moore

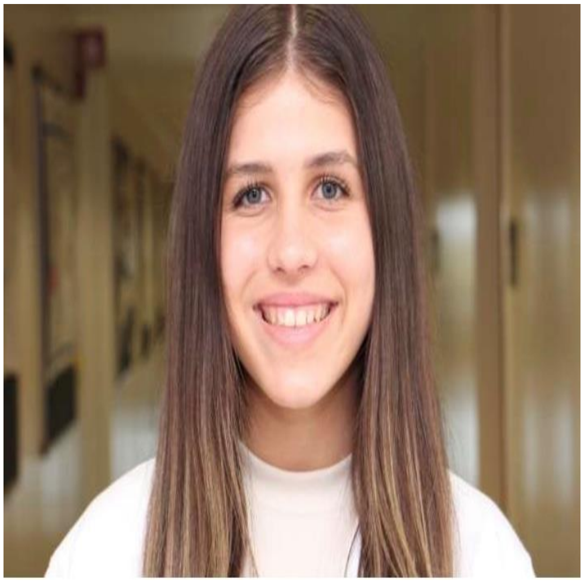
Growth of Coleus in Substrates Amended with Potassium and Watered with Saltwater

Our objective was to test if the addition of potassium (K) to the substrate along with a controlled-release fertilizer improved the growth of salt-sensitive coleus plants when watered with water high in salts (Na) (salt water). Our treatments were 1) no K and no salt water; 2) no K and saltwater irrigation; 3) K added to the substrate and no salt water; or 4) K added to the substrate and saltwater irrigation. Half of the plants were harvested 6 weeks after treatment while the remaining plants were harvested 8 weeks after treatment. Coleus plants irrigated with tap water were bigger than plants with salt water. We suspect that the high substrate electrical conductivity (EC) and Na levels in the growing substrate limited coleus plant growth. While the addition of K to the substrate did not improve plant growth, substrates with K and watered with salt water did have greater tissue/shoot K levels and lower/shoot tissue Na levels than plants watered with salt water without K in the substrate. Future research might look at different levels of Na in the water as well as leaching fractions in combination with K in the substrate.

PRESENTER(S): Denise A. Hernandez
AUTHOR(S): Denise A. Hernandez, Genesis Rodriguez, Madelyn P. Smythe, Micah L. Willis, Matthew F. Warchol, Ian R. Driscoll, Shannon Wallet, Robert Maile
FACULTY MENTOR(S): Robert Maile

Human Mesenchymal Stem Cell Extracellular Vesicles Reprogram Immune Signaling Pathways in Burn Patient Immune Cells

Despite clinical advances in patient management, infections are the leading cause of death following burn injury due to dysfunctional immune responses. Mesenchymal Stem Cell Derived-Extracellular Vesicles (MSCEVs) have immunomodulatory qualities, and we recently published that MSCEVs are effective in ameliorating overt proinflammatory responses in models of polytrauma. We hypothesized that addition of human MSCEVs to burn patient-derived peripheral blood mononuclear cells (PBMC) would result in significant immune system modulation. Bone marrow derived hMSC (ATCC) were cultured to 100% confluency, hMSCEVs purified through ultracentrifugation and size exclusion chromatography, and quantified utilizing nanotracking analysis. PBMCs were isolated and cultured (4x106 cells/ml) ± 1x106 hMSCEVs/ml ± 10uL LPS. NanoString gene analysis demonstrated significant (**p<0.01) downregulation of 37 immune genes (including IL-32 [0.35 fold change], CD28 [0.5fc]) and upregulation of 46 genes (including CXCL1 [203fc], CCL7 [439fc], IL-19 [68fc], SOCS3 [19fc] and IL-RN [27fc]) in hMSCEV treated versus untreated PBMC. Luminex cytokine analysis demonstrated significant upregulation of secreted IL-10 (87fc), IL-1β (387fc), CCL2 (MCP-1; 215fc), IL-6 (2200fc), IL-12p70 (2.2fc) and TNFα (32fc) but not IL-2 or IFN_{γ} after hMSCEV-treatment versus untreated. These data indicate that hMSCEVs can reprogram the immune response in ex vivo human burn PBMCs collected early after injury.



PRESENTER(S): Fabiana Mastantuono
AUTHOR(S): Fabiana Mastantuono, Samantha Ali, Mei He
FACULTY MENTOR(S): Mei He

Bovine placental-Derived Collagen Type 1/3: A novel Bio-Ink for 3D Bioprinting and Organoid Development

Placental tissues are recognized for their regenerative properties and unique biochemical composition, rendering them suitable candidates for biomaterial development. This study involves the isolation of COL 1/3 from bovine placenta through a pepsin digestion process. It also investigates the in vitro compatibility of COL 1/3 with human lung epithelial (BS2B) cells, utilizing 2D cytocompatibility assays and MTT tests. This is complemented by SEM analysis, confirming the characteristic collagen morphology while providing pore size measurements. Additionally, the study extends into a microfluidic device-based 3D in vitro

model, to compare COL 1/3 and commercially available bovine tendon collagen in a standardized sprouting assay. The ultimate objective is to leverage COL 1/3-derived spheroids as bio-ink for 3D bioprinting, with the aim of creating precise and biomimetic organoid models. This research aims to compare the quality and performance of organoid models constructed using COL 1/3-derived spheroids with those built using commercially available bovine collagen. By capitalizing on the regenerative potential of placental tissues and the unique composition of placental-derived COL 1/3, this study has the potential to advance the field of 3D bioprinting and biomedical modeling since it presents an opportunity in the development of biocompatible and regenerative solutions for regenerative medicine.

PRESENTER(S): Adrian Gonzalez Socorro
AUTHOR(S): Adrian Gonzalez Socorro, Mingjie Liu
FACULTY MENTOR(S): Mingjie Liu

Synergetic Effects of Transition Metal Atoms Anchored on Graphdiyne: A Comparative Analysis of Finite and Periodic Models

Graphdiyne (GDY) is a 2D carbon allotrope consisting of sp2 and sp hybridized carbon atoms. This periodic structure consists of hexagonal carbon rings linked by two acetylenic chains, leading to a highly conjugated network of π bonds. The transition metals anchored on GDY pores have been intensively studied computationally and proposed as new electrocatalyst for CO2 reduction reaction. However, periodic calculations of the electronic structures are computationally expensive; thus, finite molecular representations are used to speed up first-principles calculations. In our study, we analyzed the geometry, charge, and formation energy of 3d transition metal atoms on GDY for similarities with finite and periodic structures by density functional theory simulations. The finite model was found to be susceptible to buckling, while the periodic model remained 2D. We observed that late 3d transition metals anchored on the finite model have the best accuracy when compared with the periodic model in terms of metal-metal bond lengths, distortion of the pore chain, and metal-carbon bond lengths. The formation energy has the same trend for both models. Bader charge analysis indicates that charges highly delocalized from the metals to the carbon structure in the finite model compared to the periodic model.

PRESENTER(S): Natalie Barber
AUTHOR(S): Natalie Barber, Sabrina Zequeira, Isabella Mark, Jadyn Krokosky, Kevin Avaiya, Barry Setlow, Jennifer Bizon
FACULTY MENTOR(S): Barry Setlow

Effects of Chronic Delta-9-Tetrahydrocannabinol (THC) Consumption on Cognitive Performance

Older adults represent the fastest-growing population of cannabis users in the United States. Given this increase in use, it is important to understand how cannabis and its cannabinoid constituents such as THC interact with age-related changes in cognition. Cognitive processes mediated by the prefrontal cortex (PFC) and hippocampus (HPC) typically decline as aging progresses. The same aspects of cognition are impaired by chronic THC administration in young subjects, but there is limited research on how aged subjects are affected. Some pre-clinical work suggests that cannabis can enhance some forms of cognition. This study aims to determine whether cognitive effects of chronic THC consumption differ across age groups using a rat model of age-related cognitive decline. Male and female young adult (6mo.) and aged (24mo.) Fischer 344 x Brown Norway F1 hybrid rats were tested on a HPC-dependent trial-unique non-match-to-location (TUNL) task. Upon reaching stable performance, rats were given 4 weeks of daily 1-hour access to either plain gelatin or gelatin containing 1.0 mg/kg THC in their home cage in the afternoons, while testing in the TUNL task continued in the mornings. Results to date showed that chronic oral THC did not impact young males' performance on the TUNL task.

PRESENTER(S): Anamaria Cotelo
AUTHOR(S): Anamaria Cotelo, Natalie L. Johnson, Minghong Ma, Daniel W. Wesson
FACULTY MENTOR(S): Daniel Wesson

Organization of Midbrain Dopaminergic Input to the Ventral Striatum

Dopamine (DA) is a potent neuromodulator with widespread effects on sensory processing and motivated behavior. The ventral striatum, comprised of the tubular striatum (TuS, also known as the olfactory tubercle) and nucleus accumbens (NAc), receives dense DAergic input from the ventral tegmental area (VTA). This VTA→ventral striatum DAergic pathway mediates reward processing. To understand how VTA DAergic neurons differentially innervate regions of the ventral striatum, we injected a Cre-dependent anterograde AAV encoding synaptophysin mRuby fusion protein into the VTA of DATIRES-Cre mice. This approach allows for visualization of red fluorescent puncta, indicative of synaptic terminals, in regions receiving midbrain DA input. We quantified fluorescent puncta throughout the anterior to posterior span of ventral striatum subregions. We found that the VTA densely innervates the anteromedial TuS and NAc at comparable levels. To confirm that VTA neurons synapse onto ventral striatum neurons, we injected an anterograde transneuronal AAV encoding Cre into the VTA of Ai9 (tdTomato Cre reporter) mice. We observed robust tdTomato expression in first-order downstream targets of the VTA. Together, these results inform the neuroanatomical organization of VTA DA input to the ventral striatum, providing a foundation for future studies investigating causal manipulations of DA's effects in the ventral striatum.

PRESENTER(S): Sophie Clark
AUTHOR(S): Sophie Clark, Elizabeth Lada
FACULTY MENTOR(S): Elizabeth Lada

An Analysis of the NGC 1977 Cluster with Gaia DR 3 and Spitzer

NGC 1977 is a far-ultraviolet radiation environment significantly weaker than that of the famous Orion Nebula Cluster (ONC) a short distance to the south. Because the effects of this type of environment, which may be common in nearby star-forming regions, on circumstellar material and cluster properties has not been extensively studied, NGC 1977 is a region of particular interest for a deeper understanding of star formation processes. We present an analysis of the three-dimensional structure of the cluster and a preliminary analysis of the members' stellar characteristics. We crossmatched Gaia sources to photometric information from Spitzer and 2MASS, and used these data to investigate the cluster size, member distribution, K-luminosity function, and infrared excess fraction (an indicator of circumstellar disks). We find that the size of the cluster and the distribution of cluster sources agrees with the discovery of an expanding bubble around the region by Pabst et al. (2022). Further analysis of the cluster's history via source motion may support the notion that the cluster could have been formed by feedback from the Orion-BB event hypothesized by Großschedl et al. (2020), especially considering the correlation between the proper motions of the ONC and NGC 1977.

PRESENTER(S): Jordan Dickens
AUTHOR(S): Jordan Dickens
FACULTY MENTOR(S): Steven Noll

Coming Out in the Cold: The Johns Committee, Academic Freedom, and Moral Panic in Florida

In 1956 the Florida Legislature formed the Florida Legislative Investigation Committee to investigate the influence of communism in state institutions. Known as the Johns Committee, what followed was a reign of oppression against LGBTQ+ students and faculty at Florida universities. This project seeks to examine the political and cultural situation that allowed for the Johns Committee to occur, specifically the Red and Lavender Scares of the mid-20th century. Additionally, it seeks to explore the role that mobilization and activism played in the downfall of the Johns Committee. My study finds that a multiple trends, including hostility to academic freedom and moral conservatism, made Florida a fertile space for the Johns Committee to target LGBTQ+ people within state institutions. Additionally, activism played a much larger role than previously believed in the Committee's downfall, as represented by the actions of individual victims and the mobilization of groups like the American Association of University Professors (AAUP) and American Association of University Women (AAUW). I conclude with an analysis of how we can see similar trends emerging today in Florida, as represented through legislative decisions limiting academic freedom like the 2023 Higher Education Bill banning diversity, equity, and inclusion (DEI) programs at public universities.

PRESENTER(S): Leah Morgen
AUTHOR(S): Leah Morgen, Nimisha Kumari
FACULTY MENTOR(S): Nimisha Kumari

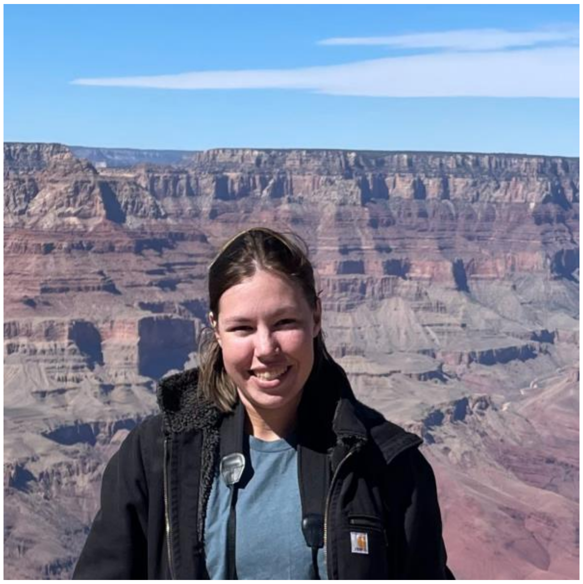
Investigating flux calibration of the GMOS-IFU data

Integral field spectroscopy combines imaging and spectroscopy, and hence is extremely useful in performing the spatially-resolved analysis of extended objects in astronomy. The technique is being employed in several world class telescopes, both in space (e.g., JWST) and on ground (e.g., MUSE/VLT and GMOS/Gemini). However, previous studies have shown signatures of large offsets in absolute flux calibrations in the data taken with integral field unit (IFU) on the Gemini Telescopes. Hence, in this project we investigate several photometric standard stars which are used for flux calibrations for GMOS-IFU data. In particular, we perform an extensive search of the Gemini Archive for the photometric standard stars for which the good quality stellar spectra are already available from other telescopes, e.g., STIS/HST spectra from CALSPEC. We then reduce the IFU observations of standard stars via the Gemini data reduction pipeline, which includes steps such as flat fielding, wavelength calibration, sky-subtraction, flux calibration and cube-building. We then extract the standard star spectrum from the cube to compare with the model spectrum to check for any systematic effects in flux calibration. Such studies are important to inform community about the careful analysis needed for reducing the GMOS IFU data.

PRESENTER(S): Luke Kline
AUTHOR(S): Luke Kline, Mary Watt
FACULTY MENTOR(S): Mary Watt

Dante's Divine Comedy as a Journey toward Jungian Individuation

This essay seeks to understand the relationship between Dante Alighieri's Divine Comedy and Carl Jung's concept of individuation. The journey of the soul as experienced through Dante's travels through each canticle will be likened to each step of the individuation process. For one, this essay will outline Dante's experiences in Inferno as a confrontation with the shadow. Secondly, this essay will look explain how Purgatorio demonstrates the confrontation with the anima. Lastly, this essay will highlight the similarities between Paradiso and encounters with the wise old man archetype, which is a means of achieving the transcendent function, also illustrated in Paradiso. This essay will look to phraseology, the construction of narratives, and interactions with characters as a means of likening Dante's Comedy and Jungian individuation and archetypes. Ultimately, this essay will seek to illustrate that while not explicitly stating it, Dante has intuited many of the ideas of Jung. This itself is a demonstration of the collective nature of man, as illustrated in Jungian concepts such as the collective unconscious and archetypes. This essay will employ content analysis as a means of qualitative methodology.



PRESENTER(S): Faith Dunlap, Thien Nguyen
AUTHOR(S): Faith Dunlap, Thien Nguyen, Arik Hartmann, Max Maddox, Steven Klioze, Cory McKinstry, Ana V. Longo
FACULTY MENTOR(S): Ana Longo

Fungus in Florida: analyzing spatiotemporal spread of the amphibian pathogen Batrachochytrium dendrobatidis with 100 years of museum specimens

Florida is a region of high amphibian diversity, but since the 1970's declines and extirpations have been reported for several species. While no single cause has been identified, recent work has shown diseases caused by emerging pathogens are likely driving ongoing population declines in some species. For species that have experienced local extinction, identifying the cause of decline remains a challenge because traditional surveying methods are not possible. However, museum collections provide an essential tool to resolve questions related to infectious disease and population dynamics, because specimens often preserve their pathogens at the time of collection. Here, we establish spatiotemporal patterns of Batrachochytrium dendrobatidis (Bd), an emerging pathogen linked to global amphibian declines, using specimens spanning over a century of collection in Florida. Using qPCR, we quantified pathogen prevalence in 4,305 museum specimens (1,680 Anurans, 2,625 Caudates), representing 18 species, including those with histories of decline. We first detected Bd in 1928, and in both abundant and declining species. Prevalence varied across host species, geographic regions, and time. Overall, this study expands infection records for understudied taxa, allowing us to understand the spread and impacts of amphibian pathogens in the southeastern USA.

PRESENTER(S): Dima Alsheikh, Jade Hernandez, Olivia Keable, Kiara Pfister, Divya Somayaji
AUTHOR(S): Dima Alsheikh, Jade Hernandez, Olivia Keable, Kiara Pfister, Divya Somayaji, Melissa Moreno, Wendy Dahl
FACULTY MENTOR(S): Wendy Dahl

Test-Retest Reliability of Phase Angle Assessment in Prader-Willi Syndrome

Prader–Willi syndrome (PWS) is a rare genetic syndrome characterized by altered body composition, reduced energy expenditure, and hyperphagia, leading to obesity. Obesity and altered body composition contribute to low-grade inflammation (LGI) leading to increased risk of morbidity in those affected by PWS. LGI in adults with PWS may be assessed by phase angle (PhA), an indicator of cell membrane integrity. Bioelectric impedance analysis (BIA), a non-invasive body composition test, assesses PhA. This study aimed to determine the test-retest reliability of PhA using BIA in adults with PWS compared to unaffected adults. In this cross-sectional study, we recruited 29 participants (n = 9 adults affected by PWS; n = 20 control adults). Repeated through two morning visits, control participants arrived having fasted after midnight before their visit, while participants with PWS did not fast. Measurements of participants' body composition, height, weight, and previous 24-hour beverage intake and physical activity were recorded. After data analysis, the correlation coefficients for the control and experimental groups were calculated to be 0.99 and 0.96, respectively, demonstrating a strong correlation and, therefore, high test-retest reliability. These values suggest that a PhA assessment could reduce the burden of frequent blood analysis experienced by adults with PWS.

PRESENTER(S): Lucy Pellenbarg
AUTHOR(S): Lucy Pellenbarg
FACULTY MENTOR(S): Katherine Deliz

Comparative Toxicity of Short vs. Long Chained PFAS: Implications for Mobility and Mortality

Per- and polyfluoroalkyl substances (PFAS), also known as forever chemicals, are present in a wide array of human-made products, including food packaging, cosmetics, textiles, and firefighting equipment. The PFAS family is classified into long-chained and short-chained PFAS based on the number of fluorine atoms in their molecular structure. With over 15,000 distinct types of PFAS, the industry has traditionally viewed short-chained PFAS as safer alternatives to their long-chained counterparts, due to their reduced potential for bioaccumulation. Recent findings by the FDA challenge the industry's perception that short-chained PFAS are less toxic and bioaccumulate less than their long-chain counterparts. These studies show that short-chain PFAS, such as perfluorohexanoic acid, can accumulate in lab animals at levels comparable to those of long-chain PFAS. Moreover, these substances exhibit high mobility in soil and water, facilitating rapid distribution into water resources, including drinking water. Our project, supported by the EPA, aims to identify exposure pathways to PFAS in Brevard County, Florida, through environmental monitoring and enhancing resilience to PFAS. This phase focuses on conducting a thorough literature review of prior PFAS studies to compile physicochemical and toxicity data on PFAS. This information will enable us to develop a risk assessment framework for health guidelines.

PRESENTER(S): Erika I. Sodeika, Kayla M. Haweny, Sasha B. Monaco, Morgan E. Botknecht, Martin Heesacker
AUTHOR(S): Erika I. Sodeika, Kayla M. Haweny, Sasha B. Monaco, Morgan E. Botknecht, Martin Heesacker
FACULTY MENTOR(S): Martin Heesacker

Academic Delay of Gratification Partially Mediated the Relationship Between Social Media Addiction and Academic Performance

Social media addiction has been negatively correlated with academic productivity (Hou et. al, 2019; Al-Menayes, 2015) and with one's ability to delay gratification (Sriram, 2023). It also increases sensitivity to ego-depleting events (Reinecke, 2014). The diminished ability to delay gratification and higher depletion sensitivity attributed to social media addiction may mediate this negative correlation. University students (n=315) were surveyed. Social media use was measured by Bergen's Social Media Addiction Scale and self-reported screen time on Instagram, X, and Tiktok. Productivity was measured by the The Instrument to Assess Worker's Productivity, self-reported GPA, and self-reported assignment completion. The Academic Delay of Gratification Scale (ADOG) and Depletion Sensitivity Scale measured two hypothesized mediators. Hypotheses were tested with four multivariate multiple regressions, following Baron and Kenny's (1986) tests of mediation. The social media variables significantly predicted academic productivity, as in prior studies, mostly because social media addiction predicted Academic Productivity Scale scores (a large effect: partial $\eta 2$=.134). Academic delay of gratification was a partial mediator. As in prior research, social media addiction was linked with lower collegiate academic productivity and in our study this effect was partially mediated by lower levels of academic delay of gratification, but not by depletion sensitivity.

References

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. Journal of Personality and Social Psychology, 51(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

PRESENTER(S): Robert Rice
AUTHOR(S): Róbert Rice
FACULTY MENTOR(S): Christopher McCarty

Personalizing AI-generated Jazz Improvisation Using LSTM Networks

Real-time personalization of AI-generated jazz improvisation is a compelling field in its infancy. The "BebopNet" project provides a foundation for generating monophonic jazz improvisations under harmonic constraints and uses the beam search heuristic approach for personalizing them based on user preference. For true personalization and deeper understanding of the jazz language, we need to analyze stylistic nuances within solo improvisations. In constructing the model, we are employing a Long Short-Term Memory recurrent neural network (LSTM), known for handling sequential data, to extract features like phrasing, note density, and intervallic patterns from transcribed jazz solos. To facilitate real-time interaction, our personalization technique involves incremental learning with L2 regularization, that allow the LSTM to adapt its generation style in response to a live musician's performance. This research aims to advance real-time AI personalization in jazz, combining the power of LSTMs for temporal analysis with the potential for broader musical understanding through future semantic modeling explorations. It has the potential to contribute to both enhanced AI music generation and deeper insights into jazz improvisation itself.

PRESENTER(S): Sophia Dadla
AUTHOR(S): Sophia A. Dadla, Yu Tin Lin, Susana Bao, Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

Preprocessing of imaging mass spectrometry data using iMSminer

Imaging mass spectrometry is a powerful tool that provides for the label-free spatial mapping of thousands of biomolecules in a single analysis. The multiplexed nature of compound detection and the thousands of pixels present in each image necessitates efficient tools for image processing and data analysis. Our lab is developing a computational toolbox, broadly termed iMSminer, constructed in Python to facilitate the preprocessing and visualization of imaging mass spectrometry (IMS) data. iMSminer addresses the challenges associated with data processing by offering a user-friendly website where researchers can effortlessly load data files, choose specific data processing functions, and obtain visualizations from their chosen functions. A key feature of iMSminer lies in its generalized functions. Herein, we describe the implementation of these generalized functions for the analysis of a sample mouse brain imaging dataset. For example, the peak picking function allows users to visualize mass spectra and annotate the positions and intensities of individual peaks, which is a crucial step for downstream analysis. Additionally, the mass alignment function aligns peaks across all pixels, projecting them onto an m/z axis and enhancing data interpretation using a Python library. Future development of a website interface will make iMSminer an invaluable resource for IMS researchers.

PRESENTER(S): John Williams
AUTHOR(S): John Williams, Jason Williams, Andrea Lucky
FACULTY MENTOR(S): Andrea Lucky

Taxonomic Revision of the Nylanderia austroccidua (Hymenoptera: Formicidae) Species Complex

The ant genus Nylanderia (Emery) includes 125 described species and likely hundreds more undescribed. Classifying taxa within this genus is difficult because morphological characters for delimiting species are subtle, leading to distantly related species looking very similar. Taxonomic confusion in this genus has caused problems in the past, leading to policy inaction during the early stages of invasion. The goal of this project is to revise the taxonomy of the Nylanderia austroccidua (Trager) species complex to help understand the biodiversity of this genus. Nylanderia austroccidua complex has a large geographic range, from Utah to Panama, and has a highly variable morphology. In total, we describe 7 new species using qualitative and quantitative morphological data from over 65 specimens, including 14 standardized measurements. Together, the morphological and geographic data are used to delimit new species and provide tools for their identification, including images, distribution maps, and a dichotomous key for the N. austroccidua complex.

PRESENTER(S): Ramila Odzakovic
AUTHOR(S): Ramila Odzakovic, Trish-Ann Parkinson, Laurynn McGee, Sharon Difino
FACULTY MENTOR(S): Sharon Difino

"Exploring the impacts of language and cultural barriers on the underdiagnosis of Post Traumatic Stress Disorder among Bosnian Immigrants in the United States"

In 1992, a civil war broke out in Bosnia and Herzegovina, which led to political turmoil. This atrocity led to a substantial refugee crisis, resulting in approximately 300,000 Bosnians immigrating to the United States. The high prevalence of Post Traumatic Stress Disorder (PTSD) in Bosnia, around 10% of the population, suggests a significant number of Bosnian immigrants in the United States may also suffer from it. This study analyzes the consequences of language and cultural barriers and how they inhibit access to mental health services in Bosnian immigrant populations in the United States, particularly focusing on how these impacts contribute to the underdiagnosis of mental disorders. A literature review was conducted to assess the current status of mental health in Bosnian immigrants in the U.S. and explore their cultural attitudes toward seeking mental health services. Data was collected via traditional search engines such as Google Scholar and PubMed, as well as through hand searching. Through an in-depth analysis of language and cultural barriers, this study has identified hardships hindering Bosnian immigrants' access to mental health services. Cultural attitudes towards mental health services among Bosnian immigrants were found to be influenced by stigma and mistrust towards Western medical practices.

PRESENTER(S): Cathrine Beshay
AUTHOR(S): Cathrine A Beshay, Marisa O Pacheco, Whitney L Stoppel
FACULTY MENTOR(S): Whitney Stoppel

Evaluating the synthesis of granular silk fibroin scaffolds for applications in tissue engineering

Naturally derived silk fibroin materials from the cocoons of Bombyx mori have proven valuable in the study of biomaterials. This cytocompatible material has been formulated into particles, scaffolds, and hydrogels for applications in tissue engineering. Silk fibroin micro-and nanoparticles have shown promising results in the encapsulation and controlled release of bioactive compounds. Recent work involves synthesizing granular scaffolds that maintain this controlled release behavior while also allowing for cell infiltration and degradation. In this work, we determine how changes in key steps of particle and scaffold synthesis such as extraction time and water-annealing temperature impact scaffold morphology and function. The particle size range resulting from the varying extraction time was analyzed with DLS and SEM. Granular scaffolds were then prepared by packing and lyophilizing particle suspensions, followed by water annealing to induce increased crystallinity. The temperature of the water annealing was varied to explore the levels of crystallinity that can be achieved in these scaffolds, hypothesized to impact mechanical toughness, release behavior, and degradation timelines. Scaffold morphology was evaluated through histology and SEM. The level of crystallinity was evaluated by FTIR. Future work will evaluate the encapsulation of compounds, their controlled release, cell infiltration and remodeling.

PRESENTER(S): Brooke Cohen-Pinsky
AUTHOR(S): Brooke Cohen-Pinsky, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Douglas Soltis

The Effects of Climate Change on Endemic Species in Florida's Upland Hardwood Forests Using Ecological Niche Modeling: Targeting Models for Toxicodendron radicans (poison ivy) and Diospyros virginiana (persimmon)

Florida is one of the most biodiversity-dense states in the country and has many animals that are dependent on endemic plant species. This dependence is potentially threatened by climate change. The species Toxicodendron radicans, poison ivy, and Diospyros virginiana, common persimmon, were selected for this study. Toxicodendron radicans is an infamously allergenic vine known to grow in a variety of habitats of varying conditions much like Diospyros virginiana, which is a fruit-bearing tree. To facilitate the analysis of these two species, I downloaded thousands of species occurrence records and then ran them through multiple data cleaning and analytical processes to develop an ecological niche model for each species. Then I plotted suitable habitat for each species under current climate conditions. I then used these models and climate change predictions to predict the suitable habitat under future climate scenarios. The results of this study will provide predictions that can be used to further develop our understanding of the impact of climate change on these specific plants while also being a model that can be developed and used for other species. With this information, we can develop proactive policy and reforms that can possibly counteract these environmental changes.

PRESENTER(S): Liliana Katz
AUTHOR(S): Liliana Katz, Vinod Vijayakurup, Maria V. Guijarro, Maria Zajac-Kaye
FACULTY MENTOR(S): Vinod Vijayakurup

Genetic Insights into Pancreatic Neuroendocrine Tumorigenesis: Thymidylate Synthase and MEN1 Deletion in the TS/Men1-/- Mouse Model

Transgenic mouse models for cancer research are genetically designed to express cancer-promoting genes or carry mutations in tumor suppressor genes, resulting in genetic changes that lead to the formation of mouse tumors. These models serve as valuable tools for investigating the impact of different gene mutations on cancer promotion. In our laboratory, we have developed a novel pancreatic neuroendocrine tumor (PanNET) mouse model known as TS/Men1-/-. PanNETs are neoplasms originating from the islet tissues of the pancreas. Our recent findings using the TS/Men1-/- model demonstrate that elevated levels of human thymidylate synthase (hTS), an enzyme associated with DNA metabolism, play a pro-tumorigenic role in PanNETs arising from Men1 gene mutations. MEN1 is a tumor suppressor gene, and its somatic inactivation is achieved in mice through the expression of the CRE gene, leading to the deletion of the exons between the lox sites in the Men1 gene (Men1-/-). We validate the TS/Men1-/- genotype by confirming Men1 deletion, hTS, and CRE presence through PCR techniques, thus ensuring that the mice are suitable for further experiments in our laboratory.

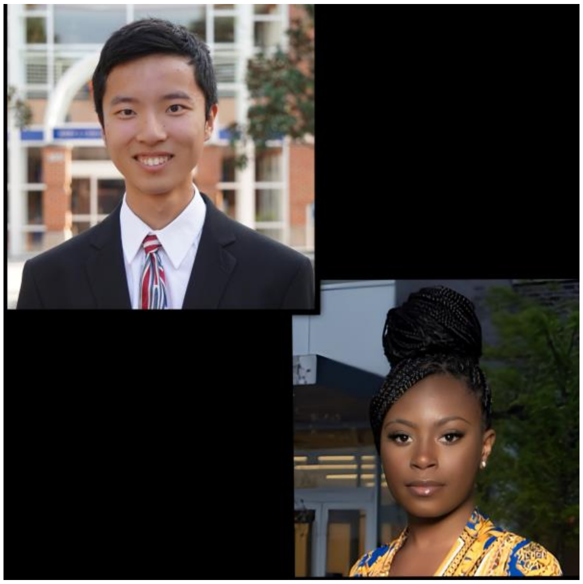
PRESENTER(S): Aahan Dwivedi
AUTHOR(S): Aahan Dwivedi, James Hamlin
FACULTY MENTOR(S): James Hamlin

Regression Analyses of Multicomponent Alloys

Multicomponent alloys are a novel class of materials with five or more elements alloyed together at relatively equiatomic ratios, unlike traditional alloys with one primary element and secondary additives. These alloys have shown potential for better mechanical and functional properties than traditional alloys, but due to the sheer size of the parameter space for elemental ratios in any given alloy, it is difficult to optimize the alloy composition for desired properties.

In this work, we utilize a variety of machine learning regression models to predict the lattice constant for the Cantor Alloy (CrMnFeCoNi), based on published experimental measurements, as a function of the alloy composition.

We find that a simple multiple linear regression model performs the best, reaching a score of 0.75. Additionally, the concentrations of Cr and Mn are found to be proportional to the lattice constant, while that of Fe, Co, and Ni are inversely proportional. The calculated coefficients provide insight into the mechanisms at play in the formation of the uniform lattice structure seen, while the success of the regression provides a method to efficiently explore the parameter space of multicomponent alloys experimentally.



PRESENTER(S): Tianjun Wang, Breuna Wilson
AUTHOR(S): Tianjun Wang, Breuna Wilson, Curtis Taylor, Belal Batwa, Peng Jiang
FACULTY MENTOR(S): Curtis Taylor

Surface Patterning of Shape Memory Alloy Thin Films

Shape Memory Alloys (SMA), like nitinol (nickel-titanium), are a class of materials that can recover their shape at elevated temperatures after being deformed at a lower temperature. Due to this unique behavior, SMAs are called smart materials that are widely used in emerging technologies such as morphing airplane wings, mobile robots, electric motors, intelligent heart stents, and biomedical devices. This research explores the ability to control the optical properties of SMA thin films (< 2 μm) via surface engineering. This involves nanoscale patterning of the surface that is achieved by indentation with a diamond indenter tip (radius < 150 nm) at ultra-low contact forces (< 2000 μN). Hertzian contact theory is used to guide indentation parameters and analysis results. Atomic force microscopy (AFM) is then used to find and image the new patterns generated by indentation. The AFM images are used to characterize surface roughness and surface feature morphology. The results showed that nanoindentation can precisely control the surface feature size, shape, and distribution for the study of surface patterns and their effect on the optical properties of nitinol.

PRESENTER(S): Reagan Cutich
AUTHOR(S): Reagan Cutich
FACULTY MENTOR(S): Sharon DiFino

Oxygenating Voices: Hyperbaric Therapy for Speech-Language Recovery

Hyperbaric oxygen therapy (HBOT) involves the administration of pure oxygen in a pressurized environment, aiming to repair skin, blood vessels, and other tissues by increasing oxygen delivery to the blood. While traditionally used for conditions such as decompression sickness in deep-sea divers, carbon monoxide poisoning patients, and fatigue recovery in athletes, its therapeutic potential also extends to individuals with neurological conditions, such as traumatic brain injury (TBI), cerebral vascular accident (CVA), and autism spectrum disorder (ASD). Searches across databases including Google Scholar, PubMed, and NIH were used to evaluate relevant literature related to hyperbaric oxygen therapy and its role in recovery and impact on cognition, speech, and language performance. The literature revealed improvements in blood circulation and reduced inflammation as evidenced by reduced oxidative stress and inflammatory markers, functional MRIs, SPECT scans, and PET scans. Progress in cognitive (expressive and receptive language) tasks, gross motor skills, and behavioral measurements suggest the untapped potential of a combined therapy approach. The data supports the efficacy of implementing HBOT as a complementary intervention with speech and language therapy. Further research is needed to determine the frequency and intensity of HBOT sessions based on the severity of patients' neurological conditions.

PRESENTER(S): Amanda Lichter
AUTHOR(S): Amanda Lichter, Laurel Lietzenmayer, Lisa Taylor
FACULTY MENTOR(S): Lisa Taylor

Chromatic Chronicles: Exploring the Evolution of Color Vision in Jumping Spiders Using iNaturalist Prey Records

Jumping spiders are a diverse family with more than 6,600 species, acute vision, and remarkable hunting strategies. Long wavelength (red) color vision has evolved independently at least 4 times in this family, and we have hypothesized that this is because it helps spiders avoid toxic prey, particularly when prey advertise their toxicity with colorful warning signals. If so, we would expect that species with color vision should be better able to avoid toxic prey that use warning colors. We tested this idea in two genera of closely related jumping spiders: one with color vision (Stenaelurillus) and one without (Leptofreya). Using iNaturalist, we scored the prey of all available images of Stenaelurillus and Leptofreya on two scales: (1) degree of toxicity and (2) presence/absence of red warning signals. As expected, Stenaelurillus consumed less toxic prey than Leptofreya, but there were no differences between genera in the presence of prey warning signals. Moving forward, this research will be complemented by additional investigations into other species pairs with and without color vision to help us understand why this trait has evolved in some groups but not others.

PRESENTER(S): NIKITA PATEL
AUTHOR(S): NIKITA PATEL, LEO OHYAMA, ANDREA LUCKY
FACULTY MENTOR(S): Andrea Lucky

Exploring Ecological Traits of Native, Nonnative, and Invasive Ant Species in Florida

Florida hosts a wide range of ant species, native and nonnative. If nonnative ants become disruptive enough in ecosystems, they are categorized as invasive. Such disruptions include: native species turnover, crop damage, and nuisance to the public. Despite differences in the effects of nonnative and invasive ants, current research falls short in quantifying the differences between the two categories. These differences can be potentially quantified using ecological traits that can allow a clearer differentiation between native, nonnative, and invasive ants. This is critical as it can provide the tools and context to predict future invasives. Here, we examine the trait differences, or lack thereof, of ant species in Florida using traits that often correlate with ant ecology. We predicted that invasive ants would be differentiated primarily by larger colony size and smaller worker body size. After assessing worker and queen ecological trait data for over 200 ant species found in Florida, evidence showed that relative to native species, invasives had significantly larger colonies and worker body sizes while nonnative ants had larger mandibles than natives. These results support that measurable differences exist between native, invasive, and nonnative ants that may, in part, contribute to the success of invasive ant species.

PRESENTER(S): Deyaneira Tirado
AUTHOR(S): Deyaneira Tirado, Hailey Barker, Mariola Ferraro
FACULTY MENTOR(S): Mariola Ferraro

The Characterization of Cannabinoid Receptor Signaling during Salmonella Infection

With the increase of antimicrobial resistance in bacteria there is a need for the development of new therapeutic alternatives. Salmonella Typhimurium is a gram-negative intracellular pathogen that leads to gastroenteritis and primarily infects antigen-presenting cells such as macrophages. The endocannabinoid system (eCB) is a biological system composed of endocannabinoids (bioactive lipids) and cannabinoid receptors. Cannabinoid receptor 2 (CB2R) is highly expressed in immune cells and has been seen to play a role in altering immune responses. It is still unknown how cannabinoid receptors affect immune cell signaling during salmonella infection. Our study aimed to identify the role of CB1R and CB2R in the polarization of macrophages during S. Typhimurium infection. In vitro and in vivo experiments, with RAW264.7 and wild-type, CB1R knockout and CB2R knockout mice respectively, were conducted to evaluate the role of cannabinoid receptor signaling due to salmonella infection. In addition, pro-inflammatory responses were evaluated from infected cells to characterize the role of cannabinoid receptors during bacterial infections. CB1R and CB2R knockouts were found to have an increase in intracellular bacteria S. Typhimurium as well as TNF-α and other pro-inflammatory responses. Overall, our study highlights the potential role that cannabinoid signaling plays in S. Typhimurium infection which could influence overall clinical outcomes.

PRESENTER(S): Albert Sunny
AUTHOR(S): Albert Sunny, Amandeep Kaur, Erica M. Goss
FACULTY MENTOR(S): Erica Goss

Investigating Plasmid Diversity in the Bacterial Plant Pathogen Xanthomonas perforans

Plasmids play a key role in horizontal gene transfer, significantly contributing to bacterial evolution by facilitating transfer of genes related to pathogenicity, antibiotic resistance, and other adaptive traits. This study focuses on understanding the role of plasmids in the evolutionary diversification of Xanthomonas perforans, a devastating plant pathogen causing bacterial spot disease in tomato and pepper. Our in silico-based plasmid prediction using the MOB-suite tool revealed the presence of diverse plasmids ranging from 15kb to 230kb across different phylogenetic groups defined by chromosomal genes. The predicted plasmids were further categorized into different types based on replicon and mob-typing. Some of these plasmids carry virulence genes coding for type III effectors (T3Es), including transcriptional activator-like effectors (TALEs), and genes related to biocide resistance such as copper. Network model-based approaches utilizing k-mer similarity revealed a range of pairwise sequence similarities with the same or different plasmid types, as well as plasmids from closely related species such as Xanthomonas euvesicatoria and Xanthomonas citri, suggesting potential plasmid movement within and across different species. Overall, these results provide foundational insights into plasmid diversity in Xanthomonas perforans with further implications for studying the dynamics of plasmid persistence and bacterial adaptation.

PRESENTER(S): Serena Price
AUTHOR(S): Serena Price, Coleman Sheehy III, Robert Guralnick, Jacob Idec
FACULTY MENTOR(S): Robert Guralnick

Using AI to Evaluate Thermoregulatory Color Change in Anolis Carolinensis

Anolis carolinensis, commonly known as the green anole, is the only species of anole native to the United States. Like others within the genus, A. carolinensis is capable of voluntary color change, dorsal coloration can change rapidly between shades of green and brown using organelles known as melanophores. The adaptive purpose of these color shifts is highly debated, and studies have been conducted on this subject since the early 20th century. Early studies suggest that the change in coloration serves as camouflage in varying levels of light, some later studies contest that voluntary color change is a form of social behavior to signal dominance, and others have hypothesized a thermoregulatory purpose with brown being more absorbent of heat. The purpose of voluntary color change in A. carolinensis remains unclear because newer and older studies tend to conflict with one another. This provides a unique opportunity to investigate the adaptations of a native lizard. This study aims to take a novel approach to investigate the purpose of voluntary color change in this species. By pairing the iNaturalist database with climate metadata, AI computer vision, and AI analysis, this study investigates whether voluntary color change serves a thermoregulatory purpose in Anolis carolinensis.

PRESENTER(S): Ayisha Beauge
AUTHOR(S): Ayisha Beauge, Yu Tin Lin, Haohui Bao, David H. Chong, Jeris G. Gonzales, Troy R. Scoggins, Jason B. Ang, Sophia A. Dadla, Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

A Quantitative Analysis of Convolutional Neural Network Clustering in Imaging Mass Spectrometry

Imaging mass spectrometry enables the spatial analysis of a variety of biomolecules in tissues. The label-free nature of this technology results in the detection of hundreds to thousands of individual compounds in a single analysis, necessitating computational tools for streamlined data analysis. This study explores the application of pre-trained Convolutional Neural Networks (CNNs) for analyzing imaging mass spectrometry datasets. For the purpose of this study, we utilized a dataset of mouse brain scans, employing a Python and R-based data processing pipeline tailored for imaging mass spectrometry. We demonstrate that transfer learning surpasses both k-means clustering and direct use of pre-trained CNNs. Additionally, we investigate the theoretical underpinnings, highlighting the non-independent and identically distributed (non-IID) nature of brain scan data compared to standard image datasets typically used for CNN training. Brain scan data differs from the IID assumption due to spatial pixel dependencies and regional variations in biomolecule distributions. This non-IID nature challenges k-means clustering, resulting in lower accuracy and precision. However, transfer learning with CNNs benefits from this by leveraging spatial relationships. capitalizing on transfer learning with pre-trained CNNs improves neuroimaging analysis, paving the way for more accurate models and unlocking the full potential of this data for neuroscience advancements.

PRESENTER(S): Lazaro Fuentes Alfonso
AUTHOR(S): Lazaro Fuentes-Alfonso, Robert Dawson, Carlos Colon-Ortiz, Julia Withrow, Shreya Pathak
FACULTY MENTOR(S): Wesley Bolch

Mesh-based model of breast vasculature and glandular tissue for internal dosimetry

Purpose: To develop tetrahedral mesh-based tissue models within the breasts of the ICRP adult female mesh-type reference computational phantoms (MRCPs) at the macro-scale for use in Monte Carlo (MC) radiation transport simulations. Methods: Within the adult female MRCP, the breast is divided into adipose and glandular tissue. Adipose tissue was modelled as a homogenous volume, while glandular tissue was modeled as discrete lobule units representing breast lobes and their lactiferous ducts to the nipple. Converging internal thoracic artery, internal thoracic vein, lateral thoracic artery, and lateral thoracic vein entry vessels were manually modeled and directed into adipose tissue, at which time a blood vessel generation algorithm was triggered to perfuse homogenous adipose tissue. The number of vessels algorithmically generated is selected to achieve target overall breast blood content volume. MC simulations were performed in PHITS to compute specific absorbed fractions (SAFs) for monoenergetic photons, electrons, positrons, and alphas. These calculations were performed on a 40% glandular fraction reference model.

Conclusions: Anatomically accurate models of the breast at reference size and glandularity were constructed for the purpose of internal dosimetry. In addition to breast sizes, this process is also applicable to a collection of changes in breast tissue marked by pregnancy.

PRESENTER(S): Joanne Kim
AUTHOR(S): Joanne Kim, Donghee Lee, Chanel Shum, Heo Heon, Cleve De Souza, Jon Kim
FACULTY MENTOR(S): Jon Kim

Convolutional Neural Network for Novel Diagnostics of Canine Lymphoma on Cytological Images

Lymphoma is a type of cancer that affects the cells of the hematopoietic system and is a common malignancy naturally occurring in companion dogs. Providing an early, accurate diagnosis is important for a proper clinical management. However, its diagnosis requires professional investigation by a trained pathologist, which can delay an early intervention. In this study, we explore the feasibility and applicability of applying convolutional neural networks (CNNs) in offering rapid and reliable lymphoma diagnosis using the HiPerGator supercomputer. We used 255 clinical cases of canine lymphoma and non-tumor reactive lymph node obtained from the UF Small Animal Hospital. By employing transfer learning, ResNet50 was trained on an augmented dataset, which generated approximately 10,000 images at 400X magnification. The accuracy during training started at 88.8% and eventually marked 99.2% after 15 epochs. Among 1,264 lymphoma test images, 12 were incorrectly classified as non-tumor, whereas all non-tumor images were correctly classified. In conclusion, the ResNet50 model is applicable for lymphoma diagnosis showing a high accuracy. Our ongoing work involves utilizing multiple CNN models to assess their performance. Further research with a larger dataset and implications is required to reduce the false negative rate.

PRESENTER(S): Spencer Salminen
AUTHOR(S): Spencer Salminen, Luke Parker, Bonnie President, John Aris, Wesley Bolch
FACULTY MENTOR(S): Wesley Bolch

A Microscale Model of the Spleen for α-particle Dosimetry

Alpha-particle therapy is a promising method for treating cancers. Due to their short path-length, α-particles require a model at the microscale level to accurately evaluate the potency of α-particle radiopharmaceutical therapy. We are creating a mesh-based microscale spleen dosimetry model utilizing serial histology slides. These histology sections initially are not in sequence; therefore, tissue structure landmarks and patterns were used to put them in order and then imaged. Following the imaging, the spleen will be segmented into its histological constituents. This segmentation will enable the ability to create a mesh-based 3D tissue model that will be adjusted for in vivo conditions of the spleen that are not retained when creating histology slides. The final model will enable radiation transport simulation of α-particles emitted by a therapy radiopharmaceutical. The most at-risk targets that will be evaluated for α-particle therapy using the model are the endothelium of red-pulp and the marginal zone of white pulp. These two regions are at risk of developing angiosarcoma and B-cell lymphomas, respectively. The model developed here will enable the accurate determination of the efficacy of α-particle based therapy to treat cancers within the human body.

PRESENTER(S): Cade Cooper
AUTHOR(S): Kevin Folta, Cade Cooper
FACULTY MENTOR(S): Kevin Folta

Thai Oakleaf Lettuce Presents Defects in Red Light Sensing

Vertical farming (controlled environmental farming) has used varieties of crops suited for field growth that were not bred for growth in indoor spaces. The hypothesis tested in this report explores seedling traits that may indicate varieties that may be more ideal for growth in artificial environments. Hypocotyl elongation and cotyledon expansion serve as strong diagnostic tools for light sensing and integration. These phenotypes may inform farmers of which varieties are better suited for growth under limiting light conditions. The lettuce variety Thai Oakleaf showed highly aberrant photomorphogenic characteristics particularly under red light conditions. The insensitivity of this variety to red light is consistent with defective phytochrome B signaling as demonstrated by faulty cotyledon expansion, hypocotyl elongation, and young leaf morphology. These findings demonstrate the usefulness of early seedling analysis in deciphering the viability of certain varieties of lettuce in an artificial growth setting.

PRESENTER(S): Jay Chavakula
AUTHOR(S): Jay Chavakula
FACULTY MENTOR(S): Molly Gardner

Should Patients Have Greater Control Over Their Personal Health Information?

In recent decades, it has become easier to transfer patient information between healthcare providers. This includes not only health information, but also social security number, home address, insurance provider, and other demographic information. In this paper, I will argue that patients should have much more control over their healthcare records and that the implications of the right to privacy have not been fully appreciated thus far. Specifically, patients have a right over the distribution of their personal information. Patients should be able to exercise this right by maintaining secrecy of their healthcare information as they choose. This includes maintaining secrecy of personal healthcare information by limiting access from others, even their healthcare providers. Patients also have a non-absolute right to censor and delete information from their chart.

PRESENTER(S): Juan Valderrama
AUTHOR(S): Juan Valderrama, Chris McDevitt
FACULTY MENTOR(S): Chris McDevitt

Physics-constrained Deep Learning of Plasma-Capsule Material Mix in Inertial Fusion

Inertial confinement fusion (ICF) experiments at the National Ignition Facility have achieved record-breaking fusion yields in recent years. The fusion yield is a product of the plasma temperature, density, and energy confinement time of the plasma in the ICF capsule. One of the main contributors to the degradation of fusion yield is the atomic diffusion of the capsule material into the plasma. As the capsule material atoms diffuse into and mix with the plasma, they radiate energy away from the system and decrease the amount of fusion yield observed in experiments. While numerical models have been developed to demonstrate the atomic diffusion physics that lead to fusion yield degradation, no known model uses physics-informed neural networks (PINNs) to do so. PINNs enable the simultaneous learning of the diffusion process as a function of various parameters, such as capsule material, plasma ion species, and space-time, through the implementation of physical laws into its training. This work presents the training of such a model, which can then be considered in the optimization of the ICF experimental setup. Results include the diffusion physics predictions of a trained model for various capsule materials, plasma ion species, and spatiotemporal scenarios.

PRESENTER(S): Kira Zautcke
AUTHOR(S): Kira Zautcke, Emily Watts, Thomas Bianchi, Isaac Santos
FACULTY MENTOR(S): Thomas Bianchi

Burial and Degradation of Organic Carbon in Icelandic Fjord Sediments: Importance of Marine Contributions

Fjords are high latitude estuaries especially important in capturing anthropogenic CO2 emissions. Despite covering only 0.1% of the Earth's surface, they are the most efficient marine environments for organic carbon (OC) burial per unit area. Therefore, fjords are critical for the regulation of Earth's climate through carbon capture and storage. It is essential to better understand the drivers of carbon cycling to effectively predict how their storage capacity may shift due to climate change. This research focuses on six sediment cores from two Icelandic fjords: Reyðarfjörður and Berufjörður. The aim of this study is to determine sources, abundance, and spatial variability in OC burial of Icelandic fjords. We hypothesize the fjords of this study will bury more marine than terrestrially-derived OC in sediments, due to the relatively sparse watershed coverage of land plants. To test this hypothesis, we will measure bulk OC and nitrogen (N) content, stable isotopes (δ13C and δ15N), 210Pb, and chemical biomarkers (e.g. lignin-phenols). Preliminary data suggest these Icelandic fjords are burying OC deriving from marine primary production. Both fjords in this study illustrate how these types of ecosystems can effectively remove carbon from the atmosphere through long-term burial of OC produced by marine primary production.

PRESENTER(S): Mariyah Dhanani
AUTHOR(S): Mariyah Dhanani, Kate Ratliff
FACULTY MENTOR(S): Kate Ratliff

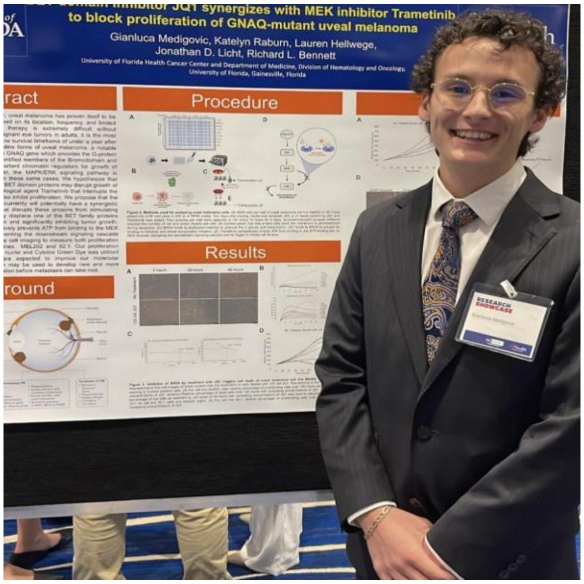
Do Healthcare Professionals Accept That They Might Harbor Implicit Racial Biases?

Racial minorities experience higher rates of mortality and illness in the United States when compared to white individuals. While there may be several factors that contribute to these disparities in medicine, one reason may be attributed to the implicit biases that healthcare professionals harbor against racial minorities. The purpose of this study is to determine whether healthcare professionals accept that they may harbor implicit racial biases that impact their scope of practice. To measure implicit racial bias amongst healthcare professionals, participants were prompted with an Implicit Association Test (IAT) and were subsequently presented with feedback on their results. After acknowledging their feedback, participants were evaluated on the defensiveness towards their results. Participants were also asked to self-report their explicit racial attitudes, as well as their perspective on the role that racial disparities play in the medical field. By determining both the implicit biases and associated responses towards feedback from healthcare professionals, we can evaluate the extent to which healthcare professionals accept that racial biases may impact their scope of practice. In doing so, the field of medicine can gain knowledge about the awareness of implicit biases in medical practice and implement interventions that actively fight against racial disparities overall.

PRESENTER(S): Sebastian GIllespie
AUTHOR(S): Sebastian Gillespie
FACULTY MENTOR(S): Rodrigo Borges

Reconciling Worlds: Uniting the Subjective & Objective

Kripke's reading of Wittgenstein in Wittgenstein on Rules and Private Language as it entails skepticism regarding the validity of norms or rules has generated enormous discussion since it has been released. Robert Brandom, in his ambitious work, A Spirit of Trust, purports to give a solution to the rule-following paradox through situating it in his reading of Hegel. In this thesis I shall flesh out the rule-following paradox that Kripke extracts from Wittgenstein. I will then move to understand how Brandom approaches and addresses such a paradox through his reading of Hegel. Finally, I shall consider the counterclaim to Brandom's analysis, that morality cannot be said to be objective (alethic), and argue that it does not succeed in undermining Brandom's argument.



PRESENTER(S): Gianluca Medigovic
AUTHOR(S): Gianluca Medigovic, Katelyn Raburn, Lauren Hellwege, Jonathan D. Licht, Richard L. Bennett
FACULTY MENTOR(S): Richard Bennett

BET Domain Inhibitor JQ1 Blocks Proliferation of GNAQ-mutant Uveal Melanoma

In both metastasized and baseline forms of uveal melanoma, a notable mutation that occurs in the majority of cases is on the GNAQ gene which encodes the G-protein alpha subunit. Prior work in our lab has identified members of the Bromodomain and Extraterminal (BET) protein family as important chromatin regulators for growth of GNAQ mutant uveal melanoma. Moreover, the MAPK signaling pathway is observed to be frequently overstimulated in these same cases. We hypothesize that the pharmacological agent JQ1 that targets BET domain proteins may disrupt growth of uveal melanoma cells. And, that pharmacological agent Trametinib that interrupts the signaling pathway at the MEK kinase will also inhibit proliferation. We propose that the two pharmacological agents operating concurrently will potentially have a synergistic quality to them. JQ1 is a BET inhibitor that disrupts these proteins from stimulating RNA Polymerase II. Trametinib is a MEK inhibitor that competitively prevents ATP from binding to the MEK kinases in the MAPK pathway, preventing the downstream signaling cascade from triggering cell division. We utilized live cell imaging to measure both proliferation and apoptosis of uveal melanoma cell lines MEL202 and 92.1. Our proliferation assays utilized red fluorescent labeling of nuclei and Cytotox Green Dye was utilized for apoptosis assays.

PRESENTER(S): Rohan Prasad
AUTHOR(S): Rohan Prasad, Eleni Bozia
FACULTY MENTOR(S): Eleni Bozia

Detecting Relationships in the Ancient World: A Machine-Learning Approach to Analyzing Classical Texts

The purpose of this research project is to explore the different relationships within classical literature to form a comprehensive evaluation of the interpersonal dynamics in the ancient Greco-Roman world. Current manual techniques of identifying and analyzing relationships are time-consuming, as they require parsing through a large corpus of texts, making it difficult to achieve a thorough analysis. We propose a more efficient machine-learning-based approach that utilizes relation extraction techniques to detect and extract relationships between different characters, locations, and entities. By training it on a large dataset of classical literary texts, subjects, and entities, we aim to create a robust framework that can correctly detect different relationships between multiple pairs of entities to create a broad network of relationships for different figures in the ancient world. Through this network of relationships, we seek to explore the socio-cultural and political dynamics within classical literature, giving us deeper insights into the complex connections between characters in the broader context.

PRESENTER(S): Madeline McCoy
AUTHOR(S): Madeline McCoy, Elizabeth Brammer-Robbins MS , Isaac Filipe Moreira Konig MS, Kit Souders PhD, Christopher J. Martyniuk MSc PhD
FACULTY MENTOR(S): Chris Martyniuk

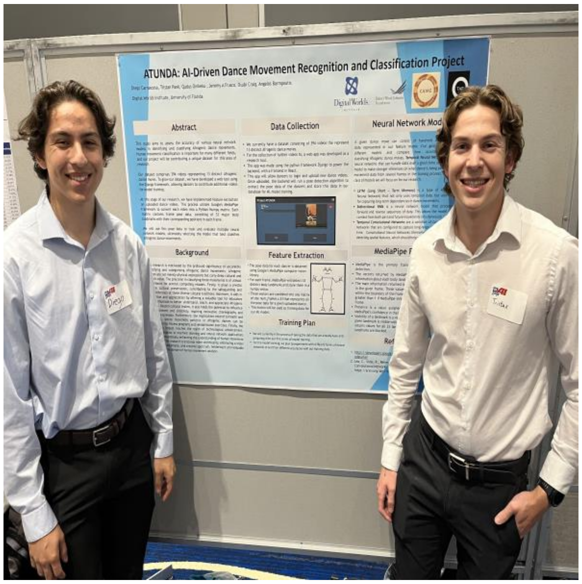
Investigation of the Effect of Low Dose Perfluorotetradecanoic Acid (PFTeDA) Exposure on Gastrointestinal Microbiome Diversity in Adult Zebrafish (Danio rerio)

Perfluorinated compounds (PFCs) are a class of manufactured chemicals that have been recognized to produce detrimental physiological and behavioral impacts in humans and animals, such as developmental toxicity, neurotoxicity, immunotoxicity, and endocrine disruption. Perfluorotetradecanoic Acid (PFTeDA) is a long-chain PFC, prevalent in aquatic environments. Past studies have shown disruption of gene regulation for mitochondrial transcription, induction of oxidative stress, and endocrine disruption . The gastrointestinal (gut) commensal microbiome is a diverse microbial niche that is heavily integrated into host homeostatic function. This study aims to investigate the effect of environmentally relevant doses of PFTeDA on the bacterial diversity of the gut microbiome in zebrafish (Danio rerio). Experimental design consisted of three PFTeDA exposure groups (control, low, high) with an equal male-female ratio. Bacterial DNA from fecal samples was isolated and sequenced using Illumina next generation sequencing to assess microbial abundance and diversity from PFTeDA exposed zebrafish. It is expected that experimental groups will have decreased bacterial diversity, as relevant to PFTeDA exposure. These data are important because dysbiosis can lead to opportunistic growth of pathogenic bacteria which may synergistically decrease individual health. This research connects and contributes to the growing fields of PFC toxicity and microbiome physiological research.

PRESENTER(S): Esha Chakraborti, Tara Fenelon, Dr. Melissa Vilaro
AUTHOR(S): Esha Chakraborti, Tara Fenelon, Melissa Vilaro, PhD, MPH
FACULTY MENTOR(S): Melissa Vilaro

Informing a Community-based Lifestyle Intervention for Colorectal Cancer Survivors with Stakeholder Perspectives: a pilot study

Cardiovascular Disease (CVD) is a leading cause of morbidity and mortality among cancer survivors, who experience a 42% higher risk of CVD than the general population. Although, the DASH Diet is a popular lifestyle approach to managing CVD, adherence to dietary guidelines is often difficult. While African Americans (AA) have a higher burden of CVD disease, there is evidence to suggest that community based programs can supplement clinical encounters and may be important strategies to help cancer survivors adhere to recommended health behaviors. Thus, as part of a multi component, pilot study we set out to obtain stakeholder perceptions to inform development of an evidence-based intervention to support AA colorectal survivors. We interviewed physicians, adult colorectal cancer survivors and, family members in phase one, then developed a codebook and analyzed transcripts for stakeholder preferences and perceptions. In phase two we conducted interactive meal preparation tasks to assess feasibility of obtaining linguistic measure of communal coping from cancer survivors and a family member. Findings show meal prep tasks are a feasible way to obtain communal coping scores. Preliminary findings are summarized and inform components of a tailored intervention for a community setting with the goal of reducing health disparities in cardio-oncology.



PRESENTER(S): Tristan Pank, Diego Carrascosa,
AUTHOR(S): Diego Carrascosa, Tristan Pank, Qudus Onikeku, Jeremy A Frusco, Osubi Craig, Angelos Barmpoutis
FACULTY MENTOR(S): Angelos Barmpoutis

Atunda: A Novel Afrogenic Dance Video Database for AI-Driven Movement Classification

This paper introduces Atunda, the first video database of Afrogenic dance moves systematically collected for training deep learning methods for movement classification. Additionally, the paper presents the results of training and testing various configurations of temporal convolutional networks. The results demonstrate classification accuracy exceeding 90% in classifying 13 different types of Afrogenic dance moves.

PRESENTER(S): Kayla Booth
AUTHOR(S): Kayla Booth
FACULTY MENTOR(S): Martin Cohn

Development of Sex Differences in the Mouse Bladder

The Cohn lab investigates the mechanisms responsible for development and sexual differentiation of genitourinary organs. The bladder is not known to be a sexually dimorphic organ, but our lab recently used single-cell sequencing to analyze the bladders of mice and found single-cell sex differences in the bladder. Some cell types express the androgen receptor, suggesting that bladder development could be responsive to sex hormones and signals that disrupt them during embryonic development. I hypothesize that sexual differentiation of the bladder could be affected by prenatal exposure to anti-androgenic endocrine disrupting chemicals (EDCs). Human exposure to EDCs includes ingestion of foods contaminated with agricultural chemicals. Most animal studies of EDCs deliver these chemicals by injection or oral gavage. I conducted preliminary experiments to refine the method of drug delivery in mice. I compared the efficacy of drug delivery by oral gavage to oral ingestion of the drug mixed into Nutella. Voluntary oral ingestion of desirable foods mimics the mode of ingestion in humans, and also promotes lower stress levels in mice. This research has multiple applications for basic science and human health, including refinement of animal research methods and showing how sexual differentiation of the bladder relates to susceptibility to disease.

PRESENTER(S): Malaica Ashley
AUTHOR(S): Franccesco Boeno, Diana Muller, Malaica Ashley, Zhuoxin “Mia” Li, Gisienne Reis, Ali Aldakkan, Yumei Zhou, Feng Yue, Orlando Laitano
FACULTY MENTOR(S): Orlando Laitano

Impact of Hindlimb Disuse on Sepsis-Induced Myopathy in Older Adult Mice

Sepsis, a severe condition triggered by an overactive immune response, can severely impact various organ systems. Patients in intensive care units (ICUs) commonly experience extended periods of immobility, exacerbating muscle disuse-induced myopathy, characterized by muscle wasting, weakness, and diminished regenerative capacity. In this study, we simulated the clinical conditions in ICUs by combining sepsis with hindlimb disuse. We hypothesized that this combination would worsen muscle atrophy and weakness while reducing the number of regenerative stem cells in muscle tissue. Using mice undergoing cecal ligation and puncture, we investigated skeletal muscle responses to sepsis. Post-surgery, the mice underwent hindlimb suspension or normal ambulation. We assessed muscle force production, cross-sectional area of hindlimb muscles, and abundance of stem cells in muscle sections. Results showed a high mortality rate following CLP surgery and significant body mass loss. Peak force production was significantly lower in mice with hindlimb suspension. Muscle atrophy was evident in mice with CLP/sepsis, particularly those with hindlimb suspension. Furthermore, hindlimb suspension significantly decreased the number of stem cells in muscle tissue. This study highlights the exacerbating effects of muscle disuse on skeletal muscle abnormalities in older adult mice with sepsis, underlining the importance of considering disuse in sepsis-induced myopathy.

PRESENTER(S): Aiden Villasuso
AUTHOR(S): Aiden Villasuso, Heather K. Vincent, Jamie K. Bolling, Kevin R. Vincent, Ryan M. Nixon
FACULTY MENTOR(S): Ryan Nixon

Comparative GRF and Load Patterns Among Runners with Tibial Stress Fracture History and non-injured Runners

The purpose of this study was to compare GRF and loading features between runners with a previous-year history of Tibial Stress Fractures (STFHx) and non-injured matched runners.

Endurance runners (N=28; 53.5% female; 22.8±10.1 yr; 35.7 km/week) ran on an instrumented treadmill at level grade for 10 minutes at self-selected speed. GRF data were captured at 1200Hz. filtered at 100Hz, normalized by body weight (BW) and presented by percent stance. Peak magnitude and timing of positive and negative loads were determined during stance. Among runners with TSFHx, anterioposterior GRF (braking/ propulsion) were 55%-106% higher during late stance (86-100% of stance) for the left limb and 64%-740% higher during late stance (83-100% of stance) for the right limb (p<.05). Runners with TSFHx showed higher impact amplitude (1.04 vs 0.66 BW: p=.05) and duration on the left limb (22.8±27.2 msvs 9.3±4.8 ms; p=.06). Active impulses were lower for TSFHx for both limbs (p<.05). Asymmetry in max load rate time existed between groups (17.5±29.4ms TSFHX vs 14.9±44.0ms; p<.05). Persistent differences late in braking/propulsion, uncontrolled loading and asymmetric time of loading exist among runners with healed TSF. Corrective gait analysis techniques and retraining could help these runners avoid recurrent injury.

PRESENTER(S): Brianey Torres
AUTHOR(S): Brianey Torres
FACULTY MENTOR(S): Christopher Smith

Between Waifu and Besto Friendo: Parasocial Relationships and Anime Fans

Anime has captivated pop culture animation fans, opening a space for fans to cultivate parasocial interactions with their favorite characters. Its increased popularity gives fans a space to have passionate relationships with the medium. These relationships have reached their sociological extreme in the form of parasocial relationships and interactions. The term parasocial interactions, coined by sociologists Donald Horton and R. Richard Wohl, describes one-sided relationships that give someone a sense of platonic or romantic friendships with media figures, creating the illusion of interpersonal relationships. Parasocial relationships with anime characters remain understudied. There tend to be variations in the intensity of parasocial relationships regarding anime characters. Anecdotal stories on social media reveal such differences, spanning from platonic to romantic. The overall negative perception of these parasocial interactions as the sensationalized sexualization of anime characters complicates the general understanding of parasocial relationships. This paper intends to analyze the relationships of the fanbases surrounding anime and their contributing factors, specifically how the adaptation of anime into live-action can disrupt these relationships by changing the aesthetic of the animes. Through understanding the history and usage of parasocial relationships in anime one can see the positive and negative impacts of parasocial relationships on anime audiences.

PRESENTER(S): Tyler Thompson
AUTHOR(S): Tyler D. Thompson, Courtney S. Wilkinson, Alexandra Sanchez, Harrison L. Blount, Marek Schwendt, Lori A. Knackstedt
FACULTY MENTOR(S): Lori Knackstedt

Chronic intraperitoneal oxytocin augments demand elasticity for oxycodone self-administration in male but not female Sprague Dawley

Oxytocin is an emerging treatment for a variety of neuropsychiatric conditions, including substance use disorder. Here we investigate the effects of chronic intraperitoneal oxytocin on behavioral economic demand for intravenous oxycodone in male (n=18) and female (n=17) Sprague Dawley. Adult, single-housed, food-restricted rats were implanted with jugular catheters. Rats were trained to self-administer intravenous oxycodone (Males: 0.4 mg/kg/infusion; Females: 0.32 mg/kg/infusion) for 3 hr/day on FR-1 for 6 days then FR-3 for 6 days. Rats then began economic demand procedures in which the fixed ratio (FR) active lever requirement to earn a reinforcer was increased in quarter log unit increments every two days of training until subjects failed to attain a reinforcer for a given FR. Rats were treated with oxytocin (1 mg/kg, IP) or vehicle (saline, IP) prior to demand curve sessions. We found that in males, not females, chronic oxytocin increases demand elasticity to self-administer oxycodone. In males, oxytocin reduces Pmax, or the maximum price (FR) rats are willing to "pay" for intravenous oxycodone. These data provide further evidence that oxytocin is effective at reducing drug-seeking in males but indicate important sex differences in its efficacy to reduce opioid-seeking.

PRESENTER(S): Karina LaRubbio
AUTHOR(S): Karina LaRubbio, Eakta Jain
FACULTY MENTOR(S): Eakta Jain

Gaze Based Authentication in Virtual Reality for Users with Visual Impairments

Eye movement biometric algorithms are currently in development and offer the promise of continuous authentication, which is particularly relevant for virtual reality (VR) applications. Users with conditions that impact gaze behavior may experience unique challenges with gaze-based interaction modalities, such as authentication, especially as eye trackers become more accessible through commercially available VR headsets. For example, users with visual impairments that are characterized by inconsistency between the two eyes, such as strabismus or amblyopia, may have different experiences with gaze-based authentication considering the unique nature of their gaze patterns. Using data collected from users with visual impairments during a VR-based visual search task, the state of the art eye movement biometric algorithm is applied to analyze authentication rates and misidentifications.

PRESENTER(S): David Cagle
AUTHOR(S): David Cagle, Larry Page, Zachary Randall
FACULTY MENTOR(S): Larry Page

Description of a New Species of Schistura from the Mae Klong River Basin in Thailand

The Mae Klong River Basin in Thailand is one of the most biodiverse "hotspots" in Southeast Asia. The taxonomic identification and classification of fishes in the Mae Klong has been a primary research initiative of the Florida Museum Division of Ichthyology since 2004. Thus far, 22 "new," or scientifically undescribed, species of fishes have been described by our team from the river basin, and approximately 15 new species currently are being studied for the purpose of eventual description. This study is examining one of these new species, which is particularly distinct morphologically, and belongs to the species-rich polyphyletic genus Schistura (Nemacheilidae). The project uses the analysis of morphological variation, which precedes the analysis of genetic material (mtDNA), a process that is currently underway. The undescribed species is being compared with the closely related Schistura sexcauda and differs most notably in the bimodal distribution of caudal and dorsal fin ray counts. The data indicate a high likelihood of allopatric speciation, a common driver of diversification in the region.

PRESENTER(S): Serina Kaochari, Vianca Gonzalez, Kierstin Doll
AUTHOR(S): Serina Kaochari, Vianca Gonzalez, Kierstin Doll, Aria Deluna, Dr. Adam C.N. Wong
FACULTY MENTOR(S): Adam C.N. Wong

Comparison of chironomid (Insecta: Diptera) larvae microbiome disruption under elevated temperature conditions

Cholera is a deadly diarrheal disease caused by the pathogen, Vibrio cholerae. Chironomids and other aquatic arthropods serve as the reservoir for this pathogen it disperses in aquatic environments. A body of relevant research has found that elevated temperatures favor particular microbes and that certain taxa may have an antagonistic effect on V. cholerae. To determine infection susceptibility under altered temperatures, chironomid larvae were incubated under normal and elevated rearing temperatures, then subjected to V. cholerae infection treatment. Homogenate was plated on selective and non-selective plates to quantify total microbiome composition and V. cholerae infection. Microbiome quantification data was then analyzed using a general linear mixed model and infection data was analyzed via Student's T-tests. Microbiome quantification data indicates that Increased rearing temperatures resulted in increased microbiome composition. Fifteen morphologies were identified between all treatment groups and determined to be differentially abundant. A 27.8% rise in infection rates among HC16-infected insects, and in contrast, insects exhibited a 6.3% reduction in infection success in C6706-infected when exposed to elevated temperatures. These findings indicate that the influence of elevated temperatures on infection success may differ by strain.

PRESENTER(S): Andrew Qiu
AUTHOR(S): Andrew Qiu, Devendra Kumar Gorle, Sara Alzahrani, and Ant Ural
FACULTY MENTOR(S): Ant Ural

Effect of Voids on Nanowire Network Conductivity

Two-dimensional (2D) networks consisting of one-dimensional (1D) nanoscale wires (nanowires), such as carbon nanotubes and metal nanowires, are promising candidates for many applications including transparent conductive electrodes, flexible electronics, and biosensors. For these networks to be conductive, they must carry charge, and therefore must percolate between nodes. Voids, which can appear unintentionally during the fabrication and deposition processes, can impact percolation so understanding their relationship with conductivity is critical. In this work, we study the effect of voids on nanowire network conductivity. We utilize Monte Carlo simulations to generate 2D square networks with square voids at the center. We compute the relative conductivity change with respect to nanowire density for several void sizes and network properties, such as wire alignment. The conductivity is found to exhibit a power-law dependence on nanowire density as predicted by percolation theory. We extract the local power-law critical exponent as a function of density for each void size and find that the critical exponent approaches 2 at high density for all void sizes, in agreement with previous observations for junction-resistance dominated networks without voids. Our results demonstrate the impact of voids on nanowire network conductivity and show the relationship between conductivity and density.

Sexual Assault and Alcohol Prevention Research Lab
SAPR

PRESENTER(S): Callaway Wells, Hannah West, Jessica Rinosa, Tianna Bryant, Mia Sadler
AUTHOR(S): Callaway Wells, Hannah West, Jessica Rinosa, Tianna Bryant, Mia Sadler, Elena Kalina & Nichole M. Scaglione
FACULTY MENTOR(S): Nichole M. Scaglione

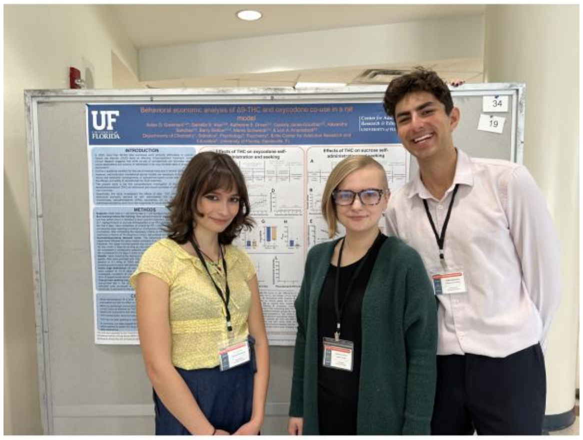
Examining Relationships between Age of Drinking Onset and Protective Behavioral Strategies in First-Year College Women

To better inform alcohol harm-reduction strategies for women transitioning from high school to college, we examined the relationship between age of drinking onset (ADO)—an established risk factor for heavy drinking—and women's use of protective behavioral strategies (PBS) prior to and during the first semester of college. First-year college women who identified as drinkers ($N = 235$) completed two web-based surveys examining their ADO ($M = 15.75$ years, $SD = 1.32$) and PBS use in the year before (T1) and in their first semester of college (T2). Results indicated a significant negative association, such that women who started drinking earlier reported using more PBS in their senior year of high school ($\beta = -2.50$, $SE = 0.65$, $p < 0.001$), even after controlling for their typical drinking behavior. Despite significant correlations between high school and college drinking behavior and PBS use, ADO was not significantly associated with PBS use in the first semester of college ($p > 0.05$). Women who began drinking earlier may have had more chances to implement PBS in high school compared to their first semester of college. Additional research is needed to examine how ADO affects PBS use throughout college and in more diverse samples.

PRESENTER(S): Lauren Geiss
AUTHOR(S): Lauren Geiss, Emma Matcham
FACULTY MENTOR(S): Emma Matcham

Bulk Density and pH Relationships on Sandy Soils in Three Florida Fields

This study aimed to investigate potential relationships between bulk density and pH in sandy soils by sampling the soils of three different crop production systems in north-central Florida: a silage corn field in Citra, peanut field in Chiefland, and turfgrass plot in Gainesville. Each of the sites were treated with pH-altering treatments, including ammonium nitrate, gypsum, and lime. Previous studies on this relationship between bulk density and pH focus on silty soils, and there is limited information on relationships between pH and physical soil properties on the sandier soils that are prevalent in Florida. While the soils in the turfgrass plot showed on observable relationship between bulk density and pH, the soils in the silage corn and peanut fields did show a slight relationship. In the peanut and silage corn fields, each plot was sampled both within the crop rows and between crop rows. In these fields, samples taken in the root area showed significant differences in pH ($p<0.001$) and bulk density ($p<0.01$) from the area between rows. Understanding relationships in the soil environment is important to maximize crop health and production, therefore further research is needed in this area.



PRESENTER(S): Daniella Viso, Aidan Garemani
AUTHOR(S): Daniella Viso, Aidan Garemani, Katherine Driver, Alexandra Sanchez, Cassidy Jones-Goucher, Barry Setlow, Marek Schwendt, Lori Knackstedt
FACULTY MENTOR(S): Lori Knackstedt

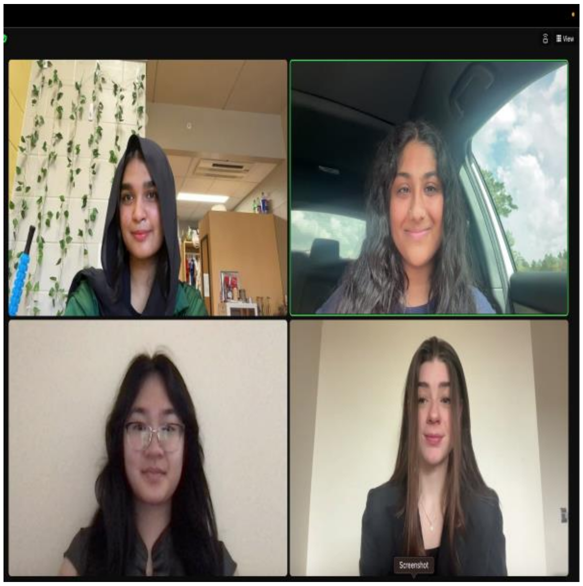
Behavioral economic analysis of THC-oxycodone co-administration in a rat model

Opioid use disorder (OUD) lacks an effective, broad-spectrum treatment. Limited evidence suggests co-use of cannabinoids can reduce the rates of opioid dependence and severity of withdrawal, though at the cost of elevated anxiety and depression. Thus, well-controlled, translational animal models are necessary to investigate outcomes of cannabinoid-opioid co-use. The current study aimed to investigate the effects of daily oral D9- tetrahydrocannabinol (THC) consumption on behavioral economic demand for intravenously self-administered (IVSA) oxycodone in male and female Sprague-Dawley rats. Rats were first trained to self-administer oxycodone or sucrose under low-effort conditions. After reaching stable training intake, rats began economic demand procedures where the FR (fixed ratio) requirement was increased in quarter log unit increments until zero reinforcers were attained. Rats also received unsweetened gelatin containing THC/Vehicle for one hour following each demand session. Following a two-week abstinence period, rats underwent a cue-primed seeking test. No effects of sex were observed on oxycodone self-administration. THC consumption leads to increased demand elasticity and decreased cue-primed relapse for oxycodone, with no effects on sucrose intake. These findings, once completed, will provide first-ever preclinical evidence regarding the effects of THC on motivation to seek oxycodone, as well as assessment of corresponding receptor activity changes.

PRESENTER(S): Marina Marquis
AUTHOR(S): Marina Marquis, Brett Scheffers, Cindy C. Cosset, David Klinges, Tsitohaina Randriambololona
FACULTY MENTOR(S): Brett Scheffers

Physiological, Morphological, and Behavioral Determinants of Vertical Niche Partitioning of Malagasy Frogs

This study investigates the role of physiology, morphology, and behavior in determining the vertical niches of select frog species endemic to Madagascar. Experiments were performed in 2017 and 2018, where 127 Malagasy frogs were placed in vertical enclosures to determine how species behaviorally regulate their hydration over time. We established two experimental treatments of vertically stratified microhabitats, one full water treatment with all microhabitats containing wet substrate and a partial water treatment with the upper half of microhabitats containing dry substrate and the lower half containing wet substrate. Using an information theoretical approach to model selection, we investigated the relationship between mean vertical height of species in the wild as a function of morphological, behavioral, and physiological factors such as snout-vent length, microhabitat use, and water loss, respectively. Linear models identified increasing snout-vent length and increasing proportion of time spent in microhabitats to be significant predictors of mean species height in the wild. Snout-vent length (morphology) was the most significant predictor of mean species height. Morphological and behavioral adaptations both contribute to the realized niche partitioning, with an emphasis on morphological adaptations.



PRESENTER(S): Saloni Datta, Leyna Doan, Najli Babar, Siara Brennan, Melissa Moreno, S. Parrish Winesett
AUTHOR(S): Saloni Datta, Leyna Doan, Najli Babar, Siara Brennan, Melissa Moreno, S. Parrish Winesett, Peggy Borum
FACULTY MENTOR(S): Peggy Borum

Brand-specific Foods for Precision Ketogenic Therapy

One-third of people with epilepsy do not respond to current medical treatments. Many of these respond positively when treated with Precision Ketogenic Therapy (PKT) that lowers the carbohydrate intake of the diet. Patients are provided PKT recipes personalized for nutritional needs and food preferences. The recipes use brand specific food products. Patients often wonder if it is necessary to go to a different grocery store to get a specific brand of the product. To address this question, we took a PKT recipe prepared by the PKT program for a specific diet prescription and prepared a nutrient composition database of each of the foods in the recipe. If all brands of a food have the same macronutrient composition, families would not have to spend the time and energy needed to always find the specified brand. Our database identifies brands of food that have the same macronutrient composition and thus can be listed as options in the recipes. However, many brands of the same food in the database have different macronutrient compositions. These data will be used to demonstrate the effect on administered therapy when using different brands to prepare the PKT recipe.

PRESENTER(S): Romina Torchia
AUTHOR(S): Romina Torchia, Ania Lipat, Chris Hass
FACULTY MENTOR(S): Chris Hass

Mechanical Somatosensory Function is Not Related to Obstacle Crossing Performance in Older Adults

Background: Older adults commonly fall during complex mobility tasks such as obstacle crossing. Mechanical somatosensory function declines with aging and contributes to balance and normal gait deficits and may contribute to obstacle crossing performance. Therefore, the aim of my study was to determine if mechanical somatosensory function is associated with obstacle crossing performance in older adults.

Methods: Participants (N = 44, average age = 74 years) were asked to walk and cross over a 10 cm tall obstacle five times. Motion capture was used to measure obstacle toe clearance, approach distance, and recovery distance. Mechanical somatosensory function was characterized as mechanical detection threshold (MDT) at the sole of the foot. MDT was determined by applying five Semmes-Weinstein monofilaments (0.007-10 g) and defined as the lowest force detected in two of three trials. Multiple linear regressions were run to assess associations between MDT and obstacle crossing parameters, controlling for age, gender, body mass index, and grip strength.

Results: MDT was not significantly associated with any obstacle crossing parameter ($p > 0.05$).

Conclusions: Mechanical somatosensory function was not associated with obstacle crossing performance in older adults. Therefore, additional factors should be investigated to improve our understanding of falls in this population.

PRESENTER(S): Nicole Strecker
AUTHOR(S): Natalia Carrasco-Rojas, Robert J. Dawson, Nicole A. Strecker, Wesley E. Bolch
FACULTY MENTOR(S): Wesley Bolch

Development and Application of the MOBY Mesh-Type Phantom for Radiopharmaceutical Dosimetry

Computational phantoms have been used to calculate specific absorbed fractions (SAFs) and S-values using Monte Carlo radiation transport simulations. Mouse phantoms can be used to estimate organ doses for comparison of computational calculations to experimental work in pre-clinical studies and improve internal radionuclide dosimetry calculations. MOBY, a polygon-mesh male mouse reference computational phantom, has historically been used in voxel format for use in simulations. This phantom was received from Dr. William Segars at Duke University and mesh to mesh intersections were removed, preserving the position and volume of the organs, by using Blender, a 3D modeling software. The medulla and pelvis of the kidneys, spinal cord, and prostate were modeled and added to this phantom. A multi-structured skeleton was then developed to include cortical and spongiosa bones and medullary cavities. After modeling the male phantom, the female phantom was created by removing the prostate, vesicular glands, and testes and adding a uterus and ovaries. Both models were scaled to five different sizes, for a total of ten mesh-type phantoms of the reference MOBY phantom. After modeling all changes, models were tetrahedralized to perform Monte Carlo simulations in PHITS to obtain the SAFs and S-values for different source-target organ combinations.

PRESENTER(S): Derod Deal
AUTHOR(S): Derod Deal, Adam Ginsburg
FACULTY MENTOR(S): Adam Ginsburg

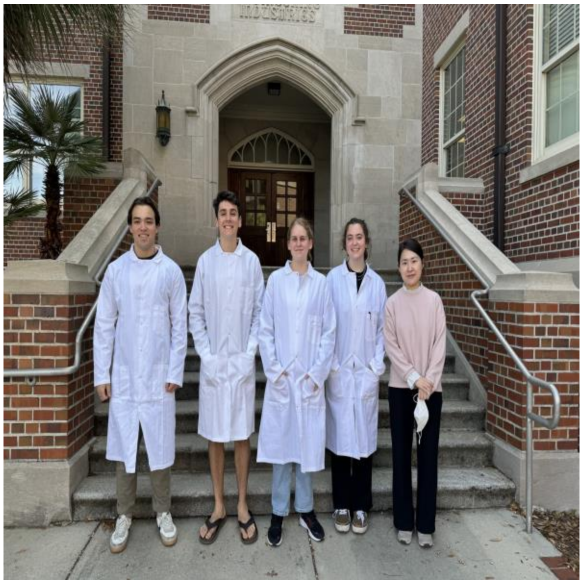
Investigating ammonia masers in the star-forming region W51-IRS2

W51, one of the brightest and most active star-forming regions in the galaxy, contains numerous ammonia masers that can potentially reveal the physics of high-mass stellar accretion. Astrophysicists theorize that NH3 emission probes processes like outflows and accretion, which indicates the evolutionary stage of young stars or protostars. We aim to create a catalog of NH3 maser positions in W51 for future research. We present our ongoing research in high radio frequencies of W51 to interpret the velocities, spatial locations, and brightness of NH3 masers and investigate where the emission lines occur in star-forming regions. The lines (5,3), (6,2), (6,3), (7,4), (7,5), (7,6), (7,7), (8,5), (9,8), and (11,9) were identified as ammonia masers. We compare our measurements of line velocities and brightness to literature measurements, finding that there have been shifts in both velocity and brightness over the past ~7 to 11 years. We showcase precise coordinates of the observed NH3 lines.

PRESENTER(S): Leah Davis, Adriana Abreu, Michael Hickernell
AUTHOR(S): Leah Davis, Adriana Abreu, Michael Hickernell, Zachary Markovich, Yi Sheng, Rui Xiao
FACULTY MENTOR(S): Rui Xiao

Uncovering the Role of G-Protein-Coupled Receptors and Associated G-Proteins on Longevity and Intestine Physiology

The gastrointestinal (GI) system plays a key role in pathogen defense and nutritional homeostasis. GI tract disruptions contribute to conditions including inflammaging, leaky gut, and irritable bowel diseases. Caenorhabditis elegans is a robust genetic system for studying GI physiology, particularly leaky gut via the “Smurf” Assay. This assay is used to visualize leaky gut in live animals through feeding of a non-toxic blue food dye that leaks from the intestine and stains the body blue. Preliminary staining in wildtype worms reveals an age-dependent increase in intestine permeability, a phenomenon also observed in other species including humans. We extended our experiment to screen the entire C. elegans genome using RNAi techniques and the Smurf assay, through which we identified many novel genes involved in intestine physiology and longevity. G-protein-coupled receptors (GPCRs) were the most enriched class of genes. Our data suggest that GPCRs and associated G-proteins have functions beyond chemosensation, being involved in aging and intestinal physiology. Since the roles of GPCRs in these pathways are unknown, our ongoing experiments aim to understand the mechanisms through which GPCRs and downstream G-proteins regulate intestinal physiology and aging. Our work will elucidate the novel function of GPCRs in intestinal physiology and longevity modulation.



PRESENTER(S): Shanie Sedio, Dexter Paulson, Jessica Ritchie, Charles Dalton, Sungyoon Jung
AUTHOR(S): Shanie Sedio, Dexter Paulson, Jessica Ritchie, Charles Dalton, Sungyoon Jung
FACULTY MENTOR(S): Sungyoon Jung

Investigation Into the Effects of Location on Microplastic Composition on the University of Florida Campus.

Microplastics, defined between 5 mm and 1 μm in length, have been deposited into the environment since the production of plastics. Their presence was unknown until the early 2000s, making the field of microplastic research relatively new. As technology advances, more accurate analysis is possible, enabling a better understanding of the distribution of microplastics. This study aims to determine the microplastic signature of the University of Florida (UF) through the analysis of leaf samples. Three leaves were collected from each of the five selected locations that reflect land usage and population density: high traffic, residential, medium traffic, remote, and construction. The samples then underwent vacuum filtration, inspected through a microscope, and processed using pyrolysis gas-chromatography mass-spectrometry (GCMS) for profiling. Our expected results include an understanding of the physical properties of the microplastics, and chemical properties from the GCMS data. Varying levels of surrounding activity have an impact on the distribution and characteristics of microplastics on the UF campus. Atmospheric deposition of microfibers is likely responsible for the ubiquitous nature of this type of plastic in our samples. Further research is needed to determine the origin of the other microplastics.

PRESENTER(S): Carson Sobolewski
AUTHOR(S): Carson Sobolewski, David Koblah, Domenic Forte
FACULTY MENTOR(S): Domenic Forte

A Framework for PCB Design File Reconstruction from X-ray CT Annotations

Reverse engineering (RE) is often used in security-critical applications to determine the structure and functionality of a printed circuit board (PCB). Although it has beneficial and malicious uses, one prominent application is to extend the lifespan of legacy devices that cannot be updated with modern circuits. Existing work has been conducted on the analysis of PCBs using X-ray computed tomography (CT) scans, including image segmentation, via recognition, and manual annotation. With these annotations and segmentations of PCB X-ray CT scans, this work outlines a Python-based framework for the automated reconstruction of PCB design files for further analysis and reproduction. Given annotations of traces, vias, and board dimensions, the pipeline automatically recognizes board shape, trace size, and connections to accurately reconstruct the PCB. This was tested on three layers of a sample PCB, highlighting great promise for future extensions to new PCBs.

PRESENTER(S): Sarah Paprotna
AUTHOR(S): Sarah Paprotna, Samantha Rakela, Bo Sortman, Brandon Warren
FACULTY MENTOR(S): Brandon Warren

Investigating the Time Course for tdTomato Expression in Targeted Recombination in Active Populations (TRAP)

Targeted Recombination in Active Populations (TRAP) is an experimental technique that induces the expression of an effector protein (tdTomato) in a way that is dependent on both 4-hydroxytamoxifen (4-OHT) injection and neuronal activity. TRAP allows researchers to selectively measure neuronal activity in neurons activated by a specific stimulus with high temporal and spatial resolution. However, the amount of time it takes for tdTomato expression remains unclear, with researchers commonly waiting up to 14 days. This paper aims to investigate the time course for tdTomato expression following 4-OHT injection in TRAP. We had mice undergo daily restraint stress for seven days to induce neuronal activity. Mice were injected with 4-OHT and euthanized either 0d, 1d, 3d, or 7d post-injection. We then quantified tdTomato expression in the dorso- and ventromedial prefrontal cortices, nucleus accumbens, basolateral amygdala, and hippocampus, and compared expression between groups. We found that there was very little expression in the 0d group, with that number slightly rising in the 1d group, and increasing further in the 3d and 7d groups. This data suggests that tdTomato expression occurs more rapidly than previously thought and allows for increased efficiency and enhanced temporal resolution in TRAP experiments.

PRESENTER(S): LLIA BYRON
AUTHOR(S): Llia Y. Byron, Emily E. Fussell, Asha P. Rao, Elizabeth L. Aikman, Whitney L. Stoppel
FACULTY MENTOR(S): Whitney Stoppel

Manipulation of Silk Fibroin for Optimal Long-Term Mechanical Performance as Anisotropic Sponges

Ethical complications are prevalent in clinical trials because of human subject testing. To evade such issues, biomaterials such as silk from the Bombyx mori silkworm are being explored. Due to its degradation rate, ease of manipulation, and compatibility in vivo (Rockwood, et al., 2011), silk fibroin serves as a novel candidate for a scaffold mimicking muscle properties for muscular dystrophy research. During the processing of silk involving boiling, dialysis, anisotropic freezing, and structure setting, multiple parameters were manipulated to yield various outcomes affecting the scaffold's mechanical properties. These parameters included polymer concentration, freezing time, and post-lyophilization method (Aikman, et al., 2023). It was found that beta-sheet content had the largest impact on the mechanical properties. Additionally, tensile strength testing was used to measure Young's modulus which ranged from 600kPa to 2800 kPa. Further tests revealed that increased polymer concentration and faster freezing rates increased tensile strength when assessed at 1% strain per minute. Long-term stability tested via fatigue tests and hysteresis showed little change in the storage and loss modulus of 5% silk scaffolds over 6000 minutes at 10% strain. Future testing would employ decellularized extracellular matrix to the scaffold to prove its viability as a muscle tissue platform.

PRESENTER(S): Jared Coleman
AUTHOR(S): Jared Coleman
FACULTY MENTOR(S): Clive Wasserfall

Optimization of Pancreatic Cell Subset Classification in Images from Multiplex Immunofluorescence Imaging Platforms

Understanding the natural history of type 1 diabetes has been hampered by limited access to the target organ (i.e., the pancreas) in living people. To make the most of these precious tissues, cyclic imaging platforms such as Miltenyi MACSima, which increase the number of markers that can be examined per section, are becoming increasingly popular. Such advances in spatial biology require reproducible cell classification algorithms. Random Tree algorithm was previously found to be the most reliable approach for differentiating exocrine versus endocrine pancreas compartments, yet an unmet need exists for an approach that can provide accurate cell type classification within the endocrine compartment. We hypothesized that a core set of markers could be used to maximize classification accuracy. To this end, pancreatic sections were stained with fluorescent antibodies against various markers and images were captured using the MACSima platform. Random Tree algorithm was trained in QuPath to classify endocrine, exocrine, vascular, and immune cell clusters in n=3 pancreas donors across a total of n=10 ROIs. Classification accuracy will be determined by comparison to ground-truth labels annotated by an expert in the field. Markers that maximize classification accuracy will be included on future pancreas runs to standardize and streamline downstream analyses.

PRESENTER(S): Michael Traweek
AUTHOR(S): Michael Traweek, Lauren Goldsby, Gerardo H. Nunez
FACULTY MENTOR(S): Gerardo Nunez

Flower Bud Development of Southern Highbush Blueberry (Vaccinium corymbosum interspecific hybrids) & Different Fall Nitrogen Rates

It is common practice for blueberry (Vaccinium corymbosum interspecific hybrids) growers to stop or decrease fertilization with nitrogen (N) during the fall to allow flower bud differentiation. However, the effectiveness of this practice is not fully understood. Nitrogen fertilization is important for the success of commercial growers; flower bud development and yields are affected by N fertilization. This experiment aims to understand the impact of fall nitrogen applications on these characteristics in both protected and open tunnel environments using the southern highbush blueberry (SHB) 'Sentinel' cultivar. Sentinel plants were subjected to four N treatments, 0 lbs, 2.5 lbs, 5 lbs, and 10 lbs per acre per week of ammonium sulfate 21-0-0. N fertilization occurred once per month November - January.At the beginning, middle and end of the experiment, the youngest fully expanded leaves were collected for nutrient analysis. Two representative branches were selected from two plants per replication. Six buds, counted from the apical end of each branch, were photographed biweekly to assess bud development using a previously developed qualitative scale. During the harvest season, weekly harvest will occur and fruiting data will be quantified. This experiment can help growers make informed decisions about their N application timings.

PRESENTER(S): Paulina Trujillo
AUTHOR(S): Paulina Trujillo
FACULTY MENTOR(S): Alyssa Zucker

Disrupting Disparities, Making Green Waves: Elevating Hispanic Women's Voices on Reproductive Policies

In a post-Dobbs United States, the public policy landscape has dramatically shifted; there has been an exponentially increasing trend with reproductive policies moving closer to the criminalization of abortion. Simultaneously in recent years, in Latin American countries there has been an increasing trend for reproductive policies moving from criminalization towards legalization. The movement in Latin America is known as the el Marea Verde or Green Wave.

Previous literature has highlighted that Hispanic Women are disproportionately impacted by the criminalization of reproductive policies. This study aims to understand Hispanic women and their nuanced perspectives on reproductive policies to elevate their voices in public policy. My research topic I will be exploring: under what conditions will Hispanic women support progressive reproductive policies?

PRESENTER(S): Sacha Sides
AUTHOR(S): Sacha Sides, Katheryn Franklin, Kristen Prufrock, Timothy Smith, Valerie DeLeon
FACULTY MENTOR(S): Valerie DeLeon

Tooth Be, or Not Tooth Be: A New Analysis of the Deciduous Dentition in the Aye-Aye

Daubentonia madagascariensis (aye-ayes) have ever-growing incisors that make them wholly unique amongst primates. The consensus is clear regarding the formula of the aye-aye's permanent dentition (1/1, 0/0, 1/0, 3/3); however, the deciduous dentition of Daubentonia is still a subject of debate. Variable presence/loss of deciduous second incisors and/or canines have been reported in the literature.

This study provides the first account of the deciduous dentition in perinatal aye-ayes analyzed through diffusible iodine contrast-enhanced computed tomography (diceCT) scans. This allows for the visualization of soft and unmineralized tissues that are not visible with conventional microCT imaging. We reconstructed the scans of two perinatal (stillborn and 5-day-old) Daubentonia using 3DSlicer. We then segmented and modeled the developing tissues of our specimens, offering a unique qualitative account of the unmineralized structures.

This study demonstrates the co-occurrence of deciduous second incisors and canines in the maxillae of both Daubentonia. Additionally, we provide a record of growth stages seen in Daubentonia's postcanine dentition. These observations supplement the existing indices of primate dentition, and raise new questions regarding the evolution of dental variation in primates and other mammals.

PRESENTER(S): Elizabeth Wolters, Iulia Berianu, Nien-Wen Hu
AUTHOR(S): Elizabeth Wolters, Iulia Berianu, Riley Colquitt, Nien-Wen Hu, Walter Murfee
FACULTY MENTOR(S): Walter Murfee

The Formation of Malformed Lymphatic Multicellular Structures During Stromal Vascular Fraction Vasculogenesis

Stromal Vascular fraction (SVF) is a rich cell source compromised of endothelial cells, pericytes, stem cells, and immune cells. It represents a promising therapeutic due to mimicking the complexity of microvascular networks. However, there is little known about the process and cell dynamics of SVF-derived lymphangiogenesis. The objective of this study is to characterize the lymphatic structures associated with SVF derived de novo vessel formation. SVF was isolated from inguinal adipose from adult mice and seeded onto avascular mesentery tissue. Tissues were cultured for 3 days and 5 days and immunolabeled with endothelial and lymphatic markers, PECAM and Lyve1, for microscope imaging and analysis. Lyve1+ multicellular structures (bleb) were measured and compared between different time points. For Day 3, 5 and 7, the bleb numbers per tissue were 0.1863 ± 0.02674 mm-2, 0.351 ± 0.028 mm-2, and 0.2539 ± 0.047, and the single bleb sizes were 0.00661 ± 0.001294 mm2, 0.004462 ± 0.0092 mm2, and 0.002572 ± 0.000851 mm2. Based on the statistical analysis, the bleb size decreased from Day 3 as well as 5 to 7. The bleb number per tissue area increased from Day 3 to 5. This motivates further investigation of Lyve1+ cell dynamics during SVF vasculogenesis.

PRESENTER(S): Sydney Miller, Mallory Paul, Nien-Wen Hu
AUTHOR(S): Sydney Miller, Mallory Paul, Riley Colquitt, Nien-Wen Hu, Walter Murfee
FACULTY MENTOR(S): Walter Murfee

The Formation of Malformed Lymphatic Multicellular Structures During Stromal Vascular Fraction Vasculogenesis

Stromal Vascular Fraction (SVF) is a rich cell source that contains factors known to promote angiogenesis. However, very little is known about the SVF to induce lymphangiogenesis. The use of ex vivo tissue models allow us to gain a better understanding of the SVF-derived blood and lymphatic vessel formation. The objective is to characterize the lymphatic structures associated with SVF derived de novo vessel formation. SVF was isolated from mouse inguinal adipose and transplanted onto avascular mouse mesentery tissues. The tissues were cultured for 3, 5, or 7 days with 10% serum, and then fixed and immunolabeled with endothelial (PECAM) and lymphatic (LYVE-1) cell markers for image analysis. LYVE-1 positive lymphatic multicellular structures (bleb) were measured and compared between different time points. Results showed that on Day 3, 5, and 7, the average bleb numbers per tissue area were 0.1807±0.0111 mm-2, 0.3120±0.0288 mm-2, and 0.2357±0.0395 mm-2, and the single bleb sizes were 0.0069±0.00147 mm2, 0.0052±0.00111 mm2, and 0.0023±0.00035 mm2. Based on the statistical analysis, the bleb size decreased from Day 3 as well as 5 to 7. The bleb number per tissue area increased from Day 3 to 5. This motivates further investigation of Lyve1+ cell dynamics during SVF vasculogenesis.


PRESENTER(S): Lauren Cardosi, Mia Lindsey
AUTHOR(S): Cardosi, Lauren A.*, Lindsey, Mia L.*, Beliakoff, Reagan E., Lorca, Graciela L. *Both authors contributed equally to this work
FACULTY MENTOR(S): Graciela Lorca

A Chemical Mutagenesis Strategy to Identify Genes Involved in Extracellular Vesicle Biogenesis and Erucic Acid Utilization in Lactobacillus johnsonii N6.2

Lactobacillus johnsonii N6.2-derived extracellular vesicles (EVs) reduce apoptosis in human pancreatic cells and induce the production of insulin by human pancreatic islets. The growth of Lactobacillus johnsonii N6.2 in media supplemented with bile, mimicking a stressor encountered by the bacterium in the small intestine, promotes a significant increase in secreted EVs. Our lab has demonstrated that dietary erucic acid (EA), a predictive biomarker for the colonization of lactic acid bacteria, is sufficient for survival and persistence of L. johnsonii N6.2 when added as the sole fatty acid source to MRS media. The genes involved in these processes are unknown. Our objective was to identify genes involved in uptake and utilization of erucic acid, as well as genes responsible for the bile-mediated hypervesiculation phenotype. Because Lactobacillus johnsonii N6.2 is unable to undergo genetic manipulation, a chemical mutagenesis strategy was utilized. The growth kinetics and production of EVs in mutants with altered phenotypes in bile or EA supplemented media were analyzed and their DNA submitted for sequencing. Bacterium with altered growth in bile correlated with fewer EVs. These data provide evidence that the production of EVs is attributable to specific genes whose expression is altered at the transcriptional level by bile.

PRESENTER(S): Melanie Beceiro, Michelle McGrath
AUTHOR(S): Melanie Beceiro, Michelle McGrath, Heather Vincent, Ryan Nixon
FACULTY MENTOR(S): Heather Vincent

Taking A Strong Stance on Soft Steps

Running is an incredibly popular form of physical activity. However, running-related injuries have become increasingly common among athletes, particularly Achilles pain (Kakouris et al., 2021). Traditional running biomechanics in existing literature have been limited in scope by pre-processing methods and limited measurements to regions of interest (Johnson and Davis, 2021). In a sample size of n=13, time derivatives of ground reactions forces (load rate) show distinct patterns for athletes experiencing this condition. For example, patients with Achilles pain demonstrated shorter stance time during running gait, resulting in higher impulses measured due to decreased time on the ground per leg. The absolute minimum load rate also exhibited significant differences between control and Achilles pain groups. The Achilles pain group exhibited a mean absolute minimum load rate at 102.53 ms, while it occurred later in the control group (142.47 ms). This difference supports existing literature that found athletes with Achilles pain to brake earlier than necessary during gait. Another difference was noted in gait asymmetry as the Achilles pain group had higher variability in the mediolateral forces applied on each leg, indicating greater instability. These loading patterns may be adjusted through gait retraining as athletes learn better running techniques.

PRESENTER(S): Michelle McGrath, Melanie Beceiro
AUTHOR(S): Michelle McGrath, Melanie Beceiro, Jamie K. Bolling, Lydia Pezzullo, Heather K. Vincent (mentor)
FACULTY MENTOR(S): Heather Vincent

Sex-Related Differences in Weight Training Related Injuries from the National Emergency Injury Surveillance System (NEISS)

Our purpose was to compare the anatomical location, type, and mechanism of weight training and equipment-related injury patterns between males and females over ten years. Using the National Electronic Injury Surveillance System (NEISS), we analyzed 24,019 patients treated in emergency departments from 2013-2022 for lifting-related injuries. Non-parametric statistics were used. Sprain/strain, contusion, upper arm injury, and fracture were the most common injury types. Compared to females, males had a higher incidence of sprain/strain (34.6% vs 29%) and upper arm strain injury (15.1% vs 14.1%; both $p<.05$). Females had a higher incidence of contusion (14.3% vs 7.5%) and fracture (10.1% vs 7.8%; both $p<.05$) compared to males. Anatomical locations, including back (lumbar, low back), chest, shoulder, and biceps were more likely to be injured among males ($p<0.001$). Females demonstrated higher incidence of knee, ankle, foot, and hand injuries than males (all $p<.05$). Females more frequently incurred injury due to dropped weight, being hit with equipment, and falling than males (all $p<.05$). Inexperience and safety preparation in a gym environment may explain these findings in females. Better training on weightlifting form may help reduce preventable injury.

PRESENTER(S): Isabelle Gerzenshtein
AUTHOR(S): Isabelle K Gerzenshtein , Marisa O Pacheco, Elizabeth L Aikman, Hannah K Bagnis, Travis D Truong, Cathrine A Beshay, Whitney L Stoppel
FACULTY MENTOR(S): Dr. Whitney Stoppel

Rheological Evaluation of Silk Fibroin Hydrogels: Influence of Polymer Characteristics and Crosslinking

Silk fibroin hydrogels offer significant promise for applications in tissue engineering and regenerative medicine due to their biocompatibility and tunability. Current silk-derived hydrogels are typically physically crosslinked, resulting in transparency loss and brittle behavior, particularly in those with high crystalline content; thus, limiting applications in dynamic biomedical environments. This work investigates the rheological behaviors of both traditional and novel hydrogels, focusing on the impact of physical, chemical, and photocrosslinking methods on the loss and storage moduli, as measured through shear rheology. We intend to assess whether gels formed through photocrosslinking methods can retain the beneficial elastomeric properties of the fibroin macromers, which often diminish over time in traditionally physically crosslinked hydrogels. The research also examines the influence of silk fibroin's molecular weight and concentration under varying conditions to determine their impact on hydrogel behavior and stability. By understanding the impact of such parameters, we aim to enhance material design for biomedical applications. Possible uses include developing dynamic stiffening disease models, transparent materials, drug delivery systems, and self-stable silk solutions. This investigation specifically allows for increased understanding of both emerging and conventional silk hydrogels' mechanical properties, essential in guiding the development of silk hydrogels for practical medical applications.

PRESENTER(S): Tara Chandra, Christopher Groff, Jennifer Kang, Suraj Raghunathan
AUTHOR(S): Matthew Eddy, Sreyashi Das, Tara Chandra, Christopher Groff, Jennifer Kang, Suraj Raghunathan
FACULTY MENTOR(S): Matthew Eddy

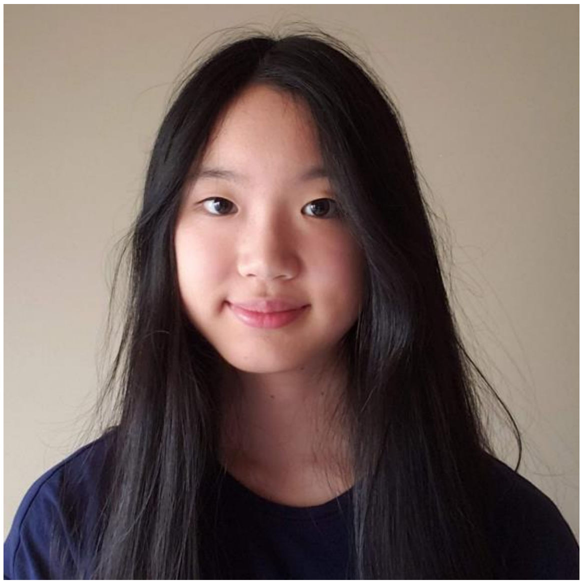
PEGylation of Amino Acid Residues for Enhanced Stability in Human Galectin-3 (Gal3C)

Galectin-3 (Gal3C), a carbohydrate-binding protein, plays diverse roles in cellular processes. Here, we investigate the generation of structurally stable Gal3C variants through targeted mutagenesis of specific amino acid residues. Stable proteins offer advantages in study, manipulation, and potential therapeutic applications. Site-directed mutagenesis allows precise alteration of amino acids based on their properties and functional effects. Our goal is to develop stable Gal3C variants for potential clinical applications that mimic Gal3C's beneficial effects while mitigating its negative ones. These variants could hold promise in preventing further tumor development and combatting cancer metastasis. Previously, our lab addressed Gal3C's instability using PEGylation (covalent modification with polyethylene glycol). Results suggested direct interactions between Gal3C and PEG, influencing thermal stability and intermediate formation. To address this, we aim to identify and test multiple optimal amino acid residues for site-directed mutagenesis, substituting the chosen residue with cysteine. Subsequently, polyethylene glycol (PEG) will be attached to the mutated protein. The final phase involves evaluating the stability of the modified protein by subjecting it to different temperatures, allowing us to discern its resilience to denaturation. This approach offers a comprehensive strategy for improving Gal3C stability, with potential implications for therapeutic cancer interventions involving this protein.

PRESENTER(S): Anna Lackovic
AUTHOR(S): Anna Lackovic
FACULTY MENTOR(S): Michael McDonald

Turnout Effects of SB-90 in Florida's 2023 Municipal Elections

In Spring 2021, the Florida Legislature passed SB-90, a bill that increased restrictions on voting for election security purposes. However, some of the changes limit voter access to resources. Prior to 2022, Floridians who requested a vote-by-mail ballot would receive a mail ballot for any election held through the next two general elections. One of SB-90's provisions was to end Florida's semi-permanent mail ballot status by requiring eligible voters to request a mail ballot prior to each election, starting after the November 2022 election. I examine the turnout effects of the new mail ballot request requirements on Florida's municipal elections in 2023. Through empirical analysis and comparison, I find that Palm Beach County overall turnout declined compared to similar 2021 elections, with this decrease in turnout aligning with an almost identical decrease in vote-by-mail turnout. In Miami-Dade County, overall turnout decreased, but overall breakdown of voting methods show that voters substituted vote-by-mail for another method. Additionally, demographic analyses show the voted electorate is becoming more diverse, which signals that vote-by-mail usage decreased. These patterns support existing research that both finds that legislation changes cause a decrease in turnout and when turnout does not decrease, substitution effects are seen.



PRESENTER(S): Laura Chang
AUTHOR(S): Laura Chang
FACULTY MENTOR(S): Prabhat Mishra

Deflating Data Bias through Guided Diffusion

Deep learning has gained a reputation as a powerful tool for executing large-scale tasks in computer vision applications. However, many image datasets used to train neural networks hold inherent biases (e.g., preference towards specific features). A biased dataset does not accurately represent a model's use case, resulting in skewed outcomes, low accuracy, and poor generalization. Thus, there is a critical need to develop efficient techniques for deflating data bias. While there exist promising data augmentation-based solutions, they have serious limitations in terms of scalability and effectiveness. Moreover, the reliance of these approaches on automatic scraping of web images can lead to ethical concerns over copyright and licensing laws. In this work, we propose an automated data augmentation framework for reducing data bias through the use of generative deep learning models. Specifically, we employ guided diffusion models to achieve automatic data augmentation. Our proposed approach is able to target underrepresented features during data augmentation and employs various strategies to optimize conditional generation in order to produce high fidelity results. Experimental evaluation demonstrates that our proposed approach achieves significant improvements in bias reduction and time efficiency.

PRESENTER(S): Ian Lange
AUTHOR(S): Santosh R. Rananaware, Katelyn S. Meister, Grace M. Shoemaker, Emma K. Vesco, Luke Samuel W. Sandoval, Jordan G. Lewis, August P. Bodin, Vedant N. Karalkar, Ian H. Lange, Brianna Lauren Maria Pizzano, Minji Chang, M.Reza Ahmadimashhadi, Sarah J. Flannery,
FACULTY MENTOR(S): Piyush Jain

PAM-Free Diagnostics with Diverse Type V CRISPR-Cas Systems

Type V CRISPR-Cas effectors have become a revolutionary innovation in diagnostics by allowing for the detection of nucleic acid targets. Despite this they are nonetheless dependent upon the presence of protospacer adjacent motif, or (PAM) sites that create a significant restriction on their versatility. A novel method named PICNIC can be used to eliminate the PAM constraint via the use of a high-temperature, high-pH treatment to separate the original double-stranded DNA (dsDNA) into single-stranded DNA (ssDNA) that can be detected with Cas12 enzymes without the need for a PAM site. The ability of the PICNIC method is shown with three different Cas12 family subtypes – Cas12a, Cas12b, and Cas12i. Also demonstrated is the ability of PAM-independent detection with a combined truncated 15-nucleotide spacer containing crRNA, with the application for the detection of non-canonical PAM sequences as well as single nucleotide polymorphisms (SNPs), as demonstrated through the detection of a drug-resistant HIV-1 variant at a PAM-less region within the genome. This approach is translated to clinical samples from human serum via the detection and genotyping of HCV-1a and HCV-1b variants with 100% specificity.

PRESENTER(S): Alexis (Lexi) Donaldson
AUTHOR(S): Alexis Donaldson
FACULTY MENTOR(S): Jenee Duncan

Gender Role Attitudes, Parental Stress, and Intimate Partner Violence in Latinx Adolescent Parents

The purpose of this study was to examine how parental stress and gender role attitudes were associated with intimate partner violence (IPV) perpetration and victimization in Latinx adolescent parents. I also explored if the interaction between parental stress and gender role attitudes would have a significant association with IPV. I hypothesized that egalitarian gender attitudes would be negatively associated with IPV perpetration and victimization, while parental stress would be positively associated with perpetration and victimization. This association was examined using a multiple regression analysis. Results indicated that higher levels of parental stress were associated with higher levels of IPV perpetration and victimization. Gender role traditionalism was also associated with higher levels of IPV perpetration. I also found a significant association between gender attitudes and parental stress, but this interaction did not have a significant association with IPV perpetration or victimization.

PRESENTER(S): Lauryn Tyler
AUTHOR(S): Lauryn Tyler
FACULTY MENTOR(S): Marit Ostebo

Aesthetic Microtrends and Aspirational Identity

On sites like Instagram, TikTok, and Pinterest, there has been a development of “aesthetic microtrends”. Aesthetic microtrends can be described as digital performances in which visual cues are associated with one’s personal identity. These are defined by pictorial symbols one shares to their profile. Interviews and digital ethnography were used to investigate how these microtrends are tied to identity and what they constitute. Social media websites Instagram, Pinterest, and Youtube were used as ethnographic sites to look more expansively at the performance of these trends where interlocutors were pulled from the University of Florida's student population. Interlocutors were aware of aesthetic microtrends but didn’t claim to identify within a specific niche. Instead, they felt their social media was a partial expression of who they truly are or who they wanted to be. Adherence to these microtrends are ways of constructing an aspirational identity, not necessarily expressions of who they are in reality. According to the interlocutors, there is meaning beyond the posts on social media that are tied to one’s lifestyle or personality. Due to this symbology, people build online personas through the curation of visual cues that indicate an aspirational identity.

PRESENTER(S): Anthony Liao
AUTHOR(S): Anthony Liao, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Pamela and Douglas Soltis

Niche Modeling for Erythrina herbacea and Lonicera sempervirens and their Projected Response to Climate Change

Florida hardwood forests host numerous plant and animal species, many of which are endangered. Florida's unique geography and geology provide habitats for many temperate as well as tropical species, allowing for numerous, diverse ecosystems. Studying these ecosystems helps in conserving biodiversity. The goal of our project is to find occurrences of specific hardwood forest species, create niche models, and use those models to estimate what their distributions might look like in the future given current projections for climate change. That is, where will the suitable niche space for these species be located in the future? The two species we focused on are Erythrina herbacea, a thorny shrub with brilliant red flowers and Lonicera sempervirens, an understory vine with red trumpet-shaped flowers. We downloaded occurrence points and used the information to create niche models for their current occurrences. Then, using databases for climate change projections we produced niche models to make future projections for 2050 and 2100. The findings for these two species, when combined with similar projections for other hardwood forest species, will allow us to better understand how Florida plant communities may change; certain species may become more narrowly distributed and others may expand or alter their range.

PRESENTER(S): Bella Gonzalez
AUTHOR(S): Bella Gonzalez, Faith Dunlap, Thien Nguyen, Arik Hartmann, Ana V. Longo
FACULTY MENTOR(S): Ana Longo

Conundrum in the Canals: Assessing Fecundity and Pathogen Potential in Introduced Typhlonectes natans

Caecilians are an order of limbless amphibians native to the tropical and subtropical regions of South and Central America, Southeast Asia, and Sub-Saharan Africa. In 2019, a single Rio Cauca Caecilian (Typhlonectes natans) was captured in a canal in Miami-Dade County, Florida, representing the first record of a wild caecilian in the United States. Numerous individuals have since been captured in the same canal system, generating potential for new lines of research concerning the ecology and impacts of the introduced population. Here, we aim to explore the body and breeding condition of caecilians within the introduced population, in addition to assessing the potential of T. natans in spreading amphibian diseases. We performed necropsies on 24 T. natans collected in south Florida, recording traits related to body and breeding condition. We also obtained skin swabs and tissue samples from each individual, which we used to detect infections with common amphibian pathogens, such as Ranavirus and Batrachochytrium dendrobatidis. Our findings may provide insights to the ability of T. natans to survive and spread in south Florida, as well as their role as a vector of disease to native amphibians.

PRESENTER(S): Brandon Isenman
AUTHOR(S): Brandon Isenman
FACULTY MENTOR(S): Renata Serra

African Youth Perspectives: An Analysis of "Waithood" Through Afrobarometer Data

In many African nations, large youth demographics, uncertain economic conditions, and disconnected political institutions have made the transition to adulthood for African youth markedly challenging, resulting in what is termed "Waithood." Waithood is a liminal space of personal development, leading to the inability to satisfy resource-demanding social expectations. Literature on African youth and Waithood suggests that such conditions have unique systemic implications, confining youth to informal employment and driving them to seek forms of social expression outside of formal political engagement. Most studies, however, have focused on single qualitative case studies. This article is the first attempt to assess Waithood quantitatively through comparative analysis. Using Afrobarometer survey data across six African nations (Ghana, Mali, Niger, Senegal, Sierra Leone, and Tunisia), statistical analysis was employed to examine responses among youth and non-youth regarding economic and political engagement. Significant differences between youth and non-youth were found in their likelihood to attend protests, approval of the government in handling the economy/unemployment, participation in political parties/voting, and perceptions of the efficacy of elected officials. The results demonstrate the promises of assessing Waithood through large-scale survey data and for incorporating such a phenomenon in future quantitative analyses of African youth institutional involvement.

PRESENTER(S): Jorge L. Alberto
AUTHOR(S): Jorge L Alberto, Justin Golabek, Erin Patrick, Matthew Schiefer
FACULTY MENTOR(S): Erin Patrick

Expanding artificial neural network-based rapid prediction of biological nerve fiber activation for DBS applications

Objective. Artificial neural network (ANNs) based rapid predictors optimize deep brain stimulation (DBS) by predicting neural activation in response to electrical stimulation, while minimizing tradeoffs between computational expense and accuracy. Previous ANNs have predicted neural activation under monopolar electrode configurations, but this is only representative of a subset of configurations that can occur during DBS programming. We sought to expand the generalization capability of this ANN to many commonly used electrode configurations. Approach. We developed two variations to predict the response of individual, myelinated axons to extracellular electrical stimulation. Training used datasets generated from a finite-element model of an implanted DBS system together with multi-compartment cable models of artificially generated axons. We evaluated the ANN-based predictors using white matter pathways derived from group-averaged connectome data within a patient-specific tissue conductivity field, comparing both predicted stimulus activation thresholds and pathway recruitment across a clinically relevant range of stimulus amplitudes and pulse widths. Preliminary results. The ANN successfully predicted neural fiber activation for monopolar, multimonopolar and bipolar electrode configurations, expanding the scope of our previous predictor model.

PRESENTER(S): Rachel Warren
AUTHOR(S): Rachel Warren, Dalia El-Shafie, Tian Lin, Natalie Ebner
FACULTY MENTOR(S): Natalie Ebner

Age moderates effects of stress on positive and negative emotion identification

Emotional identification, the detection of others' emotions, is a crucial aspect of social cognition, necessary for effectively navigating social relationships (Goncalves et. al, 2018). While age-related differences in social cognition are mixed, previous research indicates that older adults generally perform worse in emotion identification tasks and demonstrate a positivity bias (Ebner, Horta, and El-Shafie, 2023; Fernandes et. al, 2021). Moreover, stress is associated with decreased emotional recognition abilities in younger adults, but its effect on older adults is understudied (Hänggi, 2004; Mikneviciute et. al, 2022). This cross-sectional research investigates the effects of stress on emotion identification accuracy between younger and older adults. The Perceived Stress Scale was used to measure participants' recent stress. The TASIT-S Part 1 was used to measure emotion identification performance. A regression analysis was performed to examine the relationship between perceived stress and performance on negative and positive emotion identification, and the modulatory effects of age. The results indicate that higher stress is linked to more accurate negative, but not positive, emotion identification in older adults only. The findings further clarify stress' impact on social cognitive abilities for different age groups, and is critical for understanding how to best promote social cognition across the lifespan.

PRESENTER(S): Jay Nibhanupudy, Ananya Sista
AUTHOR(S): Jay Nibhanupudy, Ananya Sista, Dave Lizdas, Christopher Samouce, Simon Mesber, Samsun Lampotang
FACULTY MENTOR(S): Christopher Samouce

Developing Methodologies for the Expedient Translation of Medical Simulations

At the Center for Safety, Simulation, and Advanced Learning Technologies (CSSALT) we have developed numerous Unity simulations for the purpose of training clinicians. In doing so, some of our products have received international interest. However, translating those simulations to different languages, such as Korean and Spanish, has presented difficulties, because it is rare for translators to also have the skillset to encode translations in Unity. In this poster, we present a potential methodology for simplifying the translation workflow such that translators do not need to know how to code in order to translate medical simulations. The methodology that we have created involves the use of the NanoXLSX library (a C# NuGet package) to create Excel files from simulations. The Excel files generated from our program can then be easily modified by a translator with no knowledge of Unity and then reread by the program to automatically translate the simulation. In particular, this translation methodology has been used to translate web-based anesthesia courses such as Low Flow Anesthesia & Quantitative Neuromuscular Monitoring.

PRESENTER(S): Jacqueline Aloumanis
AUTHOR(S): Jacqueline Aloumanis, Priya Kanjani, Barbara Smith
FACULTY MENTOR(S): Barbara Smith

Effect of Acute Intermittent Hypoxia on Progressive Augmentation in ALS: Case Series

Acute intermittent hypoxia (AIH) is a therapeutic approach that consists of short periods of breathing decreased oxygen, separated by breathing normal air. AIH has potential to induce long-term facilitation, a type of plasticity where motor function improves beyond the hypoxia delivery. AIH can also trigger progressive augmentation (PA), another form of plasticity seen as gradual increases in breathing during the AIH intervention. This is important to people with amyotrophic lateral sclerosis (ALS), as their breathing ability deteriorates over time. A recent study in people with ALS found respiratory long-term facilitation after AIH, but it is not known whether PA occurred. The objective of this research is to investigate whether AIH leads to progressive augmentation in four people with ALS. During gas interventions, which consisted of 15 one-minute cycles of study gas separated by normoxia, inspiratory flow and pressure were recorded using a facemask. Minute ventilation was then compared during the initial and final hypoxic episodes over a course of 4 visits. When compared to early AIH, contrary to our hypothesis, minute ventilation significantly decreased at the end of gas interventions. Although PA did not occur in these patients, additional study will identify its impact on long term facilitation of breathing.

PRESENTER(S): Juan Perez Mosquera
AUTHOR(S): Juan Perez Mosquera, for the SBND collaboration
FACULTY MENTOR(S): Heather Ray

Investigating Kaon Reconstruction in SBND

The Short Baseline Neutrino Detector (SBND), located at Fermi National Accelerator Laboratory in Illinois, is a liquid Argon (LAr) based particle physics experiment that studies beams of neutrinos created by the Booster accelerator. The interaction of neutrinos with the LAr produces a collection of sub-atomic particles, one of which is the Kaon. The study of neutrino-induced Kaon production is important to the search for proton decay. In the investigation of the tracks Kaons make as they travel through our detector, we have discovered that the track reconstruction code is incorrectly reconstructing the direction of the Kaon track 10-20% of the time. This poster will introduce the SBND experiment and the investigation into the Kaon backward track issue.

PRESENTER(S): Avril Rosano
AUTHOR(S): Marie-Gabrielle Ayika, Avril Rosano, Jacqueline Valiente, Seemanti Chakrabarti, Jeffrey A Rollins, Braham Dhillon
FACULTY MENTOR(S): Braham Dhillon

Characterizing the palm pathogenic Thielaviopsis paradoxa species complex in Florida

Thielaviopsis paradoxa sensu lato is a soilborne fungal pathogen that causes heart and trunk rot of palms. Loss of structural integrity due to rot causes palm trunk to collapse suddenly and poses a serious threat to life and property. Even though rudimentary knowledge about Thielaviopsis infection process is available, nothing is known about the species complex in the US. This study aimed to characterize T. paradoxa s. lat. isolates collected from diseased palms in Florida. A multi-locus phylogeny revealed that isolates separated into two distinct clades with majority clustering with species T. ethacetica, while two isolates formed a separate clade and represent an undescribed Thielaviopsis species. Differences in gross colony morphology and growth rate were observed between the two clades when grown on three media and four temperatures. Thielaviopsis ethacetica was more aggressive as it produced larger lesions when inoculated on wounded leaflets. Variation in mycelial growth in response to different fungicides was also observed between the two clades. These results demonstrate the existence of two Thielaviopsis clades that can infect palms in Florida and underscore the need for targeted sampling to help uncover the diversity of Thielaviopsis species across palm growing regions in the US.

PRESENTER(S): Marium Abdulhussein
AUTHOR(S): Marium Abdulhussein
FACULTY MENTOR(S): Marcia DiStaso

Unveiling Insights from Entry-Level Communicators

This report analyzes results from a survey on entry-level professionals in the communications industry. With a combination of open and close ended questions, the study shares insights into the challenges and opportunities that entry-level communicators face and what they are looking for in potential employers. The report serves as a resource for both employers and aspiring communicators, offering recommendations to enhance talent development, workplace culture, and educational initiatives to attract high-achieving employees. By addressing key concerns and opportunities for growth, the study can prepare budding professionals on what they will be facing as they enter the field.

PRESENTER(S): Olutimilehin Sobanjo, Audrey Edwards
AUTHOR(S): Audrey Edwards, John McDonald, Olutimilehin Sobanjo
FACULTY MENTOR(S): Dr. Stepien Tracy N/A

Irrational Behavior: A Mathematical Approach to Modeling Aggression and Responses to Aggression

This study investigates the dynamics of different subpopulations of humans based on the manner in which they react when faced with aggressive behavior, as well as the stability of these subpopulations over time based on the type of societal environment they are placed in. A multivariate Lotka-Volterra model was used to run simulations with parameters adjusted to represent when retributive versus meditative punishment is the dominant societal norm in response to aggressive behavior. Stability analysis revealed that balancing aggression and punisher coefficients in our system is crucial for long-term stability of the society. The adaptive mediation strategy exhibits potential in managing aggression levels. Recommendations for better accommodating the model for human behavior are provided.

PRESENTER(S): Samantha Alicea
AUTHOR(S): Samantha Alicea, Aria Deluna, Adam C.N. Wong
FACULTY MENTOR(S): Adam C.N. Wong

Comparison of Chironomid (Insecta: Diptera) Larvae Microbiome Vibrio cholerae Infection Susceptibility Under Altered Temperature Conditions

Vibrio cholerae is a gram-negative bacterium responsible for numerous global outbreaks of cholera, a severe diarrheal disease. Chironomids have been implicated as environmental reservoirs of this pathogen. Previous research has shown that native gut microbiota can be antagonistic to the invasion of pathogens, such as Escherichia coli and Clostridium difficile in various models. Thus, we are interested in how temperature disruption of the chironomid gut microbiome may influence susceptibility to V. cholerae invasion. Chironomid larvae were treated with V. cholerae infection under normal and elevated rearing temperatures, then microbiome composition and V. cholerae infection were compared by quantifying the number of colony-forming units (CFU) present on selective and non-selective LB agar plated with insect homogenate. Microbiome composition was characterized based on colony morphology, and then through PCR and Sanger sequencing. Whole microbiome composition increased in the elevated rearing temperature across both infection-treated on non-treated groups. Sequencing revealed that 15 morphologies were differentially abundant between all the treatment groups, with infection rates increasing by 27.8% in HC16 and decreasing by 6.3% in C6706 at an elevated rearing temperature. These results indicate that some V. cholerae strains may respond better to temperature-associated shifts in chironomid microbiome composition.

PRESENTER(S): Kylie Hollis
AUTHOR(S): Kylie Hollis
FACULTY MENTOR(S): Anna Braswell

Examining impacts of shell origin and mobility on recruitment of Eastern oysters

Eastern oysters (Crassostrea virginica) are ecosystem engineers well-known for their provision of ecosystem services like water filtration and shoreline stabilization. Despite their importance, oyster populations are declining globally, including the Big Bend region of Florida. In response, oyster restoration efforts are underway to recover lost reefs. Many efforts involve use of cleaned recycled shells without biofilm, despite existing evidence that oyster larvae preferentially settle based on specific biofilm signatures. To advance this research, I investigated how substrate stability and shell origin impact larval settlement. In this study, I fully crossed mobility (unanchored, fully anchored, partially restrained) and shell origin (recycled vs. local) treatments. These treatments were replicated at two intertidal oyster bars in the Corrigan's Reef complex (Cedar Key, FL; n=6 per treatment). I will use ImageJ to assess settlement per shell and a mixed modeling approach to detect settlement patterns. I anticipate that unanchored and recycled shells will experience less settlement, possibly due to increased abrasion and lack of chemical cues. Study results will inform oyster restoration efforts, showing if energetic areas are suitable for shell-based restoration and allowing restoration managers to make informed decision about oyster restoration substrate.

PRESENTER(S): Bryanna Broderick
AUTHOR(S): Bryanna Broderick, Hannah M. Costello, Michelle L. Gumz
FACULTY MENTOR(S): Michelle Gumz

Sex Differences in Adrenal-Kidney Clock Talk

Circadian rhythms are 24-hour oscillations that are regulated by a molecular clock that exists in nearly every tissue in the body. The core proteins that coordinate this clock are BMAL1, CLOCK, CRY, and PER. In our lab, we study how these clock proteins impact renal function. Published data from the lab has shown that kidney specific KO of PER1 led to increased renal sodium retention and changes in adrenal clock expression in male mice. This led to our hypothesis that there is an adrenal-kidney clock crosstalk that could implicate kidney function.

In order to evaluate this, we utilized adrenal-specific Bmal1 KO mice. Kidneys from AS-Bmal1 KO and control male and female mice were collected at 6am and 6pm. RNA was isolated and clock gene expression was assessed by quantitative PCR.

Here, we show significant differences in multiple clock genes in the kidney, including Bmal1, Clock, Cry1, and Cry2, with no changes in Per1. These changes differed between males and females and at different times of day.

These data support the hypothesis that adrenal-kidney clock crosstalk exists and interestingly, appeared different between males and females. Future work will look to see if other tissue clocks change such as in the liver.

PRESENTER(S): Adriana Fortier
AUTHOR(S): Adriana Fortier
FACULTY MENTOR(S): Adrienne Strong

Power and Identity in Patient-Healthcare Provider Relationships

This paper investigates the accumulation of power imbalances in healthcare by featuring the patient experience. Power plays a role in every relationship, and when used as a form of control, it can shape behavior, thoughts, and perceptions, ultimately impacting the quality of care. The study considers patients' perceptions of power and how identity, such as race and disability status, intersects with social status and power. Three methods were used for data collection: five patient interviews, online doctor reviews, and twenty-five online surveys. The data presents concrete examples of the nuanced interactions between patients and doctors. The autoethnographic section of this paper exists as a way to acknowledge the author's experience and positionality, intending to better capture the complexities of the human experience. Participants expressed mixed feelings about the American healthcare system, with women mainly focusing on negative experiences with gynecologists. Insurance and dismissal were cited as the biggest barriers to quality healthcare. Common behaviors that participants claimed increased their comfort in a clinical setting were attentive listening and eye contact. Doctors should be aware of how patients perceive their power and should encourage patient collaboration. Understanding these dynamics can help improve patient-provider relationships and healthcare outcomes.

PRESENTER(S): Anh Hao Dang
AUTHOR(S): Anh Hao Dang, Hong Huang, Jia Chang.
FACULTY MENTOR(S): Jia Chang

Reposition of FDA-approved antidepressant, 2-PCPA, to treat periodontitis. Trans-2-Phenylcyclopropylamin (2-PCPA) is the first generation of antidepressants. Recently, our lab found it may enhance osteogenic differentiation.This study explores the local application of 2-PCPA to treat periodontitis in a ligature-induced periodontitis mouse model. The periodontitis lesions were induced in 10-11 weeks-old C57BL/6 mice by placing 5-0 silk sutures between the 1st and 2nd maxillary molars for 12 days. Periodontal delivery of 30 µl methylcellulose gel (Sigma-Aldrich, St. Louis, MO) containing 10 mg/kg 2-PCPA or PBS control was administered by 1) during ligature placement or 2) after ligature removal. The intervention frequency is every other day (a total of six times). By the end of the experiment, all mice were euthanized, and the gingival tissue from the treatment sites was collected. Total RNAs were extracted, and the proinflammatory cytokine genes, including IL-1b, IL-6, TNF-α, and extracellular matrix degradation enzymes, were examined through real-time RT-PCR. 2-PCPA treatment significantly reduced inflammatory cytokine gene IL-1b, IL-6, TNF-α, and tissue extracellular matrix degradation enzyme MMP8 and MMP9 gene expression in periodontitis gingival lesions in early-stage and advanced lesions.The local oral administration of the epigenetic drug 2-PCPA could reduce inflammatory tissue breakdown in periodontitis.

PRESENTER(S): Leighton Levering
AUTHOR(S): Leighton Levering, Andrew Altieri
FACULTY MENTOR(S): Andrew Altieri

Fission in the coral Siderastrea sidereal: indicator of reef decline or recovery?

Coral reefs are becoming degraded at an increasing rate due to a number of anthropogenic factors. Fission of colonies due to partial mortality is known to occur in many stony coral species. Fission could be a negative indicator of colony demise or could be a positive event that allows rapid expansion through colonial growth. To determine which of these coral health outcomes is predicted by fission, we tracked 295 colonies of the massive starlet coral (Siderastrea sidereal) across three reefs in the Bocas del Toro region of Panama from 2021 to 2023. We used repeated photo surveys and AI-powered TagLab segmentation software to measure the changes in the size of these colonies as well as the incidences of fission and the number of daughter colonies formed via fission. We found that ~ 12.5% of colonies underwent fission during the 2-year period, but that the rate varied considerably between sites. Moreover, we found a relationship between the occurrence of fission and change in coral colony size. Our findings reveal how fission of coral colonies can be used as a proxy for the overall health of corals in a reef system.

PRESENTER(S): Rachael Major
AUTHOR(S): Rachael Major, Dr. Diba Mani
FACULTY MENTOR(S): Diba Mani

Curriculum Internationalization on Intercultural Skills and Content Comprehension in APK 3200: Motor Learning in the Classroom: Abroad versus Online

Curriculum internationalization incorporates global, international, and/or intercultural elements into course content to develop students' intercultural critical thinking and communication skills. While most previous work focuses on liberal arts and language courses, evidence is lacking in the context of STEM (science, technology, engineering, mathematics) courses. The internationalization of higher education within the course, APK 3200: Motor Learning, UF College of Health and Human Performance, was the focus of this study. This study examined the self-reported development of global, international, and intercultural competencies in undergraduates participating in identical course content, either solely online or in combination with a study abroad setting. Voluntary, anonymized feedback provided by 29 students during Summer 2023 (ABROAD) and 39 students during Fall 2023 (ONLINE) was electronically collected at the start (PRE) and end (POST) of each semester with measures of demographics, perceived intercultural critical thinking and communication skill development, and course content. The results indicate a greater improvement in intercultural skill development in the ABROAD group than in the ONLINE group while suggesting that curriculum internationalization in online STEM courses does not negatively impact students' ability to comprehend course content.

PRESENTER(S): Emily Kim
AUTHOR(S): Emily H. Kim, Jessie A. Pelosi, W. Brad Barbazuk, Emily B. Sessa
FACULTY MENTOR(S): Brad Barbazuk

Gene expression patterns between gametophyte and sporophyte life phases in ferns

All land plants alternate between diploid sporophyte and haploid gametophyte generations, yet ferns and lycophytes are unique in that these life phases are nutritionally independent. The two phases share a single genome and share similarities in the genes expressed, yet have vastly different morphologies and functions. Recent studies in ferns showed that up to 90% of genes are expressed in both life phases with similar expression levels. To start unraveling the genetic underpinnings that drive the functional differences, we analyzed differential gene expression (DGE) in the fern Dryopteris ludoviciana. We extracted and sequenced RNA from sporophyte and gametophytes reared in the same environmental conditions and assembled a de novo transcriptome to assess DGE. We compared our results with data from representative species of the major clades of land plants. We found that 9.9% of genes were differentially expressed between sporophytes and gametophytes of D. ludoviciana, similar to results from Polypodium. By integrating data from a wide phylogenetic breadth, we were able to find that the functions of genes related to growth and regulation were consistently upregulated in the gametophyte and sporophyte, respectively. These results aid in understanding the genetic forces behind the differentiation of life phases in land plants.

PRESENTER(S): Quyen Nguyen
AUTHOR(S): Quyen Nguyen and Stephanie Karst
FACULTY MENTOR(S): Stephanie Karst

Investigating the Mechanism used by Murine Norovirus to Breach the Epithelial Barrier

Noroviruses are the leading global cause of virally induced gastroenteritis across all age groups. Despite the prevalence, little is known about the mechanisms dictating norovirus-induced disease. Murine norovirus (MNV) has been a widely used model that has advanced the understanding of norovirus biology. Although highly genetically similar, different strains of MNV have been associated with different, in vivo pathogeneses: diarrheagenic strains such as MNV1 and WU23 infect subepithelial intestinal cells while CR6 infects specialized epithelial cells called tuft cells. The molecular basis underlying this difference remains unclear, although it has been previously reported that in the absence of a epithelial barrier, CR6 efficiently infects immune cells. We hypothesize that its restriction from immune cell infection in vivo derives from an inability to transcytose the epithelial barrier. To assess this hypothesis, I will utilize primary organoid and immortalized epithelial cell cultures to measure transcytosis efficiency between WU23 and CR6 in the presence of well-established routes for macromolecular transport: Microfold cells and antigen presenting immune cells that extend transepithelial dendrites. Subsequently elucidating the mechanisms of host restriction responsible for CR6 attenuation will provide insight into how diarrheagenic strains avoid this restriction to establish subepithelial infection and cause disease.

PRESENTER(S): Jasmyne Nelson
AUTHOR(S): Jasmyne Nelson
FACULTY MENTOR(S): Abigail Fagan

Disparities in the Juvenile Justice System: Understanding Racial Disparities in Arrest

From arrests to dispositions, there is a disparity between youth of color and White youth at every stage of the juvenile justice system. This phenomenon, known as Disproportionate Minority Contact (DMC), is a serious and federally recognized issue. While studies have investigated DMC in recent years, more research is needed. This study assesses if the race of juveniles, specifically identifying as Black or White, impacts whether juveniles report being arrested. The present study uses the results from the 2022 Florida Youth Substance Survey (FYSAS), in which middle school and high school students in the state of Florida are asked questions assessing substance abuse, delinquency, and risk and protective factors. Binary logistic regressions revealed that Black youth had a higher likelihood of reporting being arrested compared to White youth. Risk and protective factors increased and decreased the likelihood of arrest for all students but did not alter the relationship between race and arrest. Additionally, focus groups with college students and interviews with juvenile justice personnel and community stakeholders will be conducted to provide a better understanding of DMC. The results illustrate that more needs to be done to better understand how DMC operates within the arrest stage, and identify possible solutions.

PRESENTER(S): Vedic Sharma
AUTHOR(S): Vedic Sharma, Damon Lamb
FACULTY MENTOR(S): Damon Lamb

A Machine Learning Based Analysis of Structural Brain Changes Associated with Post-Traumatic Stress Disorder

Post-Traumatic Stress Disorder (PTSD) is a prevalent mental disorder following traumatic incidents. While much research has been done on functional brain changes associated with PTSD, growing data has also indicated that certain structural changes in the brain are associated with this disorder. Advancements in machine learning have provided an effective method to study these structural alterations. The purpose of this project was to train a Convolutional Neural Network (CNN) machine learning model with structural T1-weighted (T1w) MRI scans to predict PTSD Checklist for DSM-5 (PCL-5) scores. Following this, a novel application of explainable artificial intelligence (XAI) techniques was implemented to highlight areas of the brain relevant to the decision making of the model, consequently indicating structural changes in the brain that may be relevant or associated with PTSD. Initial model training with a limited dataset yielded poor model performance in spite of data augmentation techniques. This indicates the need for a larger comprehensive dataset, with upwards of 10,000 images, for better performance. As such, this project is ongoing, with a need to obtain data from external sources including the UK Biobank or Enigma study to acquire the necessary amount of data.

PRESENTER(S): Ryan Cassidy
AUTHOR(S): Ryan Cassidy
FACULTY MENTOR(S): Andrea, Neill Torvinen, Wallis

Evaluating Portable X-Ray Fluorescence Spectrometry (pXRF) versus Neutron Activation Analysis (NAA) in Florida Ceramics

Pottery is an important form of material culture left behind by past peoples, because it provides clues for understanding the people who produced them. Understanding the full pottery production sequence (i.e., as a whole vessel form and its decoration down to its chemical makeup) is crucial archaeological research. For example, investigating the raw materials used in pottery production allows us to determine where different vessels were made and how. Of the many methods developed in archaeological chemistry this poster will compare two to determine whether a more affordable and efficient method (portable X-Ray Fluorescence Spectrometry, pXRF) can produce results that are comparable to the more expensive industry standard (Neutron Activation Analysis, NAA). Previous research in the Florida Museum's Ceramic Technology Lab involving NAA has chemically characterized 119 clay samples assigned to 14 regional groups throughout Florida. This project re-analyzes 100 of those samples using pXRF to evaluate the comparability of data produced by each method for distinguishing clay sources in Florida. Due to the success of similar projects elsewhere in the world, we expect this project to illustrate how analyzing the chemistry of archaeological pottery can be accomplished just as effectively but with a more accessible and economical method.

PRESENTER(S): Glen Dizon
AUTHOR(S): Glen Dizon
FACULTY MENTOR(S): Habibeh Khoshbouei

In Parkinson's Disease Patients, DAT-Expressing Regulatory T-Cells Are Lower Without Changes in Total T-Cell Counts

Parkinson's Disease (PD) is characterized by the loss of dopamine-producing neurons, with reduced levels of the dopamine transporter (DAT) and tyrosine hydroxylase (TH) in the central nervous system (CNS). Recent studies indicate a link between the immune system and neuronal degeneration in PD, but the underlying mechanisms are unclear. Previous research at the Khoshbouei lab showed an increase in DAT+/TH+ monocytes in peripheral circulation, without a change in the total monocyte count. Since the adaptive immune system, including T and B cells, works alongside innate immune cells, investigating how these cell subsets express DAT/TH in PD patients compared to healthy controls address a significant knowledge gap. My research aims to investigate changes in both innate and adaptive immunity in PD. Using flow cytometry, I will immunophenotype T cells from PD patients and age/sex-matched healthy subjects to determine if DAT activity affects T cell immune function. We found that regulatory T-cells expressing DAT were decreased in PD patients without changes in total T-cell counts, while TH expression did not significantly differ in B or T cells of PD patients. These results suggest a DAT-specific change in the immunophenotype of T-cells in PD patients.

PRESENTER(S): Daniel Singh
AUTHOR(S): Daniel Singh
FACULTY MENTOR(S): Xiaoya Zhang

How Neighborhood Safety Affects Sleep in Adolescents

Sleep is a natural process that all humans need to survive and function. It can regulate neurons and remove toxins from the brain. It is especially necessary during adolescence, the stage in a person's life where their most biological and psychological changes occur. However, the CDC reports that over 70% of teenagers aren't sleeping long enough every night. Additionally, adolescents who feel unsafe in their neighborhood are 71% more likely to experience insufficient sleep compared to adolescents who feel safe. This study sets out to examine the link between neighborhood risk and sleep length and efficiency in adolescence, an area that has been neglected in literature. The researchers hypothesized that neighborhood efficacy and neighborhood disadvantage will increase and decrease, respectively, adolescent sleep efficiency and duration. Using data from a dataset including 4,898 children born in large US cities, Pearson correlations suggested that greater neighborhood disadvantage was linked to compromised sleep efficiency ($r = -.100$, $p = .002$). The results provide imperative implications targeting improving neighborhood safety in promoting youth wellbeing.

PRESENTER(S): Esha Narla
AUTHOR(S): Taylor McElroy, Esha Narla, Han Gil Kim, Ezgi Simay Karabulut, Sung Min Han
FACULTY MENTOR(S): Sung Min Han

Loss of Nonsense-mediated mRNA Decay and its Impact on the Caenorhabditis elegans Neuromuscular System

The nonsense-mediated mRNA decay (NMD) pathway is a cellular mechanism that maintains the accuracy of mRNA by degrading both aberrant and endogenous transcripts containing premature stop codons. With aging in C. elegans, NMD is decreased in various tissues, including muscle. However, NMD's role in age-related motility decline remains undetermined. To investigate, we compared C. elegans strains with nonfunctional NMD including smg-2, smg-5, and smg-6 with control N2 worms. Motility assays, paralysis assays, and confocal imaging were used to assess behavior, neuromuscular function, and morphology across Days 1, 5, and 10 of adulthood. Loss of NMD resulted in decreased swimming behavior and decreased movement on unseeded plates. Loss of smg-2 specifically resulted in a resistance to aldicarb and levamisole phenotype indicating altered neurotransmission at the neuromuscular junction. smg-2 mutants also showed early neuronal aging phenotypes in GABA neurons and increased muscle myofilament disorganization suggesting premature aging. Notably, NMD activity declined in GABA neurons of aging wild-type worms. We propose loss of NMD affects age-related motility decline by undermining neuromuscular system integrity. Therapeutics targeting this pathway could improve motility in age-related conditions.

PRESENTER(S): Derek Simon
AUTHOR(S): Derek A. Simon, Erin C. Westgate
FACULTY MENTOR(S): Erin Westgate

The integration of life events differentially impacts ratings of the good life

When we encounter an event that is unexpected and confusing, we are driven to understand the implications of that event and to integrate it into our self-concept (Wilson & Gilbert, 2008). When we are successful in this integration process, we experience improvements in our well-being when we process negative events, but not positive ones (Lyubomirsky, Sousa, & Dickerhoof, 2006). While the effects of integration on traditional measures of well-being have been studied, researchers have not looked at how integration impacts happiness, meaning, and psychological richness. In the present work, we were particularly interested in examining if integration is necessary for experiencing psychological richness (Oishi & Westgate, 2022). Using a 2x2 experimental design, participants were randomly assigned to read stories that either had a positive or a negative outcome, which ended with the main character making sense of the outcome or not. For each story, participants rated the happiness, meaning, and psychological richness of the characters' lives on a 7-point scale. Unsurprisingly, we found that positive outcomes predicted greater happiness, meaning, and psychological richness. Lives were seen as psychologically richer when characters made sense of both positive and negative events, suggesting that integration may be a critical component of psychological richness.

PRESENTER(S): Anuj Master
AUTHOR(S): Anuj Master, Nan Hua, Zeng Jin, Tiffany B. Reccoppa, Wanyi Hu, Peiyi Zhang, Umasankar De, Tanzia Islam Tithi, Laura S. Parada, Stephanie H. Rosa, Guangrong Zheng, Weizhou Zhang
FACULTY MENTOR(S): Weizhou Zhang

Degradation of Epigenetic Modulator SETDB1 via Molecular Glue Points Toward Enhanced Anticancer Combination Therapy

SETDB1 is an epigenetic modulator responsible for silencing the endogenous retrovirus gene, an important gene in immune activation. In our research, we have found up-regulation of SETDB1 expression in the tumor microenvironment across multiple different cancer types. In response, we sought a method to degrade SETDB1 and bolster the immune response. Using HiBiT Lytic detection, we identified the molecular glue Lenalidomide as a potent degrader of SETDB1 within multiple human cancer types. Based off the structure of lenalidomide, we have evaluated multiple different analogous compounds that have both a stronger and more on-target effect. The efficacy of these compounds points toward a potential combination therapy as a means of improving current day cancer treatments.

PRESENTER(S): Nickolas Arustamyan
AUTHOR(S): Hubert Wagner, Nickolas Arustamyan, Matthew Wheeler, Peter Bubenik
FACULTY MENTOR(S): Hubert Wagner

Mixup Barcodes: Quantifying Geometric-Topological Interactions between Point Clouds

We developed a specialized software tool for computing image persistence, a tool from Topological Data Analysis (TDA) aimed at revealing topological features of datasets. By incorporating a new version of the computational topology software ripser, our tool not only facilitates the efficient calculation of image persistence but also generates statistics and visualizations. To validate its effectiveness, we applied the tool to analyze disentanglement processes within machine learning models, particularly examining the dynamics of class separation through neural network layers. The results suggest that our pipeline is a useful tool for characterizing interactions for low and high-dimensional data.

PRESENTER(S): David Chong
AUTHOR(S): David H. Chong, Troy R. Scoggins IV, Susana Bao, Yu Tin Lin, Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

Quantitative Analysis of Clustering Algorithms for Imaging Mass Spectrometry Data

Imaging mass spectrometry is a powerful analytical technique that provides spatially resolved molecular information from a sample, generating large and complex hyperspectral datasets. Clustering algorithms are essential in the analysis of such big imaging data as they help reveal underlying structures, identify molecular signatures, classify samples, and facilitate the interpretation by reducing the dimensionality of the data. Herein, we showcase a preprocessing workflow for imaging mass spectrometry dataset on control rat brain tissue samples, followed by quantitative analysis of performance by various clustering algorithms. The preprocessing pipeline encompasses data normalization, noise reduction, and feature extraction. Subsequently, various clustering algorithms are applied, including K-Means clustering, hierarchical clustering, DBSCAN, OPTICS, mean shift, affinity propagation, spectral clustering, and BIRCH, to uncover meaningful patterns and structures within complex molecular data. Clustering performance is evaluated via cluster validity indices and biological relevance to assess the ability of each algorithm to capture spatial and molecular relationships. This pipeline is demonstrated using rat brain fatty acid imaging mass spectrometry data. Our pipeline has the potential to provide researchers with a powerful tool to uncover intricate molecular relationships, patterns, and structures in tissue samples with accuracy and reliability.

PRESENTER(S): Esmeralda Hechavarria
AUTHOR(S): Xiaoya Zhang, Esmeralda Hechavarria
FACULTY MENTOR(S): Xiaoya Zhang

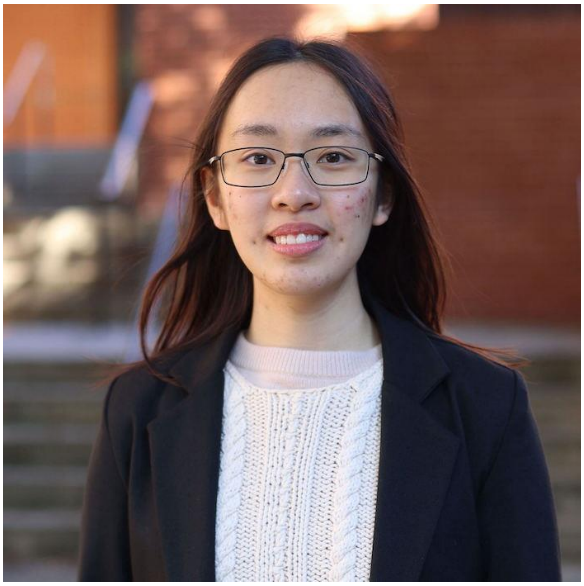
The Impact of Conflict in the Household on Students' Academic Achievement

This study examines the impact of household conflict on youth academic performance, drawing on Family Systems Theory and Bronfenbrenner's ecological model. We explore how conflict within the household, whether between adults or involving the student directly, influences academic outcomes among youth. Our research aligns with existing findings indicating a link between family conflict and adverse academic outcomes among young individuals. Utilizing data from the Florida Youth Substance Abuse Survey (N =) and correlation analyses, our study reveals that high school students responding affirmatively to questions such as "Does a parent insult you?", "Has a parent physically hurt you?", and "Have your parents physically abused each other?" exhibit lower academic performance. Our study aims to continue delving deeper into this relationship, specifically investigating how different types of household conflict—adult-adult conflict versus adult-student conflict—affect student grades. This specification allows for a precise understanding of how family conflict affects youth and may aid in finding more accurate ways of preventing and/or intervening in family conflict effectively.

PRESENTER(S): Madison Chubb
AUTHOR(S): Madison Chubb, Yang Zhang, Thomas J George, Z Hugh Fan
FACULTY MENTOR(S): Z. Hugh Fan

Engineering Microfluidic Devices for Circulating Tumor Cells Isolation

Pancreatic cancer is one of the most lethal cancers, with a 5-year survival rate of 5-10%. Metastasis is one of the most daunting challenges that exists as a barrier to reduce cancer-related mortality. Circulating tumor cells (CTCs) are cancer cells that shed from existing tumor lesions and travel through the blood circulatory system, potentially leading to cancer metastasis. CTCs are effective biomarkers that have shown significant utility with respect to tracking cancer progression and patients' responses to treatment. However, CTCs detection is limited by its extreme rarity among billions of normal blood cells. Here we report a microfluidic device that integrates both immunoaffinity-based isolation and size-based filtration to achieve a high capture efficiency of CTCs from whole blood. In this work, we utilized the microfluidic devices to monitor CTC count along the neoadjuvant treatment period for pancreatic cancer patients. This poster shows the design and working principles of our microfluidic devices in capturing CTCs and subsequent analysis.



PRESENTER(S): Lydia Chung
AUTHOR(S): Lydia Chung
FACULTY MENTOR(S): Prabhat Mishra

Secure Wrappers for Communication between Cryptographic IPs and Security Engine

Secure firmware is needed to protect critical data on embedded devices, such as health records or credit card information. Hardware security cryptographic modules enable secure computation, communication and storage of data. In previous work, cryptographic IPs were developed using cipher and hashing algorithms, including RSA, SHA, and AES. These cryptographic IPs were then tested for vulnerabilities against well-known attacks like finite-state machine vulnerability and laser fault injection attacks. After mitigations were implemented, our current work is to integrate the cryptographic IPs into a greater security engine.

Components within the security engine communicate using a shared protocol, namely, the AHB bus protocol. Cryptographic IPs must be able to communicate data with the security engine structure, such as reading keys and data from memory and storing results back. Our work aims to create a cryptographic engine wrapper which handles communication with the system bus, providing a common register interface and support for scatter-gather DMA functionality. A set of external ports provide connection to generic algorithmic components defined in RTL form. With the integration of cryptographic IPs into the security engine, this secure firmware can safeguard the confidentiality and integrity of computing devices and intellectual property.

PRESENTER(S): Wesley Madyda
AUTHOR(S): Wesley Madyda, Yunxiu Xu, Angelika Neitzel
FACULTY MENTOR(S): Angelika Neitzel

Thermally Initiated Bulk Polymerization of Styrene Via a Radical Addition-Fragmentation Chain-Transfer Mechanism

Chemically incompatible polymers generally phase-separate at the macroscale. However, the behavior of oppositely-charged chemically incompatible polymers is less known. My research group will be investigating whether these polymers undergo self-assembly to form a solid-state material that is ordered on the mesoscale (10-100 nm).To test our theory, a number of incompatible charged-polymers of known molecular weights and dispersities must be synthesized. We developed a process to synthesize a range of molecular weights of low-dispersity polystyrene (PS) using the reversible addition-fragmentation chain-transfer polymerization (RAFT) of thermally-initiated bulk styrene. 2-cyano-2-propyl dodecyl trithiocarbonate was selected for the chain-transfer agent (CTA). The CTA-to-monomer ratio, temperature, and run-time of the reaction were experimentally modified, and the resultant polymers characterized using 1H Nuclear Magnetic Resonance (NMR) and Size Exclusion Chromatography (SEC). We will further discuss the impacts of our experimental factors on the reaction kinetics, conversion, and the dispersity and molecular weight of the products.

PRESENTER(S): Vianna Quach
AUTHOR(S): Vianna Quach, Sara Pickernell, and Darragh P. Devine
FACULTY MENTOR(S): Darragh Devine

Changes in Neural and Behavioral Responses after Repeated Social Stress

Major Depressive Disorder (MDD) impacts nearly 1 in 10 adults in the US. Social stress, including isolation or alienation, contributes to MDD in humans. Using a rodent social defeat model, we socially stressed rats to induce a manifestation of depression, mirroring MDD in humans. We utilize a rodent social defeat model to observe altered behavior due to social stress. Quantifying the behaviors of socially stressed rats allow us to examine the correlation between their altered behaviors and neural indicators using RNAscope. RNAscope is an in situ hybridization technique that allows us to observe the expression of specific genes in individual neurons. mRNA for c-fos was labelled to identify which neurons were active in infralimbic cortex. This was combined with labels for vGluT1 and GAD65 mRNAs to evaluate if those neurons were excitatory (glutamatergic) or inhibitory (GABAergic). The socially stressed rats exhibited less socialization, greater plasma corticosterone concentrations after stress, and increased mRNA expression for GAD65 in the infralimbic cortex. This suggests increased stress-induced biosynthesis of GABA in inhibitory neurons of the infralimbic cortex.

PRESENTER(S): Kayla Ramos
AUTHOR(S): Kayla Ramos
FACULTY MENTOR(S): Won-tak Joo

The Resilience of Community-Based Healthcare: A Study on the Inter-Organizational Dynamics and Competition in Community Services

Non-profit organizations play a role in the healthcare sector by meeting the needs of communities impacted by health disparities. This study explores the relationship between the characteristics of several non-profit organizations affiliated with a public medical university in the South and how they effectively reduce inequality while facing financial and organizational barriers and competition for resources. Specifically, this study aims to (i.) Comprehensively review the existing literature on the social relationships of non-profits and their organizational behaviors (ii) Assess the characteristics of their relationships and how this relates to their source of revenue; (iii) Examine the organizational reasons for the survival of non-profit organizations in the community healthcare sector. The data used for this analysis is from a non-profit organization that awards grants to community-based healthcare organizations and departments within the University's medical school hospital system. This analysis synthesizes findings from existing literature and results from the data analysis to provide insights into the reasons for the successes of non-profits in meeting their mission of promoting community well-being and the reasons for their survival. Additionally, the findings of this study suggest that different strategies may be necessary to meet the needs of target populations at different times.

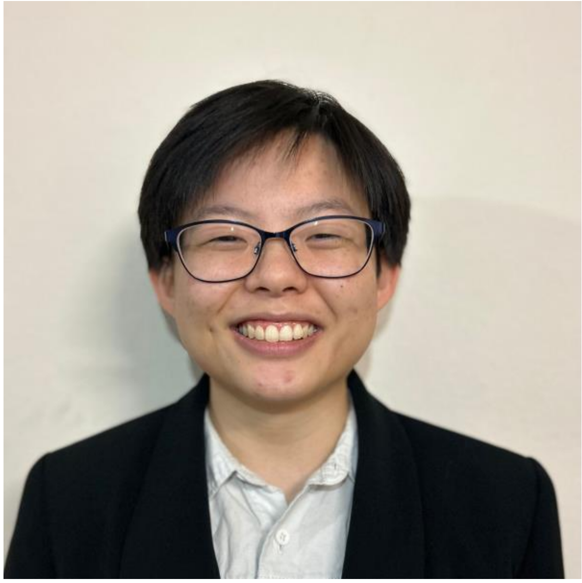
PRESENTER(S): Grace Cheng
AUTHOR(S): Everett Schwieg, Grace Cheng, Ruogu Fang
FACULTY MENTOR(S): Ruogu Fang

Aging in C. Elegans: Mortality Prediction Tool

Caenorhabditis elegans are worms often used in aging research due to their fast life cycle and sharing of many genetic homologs with humans. We aim to create a tool for lifespan prediction in C. elegans using machine learning to be utilized in such research.

We obtained video data from around 100 worms over 7 days in order to create machine learning models. The first iteration utilized extracted kinetic and physiological parameter evaluation from the video data, which was then inputted into a support vector machine (SVM) classification model to distinguish between long and short-lived worms. This achieved 79% accuracy and an F1-Score of 0.88. Then, video data was preprocessed through resizing and transformation, which was then inputted into a recurrent neural network (RNN) with long-short term memory (LSTM) to preserve temporal components of worm movement. We are in the process of evaluating video preprocessing optimization.

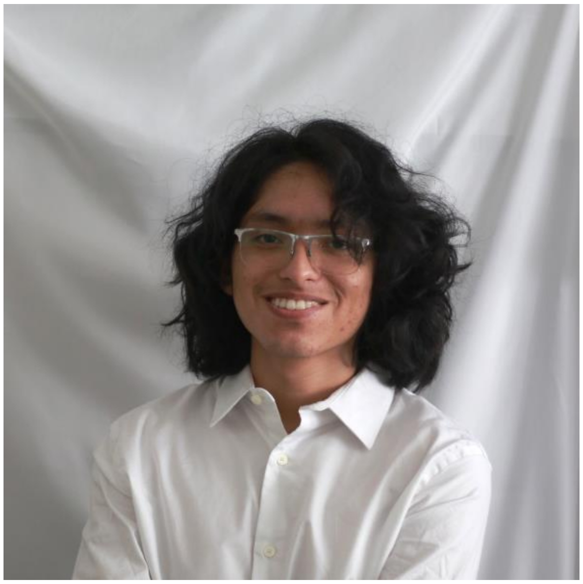
Currently, classification is limited to long and short-lived categories, and video preprocessing and data modality conversion of movement is being explored. We hope to improve the accuracy and specificity of our models through segmenting the worm body and vectorizing movement.



PRESENTER(S): Jessi Effinger-Morris
AUTHOR(S): Tianqi Li1,2, Lu Li1,2, Nicholas M. Hiers1,2, Peike Sheng1,2, Yuzhi Wang1,2, Jessi Effinger-Morris1, Conner M. Traugot1,3, Jiang Bian2,4, and Mingyi Xie1,2,3*
FACULTY MENTOR(S): Mingyi Xie

The Translational Regulation of Target-Directed miRNA Degradation

MicroRNAs (miRNAs) are a class of non-coding RNAs that interact with the target mRNAs to induce translational repression and mRNA degradation translational repression. Generally, miRNAs are stable when associating with the effector protein Argonaute (AGO). However, miRNA can turnover rapidly when binding to a target RNA with extensive complementarity, a phenomenon called target-directed miRNA degradation (TDMD). To date, the validated "TDMD trigger" sequences that can induce miRNA degradation reside in non-coding regions of the RNA. We found that when an engineered TDMD trigger was placed in the 3' untranslated region (UTR) of a green fluorescent protein (GFP) reporter, it induced more significant miRNA degradation than when the trigger was placed in the coding sequence (CDS). Inhibiting translation of the GFP reporter enhanced miRNA degradation by the CDS trigger but not the 3' UTR trigger. This is because CDS triggers become more accessible to miRNAs without the translating ribosomes. By small RNA sequencing, we identified miRNAs sensitive to global translation status in cells. Yet, no CDS triggers could be confidently assigned to these miRNAs. Our work explains the paucity of effective TDMD triggers in the CDS and suggests potential dysregulation of miRNA levels due to impaired translation.



PRESENTER(S): Gabriel Matos
AUTHOR(S): Gabriel Matos
FACULTY MENTOR(S): Ryan Sharston

Design Recommendations for Passive House Certification in Gainesville's Historic Districts

As a result of the increasing effects of climate change, efforts to reduce greenhouse gas emissions have become more relevant than ever before. Buildings are especially relevant due to their significant contribution to global emissions. Furthermore, it is important to investigate strategies for improving the sustainability of historic buildings, especially in challenging climates like Florida's. For this reason, this research aims to research ways a historic home in Gainesville Florida may be retrofitted to achieve a desired energy performance. The retrofit utilizes the requirements for the Passive House Institute's EnerPHit certification to set the energy performance goals and guide the retrofit strategies implemented. Energy consumption was then calculated through building performance simulations. Results show a significant reduction of energy use compared to the baseline. However, energy consumption would not be low enough for the house to qualify for EnerPHit certification. Further research is needed to evaluate to plausibility of achieving EnerPHit certification in other homes in Gainesville's historic districts because special conditions surrounding the intervened home impact the intervention and final performance of the house.

PRESENTER(S): Michael Yao
AUTHOR(S): Nicholas M Hiers, Michael Yao, Lu Li, Mingyi Xie
FACULTY MENTOR(S): Mingyi Xie

Identifying Mammalian Target-directed miRNA Degradation Triggers in Mouse Endothelial Fibroblasts

MicroRNAs (miRNAs) are small, approximately 22 nucleotides long, non-coding RNAs that regulate gene expression post-transcriptionally across various eukaryotic lineages. MiRNAs primarily interact with mRNAs to reduce their expression through miRNA-directed target degradation, influencing developmental processes and diseases. While miRNA's role in regulating mRNA is well known, how miRNAs are regulated within cells is less clear. Recently a mechanism suggests that some RNAs can "trigger" specific miRNAs' degradation in a process called target-directed miRNA degradation (TDMD). This occurs when trigger RNAs base pairs with both the miRNA's 5' and 3' regions, leading to a conformational change that facilitates recognition by the ZSWIM8 ubiquitin ligase. This results in the Argonaute (AGO) protein's polyubiquitination, marking it for 26S proteasome degradation, thereby exposing the miRNA to cytosolic ribonucleases. In this study, we explore potential trigger RNAs for miRNA degradation, utilizing CRISPR-Cas9 to knock out triggers identified in Mouse Embryonic Fibroblast cells. Upon loss of a bonafide trigger, the abundance of the miRNAs regulated by that trigger should increase. We therefore utilize northern blotting and small RNA sequencing to identify which miRNAs are sensitive to the trigger depletion. In essence, this discovery would unveil new miRNA pathways and potentially aid in cancer therapy.

PRESENTER(S): Cameron McMullen
AUTHOR(S): Cameron McMullen, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Douglas Soltis

The Effects of Climate Change on Florida Hardwood Forest Understory Plant Distributions and Ecological Niches

Florida hardwood forests include vital trees and endemic, temperate, and tropical species in their southernmost and northernmost distributions in the global North American Coastal Plain biodiversity hotspot. Climate change and deforestation threaten them, so ecological niche models predicting their future ranges are crucial for conservation. The American beautyberry, Callicarpa americana, an open-habitat, fast-growing, perennial shrub with purple berries for birds and deer, and the Sarsaparilla vine, Smilax pumila, a prickly vine that can grow up to 100 cm along the ground or up other vegetation with yellow flowers and red fruits that attract birds and mammals, two native species found in hardwood forest understories, face these threats. Occurrence data collected from global biodiversity databases, GBIF and iDigBio, were run through the gatoRs package in R to list all found synonyms and compiled into files with downloaded database records for each species. The data were filtered and mapped using environmental conditions to examine present-day suitable niche distributions and estimate future niche space using climatic scenarios for 2050 and 2100. These ecological niche models provide invaluable insight into the inner workings of these ecosystems, allowing for a deeper understanding of where these species may occur in the future and better conservation methods.

PRESENTER(S): Wesley Madyda
AUTHOR(S): Wesley Madyda, Yunxiu Xu, Angelika Neitzel
FACULTY MENTOR(S): Angelika Neitzel

Thermally Initiated Bulk Polymerization of Styrene Via a Radical Addition-Fragmentation Chain-Transfer Mechanism

Chemically incompatible polymers generally phase-separate at the macroscale. However, the behavior of oppositely-charged chemically incompatible polymers is less known. My research group will be investigating whether these polymers undergo self-assembly to form a solid-state material that is ordered on the mesoscale (10-100 nm). To test our theory, a number of incompatible charged-polymers of known molecular weights and dispersities must be synthesized. We developed a process to synthesize a range of molecular weights of low-dispersity polystyrene (PS) using the reversible addition-fragmentation chain-transfer polymerization (RAFT) of thermally-initiated bulk styrene. 2-Cyano-2-propyl dodecyl trithiocarbonate was selected for the chain-transfer agent (CTA). The CTA-to-monomer ratio, temperature, and run-time of the reaction were experimentally modified, and the resultant polymers characterized using 1H Nuclear Magnetic Resonance (NMR) and Size Exclusion Chromatography (SEC). We will further discuss the impacts of our experimental factors on the reaction kinetics, conversion, and the dispersity and molecular weight of the products.

PRESENTER(S): April Chukwueke
AUTHOR(S): April Chukwueke
FACULTY MENTOR(S): David Grant

Loving Robots: An Essay on the Ethics of Romantic Relationships with Large Language Models

My goal is to provide a perfectionist account of the goods we get from healthy romantic relationships with humans and explore whether or not those goods exist to the same extent in romantic relationships with virtual agents. I will argue that human romantic relationships present two important values or goods: (1) character self-perfection and (2) intellectual self-perfection. I will concede that these values can still be achieved in romantic relationships with virtual agents, however, they cannot be achieved to the same extent as healthy romantic relationships with humans. Using an argument I will call "the friction account," I will contend that the convenience of romantic relationships with virtual agents removes the friction, the difficulty of relating with another human, that exists in romantic relationships with humans. Removing this friction causes character self-perfection and intellectual self-perfection to be attained in lesser degrees. For this reason, Ted misses out on important values when he engages in a romantic relationship with Sarah.

PRESENTER(S): Kirthana Sane
AUTHOR(S): Kirthana Sane, Dr. Souad Kheder, Dr. Edith Kaan
FACULTY MENTOR(S): Edith Kaan

Effects of Reading Code-Switches on Cognitive Control: A Bayesian Analysis

Bilinguals are constantly tasked with managing and controlling two languages, which has shown to utilize immense cognitive control. Code-switching can be defined as the alternation between different languages within a single sentence or conversation. The Control Process Model (Green & Wei, 2014) hypothesizes that varied language contexts, such as types of code-switching (insertional or dense), involve different engagement of cognitive control. This study aims to examine whether conflict resolution in a non-verbal task is influenced by the type of code-switching. Through the use of a web-based reading study, we were able to test the effects of reading sentences with dense and insertional Spanish-English code-switching on cognitive control. Participants read sentences chunk-by-chunk. These sentences contained insertional (one-word) or dense (many switches, multiple words) switches from Spanish to English, or were only in Spanish. After each sentence type, participants saw a Flanker trial (congruent <<<<< incongruent <<><<) to which they indicated the direction of the middle arrow. If code-switching affects cognitive control, this should be reflected in the response times to the Flanker trials. We present an analysis using Bayesian linear mixed effects models to estimate the size of the effect of code-switching and type of switch on the Flanker response times.

PRESENTER(S): Sarah Langham
AUTHOR(S): Hajymyrat Gelimuradov, Nancy Ruzycki, Katherine Miller, Sarah Langham, Alvin Hughes
FACULTY MENTOR(S): Nancy Ruzycki

Demining Ukraine through AI Modeling and 3D Printing

Due to the Russo-Ukrainian conflict, Ukraine has experienced one of the largest deployments of landmines globally, endangering many civilians and refugees. Current mine detection methods have difficulty with predominantly plastic landmines, such as the PFM-1, and they require personnel to be dangerously close for landmine detection. A safer alternative involves using image recognition and artificial intelligence (AI) to identify these mines remotely. This identification is done via anomaly detection using a YOLOv5 (image recognition) Machine Learning (ML) model, requiring training of an annotated and clear image dataset. To advance this process, we can utilize a synthetic data set of "pseudo-landmines" created with 3D printing techniques such as fused-deposition modeling (FDM) and simple-to-print thermoplastics, including PLA, nGEN and PETG. The current iteration of this ML model has not positively identified the pseudo-mines or real-world testing data with enough accuracy for scaling. As such, it requires additional training data to improve the model's fit. Furthermore, alternate methods of detecting predominantly plastic mines could include near-IR and other forms of spectral analysis, working in conjunction with this ML model. Future work looks to expand this project with such methods to produce accurate detection with higher confidence.

PRESENTER(S): Andrew Steiner
AUTHOR(S): Andrew Steiner, Kausturi Parui, Megan Butala
FACULTY MENTOR(S): Megan Butala

Solid-State Synthesis of V2MoO8 and its Electrochemical Behavior

As the world's reliance on electronics grows, efficient energy storage devices are increasingly in demand. Understanding the structure-property relationships of energy storage materials is integral to their technological development. V2O5 and Nb3O7F have structures that make them of great interest as insertion cathode materials for lithium-ion batteries. In previous work, while substituting Mo for V in V2O5, we found a ternary phase resembling V2MoO8. When electrochemically cycled, V2MoO8 behaves differently than either V2O5 or Nb3O7F. However, its stoichiometry is unclear, and typical synthesis is costly and time consuming. Here, we report the use of solid-state synthesis methods for the synthesis of V2MoO8 from a mixture of α-V2O5 and MoO3. To validate the structure of these materials, we collect and analyze X-ray diffraction. Synthesized V2MoO8 samples were electrochemically cycled in half-cell batteries to investigate the stability and phase changes. X-ray diffraction data indicate the synthesis of phase pure V2MoO8 and its phase stability boundaries. The cycling behavior aligns with previous reports, showing symmetric discharge and charge profiles and great stability. With this knowledge, we can efficiently investigate the relationship between the structure and electrochemical behavior of V2MoO8, clarify the stoichiometry, and map the quasibinary phase space of V2O5 and MoO3.

PRESENTER(S): Duane Hardy
AUTHOR(S): Duane Hardy, Ann C. Wilkie
FACULTY MENTOR(S): Ann Wilkie

Food Waste Composting – Efficiency of Starter Microbes

Globally, food waste management poses a significant challenge. Over one-third of food produced in the United States goes uneaten, making it a primary material in landfills and incinerators annually. This situation exacerbates environmental, societal, and economic issues, as the resources used for growing and transporting the wasted food are also lost. Composting, the natural breakdown of organic waste by aerobic microorganisms into compost, offers a viable solution for food waste management. This process turns organic waste into a substance usable as fertilizer or soil amendment. However, the efficiency of the process can vary based on a range of factors, including the initial microbial inoculum. In this study, a kinetic analysis was conducted on three different inocula to compare their efficiency to initiate active composting (thermophilic phase). The study employed four 5 L insulated metal containers with food waste (FW) as the primary feedstock. The study included four treatments (three microbial inocula plus one control): 1) FW + commercial activator, 2) FW + active compost, 3) FW + local garden soil, and 4) FW + control (no inoculum). As compared to the control, starting inocula provided a shorter timeframe to reach the active thermophilic phase.

PRESENTER(S): Mia Engelbart, Olusegun Sobanjo, Ethan Hodge
AUTHOR(S): Mia Engelbart, Olusegun Sobanjo, Ethan Hodge, Avirup Chakraborty, Cole Conforti, Paul Castillo, Catherine Flores, Jianping Huang, Duane Mitchell, Loic P. Deleyrolle
FACULTY MENTOR(S): Loic Deleyrolle

Novel Adoptive Cellular Therapy Platform for Resistant Glioblastoma Cells

Glioblastoma (GBM) is a primary malignancy of the central nervous system and is typically fatal due to recurrence. Targeting residual cells after tumor removal is challenging due to the infiltrative nature of GBM. It is crucial to develop adjuvant therapies that can combat the drivers of disease recurrence. Our laboratory has discovered slow-cycling cells (SCCs) in high-grade glioma, which are infiltrative and treatment-resistant cells responsible for driving recurrence. It is imperative to develop an effective strategy to specifically eliminate this cell population. These cells have a cellular niche containing potentially immunogenic neoantigens, making them suitable targets for immune-based therapies. Our objective is to utilize SCC antigens in the form of RNA or peptides to stimulate the immune system and enable identification and targeting of treatment resistant clones, leading to effective tumor control. Our results demonstrated that T cells specific to slow-cycling cells (SCC-T cells) showed greater activation when exposed to treatment resistant tumor cells, as evidenced by increased differentiation of CD8 cells and enhanced development of effector and memory cells. Furthermore, SCC-T cells exhibited the highest level of anti-tumor activity, resulting in reduced tumor cell proliferation and increased apoptosis. Our SCC-based immunotherapy platform shows promise in targeting treatment-resistant glioblastoma cells.

PRESENTER(S): Anja Julian
AUTHOR(S): Anja E. Julian, Zuania Colón-Piñeiro, Arik Hartmann, and Ana V. Longo
FACULTY MENTOR(S): Ana Longo

Mapping the effect of natural disasters on disease prevalence in Puerto Rican frogs

Infections with Batrachochytrium dendrobatidis (Bd) have been reported globally in amphibian populations, causing the decline of over 500 amphibian species and the presumed extinction of more than 90 others. Because of the severity of the declines, understanding changes in environmental conditions can inform specific strategies to minimize amphibian susceptibility to Bd. Spatial features such as tree canopy cover, ground vegetation cover, ground and surface water, and drought levels may have been affected by the landing of María on the southeast corner of the island. Here, we compare tree canopy cover and drought as well as the impact of a severe environmental disturbance (hurricane María) to evaluate the factors that can lead to increased pathogen transmission across the landscape. We focused on the Coquí Guajón (Eleutherodactylus cooki), a threatened Puerto Rican rock-dwelling frog that is known to harbor Bd infections. We developed maps of disease risk to identify areas with significant correlations among environmental and infection factors. Our findings will allow us to establish priorities for conservation in the face of climate change and novel disease outbreaks.

PRESENTER(S): Alessia Rosa
AUTHOR(S): Alessia Rosa, Dr. Lakeisha Cousin
FACULTY MENTOR(S): Lakeisha Cousin

Association of Marijuana Use with Sociodemographics, Nausea, Stress, and Chronic Pain in the All of Us Research Program

The legalization and changing social perceptions of marijuana have led to increased usage across the United States, raising concerns among healthcare professionals about its effects and implications. This study examines marijuana usage in a national sample of adults, focusing on sociodemographic factors, perceived stress, nausea, and chronic pain. Data from the National Institutes of Health (NIH) All of Us Research Program were analyzed, comprising electronic health records (EHR) and survey responses. Logistic regression analysis was conducted to assess the association between independent variables (perceived stress, nausea, chronic pain) and reported lifetime marijuana use, controlling for covariates (gender, age, race, ethnicity, household income). Results indicate that marijuana usage is most common among college-educated mixed-race males of lower or upper-middle socioeconomic status, with high levels of perceived stress. While participants with moderate and high perceived stress had higher odds of reporting marijuana use, those reporting nausea had slightly lower odds. Participants with chronic pain reported lower marijuana use. Limitations include a skewed age distribution in the sample and reliance on self-reported marijuana usage data, potentially underestimating usage among minority populations. This study adds to the understanding of marijuana usage in the US. It highlights the need for further research to elucidate its role in medical treatment and its impact on public health.

PRESENTER(S): Andrea Orozcotorres
AUTHOR(S): Andrea Orozcotorres
FACULTY MENTOR(S): Whitney Stoppel

Optimizing the Solubility of Plodia Interpunctella Silk Fibroin for Biomedical Applications by Assessing Influential Parameters

Silk fibroin (SF) is a natural biopolymer used for biomaterial synthesis due to its advantageous properties, such as high mechanical strength, biocompatibility, and biodegradability that make it favorable in biomedical applications. The field of silk-based biomaterials is heavily influenced by studies of the Bombyx mori (Bm) silkworm as it predominates due to its extensive cultivation from the textile industry. However, rearing of Bm silkworms is largely without environmental control, leading to batch-to-batch variability in the raw silk fibers used for biomaterials. To address this limitation, we study an alternative silkworm, Plodia Interpunctella (Pi), which can be reared in an environmentally controlled laboratory setting. This work focuses on the development of methods to solubilize Pi silk to improve the stability of SF in solution as a preliminary step in fabricating Pi biomaterials. To better understand silk protein solubility, we utilize the natural processing within the silkworm's silk gland to optimize the artificial processing of silk fibers to silk solution through parameters of dissolution temperature, pH, salt type, and salt concentration. Successful SF solutions are subsequently used for a myriad of applications such as films, sponges, and nanoparticles, demonstrating the potential of developing Pi silk-based biomaterials in the biomedical field.

PRESENTER(S): Nia Dufeal
AUTHOR(S): Nia Dufeal, Gabbie Robilotto, Aaron Mickle PhD
FACULTY MENTOR(S): Aaron Mickle

Comprehensive Visualization of Bladder Sensory Neurons via Passive Clearing of Dorsal Root Ganglia

Within dorsal root ganglia (DRGs) reside the cell bodies of sensory neurons, tasked with transmitting signals between the bladder and spinal cord. Homeostatic deviations within either organ system, such as inflammation or overactivity, result in increased communication between the two. Current DRG analysis relies on continuous sampling of tissue via serial sectioning. This methodology, which remains cumbersome and often leads to tissue layer loss, severely limits the scope of large-scale observation of viral transduction effects in peripheral neurons. To overcome such limitations, CLARITY (Clear Lipid-exchanged Acrylamide-hybridized Rigid Imaging-compatible Tissue-hydrogel) improves DRG assessment through improved visualization of three-dimensional tissue morphology. Evaluation of cleared tissue expands upon current techniques for microscopic analysis of biological tissue by allowing for identification of altered neurons due to peripherally-injected viruses, as well as bladder innervation visualization. To achieve DRG transparency, the mPACT (modified Passive Clearing Technique) method will be utilized, which expedites clearance time compared to alternative PACT and psPact (process-separate PACT) methods, through the usage of an 8% SDS-based clearing solution and 0.5% α-thioglycerol. Rodent tissues are expected to clear in about 17 days, by which they should be nearly translucent and will be compared to non-cleared tissue for clarity and specificity of immunohistochemical staining.

PRESENTER(S): Kevin Fernandez
AUTHOR(S): Kevin Fernandez, Bryce Shirk, Liam Rodgers , Whitney Stoppel
FACULTY MENTOR(S): Whitney Stoppel

Unlocking Potential: Crafting Needles for Genetic Engineering in Plodia Interpunctella Silk Moths

Silk biopolymers have an extensive history of use for medical applications, including in drug delivery systems and tissue engineering applications. While Bombyx mori silk is commonly employed in clinical settings, it presents challenges due to unstandardized sourcing, resulting in batch-to-batch variability. B. mori silk fibroin is also biologically inert, hampering functionalization or recombinant expression. Alternatively, Plodia interpunctella (Plodia) can be reared indoors, allowing for scalable silk production while reducing variability. Leveraging the biological machinery in Plodia holds promise for generating novel recombinant proteins that overcome current limitations. To genetically modify Plodia using CRISPR/Cas9, we need to microinject freshly laid embryos using custom needles made with a SU P-3O needle puller. Optimization of the 3 parameters of the needle puller to produce the desired needle was crucial to create a fine puncture and deliver a small payload of the mutagenic solution. Those 3 parameters were: the degree of heating of the tubes (Heat), the pulling strength applied, (Pull), and the duration between heating and pulling (Optical Meter). The optimal settings found were Heat 650, Pull 100, and an OM of 3-5. These needles enable transfection of plasmid constructs into moth embryos, fostering the development of rationally designed Plodia silk fibroin.

PRESENTER(S): Rachel Brown
AUTHOR(S): Rachel Brown, Erin Westgate, Anais Ortiz
FACULTY MENTOR(S): Erin Westgate

Art and the "Good Life"

This study delves into the influence of artistic expression on psychological richness, a phenomenon distinct from happiness or meaning, characterized by diverse and perspective-altering experiences. Drawing on previous research indicating the association between engagement in the arts and psychological richness, this project investigates whether depicting one's life narrative visually enhances psychological richness compared to expressing it in written form. A sample of 280 University of Florida undergraduate participants will be recruited and randomly assigned to reflect on either their past or future life narratives. They will then be instructed to express their narratives either visually or in writing. Afterwards, participants will analyze the richness, meaning, and happiness of their lives, along with changes in perspective and wisdom. My hypothesis is that participants in the visual art condition will report higher psychological richness, particularly when reflecting on past experiences. This study aims to provide crucial insights into the role of artistic expression in cultivating psychological richness and understanding the causal effects of perspective shifts on well-being. It can potentially contribute to knowledge regarding the impact of past versus future reflection on psychological richness, with implications for interventions promoting psychological well-being.

PRESENTER(S): Savannah Wright
AUTHOR(S): Savannah Wright, Ann C. Wilkie
FACULTY MENTOR(S): Ann Wilkie

Future Farming – Application of Sustainable Practices

This research study focused on converting a 35-foot by 65-foot area at the Bioenergy and Sustainable Technology Lab into a sustainable farming model. This involved employing eco-friendly “best management practices” to improve soil health and fertility. Methodology included land preparation, strategic planting, fertilization, watering, and harvesting, all supported by calculations for crop success. Throughout the study, organic fertilizers, cover cropping, and companion planting were used, along with precision agriculture tools to optimize efficiency and minimize plant disturbance. Emphasizing a smaller scale, the goal was to demonstrate the effectiveness of sustainable and regenerative practices for future adoption. The choice of cultivars and their strategic placement, such as intercropping Marigolds and Zinnias to attract pollinators, showcased an approach to creating a balanced and symbiotic ecosystem within the space. Additionally, the implementation of cover crops, including hairy vetch and clover, not only served as a barrier to weed growth but also contributed to nitrogen fixation, enriching the soil in a sustainable manner. These sustainable practices are scalable and will contribute to the advancement of a more resilient agricultural system.

PRESENTER(S): Joanne Koshy
AUTHOR(S): Joanne Koshy, Tristan Hammoor, Mauli Bhogade, Dr. Ben Giasson, Phillip Mackie, Dr. Habibeh Khoshboeui
FACULTY MENTOR(S): Habibeh Khoshbouei

Investigating the role of macrophages in enteric synucleinopathy

Recent studies have suggested that aggregated α-synuclein is found in the enteric nervous system in Parkinson's Disease. In this upcoming publication, we aimed to understand the interaction between macrophages, phagocytic immune cells, and the enteric nervous system in Parkinson's disease, specifically its role in α-synuclein pathology. We injected one group of mice with saline and the other with PFFs (preformed fibrils of α-synuclein) to induce enteric α-synuclein pathology. Using this paradigm, we depleted ENS macrophages using an anti-CSF1R antibody to see if an absence of macrophages would affect the development of α-synuclein pathology. In previous validation studies, we found that macrophages disappear 7 days post injection (dpi) and reappear by 30 dpi. At 30 dpi, we harvested duodenal tissue, dissected off the mucosa to expose the enteric neurons, and then performed immunostaining for macrophages, enteric neurons, and a pathologic form of α-synuclein. Confocal microscopy and subsequent analysis revealed that a loss of macrophages contributed to increased PFF-induced ENS α-synuclein pathology compared to PFF injection alone. We concluded that ENS macrophages have a protective factor in the gut.

PRESENTER(S): Sai Shrestha
AUTHOR(S): Sai Shrestha, Daniel Ferris, Chang Liu
FACULTY MENTOR(S): Chang Liu

Gait Parameters During Body-Weight Support Conditions

Stroke is one of the leading causes of death and disability worldwide, with 80% of survivors experiencing hemiplegic gait. Despite rehabilitation, some will continue to face gait impairments affecting daily tasks. This has prompted a shift towards using body-weight support systems in rehabilitation to address these gait impairments. The objective of this study is to determine the effect of body-weight support systems at different supports (0%, 20%, 40%, 60%) in stroke patients by analyzing spatial and temporal gait parameters with comparison to their matched neurotypical participant. We recruited 10 participants (5 healthy and 5 stroke) for the experiment. We collected gait kinematics and ground reaction forces by using motion capture and force plates. We derived gait parameters including step time, step length, and step width. Preliminary findings revealed a trend: increased body-weight support led to longer step times and reduced asymmetry between the paretic and non-paretic limbs. Future analysis will investigate the differences between stroke and neurotypical individuals. This suggests that varying body-weight support levels and equipment designs could improve gait symmetry in stroke survivors, warranting further research to optimize rehabilitation strategies.

PRESENTER(S): Aidan Burrowes
AUTHOR(S): Aidan Burrowes, Eleni Bozia
FACULTY MENTOR(S): Eleni Bozia

A Syntactic Analysis of Linguistic Variation and Evolution in Latin Using Artificial Intelligence

Prior studies using artificial intelligence to analyze the syntactic structure of Latin, such as those utilizing deep syntactic tree prediction and transformer models, have underscored the challenges in modeling classical language structures. This project further explores AI techniques to analyze Latin and provide new insights into its evolution, enhancing our understanding of syntactic variations across different periods and speaker backgrounds. Leveraging Harrington Treebanks and Metreex API, this study trains machine learning models to identify and analyze syntactic patterns in Latin texts. The project adopts methodologies from recent research, including dependency parsing and fine-tuned BERT models, and compares them to established English and Czech grammatical frameworks due to their influence on Latin dependency treebanks. While the project is ongoing, initial phases have involved extensive data preparation and model training with LatinBERT, LatinCy, and English and Czech dependency models. We aim to validate these methodologies against known treebank data and establish a baseline for syntactic pattern recognition. Further research will focus on refining our models and exploring more sophisticated dependency parsing methods. Ultimately, this study seeks to address the gaps in our understanding of Latin's linguistic variation and evolution, contributing valuable perspectives to humanities, linguistics, and AI.

PRESENTER(S): Hayley Chambers
AUTHOR(S): Hayley Chambers
FACULTY MENTOR(S): Lori Warren

Virgin Coconut Oil and its Potential Impact as an Antibacterial on the Gastrointestinal Microbiome of Horses

Virgin Coconut Oil (VCO) has been used as a medicinal remedy throughout history. This natural oil contains a high concentration of medium-chain fatty acids, including lauric acid. Upon digestion, lauric acid is converted into monolaurin, which has been found to be an effective antibacterial. Although VCO has been studied in a variety species, it has never been applied to horses. This thesis utilized both empirical and theoretical approaches to determine potential effectiveness of VCO as an oral antibacterial agent for horses. A meta-analysis of the bactericidal activity of VCO was performed using data obtained from published studies that focused on VCO's effect as an antibacterial within other species. A comparative analysis of the gastrointestinal microbiome of horses and species where VCO was shown to be an effective antibacterial was also performed. It was determined that hydrolyzed VCO is effective against certain strains of both gram-positive and gram-negative bacteria. Prior to digestion, the results showed that unhydrolyzed VCO has limited antibacterial properties. Based upon the results obtained within the study, VCO has the potential to act as an effective antibacterial within the equine microbiome.

PRESENTER(S): Talianna Ulloa
AUTHOR(S): Talianna Ulloa, John Langhout, Elizabeth Gages, Shane Shepard, Juan Nino, Megan Butala
FACULTY MENTOR(S): Megan Butala

Hierarchical Length-Scale Structures in Disordered Rocksalts

There is a growing importance in understanding lithium excess disordered rock salts (DRX) due to their high energy density and high chemical flexibility in Li-ion battery applications. What makes these DRXs unique is the ability to tailor their properties to optimize performance. Emphasis is placed on understanding short-range order (SRO), long-range structure, and phase separation in DRXs. Total scattering techniques, such as pair distribution function (PDF) analysis, offer insights into SRO, while X-ray diffraction (XRD) provides information on long-range structure. In this series we utilize the compositional series Li1.2Mn0.4Ti0.4-xZrxO2 in which we gradually replace Ti with Zr. We assemble batteries using this series and monitor the performance of the battery through galvanostatic cycling. We found that as the lattice parameter expands, battery performance improves since Li has space to move freely. The change in the lattice parameter isn't linear with Zr content, but instead requires the correct balance with regards to short-range order to get favorable results. While higher Zr content and a larger lattice parameter may initially appear beneficial, they result in unfavorable SRO and strain. Our findings indicate that achieving the appropriate balance between Ti with Zr is crucial for achieving optimal performance.

PRESENTER(S): Lily Cao
AUTHOR(S): Lily Cao, Mojdeh Faraji, Jennifer L. Bizon, Barry Setlow
FACULTY MENTOR(S): Barry Setlow

Optogenetic inactivation reveals temporally-distinct contributions of ventral hippocampus to risky decision making in rats

The ventral hippocampus has been linked to approach-avoidance conflict, but it is unclear how the ventral hippocampus is involved in risky decision making, which involves probabilistic negative outcomes. In order to understand the contributions of the ventral hippocampus to risky decision making, rats were trained in operant chambers on the “risky decision-making task” (RDT). In the RDT, rats made a choice between two levers: one that delivered a small, “safe” food reward and the other that delivered a large, “risky” food reward that was accompanied by varying probabilities of mild footshock. Optogenetic inhibition was conducted during discrete phases of the task in separate sessions. Depending on rats’ choice on each trial, three outcomes were possible: delivery of the small, safe reward; delivery of the large reward without footshock (large, unpunished reward); and delivery of the large reward with footshock (large, punished reward). Inhibition of the ventral hippocampus during receipt of the large, punished reward led to a reduction in choices of the large, risky reward. These results provide evidence for a causal role of temporally-discrete ventral hippocampus activity in cost-benefit decision making.

PRESENTER(S): Andrea Camacho-Betancourt, Andrew McGrath, Max Gonzalez
AUTHOR(S): Andrea Camacho-Betancourt, Andrew McGrath, Max Gonzalez, Katie Basinger-Ellis
FACULTY MENTOR(S): Katie Basinger-Ellis

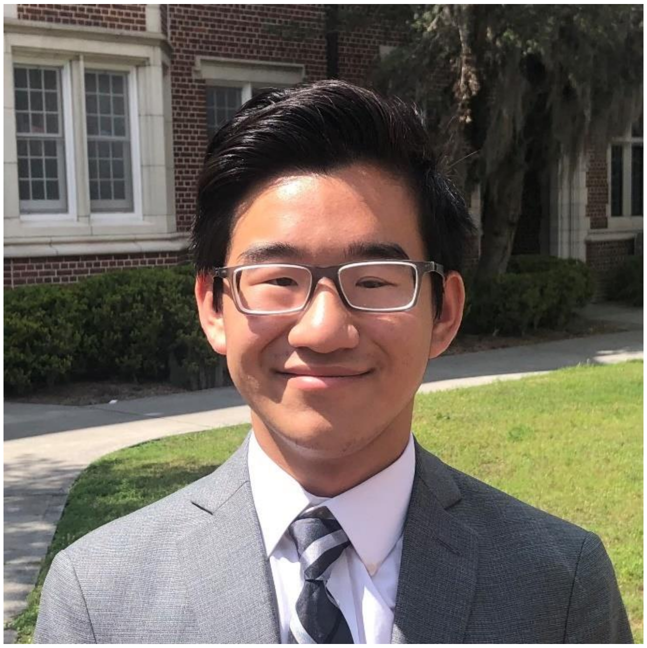
Art and Science of CNC: Assessing Educational Outcomes in CNC Manufacturing

We are evaluating the art of designing a course to allow engineers to explore their creativity while honing their technical design skills. We do so by measuring students' development and learning throughout the semester in a computer-numerical-control (CNC) manufacturing course. Using a survey-based methodology, the research focuses on analyzing student perception of personal learning progression as well as the intuitiveness of creative problem-solving. Initial results indicate that students perceive lectures, labs, and homework assignments as steadily cohesive throughout the course. Furthermore, the study aims to identify points for improvement within the CNC manufacturing educational model, asking students to rate how crucial each lab is in contributing to knowledge of CNC design. Findings show that the first four labs are equally greatly beneficial, while the last lab did not offer new knowledge. Future work will compare findings from the current cohort of college students with a cohort of high school students.

PRESENTER(S): Alisha Das
AUTHOR(S): Alisha Das, Gilberto Perez Rodriguez Garcia, Esteban A. Cabezas Rubio, Naykky Singh Ospina
FACULTY MENTOR(S): Naykky Singh Ospina

A Systematic Review & Meta-Narrative of Unmet Needs in Adult Thyroid Cancer Survivors

Most patients with thyroid cancer have excellent survival (98.5% at 5 years). Thyroid cancer survivors represent 10% of all cancer survivors in the U.S. Our objective was to summarize the unmet care needs of thyroid cancer survivors. We conducted a systematic review of studies evaluating the unmet care needs of adult thyroid cancer survivors. We included quantitative and qualitative reports without any language restrictions published between 2000-2023. Quantitative findings were summarized descriptively due to data heterogeneity precluding meta-analysis. Meta-aggregation was used to summarized qualitative findings. We identified 12 quantitative (N=7083) and 7 qualitative studies (N=125). Only 3 studies utilized validated questionnaires to assess unmet needs, with unmet psychological needs been the most common (50-70% of participants). Informational needs were the most commonly evaluated, with variability in the extent to which they were considered unmet needs (7-40% of participants). Three synthesized findings were obtained from meta-aggregation: thyroid cancer “good cancer” label driving unmet needs, unmet informational needs through the survivorship process and unmet emotional support needs from family, peers, medical professionals, and co-workers. Thyroid cancer survivors commonly expressed unmet psychological and emotional support needs that might be driven by the label of “good cancer”, with variability in unmet informational needs.



PRESENTER(S): Jonathan French (Presenter)
AUTHOR(S): jonathan French, Shamitha Narra, William Mann, Walter O'Dell
FACULTY MENTOR(S): Walter O'Dell

AI Tumor Detection in Metastatic Lung Cancer

In 2020, approximately 18 million individuals were diagnosed with cancer, resulting in an estimated 9.89 million deaths, with 90% attributed to metastatic cancer. Delayed treatment significantly increases mortality rates, with lung cancer's 5-year survival rate dropping from 87.3% at Stage 1 to 18.7% at Stage 4. This research project aims to enhance early detection of metastatic cancer through three objectives: computer-aided detection (Aim 1), dataset expansion and refinement (Aim 2), and utilization of whole-body MRI scans (Aim 3), all complementing one another. Aim 1 focuses on enhancing the detection and sizing accuracy of asymmetrical cancerous lesions using computer software. It implements datasets from Aim 2 and other acquired databases containing metastatic lesions across various cancer types. Aim 2 seeks to expand the existing virtual tumor database by including tumors with irregular shapes, deformities, and varying densities. Aim 3 aims to optimize patient outcomes by evaluating current whole-body MRI protocols for individuals at heightened risk of metastatic cancer. Early detection, as discussed earlier, is pivotal in improving prognosis, making this aim directly aligned with the overarching goal of early intervention and improved survival rates for metastatic cancer patients.

PRESENTER(S): Tara Chandra, Christopher Groff, Jennifer Kang, Suraj Raghunathan
AUTHOR(S): Matthew Eddy, Sreyashi Das, Tara Chandra, Christopher Groff, Jennifer Kang, Suraj Raghunathan
FACULTY MENTOR(S): Matthew Eddy

PEGylation of Amino Acid Residues for Enhanced Stability in Human Galectin-3 (Gal3C)

Galectin-3, a carbohydrate-binding protein, plays diverse roles in cellular processes. The N-terminal truncated galectin-3 (Gal3C) is used as a targeted therapeutic for cancer, but this variant exhibits a minimum residence time in our system. The best way to use Gal-3C as a therapeutic moiety is by altering its stability and residence time. Here, we investigate the generation of structurally stable Gal-3C variants through site-directed mutagenesis of specific amino acid residues based on their properties. Our goal is to develop stable Gal-3C variants that mimic the protein's beneficial effects while mitigating its negative ones. These variants could hold promise in preventing further tumor development and combatting cancer metastasis. Previously, our lab addressed Gal-3C's instability using PEGylation (covalent modification with polyethylene glycol) with results suggesting that PEG influences its thermal stability. To further investigate this, we aim to test multiple optimal amino acid residues, substituting the chosen residue with cysteine. Subsequently, polyethylene glycol (PEG) will be attached to the mutated protein. The final phase involves evaluating the stability of the modified protein by subjecting it to different temperatures to discern its resilience to denaturation. This approach offers a comprehensive strategy for improving Gal-3C's stability, with potential implications for therapeutic cancer interventions.

PRESENTER(S): Kayla Ehrlich, Maria Reyes-Leon
AUTHOR(S): Kayla Ehrlich, Maria Reyes-Leon, Francisca Ordonez Hinz, Patrick Wilson
FACULTY MENTOR(S): Patrick Wilson

The Toxicity of Diuron and Fluridone to Lemna minor

Exposure of non-target aquatic plants to herbicides can be detrimental to aquatic ecosystems. Knowledge of dose-response relationships are needed to better understand potential impacts and toxicity thresholds. Three useful thresholds include no observable effects concentrations (NOEC), lowest observable effects concentrations (LOEC), and EC50s (concentration that reduces plant growth 50%). Diuron and Fluridone are herbicides used in agricultural crop production and aquatic plant management, respectively. Non-target aquatic plants may be exposed to these herbicides. This study aims to determine the NOEC, LOEC, and EC50 for diuron and fluridone on the aquatic macrophyte Lemna minor. Lemna spp. are found throughout world and are commonly used in bioassays to assess risks to non-target aquatic plants. A range-finding study was conducted for each herbicide. L. minor from an axenic culture were exposed to a range of herbicide concentrations (0.1ppb to 1ppm) over a 14-day period.. Plant biomass production and growth rates were measured after 7 and 14 days exposure. Data from this study will be used to develop a definitive study to establish more refined estimates of the NOEC, LOEC, and EC50 for each herbicide with L. minor.

PRESENTER(S): Rida Imran
AUTHOR(S): Rida Imran, Rehae Miller, Daesong Jang, Seunghee Cha
FACULTY MENTOR(S): Seunghee Cha

Upregulated PNPase Expression and Activation in Response to IFN-β Stimulation in the Monocytes of Childhood Sjögren's Disease

Childhood Sjögren's disease (cSjD) is an autoimmune disease characterized by salivary and lacrimal gland inflammation, resulting in dry mouth and dry eyes, respectively. The etiology of cSjD remains unknown. Single-cell RNA-seq (scRNA-seq) analysis of peripheral PBMC from cSjD patients shows that mitochondrial degradosome proteins, specifically PNPase, is upregulated in IFN gene-enriched monocyte cluster relative to healthy controls. The degradosome maintains mitochondrial integrity in eukaryotes primarily through its role in junk RNA degradation within the mitochondria. To test the roles of upregulated PNPase in cSjD monocytes, we overexpressed PNPase in the human monocytic THP-1 cell line by transfecting the cells with PCMV-3-PNPT1 construct expressing PNPase. We observed enhanced protein expression of PNPase by only a 1.5-fold, which turned out to be due to a potential autosuppression of its expression by PNPase itself. Next, we induced PNPase overexpression by type I interferon beta (IFN-β), a cytokine found to be upregulated in cSjD monocytes. We measured gene expression by PCR, western blotting, and immunocytochemistry. Our results show that IFN-β induces upregulation of PNPase in a dose-dependent manner. Pro-inflammatory genes including p-PKR and ISGs (TNSF10 and IFITM-1) and cytokines (CXCL10) are also upregulated. The effect of PNPase on innate immune functions of monocytes warrants further investigation.

PRESENTER(S): Mauli Bhogade
AUTHOR(S): Mauli Bhogade, Phillip Mackie, Malu Tansey, Ben Giasson, Habibeh Khoshbouei
FACULTY MENTOR(S): Habibeh Khoshbouei

Molecular Characterization of the Macrophage Response To Enteric Synucleinopathy

Parkinson's disease (PD) patients often present with both Lewy body pathology throughout the enteric nervous system and gastrointestinal issues prior to loss of motor function. The mechanisms behind these dysregulations are unknown. Microglia, the resident macrophages of the brain, attempt to degrade a-syn and can become activated, exacerbating pathology. However, little is known about the changes in enteric immune cells, like macrophages, in response to asyn. In this study, we injected C57C6/J mice with either saline or pre-formed fibrils (PFF) of asyn into the duodenum to induce asyn pathology. After 30 days, we performed droplet-based single-cell RNA sequencing on over 27,000 cells isolated from duodenal tissue. Hierarchical clustering and cross-referencing literature identified nine transcriptionally distinct macrophage clusters. Our data showed two ENS macrophage clusters. MP2 was enriched in lysosomal pathway genes, which has been implied in asyn aggregation. MP6 was synucleinopathy-associated, distinguished based on high expression complement genes. Functional annotation indicated this cluster was engaged in antigen presentation and synaptic pruning. Paired with previous data, the sequencing revealed engulfment activity by macrophage populations in the PFF model, leading us to look at the potential role of complement in the engulfment of asyn and enteric synapses during enteric synucleinopathy.

PRESENTER(S): Katya Kasprzak
AUTHOR(S): Katya Kasprzak, Ann C. Wilkie
FACULTY MENTOR(S): Ann Wilkie

Sorghum bicolor Growth Shows Promise in Marginal North Florida Soils

Increasing global population and energy demand necessitate a shift to renewable resources. Bioethanol, derived from crops like sweet sorghum (Sorghum bicolor), offers a sustainable alternative, but cultivation of energy crops can also deplete the soil of its nutrients and create marginal, non-fertile soils. This study evaluated the response of sweet sorghum to marginal sandy acidic soils in North Florida, exploring the potential benefits of intercropping with the nitrogen-fixing crop red clover (Trifolium pratense) for increased nitrogen availability and reduced environmental impact. The research goes on to evaluate the impact of compost amendment on soil properties and sorghum growth. Sorghum and red clover were grown from seed in 3-gallon pots, in triplicate, in a non-climate-controlled greenhouse. Sorghum herbage accumulation and growth rate were evaluated, and soil was tested for Total-N, NH4-N, NO3-N, and pH to investigate the nitrogen uptake of sweet sorghum and output by red clover. Sweet sorghum showed the highest growth rate and herbage accumulation in the marginal soil control. Compost and red clover amended soils received greater NH4-N and NO3-N concentrations. Therefore, sorghum in these soils may have been overwhelmed with nitrogen or competition from surrounding crops.

PRESENTER(S): Kinfeosioluwa Bankole
AUTHOR(S): Kinfeosioluwa S. Bankole1,2, Adalena V. Nanni3, Netanya Keil1,2, Artyom Kopp4, Olga Barmina4, Alison Morse1,2, Rebekah Rogers5, Ana Conesa6, Lauren M. McIntyre1,2
FACULTY MENTOR(S): Lauren McIntyre

Using Long-Read Sequencing Data to Analyze Sex-Based Differences in Alternative Splicing in Species of Drosophila

Alternative splicing is a fundamental regulatory process that results in structural differences in mRNA transcripts. These differences contribute to the variation in proteins and the diversity of the tree of life. We are interested in identifying conserved splicing patterns in Drosophila species. Transcript isoforms are now directly measurable due to advancements in long read sequencing technology. We measured transcripts in males and females in five species of Drosophila. We developed an analytical approach that leverages reference transcriptome annotations from many species and creates a 'combined' annotation. Additionally, we introduce a methodology that groups transcript by potential functional/regulatory similarity as proteins. By unifying the annotation for five species of Drosophila (melanogaster, simulans, yakuba, santomea, and serrata) we are able to analyze the sex-based differences in expression of these functional/regulatory groups and can identify conserved and divergent differences.

PRESENTER(S): Justin Strikowski, Max Ross
AUTHOR(S): Justin Strikowski, Mingjie Liu, Max Ross
FACULTY MENTOR(S): Mingjie Liu

Pipelining computational chemistry data into Database: a case study on carbon-based materials

There are several databases existed that serve as a dictionary of molecules and materials. However, none of those specialize in carbon. In this study, we introduce a specialized database and data pipeline using MongoDB, Python, and Node.js to facilitate the creation and analysis of molecular carbon structures calculated by quantum mechanics simulations. These will serve as the training data for an ML model that leverages the calculations stored in our system to predict various properties of these complex structures. The specialized database not only simplifies the process of studying theoretical carbon molecules but also lays the foundation for future research by enabling the integration of machine learning models with our system. The next steps are to develop an ML model that can leverage the calculations stored in the system to predict various properties of these complex structures with high accuracy and to publish the website portion with the data to facilitate future research.

PRESENTER(S): Illeana West, Miruna Anica
AUTHOR(S): Illeana West, Miruna Anica, Aryeh Silver, Diana Feier, Avirup Chakraborty, Changlin Yang, Dongtao A Fu, Christina Von Roemeling, Maryam Rahman, Matthew Sarkisian, Jianping Huang, Jeffrey Harrison, Duane A. Mitchell, and Loic P. Deleyrolle
FACULTY MENTOR(S): Loic Deleyrolle

Using Spatial Analysis to Understand the Tumor Microenvironment, Metabolism, and Potential for Immunotherapy in Human GBM

Glioblastoma (GBM) is an aggressive form of brain cancer that results in low survival rates, fast progression, and high rates of recurrence. Current treatments have minimal effects and focus primarily on prolonged survival and supportive care. GBM is rich in heterogeneity, and understanding these differential interactions is essential to developing effective treatments. Our lab has identified the presence of two types of tumor cells: fast and slow-cycling cells. Slow-cycling cells (SCCs) are characterized as more invasive and treatment-resistant compared to their fast-cycling cell (FCCs) counterparts. The therapy-resistant nature of SCCs helps cause the recurrence characteristic of GBM, demonstrating the role SCCs play in the severity of GBM and its capacity to spread rapidly. Our lab has observed the transfer of lipids from macrophages to invasive SCCs through time-lapse imaging. This transfer provides greater insight into understanding how SCCs manipulate their immune microenvironment to support their metabolic needs and create an immunosuppressive milieu. A disruption of such communicative pathways could lead to advancements in the development of cancer therapies. Ultimately, these investigations hold great potential to translate into practical uses and development of treatments in the clinical world.

PRESENTER(S): Manasa Addagarla
AUTHOR(S): Manasa Addagarla, Karol Sanchez, Julie Maupin-Furlow
FACULTY MENTOR(S): Julie Maupin-Furlow

Exploring the Impact of Lysine Acetylation on Glycerol Kinase from Haloferax Volcanii through Site-Directed Mutagenesis

Glycerol kinase (GK) is a crucial enzyme in the halophilic archaeon Haloferax volcanii, playing a pivotal role in glycerol metabolism and stress protection. Post-translational modifications, such as lysine acetylation, can modulate the activity and function of enzymes, thereby influencing cellular processes. This study aims to investigate the impact of lysine acetylation on the function of GK from Haloferax volcanii through site-directed mutagenesis. The lysine residue at position 153 (K153) of the GK sequence was targeted for mutagenesis producing two mutant variants. K153Q mimics the deacetylated state by substituting lysine with arginine, and K153Q, mimics the acetylated state by substituting lysine with glutamine. The findings from this study will provide insights into the role of lysine acetylation in regulating the activity and function of GK in Haloferax volcanii. Understanding the impact of post-translational modifications on this crucial enzyme could shed light on the adaptive mechanisms employed by this halophilic archaeon to thrive in extreme environments.

PRESENTER(S): Grace Granum
AUTHOR(S): Grace Granum, Sara Pickernell, Sparsha Muralidhara, Paige Sidwell, and Darragh P. Devine
FACULTY MENTOR(S): Darragh Devine

Defining the social defeat stress model through analyzing depressive-like behavior in rats

Major depressive disorder (MDD) is one of the most common disorders on a worldwide scale, and is characterized by persistent and prolonged despair and anhedonia. Social stressors have been shown to play a role in defining MDD, and because of this, has been studied via the social defeat model using rodents. Dominant and submissive behaviors in the model have been studied using mice, but never rodents- this investigation will be analyzing the changes in dominant and submissive behavior in rats observed over time. Specifically, the investigation will analyze whether or not dominance behavior in resident rats during the training session is stable or dynamic when interacting with a novel group, as well as if there is a relationship between dominance behavior seen in residents and submissive behavior seen in intruders (and if this dynamic changes over time). While the investigation is currently analyzing the residents' behavior when interacting with a novel group, data from the trainer residents have shown that the time for residents to defeat an intruder decreased over the 8 days, revealing that the territorial dominance of residents increased as they became familiarized with the social defeat model.

PRESENTER(S): Julia Bailey
AUTHOR(S): Julia Bailey, Laxmi Rathor, Taylor McElroy, Sung Min Han
FACULTY MENTOR(S): Sung Min Han

Mitochondrial Fusion Promoter M1 Molecule Is Sufficient to Enhance Mitochondrial Function and Organismal Lifespan

Mitochondria play a crucial role in regulating organismal aging and health. Existing studies suggest a correlation between age-related decline in mitochondrial function and aging. Improving mitochondrial activity and homeostasis has been proposed as a potential strategy to mitigate the effects of aging. However, there is currently insufficient knowledge about the effectiveness of pharmacological manipulation of mitochondrial homeostasis in enhancing the lifespan and healthspan of a live animal.

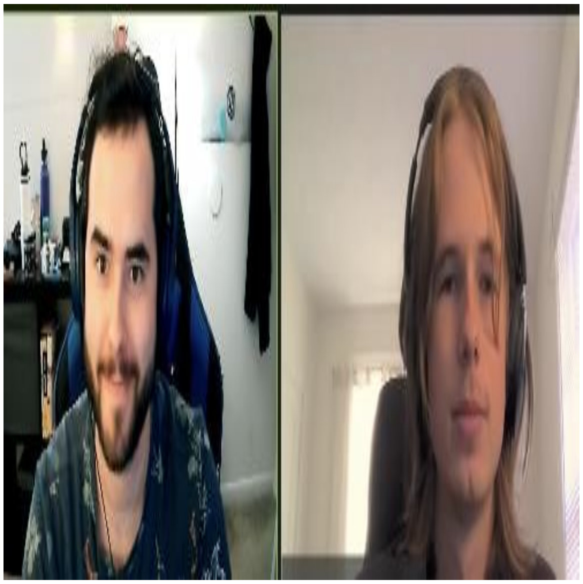
Our study focuses on M1, a small molecule recognized for its ability to promote mitochondrial fusion and transport. To investigate the impact of M1 on mitochondrial homeostasis and organismal aging, we employed the nematode C. elegans as an in vivo model. Our findings indicate that M1 enhances mitochondrial membrane potential and reduces reactive oxygen species levels. Notably, M1 treatment results in a dose-dependent lifespan extension in worms, while the accumulation of lipofuscin, an aging pigment, remains unchanged.

These results provide promising insights into M1 as a potential modulator of animal lifespan. Our ongoing research aims to explore whether M1 requires mitochondria to influence lifespan and to assess its broader impact on various healthspan parameters, including mobility and stress tolerance.

PRESENTER(S): Kathleen Rush
AUTHOR(S): Kathleen Rush
FACULTY MENTOR(S): Rodrigo Borges

Does Physics Require Metaphysics?: A Leibnizian Approach to the Relationship Between Philosophy and Empirical Science

A number of thinkers both past and present have been skeptical of the role of metaphysics in science. Hume denigrated metaphysics as an attempt to “penetrate into subjects utterly inaccessible to the understanding,” while the Logical Positivists saw metaphysics as meaningless, wholly useless to scientific inquiry. In contrast to these thinkers stands the modern philosopher Gottfried Leibniz. A mathematician and scientist himself, Leibniz held that metaphysics was not merely useful for empirical science, but necessary for its intelligibility. Guided by his Principles of Contradiction and Sufficient Reason, Leibniz opposed both those theories which posited arbitrary divine involvement in physics, as well as those which ignored the multiple levels of causation within the natural world. Leibniz argued for a middle path of scientific pursuit, consistent with his belief in a mechanistic reality undergirded by nonsensible unities. Drawing on Leibniz’s diverse corpus, I will reconstruct his arguments for the necessity of metaphysics to empirical science. I will then describe his contributions to the scientific debates of his time, in which his metaphysics grounds his physics. Finally, I will defend Leibniz’s approach to scientific inquiry against potential objections, arguing that a physics lacking metaphysics creates the very dogmatic stagnation it seeks to eliminate.



PRESENTER(S): Mark Kharab, Markus Mulvihill
AUTHOR(S): Markus Mulvihill, Jessie Srigiri , Mark Kharab, Ezequiel Juarez Garcia, Nicholas Napoli
FACULTY MENTOR(S): Nicholas Napoli

Modeling Multimodal Time Series Data for Approach and Landing of Aircraft

Despite the decrease in airplane fatalities over recent decades, aviation accidents remain a threat to aviation safety. Ongoing efforts to predict unstable landings, a large contributor to airplane incidents, have resulted in advancements to in-flight anomaly detection. A recent approach to anomaly detection, specifically to identify unstable landings ahead-of-time, has been the use of deep learning methods. Deep learning is used to mine for events or states in the flight data that are present prior to an unstable approach. These precursors are used to predict unstable approaches several minutes prior to landing. Despite their overall success, deep learning methods do not provide pilots with sufficient insight on the cause of the unstable approach. To address the reduced interpretability of deep learning models, we propose the use of Kalman filters to model multimodal time series and detect an unstable approach before landing. The identification of important flight dynamics can provide pilots with valuable insight on the specific flight variables that cause unstable approaches.

PRESENTER(S): Zachary Knutson
AUTHOR(S): Zachary Knutson (1), Triana Almeyda (1), Jack Gallimore (2), Andrew Robinson (3), Sebastian Hönig (4)
FACULTY MENTOR(S): Triana Almeyda

Light Echo Modeling of Active Galactic Nucleus NGC 3783 Using TORMAC

When supermassive black holes, found in the center of most galaxies, rapidly consume material, they become active galactic nuclei (AGN). This study employs computational modeling to explore the dust structure commonly found around AGN, focusing on one such AGN, NGC 3783. Utilizing the TORMAC code developed by Dr. Triana Almeyda, I generated simulated infrared (IR) light curves based on a 3D ensemble of clouds within the simulated dust structure, using observed optical light curves of NGC 3783 as the emission from a simulated continuum source. I used a Markov Chain Monte Carlo (MCMC) code, written by collaborator Dr. Jack Gallimore, to determine the best-fit parameter set by comparing the simulated IR light curves to the observed IR response light curves for NGC 3783. Here I will present preliminary results from these simulations and demonstrate their application towards constraining the structure and geometry of NGC 3783. This project is the first time a time-domain radiative transfer model is used to generate simulated response light curves that are then fit to observed response light curves. This method will potentially open avenues for statistical studies of the dust distribution and properties in AGN beyond NGC 3783.

PRESENTER(S): Angelina Cintron
AUTHOR(S): Angelina Cintron
FACULTY MENTOR(S): Sarah Brunnig

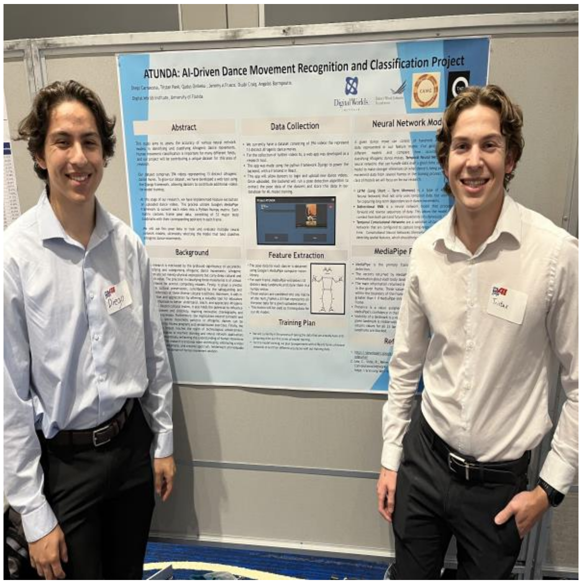
Investigating Oral Contraceptive Pill User Awareness of Nutrition Related Effects

Evidence exists for altered micronutrient status in oral contraceptive pill users, but no previous studies have explored user knowledge of such impacts. This pilot study aimed to investigate user knowledge of oral contraceptive pill benefits and risks, comparing nutritional and general health domains. The study employed an anonymous, online survey in which college-aged women who use an oral contraceptive pill could participate. The survey included background and qualifying questions, as well as a knowledge test at the end. The difference in knowledge between the nutrition and general health sections was statistically significant. Participants performed significantly less accurately on the nutrition knowledge questions than on the general knowledge questions, indicating a knowledge gap. Secondary outcomes aimed at identifying possible modulating factors for user knowledge did not yield statistically significant trends. Other survey results delve into user information sources, healthcare provider type, healthcare provider nutrition discussion frequency, and more. The study concludes with recommendations for future studies and potential methods of educating oral contraceptive pill users about nutrition.

PRESENTER(S): Leah Reudink
AUTHOR(S): Leah Reudink, Joseph Rivera, Adam Stern
FACULTY MENTOR(S): Adam Stern

Retrospective Study of the Demographics of Animal Abuse Offenders in Florida

Research has identified some trends in animal abuse offenders, including males under 30 commit intentional animal abuse more often than women and animal hoarders tend to be socially isolated females. This study analyzed animal abuse fatalities in cats and dogs submitted to the Veterinary Forensic Sciences Laboratory (VFSL) by examining offender demographic data, the animal-victim offender relationship (AVOR), and cause of death. The autopsy reports and publicly available court records of 273 animal abuse cases submitted to the VFSL (October 2018 to October 2023) were retrospectively examined. Offender demographics, the AVOR, and the cause of death were statistically analyzed. The cause of death was consistent with intentional abuse (101 cases), neglect (147 cases), and undetermined (25 cases). Offender information (limited to complete) was available from 195 cases: 100/195 of the offenders were male, 104/132 were white, 33/61 had a previous criminal conviction, and 164/224 of the offenders were the animal's owner. Analysis revealed males are significantly more likely to intentionally harm animals than females, and the more relationally distant the offender is to an animal, the more likely they will intentionally harm the animal. Additional studies are needed to gain a better understanding of the AVOR.



PRESENTER(S): Diego Carrascosa, Tristan Pank
AUTHOR(S): Diego Carrascosa, Tristan Pank
FACULTY MENTOR(S): Angelos Barmpoutis

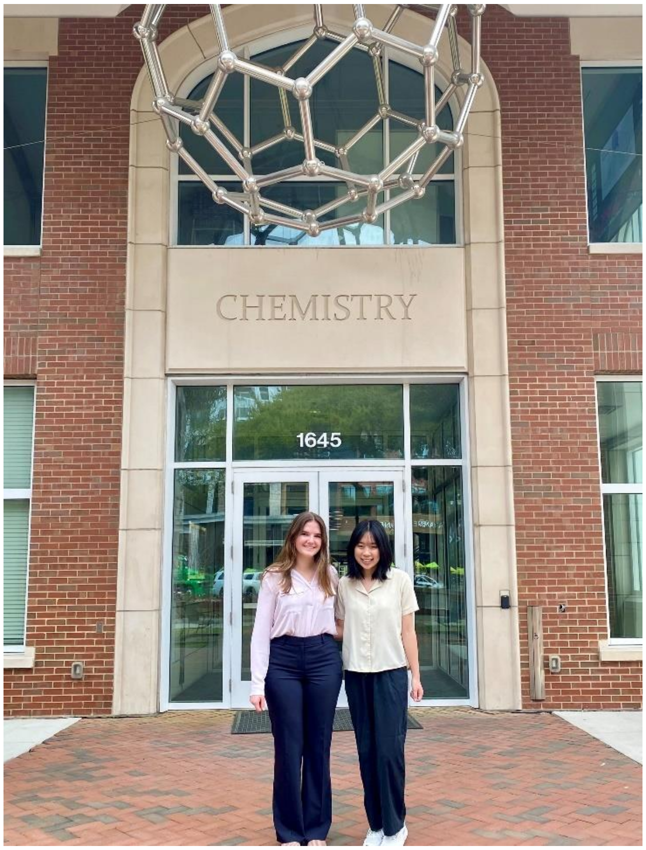
Atunda: A novel Afrogenic dance video database for AI-driven movement classification

This paper introduces Atunda, the first video database of Afrogenic dance moves systematically collected for training deep learning methods for movement classification. Additionally, the paper presents the results of training and testing various configurations of temporal convolutional networks. The results demonstrate classification accuracy exceeding 90% in classifying 13 different types of Afrogenic dance moves.

PRESENTER(S): Sofia Arvelo Rojas
AUTHOR(S): Sofia Arvelo Rojas, Karen Siena Villancio-Wolter, Daniel P. Ferris, Chang Liu
FACULTY MENTOR(S): Daniel Ferris

IMU Position Optimization for Gait Detection at Varying Walking Speeds

Optical motion capture and force plates are the gold standard for quantitatively assessing gait, but these technologies are confined to laboratory spaces which prevents the collection of data from patients in unsupervised real-world environments. The aim of the study is to (1) assess the impact of inertial measurement unit (IMU) placement on the accuracy of gait event detection and (2) determine if walking speed affects the accuracy of event detection. Angular velocity was collected using IMU placed in 8 locations of the right leg while participants walked at 6 different speeds. Gait parameters were derived using a novel algorithm to determine heel strike (HS) and toe-off (TO) events from the angular velocity signal along the sagittal plane. We computed the difference between the HS and TO timing measured by the force plate and IMU. Preliminary results show that the accuracy of event detection increases as the walking speed increases (mean difference for TO at 0.2m/s and 1.2m/s is 51ms and 31ms, respectively) and IMUs placed below the knee are more accurate than those placed above the knee with the current algorithm. The algorithm will need further development to recognize gait patterns for IMU's above the knee.



PRESENTER(S): Morgan Bonk Prusinski, Zoey Chang, Nitishsai Nandineni, Zoe Ringewald
AUTHOR(S): Morgan Bonk Prusinski, Zoey Chang, Nitishsai Nandineni, Zoe Ringewald, Mahi Athar
FACULTY MENTOR(S): Alexander Angerhofer

Investigation of Structure-Function-Relation of Oxalate Decarboxylase

Oxalate Decarboxylase (OxDC), a bicupin acid stress-regulatory enzyme native to Bacillus subtilis, is responsible for the unimolecular disproportionation of oxalate to formate and carbon dioxide at pH 4. OxDC adopts a hexameric quaternary structure, composed of a dimer of trimers. A trimeric variant of OxDC (PlOxDC) from Photorhabdus luminescens, shows a conserved active site but exhibits diminished activity, suggesting a relationship between the quaternary structure and enzyme activity. The crystallographic structure of OxDC suggests that the first 47 amino acids constitute a claw that binds the two trimers together. The trimeric structure of PlOxDC is attributed to its lack of these first 47 amino acids. To understand the structure-function relation of OxDC, the first 47 amino acids were truncated to split the hexamer into independent trimers. This contribution reports on SDS-PAGE and Native-PAGE gel-electrophoresis experiments which provided preliminary proof of the truncation of the first 47 amino acids and the adoption of a trimeric structure by the mutated enzyme. CD spectroscopy, metals analysis, and formate dehydrogenase (FDH) activity assay were performed to analyze the secondary structure and kinetics of the trimeric mutant. Lastly, we report attempts to crystallize the mutant enzyme to perform X-ray diffraction analysis to study structure.

PRESENTER(S): Kailey Schaible
AUTHOR(S): Kailey Schaible, Kim Valenta
FACULTY MENTOR(S): Kim Valenta

Effect of Nocturnal Light Exposure on the Activity Distribution of Endemic Cathemeral Carnivores in Madagascar

Nocturnal light exposure influences cathemeral behavior in lemur species of Madagascar. However, the effect of nocturnal luminosity on the daily activity distribution of the predominant lemur predator Cryptoprocta ferox, commonly known as the fossa, has not been investigated thoroughly. This study aims to establish the relationship between the fraction of moon illuminated and trends in nocturnal activity among fossa in protected areas of Madagascar. From 2007 to 2021, selected regions were photographically sampled using a camera trap grid system. Captures containing fossa were labeled "diurnal" or "nocturnal" based on sunrise and sunset times in Antananarivo, the Malagasy capital. Data for the corresponding dates' fraction of moon illuminated was collected from the U.S. Naval Observatory's Astronomical Calendar at the time zone three hours east of Greenwich. In general, more fossa captures were obtained in the hours after sunset and before sunrise, but frequent appearances also occurred in the minutes directly following sunrise and preceding sunset. Greater nocturnal activity was observed when the moon illumination fraction was highest, and nocturnal captures were generally less frequent on dates where moon illumination was lowest. These findings suggest that the fraction of the moon illuminated may be a good predictor of nocturnal activity in fossa.

PRESENTER(S): Ana Rodriguez, Hannah Thomas, Kara Kent, Susan Nittrouer
AUTHOR(S): Ana Rodriguez, Hannah Thomas, Kara Kent, Susan Nittrouer
FACULTY MENTOR(S): Susan Nittrouer

1 Generalization of Inter-Articulator Timing Control and Coordination

During speech, sets of articulators work cooperatively to achieve target constrictions in the vocal tract. Prior research has sought to define control parameters for consistent and precise attainment of these constrictions, focusing on: 1) latency of movement onset of one articulator relative to the other and 2) angle on the time-space plane of one articulator relative to the other. Tongue-tip/jaw relations studies have found that latency defines phonological structure more reliably (Masapollo & Nittrouer, 2023). The aim of this study was to see if this generalizes to other articulators. Five talkers recorded /tVCɑt/ and /bVCɑb/ sequences using electromagnetic articulography, where V was (/ɑ/−/ɛ/) and C was (/t/−/d/) or (/p/-/b/) with variation in rate and stress. Tongue-tip (TT) and lower-lip (LL) latencies and phase angles relative to the jaw's opening-closing cycle were obtained. Phonological structure explained most variance in latency and phase angle for both TT and LL. The TT displayed significantly higher eta-squared values for latency, making it more reliable. For LL, latency and phase angle were highly and equally reliable. Precise coordination of independent articulators is responsible for phonological identity regardless of the articulators involved. Timing is a consistent control parameter for all coordinative structures.

PRESENTER(S): John McCauley
AUTHOR(S): John McCauley, Daniel Stribling, Lauren Gay, Rolf Renne
FACULTY MENTOR(S): Rolf Renne

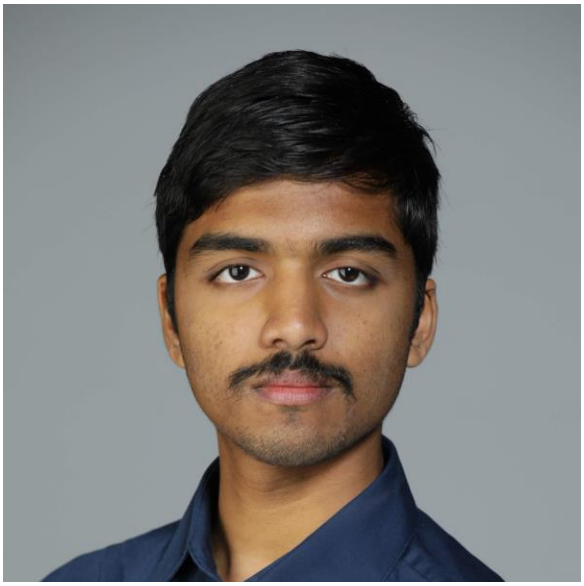
Bioinformatically Characterizing KSHV miRNA Splicing Effects on Latency

Micro RNAs (miRNAs) are a class of short, regulatory RNA molecules which play an important role in human health and disease. miRNAs regulate gene expression by influencing both the stability of transcripts and protein translation. Kaposi's Sarcoma-Associated Herpes Virus (KSHV) encodes 25 regulatory miRNAs necessary for maintaining the virus's latent phase, which leads to the development of Kaposi's Sarcoma (KS). However, despite years of dedicated research, the extent of KSHV miRNAs' involvement in promoting latency remains unknown. Here, we explore how KSHV miRNAs affect transcript splicing in infected cells and their effect on latency. Certain KSHV miRNAs have exhibited alternative splicing (AS) activity, suggesting potential links to latency. A knockout of a particular KSHV miRNA has shown splicing factor dysregulation, displaying differentially expressed transcripts. We are characterizing exonic binding sites for motifs associated with dysregulated transcription factors using bioinformatics tools. Our pipeline utilizes both established Bioinformatics tools and newly developed scripts, including hard-coded motifs. The goal of this project is the creation of a pipeline to allow investigators to characterize AS events for knockout miRNAs of KSHV. On completion, this work could help uncover the contribution splicing has on latency, helping create treatments for the eradication of the cancer entirely.

PRESENTER(S): August Bodin
AUTHOR(S): Carlos Orosco, Santosh Rananaware, Vedant Karalkar, August Bodin, Lilia Yang, Minji Chang, Zoe Fang, Ian Lange, Sarah Flannery , Jordan Lewis, Katelyn Meister, Piyush Jain
FACULTY MENTOR(S): Piyush Jain

Programmable DNA-guided RNA detection with CRISPR-Cas12 system

Type V CRISPR-Cas systems have been established tools in CRISPR-based nucleic acid diagnostic platforms. During our investigations into the diagnostic capabilities of CRISPR-Cas12i, we discovered that introducing only the spacer of the guide RNA, without its scaffold, induced selective trans-cleavage upon recognition of ssDNA targets in cis, but not dsDNA. Leveraging this, we engineered a diagnostic platform utilizing short endogenous RNAs, particularly miRNAs, as surrogate guides for nucleic acid detection. With our new approach, we precisely detected synthetic mimics of clinically relevant miRNAs such as miR-21, miR-155, and miR-122 by supplying Cas12i and a short single-stranded cDNA to the miRNA-rich sample to initiate a trans-cleavage reaction. Furthermore, we observed that adding synthetic DNA scaffolds at 3'-end of the cDNA significantly boosts the trans-cleavage activity of this system for RNA detection and enables the detection of longer RNA molecules such as the genomic RNA from HIV and HCV. We call this construct of cDNA coupled with a 3'-end DNA handle as the pseudo-DNA (or ψDNA) and leverage it for highly accurate detection of various RNA targets. Thus, we have uncovered a novel DNA-guided RNA detection with the type V CRISPR-Cas12i system and applied it for nucleic acid detection.



PRESENTER(S): Sreeram Vasudevan
AUTHOR(S): Johnny Adams, Marc Lewkowitz, Castaly Fan, Sreeram Vasudevan, Neil Sullivan, Ali Sirusi Arvij
FACULTY MENTOR(S): Neil Sullivan

A High Sensitivity Tunnel Diode Oscillator for the Detection of Weak Magnetoelectric Effects

A versatile low temperature tunnel-diode oscillator has been developed for high sensitivity measurements

of the magnetic susceptibility of samples over a wide temperature range (1.7-100 K). The system was able

to detect the very weak magnetoelectric effect in simple molecular magnets. Thermal isolation of the diode

circuit form the sample allows for studies of the magnetic properties of the sample over a wide temperature

range, typically 1.7 - 200 K.

PRESENTER(S): Geena Salinas
AUTHOR(S): Geena M Salinas, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Pamela Soltis

Ecological Niche Models of Athyrium filix-femina subsp. asplenioides and Magnolia grandiflora in Northern Temperate Mixed-Hardwood Florida Forests

Florida temperate mixed-hardwood forests provide essential habitats and resources for both plants and animals, some of which are considered indicator species. Florida has been named a global biodiversity hotspot, but plant and animal species within hardwood forests are rapidly vanishing due to urbanization and agricultural development. Hardwood forests are sophisticated and dominated by deciduous species of trees that create well-developed closed-canopy forests in mesic habitats adept at withstanding natural disasters. This project develops ecological niche models for two important hardwood forest species, Athyrium filix-femina subsp. Asplenioides and Magnolia grandiflora, and to make predictions on habitat suitability with future climate change scenarios. Athyrium filix-femina subsp. asplenioides is a native perennial that thrives in damp, shady woodland, often near streams with saturated soil. Magnolia grandiflora is a perennial blooming tree that grows best in coastal plains with rich soil near swamps and streams. These models were created using occurrence records from iDigBio and GBIF and environmental data from Soil Grids and BioClim. This project is essential for foundational research in predicting species migration as global climates continue to change and the need for species adaptation follows suit.

PRESENTER(S): Malena Gonzalez Fernandez
AUTHOR(S): Malena Gonzalez Fernandez, Katherine Deliz Quiñones, Sanneri Santiago
FACULTY MENTOR(S): Katherine Deliz Quiñones

PFAS Partition and Migration in the Indian River Lagoon: Sediment and Water Concentration Analysis

Per- and polyfluoroalkyl substances (PFAS) represent a significant environmental concern due to their widespread presence in consumer and industrial products, leading to their leaching into the environment. These compounds, which have been in use since the 1950s, are known for their toxic effects. Despite the extensive use of thousands of different PFAS compounds, the current understanding of their environmental distribution is still limited. This study is part of a project funded by the Environmental Protection Agency (EPA) aimed at investigating the exposure pathways to PFAS in Brevard County, Florida, and enhancing community resilience to these substances. This study aims to close the gap in knowledge by determining how PFAS are distributed between sediments and water in the Indian River Lagoon. Our results show a positive correlation between the increase in total PFAS concentration in sediment and their partitioning into water, although this relationship is relatively weak. Moreover, sediments exhibited a greater diversity and concentration of PFAS, along with a higher diversity of long-chained PFAS compared to water. This study offers insights into the physical and chemical characteristics of PFAS and environmental samples from the Indian River Lagoon, which are crucial for understanding their partitioning behavior between water and sediment.

PRESENTER(S): Elsa Osmani
AUTHOR(S): Elsa Osmani, Dr. Janise McNair
FACULTY MENTOR(S): Janise McNair

Advancements and Challenges in Quantum Satellite Networks

Rapid advancements in the field of quantum technologies have encouraged research in quantum networks. Development of global quantum satellite networks stands as a step towards the quantum internet, promising yet another technological revolution. This research conducts a comprehensive review of existing literature and ongoing projects, identifying key challenges confronting the practical realization of these networks. Our analysis delves into quantum entanglement distribution, quantum key distribution (QKD), and quantum teleportation over satellite links. We investigate the impact of environmental factors, such as atmospheric turbulence and decoherence, on the fidelity and efficiency of quantum communication through satellites. Moreover, we explore potential solutions and mitigation strategies, including novel satellite network architectures and the security aspects of quantum satellite networks. We compare the robustness, scalability, and efficiency of various entanglement generation and distribution protocols. Addressing the management challenges, our research focuses on solutions involving Software-Defined Networking (SDN) paradigms. Leveraging SDN principles enables efficient resource allocation, routing optimization, and flexible network control. Last, we explore the limitations of QKD protocols in achieving secure key distribution over long distances via satellite links.

PRESENTER(S): Griffin Martin
AUTHOR(S): Griffin Martin, Umesh Persad
FACULTY MENTOR(S): Umesh Persad

Automating Transtibial Prosthetic Socket Design: Leveraging Smartphone Scanning and Statistical Shape Modeling for Accessible Prosthetics

This research addresses the need for an automated tool to generate transtibial prosthetic sockets, aiming to enhance prosthetic access in developing regions where prosthetic services are scarce and costly. The prosthetic field has been seeing a gradual shift away from hand-made prosthetics and towards digital design - however, this process remains expert-led, not automated. Designs vary, but the most popular transtibial socket design is the patellar tendon bearing (PTB) design, which has a well-documented displacement distribution across certain anatomical landmarks. Smartphone LIDAR/photogrammetry scanning was selected as the primary input method for gathering residual limb data. As these scans are inherently noisy and unprocessed, data was cleaned up using the open-source Python library AmpScan. Following this, the data was processed using a statistical shape model to extract landmark locations and generate a virtual limb model. In future research, this virtual limb model can be utilized to generate prosthetic designs based on the PTB design. Additionally, this research laid the foundations for the utilization of FEA in tandem with generative design procedures to optimize designs beyond the basic categories found today.

PRESENTER(S): Maganda Holmes, Boyd Nelson
AUTHOR(S): Maganda Holmes, Boyd Nelson
FACULTY MENTOR(S): Sindia Rivera-Jimenez

Transforming Chemical Engineering Laboratories to Increase Accessibility through Remote Learning

Traditional chemical engineering unit operations labs help to prepare students for industry, but limited exposure can hinder a students ability to grasp the scope of this experience. To address this, the department of Chemical Engineering at the University of Florida has developed small-scale kits that increase accessibility for students who cannot experience industrial scale equipment. Specifically pertaining to remote learning without sacrificing learning outcomes. In 2020, as a result of emergency remote teaching, kits were 3-D printed alongside Arduino technology with the goal of online and in person implementation. These kits, when combined with existing pilot scale experiments, help to enhance the learning experience of students and complement the unit operations laboratory course. However, before full implementation of the kits in remote learning environments, their challenges need to be addressed, including intricate electrical setups and unrefined laboratory documents. Addressing this, the kits will undergo a full evaluation by a research team resulting in a redesign of the builds and instructional material to ensure clarity and reliability for future students. This work will have an immediate impact on a broader engineering education research study that will be launched in Summer 2024. Ultimately these efforts aim to demonstrate developments in engineering education.

PRESENTER(S): Carolina Rodriguez
AUTHOR(S): Carolina Rodriguez
FACULTY MENTOR(S): Anna Peterson

Does exposure to environmental degradation drive pro-environmental behavior or foster apathy among individuals?

The global environmental crisis has intensified discussions on the intricate relationship between environmental degradation and human behavior. This research explores whether exposure to environmental degradation triggers pro-environmental behavior or fosters apathy, and whether societal motivation alone can drive behavioral change amidst environmental challenges. Examining the impact of environmental degradation on habitat quality and community well-being reveals the nuanced interplay between infrastructure, economic development, and pro-environmental behavior. Grounded in the Theory of Construal Level, this research investigates how psychological distance influences responses to environmental issues across multiple different dimensions. Moreover, the role of place attachment in shaping individuals' emotional connections to their environment and subsequent behavioral responses is analyzed, drawing on contrasting findings from previous studies. Furthermore, this research delves into the influence of emotions, particularly learned helplessness, on engagement in pro-environmental behavior, highlighting the need to address psychological barriers to action. Through case studies and examples, such as Switzerland's waste recycling initiatives, and an evaluation of successful environmental interventions, this study underscores the importance of societal attitudes and policies in shaping behavioral responses to environmental challenges.

PRESENTER(S): Alexa Neilson
AUTHOR(S): Alexa Neilson
FACULTY MENTOR(S): James Davidson

Archival and Archaeological Insights into Consumer Choice in Reconstruction-Era Alachua County

During the Reconstruction era (1865-1877), Southern freedmen and their families who engaged in systems of tenant farming are often presumed to have had minimal and highly ephemeral material possessions. Archaeological excavations of such domestic sites typically turn up little, and, as such, consumer choice among tenant farmers is poorly understood. This study employs a unique archival resource — a general store ledger from Alachua County, Florida, circa 1873 — to provide a view into consumer choice among tenant farmers during this period. Through thorough analysis, profiles have been compiled for each individual or family, and all of their purchases have been categorized. The resulting dataset shows that many purchases were of daily consumables — e.g., tobacco, coffee, and ground corn — which, despite composing the majority of expenditures, have little archaeological signature. Therefore, when archaeological assemblages are analyzed in efforts to understand the income and economic engagement of tenant farmers, these expenditures are entirely missed. These otherwise hidden choices of consumption are captured in the ledger, and offer insights into the material culture of tenant farmers during a volatile era of American history.

PRESENTER(S): Heon Heo
AUTHOR(S): Heon Heo
FACULTY MENTOR(S): Nicolas Gauthier

Predicting Climate Constraints on Forest Growth with Machine Learning

Potential natural vegetation (PNV) represents a hypothetical state of vegetation expected solely based on climate, unaffected by human activity. PNV is crucial for predicting changes in forest distributions due to climate change, acting as inputs to global climate models and biodiversity conservation strategies. Previously, PNV maps were generated from low-quality data, relying on methods such as expert opinions, empirical summaries, or simple regression models, potentially introducing bias and subjectivity. The emergence of machine learning has enabled the development of a PNV prediction model that accounts for nonlinear interactions between climatic factors affecting plant growth. In this study, we leverage high-resolution climate data to train various machine learning models to predict potential forest cover. We have applied Bayesian hyperparameter tuning to enhance model performance, which we evaluated using classification and class probability metrics. Our findings demonstrate that models optimized with Bayesian tuning and preprocessed using the SMOTE algorithm show improved performance, particularly in predicting less common vegetation types. The model has identified the most significant climate factors influencing forest distribution. Incorporating high-resolution climate data with machine learning techniques presents a promising avenue for accurately predicting forest distribution.

PRESENTER(S): Serena Huberty, Meg Morrow
AUTHOR(S): Serena Huberty, Meg Morrow, Mallory Willem, Kristin Wolfe, Christopher Dutton
FACULTY MENTOR(S): Christopher Dutton

Tall Tales from the Gut: Bacterial Microbiome Analyses of Giraffes and Various Ungulates

The microbes in an organism's gastrointestinal tract, also known as the gut microbiome, can reveal valuable information about their daily life, diet, environment, and more. While widely studied in humans, our study seeks to illuminate animals' gut microbiota, specifically giraffes and other ungulates housed at Disney's Animal Kingdom. Utilizing samples collected from known individuals at Disney's Animal Kingdom, we extracted DNA using ZymoMagBead kits. After cleaning and preparing the DNA, we sequenced the 16S rRNA gene to reconstruct the microbial community with the Nanopore MinION. Since microbiomes play an essential role in the health of an organism, our results can help direct animal care teams to investigate potential reasons for changes in their animals' health. This presentation discusses preliminary findings from the beginning of a long-term collaboration between Disney Animal Kingdom keepers and researchers at UF, while helping to expand microbiome research in the animal field.

PRESENTER(S): Saesha Wani, Kajsa Carlsen, Riley Cassidy, Jackson Famularo, Kay Johnson, Arya Kapadia, Rachel Lee, Christian Palisoc, Grayson Rieck, Ann Tadros
AUTHOR(S): Aida Miro-Herrans
FACULTY MENTOR(S): Aida Miro-Herrans

Understanding Human and Louse Co-Evolution through Louse Mitochondrial DNA Analysis

Pediculus humanus are ectoparasites that live on human blood and spend their lifetime on their human host. There are two ecotypes (head louse and body louse), which are vectors of various infectious diseases and impact the health of individuals worldwide. Because head lice spend their lives on human hosts, their evolution can be linked to that of humans, as they have consequently evolved with their hosts (Perry, 2014). It is important to understand the evolution of head lice and the genetic relationships of lice to understand human evolution. Pediculus humanus are classified into six clades defined by differences in their mitochondrial DNA. Their mitochondrial DNA is organized into 20 minichromosomes, instead of one chromosome like most bilateral organisms. It is unclear whether genes on different minichromosomes exhibit the same relationship between louse populations (i.e., grouped into six clades). This project explores whether genes on different minichromosomes support the same shared evolutionary history. Computational procedures were employed to process DNA sequences for 448 samples collected world-wide. Phylogenetic trees were constructed to determine genetic relationships among individual lice. These phylogenetic trees were then compared across the different genes to identify patterns of shared evolutionary history.

PRESENTER(S): Journie Hector
AUTHOR(S): Journie A. Hector[1], Justin Ellenburg[1], Boone M. Prentice[1]
FACULTY MENTOR(S): Justin Ellenburg Boone Prentice

Imaging Mass Spectrometry of Sulfur Containing Metabolites in a Model of Systemic Staphylococcus aureus Infection

Systemic Staphylococcus aureus infection is characterized by an immune response that results in soft tissue abscesses within the host. Iron, fatty acids, and nitrogen are confirmed to be necessary for S. aureus replication within abscesses. However, in situ evidence of S. aureus scavenging sulfur-containing metabolites is lacking. Herein, we have used matrix-assisted laser desorption/ionization (MALDI) imaging mass spectrometry to map the spatial distribution of sulfur-containing metabolites utilized in S. aureus infection. Kidney tissue samples were analyzed from eight-week-old female mice infected with 107 colony-forming units of S. aureus strain JE2 via retro-orbital injection. The mice were euthanized 96 hours post-infection and the infected organs were harvested. Tissues were sectioned via a cryomicrotome at 10 μm thickness and thaw-mounted onto indium tin oxide-coated glass slides. A 9-aminoacridine MALDI matrix was applied using a custom-built sublimation apparatus and subsequently recrystallized. Tissues were then analyzed in negative ion mode on a 7T SolariX Fourier Transform Ion Cyclotron Resonance (FT-ICR) mass spectrometer. Cysteinyl glycine was found to be localized within infectious abscesses relative to uninfected control tissue, while glutathione and oxidized glutathione were downregulated within infected tissues. Future work will focus on confirming the identity of detected metabolites using MALDI imaging.

PRESENTER(S): Sarah Williams
AUTHOR(S): Sarah Williams, Madison E. Carelock, Rachel Stump, Mo Jiao, PhD, Peiyi Zhang, Zeng Jin, Lei Wang, Guangrong Zheng, and Weizhou Zhang, PhD
FACULTY MENTOR(S): Weizhou Zhang

Dissecting specific roles of BCL-XL in breast cancer metastasis

B-cell lymphoma X-large (BCL-XL) has been shown to promote breast cancer metastasis independently of its anti-apoptotic function. We designed 6 syngeneic mouse breast cancer models with genetic deletion of BCL-XL. Our preliminary tumor experiments showed opposing results with most models showing reduced metastasis by BCL-XL deletion and 1 model, Py8119, showing increased metastasis with BCL-XL deletion. We hypothesize that BCL-XL may play different roles in breast cancer metastasis depending on cellular cues from different cancer cells. We performed proteomic analysis on these cells lines to determine what molecular pathways were upregulated in the knockout (KO) lines that could contribute to this opposing phenotype in the Py8119 model. We found that there are multiple pathways contributing to metastasis, cell-cell junction, lipid metabolism, and kinase activity in the genetic KO line of Py8119 versus the wild-type (WT) line. We conclude that BCL-XL is a viable therapeutic target for treating breast cancer metastasis, but further investigation into cancer-specific BCL-XL targeting is needed. Our future efforts will focus on investigating why BCL-XL inhibits metastasis in some cancer models, which can be used as an exclusion criterion for BCL-XL-targeting therapy and potentially uncover a novel anti-tumorigenic role of BCL-XL in the tumor microenvironment.

PRESENTER(S): Ricky Cheng
AUTHOR(S): Ricky Cheng, Faith Gilbert, Hannah Engle, Caitlin Traiser, Andreas Keil
FACULTY MENTOR(S): Andreas Keil

AI Generation of Standardized Affective Images

For psychological researchers studying emotion, there are a wide range of resources used. One of the most established methods is the The International Affective Picture System (IAPS). IAPS has been thoroughly developed to provide a standardized set of static images that induces emotion on a dimensional scale of valence and arousal (Lang, 1997). But challenges arise as new generations of observers become less pertinent to these images, and researchers request more images than available. This study seeks to address these challenges by generating AI images that imitate the original IAPS images to evaluate the efficacy of this method in hopes of creating a larger standardized database for researchers to use. We showed participants 120 images with 60 being original IAPS images and 60 being artificially matched counterparts. Among the 60 images, each set contained 20 unpleasant images, 20 pleasant images, and 20 neutral images. We tracked their behavioral self-report responses, neural EEG responses (late positive ERP potential, LPP), as well as their pupil dilation. Our findings suggest that the valence ratings, LPP amplitude, and pupil dilations did not differ significantly between the original and AI images while the arousal ratings did.

PRESENTER(S): Ayana Price
AUTHOR(S): Ayana Price,Dr. Raquel Dias, Dr. Joseph Larkin
FACULTY MENTOR(S): Raquel Dias

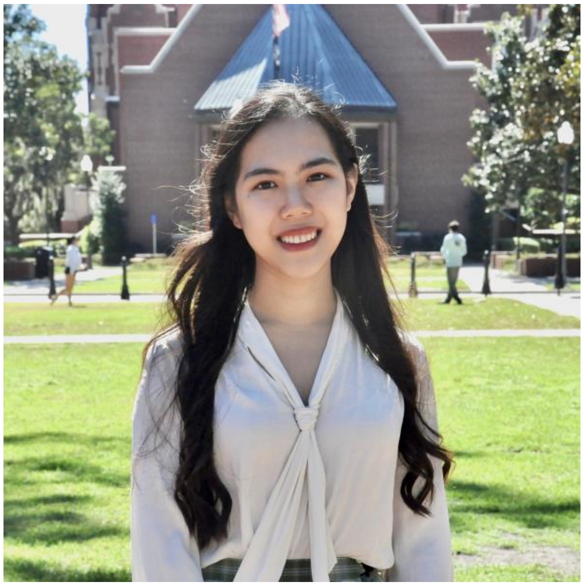
Binding Affinity of SOCS1 Dimer vs SOCS1 Monomer to JAK2

Research has shown that protein SOCS1 dimer has higher affinity to JAK2 than SOCS1 monomer. SOCS1 plays an integral role in the JAK-STAT pathway. The JAK-STAT signaling pathway is involved in the processes of immunity, cell division and cell death. SOCS1 is inhibits JAK from binding which will down-regulate the signaling events. Bioinformatic tools and AI were used to analyze protein-protein interactions. Using Hipergator, AlphaFold generated 3D models of JAK2 and SOCS1 multimers. AlphaFold's precision aided in creating accurate models, enabling us to analyze bonding angles, rotations, and protein folding. Through these comparisons, we gain insights into the reasons behind the superior binding of the SOCS1-KIR dimer, providing a visual understanding of their interactions. Stability checks on each structure ensured they were accurate. The Ramachandran plot of SOCS1 monomer revealed many amino acids in disallowed regions. This suggests that there may be structure distortions in the protein's conformation due to strained conformations or misfolding. Structural complications of SOCS1 will lead to inflammation and autoimmune disorders. In forthcoming studies, we will investigate the evolutionary dynamics across diverse species to analyze the conformational changes of JAK2, JAK1, JAK3, SOCS1, and TYK2. Thus, revealing which mutations are driving this function.

PRESENTER(S): Aneth I. Castaneda-Garcia
AUTHOR(S): Aneth I. Castaneda-Garcia, Haohao Zhao, Jeongim Kim
FACULTY MENTOR(S): Jeongim Kim

Unraveling The Role of Mediator Subunit 5 in Tomato

Mediator, a multisubunit complex, is a coactivator of transcription in eukaryotes. It is structurally divided into three core modules: head, middle, and tail, and a dissociable cyclin-dependent kinase module. The Mediator subunits have versatile functions in plant growth, stress responses, and metabolism homeostasis. Mediator subunit 5 (MED5), a tail subunit, has been identified as a central player in the phenylpropanoid metabolism in Arabidopsis thaliana. However, the role of MED5 in other plant species remains obscure. Understanding the role of MED5 in tomato (Solanum lycopersicum L.) provides opportunities to enhance the nutritional value of tomato. Three MED5 homologs, SlMED5A, SlMED5B1, and SlMED5B2, were identified in the tomato genome. To determine the function of tomato MED5s, we generated slmed5a single and slmed5b1/b2 double mutants using the CRISPR-Cas9 system. To verify the successful knockout of each gene, we performed sequencing for predicted mutation regions. The sequencing results indicated deletion mutations in SlMED5A, SlMED5B1, and SlMED5B2 of the single and double mutants, resulting in nonfunctional SlMED5s. Then, we crossed slmed5a and slmed5b1/b2 to get triple mutant. Among the F2 generation, we identified a slmed5a/5b1/b2 triple mutant candidate. Further validation and characterization of slmed5a/5b1/b2 triple mutant will reveal the role of SlMED5.



PRESENTER(S): Haohui Bao
AUTHOR(S): Haohui Bao, Fang Xu, Tianyu Zhou, Jing Du
FACULTY MENTOR(S): Jing Du

Augmented Reality in Public Safety: Exploring Spatial Cognition with HoloLens2 for Enhanced First Responder Coordination

Augmented Reality (AR) technology enabled by head-mounted display (HMD) has diversified the ways humans interact with the physical environment through its ability to create and overlay information and visual effects on real-world objects. ARHMDs with optical see-through (OST) lenses hold the potential to improve the effectiveness of public safety, especially in assisting in mission-critical situations. This study explores the possibility of utilizing HoloLens2 in dynamic environments to assist first responder coordination and spatial cognition. Conventional maps present the minimum necessary information required for spatial understanding and estimation in wayfinding, and the distance may be reflected differently on the map than it appeared to users based on their previous experience of the physical world. The unique capability of ARHMDs to align 1:1 scaled holographic maps with the user's first-person view offers a novel approach to depth and spatial information closer to the user's natural interpretation of the physical world. A series of user studies is designed to investigate performance differences in distance estimations and path planning to assess the efficacy of this system. Additionally, the study evaluates the impact of UI designs and limitation in visualization to understand ARHMDs' potential in practical applications comprehensively.

PRESENTER(S): Ayisha Beauge
AUTHOR(S): Ayisha Beauge, Yu Tin Lin, Haohui Bao, David H. Chong, Jeris G. Gonzales, Troy R. Scoggins, Jason B. Ang, Sophia A. Dadla, Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

A Quantitative Analysis of Convolutional Neural Network Clustering in Imaging Mass Spectrometry

Imaging mass spectrometry enables the spatial analysis of a variety of biomolecules in tissues. The label-free nature of this technology results in the detection of hundreds to thousands of individual compounds in a single analysis, necessitating computational tools for streamlined data analysis. This study explores the application of pre-trained Convolutional Neural Networks (CNNs) for analyzing imaging mass spectrometry datasets. For the purpose of this study we utilized a dataset of rat brain scans, employing a Python and R-based data processing pipeline tailored for imaging mass spectrometry. We demonstrate that transfer learning surpasses both k-means clustering and direct use of pre-trained CNNs. Additionally, we investigate the theoretical underpinnings, highlighting the non-independent and identically distributed (non-IID) nature of brain scan data compared to standard image datasets typically used for CNN training. Brain scan data differs from the IID assumption due to spatial pixel dependencies and regional variations in biomolecule distributions. This non-IID nature challenges k-means clustering, resulting in lower accuracy and precision. However, transfer learning with CNNs benefits from this by leveraging spatial relationships. capitalizing on transfer learning with pre-trained CNNs improves neuroimaging analysis, paving the way for more accurate models and unlocking the full potential of this data for neuroscience advancements.





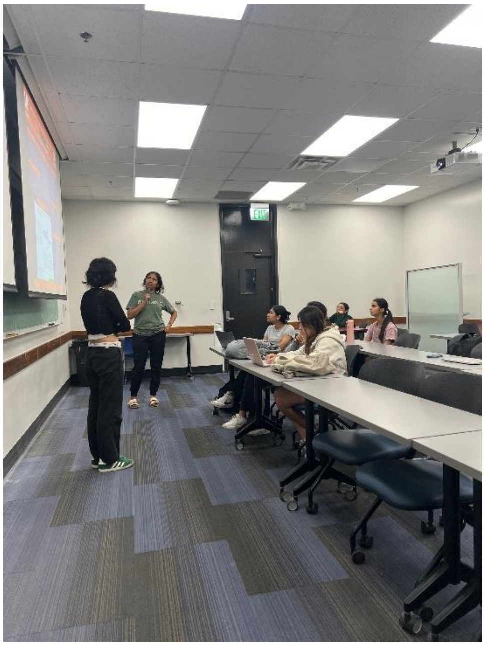
PRESENTER(S): Hailet Sejpal, Alyssa Lee
AUTHOR(S): Hongwu Wang, Raghuveer Chandrashekhar, Yuan Li, Alyssa Lee, Hailey Sejpal
FACULTY MENTOR(S): Hongwu Wang

Walker Acquisition and Usage for Older Adults- An Explanatory Study

Impropriate walker setup and usage could lead to adverse events such as falls and injuries. This study aimed to explore how walkers' acquisition, utilization, and upkeep contributed to walker-associated incidents.

An in-person survey was conducted with 16 walker users, with 87.5% over 75 years of age. Most of the participants use four-wheeled walkers (68.8%), followed by two-wheeled walkers (25%) for less than 4 years (68.8%). 75% of participants got their walkers without professional referrals. 87.5% of participants claimed to be satisfied with their walkers. However, about one-third had trouble using their walkers, and 37.5% reported injuries associated with walker usage. None of the participants received written information/guidance on seeking advice or support if needed with their walker.

These findings highlight the need for evidence-based assessment and referral processes for walkers. Further work needs to be done focusing on establishing guidance for walker setup and education tutorials to walker users to reduce potential injuries with enhanced mobility and independence.



PRESENTER(S): Drishti More, Isabella Guenzler
AUTHOR(S): Drishti More*, Isabella Guenzler*, Rachana Kandru
FACULTY MENTOR(S): Ajay Mittal

Understanding the Effectiveness of NSAID Pain Interventions for Women Experiencing IUD Insertion Pain

The dismissal of women's pain during gynecologic procedures in the United States, is not a new occurrence, specifically, the under-treatment of women's pain during IUD insertion procedures is a common issue. The pain women experience in medical procedures is often not given proper attention from providers, resulting in the under-treatment of women's pain with the necessary pain medication, potentially exposing women to unnecessary pain. We aimed to understand how the treatment of IUD insertion pain with NSAIDs can impact women experiencing IUD insertion pain throughout the IUD insertion procedure. Addressing this issue is vital to public health because it can prevent unintended pregnancy by addressing the hesitancy to receive an IUD as a result of anxiety surrounding the perceived potential pain of IUD insertion. Understanding this issue explores the effectiveness of an accepted form of pain management for IUD insertion to determine if NSAIDs are appropriate pain relievers to significantly decrease the pain experienced during IUD insertion. Overall, truly understanding the experiences of women obtaining IUDs in relation to NSAID pain management techniques reveals this treatment does not significantly decrease women's experience of pain during the IUD insertion procedure. Thus, more comprehensive pain management must be pursued in the future.

PRESENTER(S): Maheera Hossain
AUTHOR(S): Maheera Hossain, Yi Guo, Ang Li
FACULTY MENTOR(S): Yi Guo

Impact of Healthcare Access Amongst High Risk HIV Populations Using Cancer Screening Questions: Cross-Sectional Analysis of 2023 BRFSS Data

When studying high risk human immunodeficiency virus (HIV) populations, many studies are done that look at the impact of HIV on overall health as well as immunity to COVID-19, influenza, and other such diseases. Cancer is known for not having a definitive cure nor is there a definitive means to ensure that one can avoid getting cancer. While research has been done on multiple high risk populations in regards to race and socioeconomics, the HIV population is often overlooked when it comes to their risk to cancer. This study intends to look at the HIV population in America in comparison to the cancer screening questions via the BRFSS data and determine whether the impact on healthcare access plays a role in the correlation between HIV populations and their ultimate risk for cancer. The data used was from the 2023 BRFSS data set offered by the CDC via a cross sectional survey. Multivariable logistic regression model was performed to evaluate associations of healthcare access and HIV testing with the uptake of cancer screening

PRESENTER(S): Martha Lockman
AUTHOR(S): Martha Lockman
FACULTY MENTOR(S): Seth Bernstein

War Through Women's Eyes: Analyzing WWII Narratives in the Soviet Woman

This research project examines World War II memory through the perspective of the Soviet Woman. The Soviet Woman was a women's magazine and a form of Soviet propaganda published by the Soviet Women's Anti-Fascist Committee from 1945 to 1991. To celebrate Victory Day, the May issues of the Soviet Woman featured many stories of women who participated in or contributed to World War II. This research analyzes the May issues of the Soviet Woman published from 1955 to 1990 in five-year increments. The aim is to understand how the Soviet Woman treated World War II by investigating the commemoration of Victory Day over time and focusing on the concerns presented in the stories, such as the disarmament of nuclear weapons, the future of children, and solidarity between women. The contents of the stories featured changed between 1955 and 1990 according to how the Soviet Woman intended to present World War II to its readers. This research project reveals that the portrayal of World War II within the May issues of the Soviet Woman changed multiple times, reflecting shifts in how the Soviet Union intended to present World War II memory and its ideological messages to an international audience.

PRESENTER(S): Savannah Still
AUTHOR(S): Savannah Still, Jared Cathey, Anthony Gonzalez
FACULTY MENTOR(S): Anthony Gonzalez

Searching for Lens Structure in SPT0311-58

Using James Webb Space Telescope (JWST) NIRCam and MIRI imaging, which we acquired through Program GO 1791 (PI: Spilker), we extract photometry. To calculate photometric redshift, we fit the Spectral Energy Distribution (SED) for the additional structures near the SPT0311-58 system. Current gravitational lens models for this system do not account for structures aside from the central lens, which is magnifying the source at a redshift z=6.900. These auxiliary structures are identifiable through examination of HST and ALMA images of the same region. To improve current lens models, further information is needed about other structures in the system to determine whether they are foreground objects or associated with the lens. In extracting photometry from these objects at each available wavelength, we use GALFIT to model the central lens, which would otherwise contaminate the signal from nearby structures within the data. With these fluxes, we use EAZY-py to calculate respective redshifts through SED fitting. These redshifts will inform whether these structures are important to account for in the lens or not.

PRESENTER(S): Sean Munsie, Riya Saraf, Noah Whelden
AUTHOR(S): Noah Whelden, Riya Saraf, Sean Munsie, Wayne C.W. Giang
FACULTY MENTOR(S): Wayne Giang

"Can ChatGPT do my Homework?": Human Factors Methods to Improve Student use of ChatGPT

ChatGPT will have transformative effects on education. However, whether students can effectively use these tools and their impacts on learning are not well understood. This research applies human factors concepts to teach effective use of ChatGPT, focusing on task analysis and function allocation as strategies to integrate AI tools.

We redesigned an assignment from a senior undergraduate human factors course by implementing a "learn-by-doing method". Based on an assessment of their own and ChatGPT's strengths and weaknesses, students will allocate writing tasks which they identified through a task analysis. They will then collaboratively write and critique an essay. Next, students will research ChatGPT to better understand its capabilities before reallocating the tasks and generating a new essay, which will be compared to the original. To measure how student views of AI tools have changed, students will complete a survey explaining their knowledge and perceptions about ChatGPT both before and after completing the assignment.

We anticipate that this assignment will lead to a better understanding of ChatGPT's capabilities, more effective task allocation, improved essay quality, and increased trust in AI tools. This research aims to show that students can utilize AI to aid in completing tasks, transforming both education and productivity.

PRESENTER(S): Emily Garnica
AUTHOR(S): Emily Garnica
FACULTY MENTOR(S): Sarah Gamble

House Relocation in Relation to Future Sea Level Rise in Florida

In Pinellas County, Florida, the effects of global warming are becoming more pronounced and coastal homeowners face greater risks of property damage. In a search for solutions there is the historic practice of house relocation. This may look like lifting a home, moving it to a different location within the same property, or transporting it to another property altogether. House relocation as a practice requires a permit, contractor, coordination with the city in certain cases, and (most importantly) time. Navigating often roundabout information about the subject, coastal property owners are left questioning how they can save their properties before it's too late.

What individual and community benefits does house relocation provide historically and in context with rising sea levels? How can house relocation be used in response to rising sea levels? To answer these questions, this project analyzes the current policy concerning house relocation in the major coastal cities of Pinellas County and trends of its occurrence. It identifies five case studies of homes and historic buildings being relocated. Then, interviews are conducted with locals across disciplines in connection to house relocation. This project then provides alternatives for the county to improve accessibility for homeowners to plan for their futures.

PRESENTER(S): Melody Morales Rojas
AUTHOR(S): Melody Morales Rojas, Mateus Rocha
FACULTY MENTOR(S): Mateus Rocha

Insights into Resin Cement Polymerization: Preliminary Investigations for Predictive Modeling in Ceramic Restorations

Ceramic materials have emerged as a popular choice for restorative dental treatments due to their favorable optical and biomechanical properties. However, selecting the ideal cement or luting agent for ceramic restorations remains a challenge for clinicians. Recent interest has focused on the polymerization of resin-based cements, a critical factor influencing clinical outcomes. While various variables, including ceramic type, thickness, and light-curing conditions, impact resin cement properties, detailed investigation on predicting polymerization based on these variables is lacking. This study focuses on evaluating the degree of conversion (DC) of light-cured and dual-cured resin cements under different conditions, serving as a foundation for the application of artificial neural networks (ANN) to analyze resin-based cements more comprehensively in future research endeavors. The spectral irradiance of single-peak and multi-peak light-curing units and the light transmittance through the rectangular lithium disilicate specimens with six different thicknesses were evaluated using Fourier-transform infrared (FTIR) spectroscopy. The results provide insights into resin cement polymerization dynamics contribute to enhanced predictive modeling using machine learning software (SAS Viya), potentially improving ceramic restoration longevity.

PRESENTER(S): Ann-Kareen Gedeus
AUTHOR(S): Terek Arce, Ann-Kareen Gedeus, Kyla McMullen
FACULTY MENTOR(S): Kyla McMullen

A Comparison of Mixed Reality Corsi-Block-Tapping Tests To Their Physical Counterparts

Spatial memory allows us to remember the location of objects in our environment. Spatial memory in peripersonal space (within reaching distance) may function differently from spatial memory in navigational space (route memory). Spatial memory in peripersonal space is commonly measured by the Corsi-Block Tapping Test (CBT), while spatial memory in navigational space is commonly measured by the Walking-CBT (WalCT). Both the CBT and WalCT are subject to inconsistencies due to non-standard practices in their physical setup and administration. Mixed Reality versions of the CBT and WalCT could improve some of these inconsistencies. Mixed Reality (MR) head-mounted display (HMD) technology, such as the Microsoft HoloLens, seamlessly integrates virtual simulations into physical environments. MR HMD's provide users with an intuitive interface, enabling them to interact with virtual objects through hand gestures rather than mouse, keyboard, or controller. In order to assess the comparability of the MR CBT and physical CBT, they both were implemented, and their equivalence compared. The results suggest that the tests were not equivalent. These results were interpreted in the setting of device tracking imprecision, which is the cause of longer sequence completion times.

PRESENTER(S): Isabella Mark
AUTHOR(S): Isabella Mark , Sabrina Zequeira, Katherine Provan, Barry Setlow, Jennifer Bizon
FACULTY MENTOR(S): Barry Setlow

Effects of Acute delta-9-tetrahydrocannabinol (THC) on Age-Related Cognitive Decline

Older adults now represent the most rapidly growing group of cannabis consumers. Cannabis has been suggested to positively influence cognition among animals and human studies. Prior data from our lab showed that acute exposure to cannabis smoke enhanced working memory performance in aged male rats. Additionally, work from our lab has demonstrated that chronic oral THC administration enhances working memory performance in both aged male and female rats. Here, we look to determine whether acute oral THC consumption impacts cognitive performance in Fischer 334 x Brown Norway F1 hybrid rats (n=18). Rats were trained in operant chambers on a delayed response working memory task, in which they had to remember the left/right position of a response lever over short delays (0-24 s) to earn food rewards. Upon achieving stable baseline performance, THC was administered via a randomized, within-subject design such that each rat was tested with multiple doses (0, 0.1, 0.3, 1.0, 2.0 mg/kg). Initial data show that acute oral consumption of THC had no significant effect on performance in young or aged rats of either sex. Considered together with our prior work, these results indicate differential effects of cannabis/cannabinoid ingestion, depending on both route and duration of administration. Future studies will evaluate the effects of acute oral THC consumption on other forms of cognition, as well as the effects of CBD and THC co-administration on cognition.

PRESENTER(S): Ashley Wu
AUTHOR(S): Ashley Wu
FACULTY MENTOR(S): Laura Dallman

Violations of Musical Expectation and Emotion: A Qualitative Study and Interpretation

A natural consequence of listening to music is the development of musical expectations, or rhythmic, harmonic, and structural anticipations of what the listener expects to hear . Existing research in psychology and neuroscience demonstrates that violation of these musical expectations has significant physiological and emotional effects on the listener. This study investigates the relationship between types of violations of musical expectations and perceived emotions. Through a survey format, participants were asked to evaluate their experience listening to twelve excerpts by providing written responses and completing two rating scales defined by Faith and Thayer (2021). This allowed for a more qualitative evaluation of emotion in contrast to physiological measures that have been used in other studies. Nonparametric and chi-squared tests showed statistically significant differences between median ratings according to type of violation. Thus, this study provides evidence supporting a relationship between types of violations of musical expectation and perceived emotions in listeners. Further research is suggested for possible applications of this relationship in musical compositions.

PRESENTER(S): Christina Bennett
AUTHOR(S): Christina Bennett
FACULTY MENTOR(S): Ellen Martin

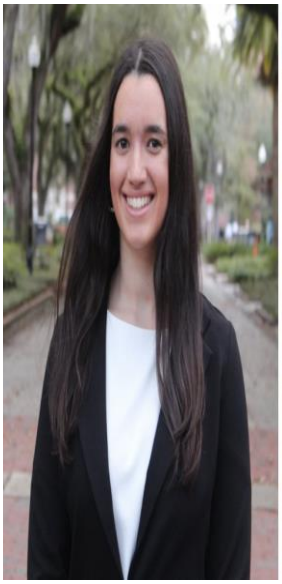
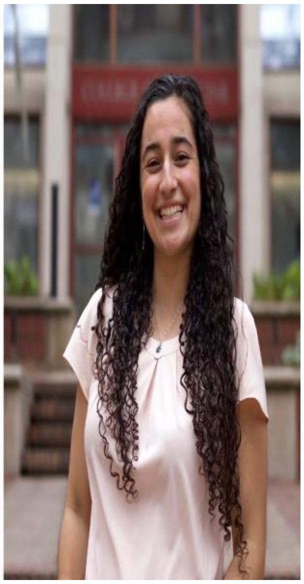
Radiogenic Isotope and Chemical Weathering Trends in Kobbefjord, Greenland

Over the last 20,000 years, glacial retreat across Greenland's landscape has exposed fine grained, mechanically weathered glacial sediment that is readily weathered by chemical reactions. The Kobbefjord region in SW Greenland creates a microcosm of the proglacial and deglaciated environments in the Arctic with a deglaciated watershed exposed over the past 10,000 years adjacent to permanent ice caps that currently supplies the system with glacial meltwater. Analysis of the radiogenic Sr isotope ratios of paired bedload sediment and stream water samples illustrates distinct Sr isotopic signatures for waters collected from sites draining glacial melt water compared to soil waters draining active layer melt. These two endmember sources are further modified as the waters flow through lake systems in the Kobbejord valley. The $^{87}Sr/^{86}Sr$ values of the waters in icecap meltwater-dominated sites are 0.12557higher than the $^{87}Sr/^{86}Sr$ values of the sediment, while this difference is only 0.02954 in active layer-dominated sites. These differences reflect variations in the extent of chemical weathering associated with each of these environments. The geochemistry of icecap meltwaters is dominated by reactive trace minerals indicating a low extent of chemical weathering, while the soil water geochemistry suggests more extensive weathering of major rock-forming minerals. These patterns mirror previously observed trends in deglaciated watersheds. Analysis of these weathering trends can have implications for the changes in nutrients delivered to the ocean and greenhouse gas exchange associated with weathering as global temperatures continue to increase and glaciers retreat.

PRESENTER(S): Julia Seifer
AUTHOR(S): Julia H. Seifer, Makenzie E. Mabry, Alex C. McAlvay, Douglas E. Soltis, and Pamela S. Soltis
FACULTY MENTOR(S): Pamela Soltis

Path to Food Security: Investigating the Utility of Feral Populations for Brassica Crop Breeding

Feral plants are valuable, yet underappreciated, genetic resources that could improve the yield of existing crops and increase our understanding of evolutionary processes. Our research works to expand our current understanding of feral crops through ecological niche modeling (ENM) for Brassica oleracea and Brassica rapa, projecting these onto maps of current and future environmental conditions, enabling us to better understand abiotic limits of species' distributions and how this may be impacted by climate change. One challenge in developing ENMs is finding occurrence records that accurately reflect species records, so we compared datasets filtered by manual categorization, geolocation based on land use, and artificial intelligence software, ultimately to differentiate between feral and cultivated collections of Brassica. Niche modeling can point to which feral populations may handle climate change related stresses (i.e., temperature, salinity, water) best, which can be leveraged for targeted collection of new germplasm. This can then be evaluated for genes associated with pathogen resistance and overall environmental stress tolerance. Overall, we hope our research highlights the pivotal role of digitized natural history collections with georeferenced locality information. These collections, often overlooked, represent an expansive and underutilized reservoir poised to significantly contribute to the development of climate-ready crops.

PRESENTER(S): Rachel Nattis, Eden Goldenberg
AUTHOR(S): Rachel Nattis, Eden Goldenberg, Sarah Bottari, John Williamson Samantha Penhale, Isabella Nelson, Dolores K. Miller-Sellers, Susheela Hadigal, Michael Jaffee, Eric Porges, Damon Lamb
FACULTY MENTOR(S): John Williamson

The Impact of Diurnal Cortisol Levels on Neurobehavioral Symptoms and Sleep Quality in PTSD Patients

Sleep disturbance is a common symptom of post-traumatic stress disorder (PTSD), with many patients demonstrating a pattern of more shallow and fragmented sleep as well as frequent nightmares. In veterans, mild traumatic brain injury (mTBI) and PTSD are often linked. Hypothalamic-Pituitary-Adrenal (HPA) axis dysregulation in the context of chronic stress may be one mechanism underlying sleep disruption in patients with PTSD and mTBI. In the present study, we examined the relationship between diurnal cortisol levels, sleep quality, and neurobehavioral symptom presentation in veterans with PTSD and/or mTBI. We hypothesized that smaller average dynamic range in cortisol levels may be associated with greater self-reported neurobehavioral symptoms and poorer sleep quality. Analyzing data from 34 veterans demonstrated a negative correlation between PSQI/NSI scores and cortisol levels. Given that higher PSQI scores are indicative of poorer sleep quality and higher NSI scores are indicative of greater neurobehavioral symptom presentation, these findings appear consistent with current literature. A greater evening-morning cortisol difference relates to improved sleep quality and reduced neurological symptoms.

PRESENTER(S): Aiden Hernandez
AUTHOR(S): Aiden Hernandez
FACULTY MENTOR(S): Douglas Soltis

Ecological Niche Modeling in Ostrya virginiana and Ulmus alata

Hardwood forests are an important factor of the ecological biomes in Florida. Various florae depend on the conditions of hardwood forests to thrive and are largely endemic to them. Should the occurrence of suitable habitats for these species shift due to climate change, the overall balance of these ecosystems will be put at risk. The goal of this project is to produce ecological niche models for two species that are characteristic of these hardwood forests. This work will allow researchers to predict geographic ranges and distributions of these species based on projected climate change. The two species chosen are Ostrya virginiana and Ulmus alata due to prior experience in field identification. Once a model is mapped it can be compared with future ecological niche models built on projected climate change data. This research will build upon the efforts of other researchers to further advance ecological niche modeling strategies, which could help conservation efforts gain an advantage in future environmental protection. The future steps for research include the continuation of ecological niche modeling opportunities, especially with new technological advancements.

PRESENTER(S): Artem Egorov
AUTHOR(S): Artem Egorov, Dr. Kyle Riding
FACULTY MENTOR(S): Kyle Riding

Effects of calcined clay cement on the shrinkage cracking of 3D printed concrete

This study investigates the effectiveness of calcined clay, a low carbon footprint cementitious material, in reducing shrinkage cracking. While research has been done on the rheological and mechanical properties of calcined clay 3D printed concrete (3DPC), the durability properties have not been investigated in full. Restrained shrinkage rings will be used to measure the shrinkage cracking of 3DPC. A control 3DPC mix was first developed using locally sourced materials, including Portland-limestone cement, sand, and admixtures. The mix was assessed for shape retention and flowability using ASTM 1437 flow test, for pumpability and printability using a caulking gun, and for buildability using a robotic arm 3D printer. A ram extruder was built to measure the rheological parameters: yield stress and viscosity. Based on past research and performed trials, an acceptable region of 130 to 210 mm slump-flow was selected for further testing using calcined clay. The influence of admixtures was noted: a higher dosage of superplasticizer increased slump-flow, the increase in viscosity-modifier content decreased slump, and the addition of air entrainer improved pumpability. The next phase of the project consists of developing a 3DPC mix using calcined clay, determination of its rheological parameters, buildability assessment, and restrained shrinkage testing.

PRESENTER(S): Varun Hoskote
AUTHOR(S): Varun Hoskote, George Adedokun, John Scott Wheeler, Matthew Jansen, Z. Hugh Fan
FACULTY MENTOR(S): Hugh Fan

Integration of Isothermal Amplification with RNA Extraction for Point of Care Virus Detection

Mosquito born viruses such as Zika and Dengue virus cause significant mortality worldwide. To reduce the mortality rate of such diseases, rapid, point-of-care devices are important to provide timely identification for appropriate care in resource-limited settings. We have developed a point-of-care testing device, utilizing a ball-valve-enabled delivery system to prepare and purify nucleic acids from a sample onto cellulose paper. Detection can be performed on this extracted RNA sample using reverse transcription loop-mediated isothermal amplification (RT-LAMP). This highly specific process takes less than 60 minutes from the start of sample preparation to the end of detection. However, a drawback of this device is the stringent requirement of cold storage for RT-LAMP reagents, often unavailable at the point of care. To address this, we are improving this device by integrating lyophilized RT-LAMP reagents that can be stored and transported at room temperature, eliminating the need for cold storage. Reconstitution occurs after the RNA has been purified utilizing a separate well in a PDMS attachment with a sealable channel into the detection unit. This innovation aims to demonstrate the feasibility of room temperature storage and usage at the point of care, enhancing accessibility and effectiveness of our device in low resource settings.

PRESENTER(S): Adelyn Richgels
AUTHOR(S): Adelyn Richgels, Andrea Orozcotorres, Lauren Eccles, Whitney Stoppel
FACULTY MENTOR(S): Whitney Stoppel

Parameters influencing the mechanical properties and solubilization of Plodia interpunctella silk fibroin for biomaterial applications

Silk, a natural biopolymer, is commonly utilized in biomedical applications due to its advantageous assets – specifically, its robust mechanical properties, biocompatibility, and biodegradability. Silk is primarily composed of two classes of proteins, fibroins and sericins, with sericins potentially causing immune responses when used as a biomaterial. Silk fibroin-based biomaterials are heavily influenced by studies of the Bombyx mori (Bm) silkworm, due to its regularity in the textile industry. However, due to the minimal environmental control on Bm rearing, we study an alternative silkworm, Plodia interpunctella (Pi), which can be responsibly reared in a laboratory setting. This work focuses on evaluating methods to extract SF from Pi silk, both through degumming of the solid silk fiber and through the generation of silk solution that can then be purified downstream. It is expected that degummed silk fibers will exhibit different structural and mechanical properties than non-degummed silk due to the absence of sericins, which can also impact the solubility of the SF. Ongoing work has established a protocol to solubilize Pi silk, simultaneously paralleling and contrasting methods in that of Bm processing. Optimization of this process by modifying parameters is essential to addressing existing challenges of solution stability and applications.

PRESENTER(S): Khushil Patel
AUTHOR(S): Khushil Patel, Beatriz Veronese, Zhe Ma
FACULTY MENTOR(S): Zhe Ma

The Role of KSHV-encoded cGAS-STING Inhibitors in Lytic Replication

Kaposi's sarcoma-associated herpesvirus (KSHV) establishes persistent infection in the host by encoding a vast network of proteins that aid in the evasion of innate immunity pathways. The cGAS-STING is a potent immune sensor pathway associated with antiviral responses, and this pathway is able to inhibit the reactivation of KSHV from latency. Previously, we have identified multiple cGAS/STING inhibitors encoded by KSHV, which highlights the critical anti-KSHV role of this pathway and suggests the importance of these inhibitors on optimal KSHV lytic replications. In this study, we aim to validate and further investigate three of these promising inhibitors (ORF48, ORF55, and ORF67). Our hypothesis is that these viral proteins inhibit the cGAS-STING pathway to facilitate KSHV replication. We utilized short interfering RNAs (siRNAs) to knockdown ORF48, ORF55, or ORF67 in iSLK.219 cells, a cell line that harbors the entire KSHV genome. We report that knockdown of ORF48, ORF55, and ORF67 significantly impairs lytic replication of KSHV, as demonstrated by reduced lytic gene, lytic protein expression, viral genome replication, and infectious virion production. We are further dissecting the mechanism by which these ORFs suppress the cGAS-STING pathway to facilitate replication.

PRESENTER(S): Hannah Gutierrez
AUTHOR(S): Hannah Gutierrez
FACULTY MENTOR(S): Vandana Baweja

Climate Justice Education in Design

Climate change is an intersectional issue with impacts that extend far beyond the environment alone. Environmental hazards caused by climate change affect global economic and social systems, and disproportionately impact minorities. The climate justice movement emerged in 1982 as a response to the unequal impacts of climate change. This paper analyzes how climate justice education in design can mitigate climate change by encouraging sustainable and resilient design. The design and construction field as a whole is a large contributor of greenhouse gas emissions which are known to exacerbate climate change. Through prioritizing energy efficiency and sustainable design, building's greenhouse gas emissions can be significantly reduced. Climate justice education through a human centered approach fosters a personal connection to climate change as an issue. It is important to educate the next generation of designers so that they can put their education into practice, and develop personal stake in combating climate change.Through an analysis of climate change focused research, this paper concludes that climate justice education is imperative for creating competent designers that can address climate change and its impacts.

PRESENTER(S): Joshua Thomas
AUTHOR(S): Joshua Thomas
FACULTY MENTOR(S): Eric Schwartz

PreFlight: Elevating Autonomous Submarine Safety

PreFlight is an innovative diagnostic tool integrated into the terminal of the SubjuGator, an autonomous submarine, designed to ensure the operational integrity and safety of its missions. This comprehensive tool is structured into software, electrical, and mechanical sections, each dedicated to meticulously checking and verifying the corresponding components of the submarine before deployment. By leveraging advanced algorithms and diagnostic techniques, PreFlight identifies potential issues in real-time, facilitating prompt corrections and enhancing the reliability of the SubjuGator. This tool not only significantly reduces the risk of mission failure due to component malfunctions but also extends the operational lifespan of the submarine by maintaining optimal system health. The integration of PreFlight into the SubjuGator represents a pivotal advancement in autonomous submarine technology, setting new standards for pre-launch testing and operational safety. This paper discusses the development, implementation, and impact of PreFlight, highlighting its crucial role in advancing autonomous underwater exploration and its potential applications in broader marine research and industry sectors.

PRESENTER(S): Lexie Bostic
AUTHOR(S): Lexie Bostic, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Douglas, Pamela, Makenzie Soltis, Soltis, Mabry

Current And Projected Ranges for Prunus americana and Trillium underwoodii

Hardwood forests stretch across a broad section of the United States and are home to a variety of animal and plant species. This project seeks to characterize specific species' ranges today based on digital herbarium records and use climate change data to map how the range will differ in the future. This portion of the project is dedicated to the species Prunus americana and Trillium underwoodii. The species names and their synonyms were used to pull occurrence records from the online databases iDigBio and GBIF. We then cleaned and filtered the data based on different factors. Ecological niche models were developed for each species and projected onto maps to predict future ranges in response to climate change. These results will be combined with those for other species of the hardwood forests to get a more complete perspective on range. These data are important for showing the impact that climate change can have on a broad variety of species. In the future, this research could be used to investigate the impact climate change might have on animals that tend to mainly inhabit mixed hardwood forests.

PRESENTER(S): Tarek Alsaghir
AUTHOR(S): Tarek Alsaghir, Elisabeth Barton, Yangyi Luo
FACULTY MENTOR(S): Elisabeth Barton

Contribution of Fibro-Adipogenic Progenitors to Spinal Muscular Atrophy Pathology

Spinal Muscular Atrophy (SMA) is a neurodegenerative disease caused by loss-of-function mutations in the survival motor-neuron-1 gene. One devastating attribute of the disease is the intramuscular adipocyte infiltration and fibrosis. Fibro-adipogenic progenitors (FAPs) are the primary cells that cause intramuscular adipocyte infiltration in pathological conditions. The behavior of FAPs in SMA has not been studied, and therefore, the goal of the project was to quantify FAPs in SMA mouse muscles. Tibialis-anterior and gastrocnemius muscles were harvested from wild-type and SMA mice. These muscles were then cryosectioned, stained, and imaged using fluorescence-microscopy to analyze muscle cell membranes, nuclei, and FAPs. The ratios of FAPs to nuclei and FAPs to muscle fibers were quantified and compared between wild-type and SMA muscles of the same muscle type and sex. It was found that there was no significant difference in the ratio of FAPs to nuclei between wild-type and SMA muscles. There was also no significant difference in the ratio of FAPs to muscle fibers. This data suggests that FAP abundance is not a key factor contributing to the observed adipocyte infiltration and fibrosis in SMA. Further investigations are required to unveil additional intricacies of FAP behavior in SMA pathogenesis and potential therapeutic targets.

PRESENTER(S): Imran Nasrullah
AUTHOR(S): Imran Nasrullah, Dr. Gustavo Seabra
FACULTY MENTOR(S): Gustavo Seabra

Quantum Algorithms for Protein-Ligand Interactions: A Path Toward Accurate Modeling

The accurate modeling of protein-ligand interactions is a fundamental challenge in computational chemistry. Quantum-mechanical methods provide the necessary precision, but their application to complex biological systems remains computationally intensive on current hardware. However, with the advent of quantum computers, we anticipate a transformative shift. These future machines promise to simplify the simulation of intricate biological systems, prompting the development of tailored algorithms specifically designed for quantum architectures.

Our research focuses on the Variational Quantum Eigensolver (VQE), a powerful quantum algorithm. By constructing a trial ansätz for a molecule's ground-state electronic wavefunction and efficiently calculating ground-state energy eigenvalues, VQE offers a pathway to accurate predictions. Leveraging the Born-Oppenheimer approximation, we optimize nuclear positions within the molecule.

In this work, we explore VQE's potential for predicting quantum wavefunctions relevant to biochemical interactions. We introduce key optimizations, including exploiting inherent molecular symmetry to accelerate the algorithm. By adopting a "z-matrix" format common in computational chemistry, we achieve substantial speedup (by a factor of ~1.5) and reducing the ground-state parametrization by over 70% for molecular hydrogen. We also applied our modified version of VQE for simulating larger systems such as water and have achieved an accurate prediction of its ground state. Finally, we use a choice neural network to predict the potential energy surface (PES) of increasingly complex systems, thus mitigating computational complexity.

In summary, our work bridges the gap between quantum algorithms and biochemistry, paving the way for precise protein-ligand modeling on future quantum computers.

PRESENTER(S): Lainey Kemmerer
AUTHOR(S): Lainey Kemmerer, Timothy Johnson, Daniel Czyz, Jessie Fernandez
FACULTY MENTOR(S): Jessie Fernandez

Investigating Soil Bacterial Isolates from the Gainesville Area for Inhibitory Activities Against Rice Blast Disease

Rice blast disease, caused by the fungus Magnaporthe oryzae, annually destroys between 10-30% of rice crops harvested worldwide. To combat this destructive pathogen, our research focuses on investigating the use of biological control agents as a mitigation strategy for this disease. We initiated our investigation by testing twenty-four different soil isolates from the Gainesville region through a 1:1 antagonistic assay. Two additional bacterial samples (Bacillus subtilis and Pseudomonas chlororaphis strain EA105) were added as positive controls. We found that five of our isolates showed notable inhibitory properties when co-plated with M. oryzae. Following these results, we initiated a volatile assay where 5 µl of bacterial suspension was plated and grown overnight. The following day, 5 mm fungal cores were plated and the bacterial plate from the previous day was connected to the fungal plate using parafilm. After 5 days, the diameter of the fungal growth was measured on control and experimental plates, enabling us to calculate the percentage of inhibition. We found that four of our isolates along with EA105 and Bacillus subtilis, all showed statistically significant inhibition of M. oryzae. In the future, our goal is to identify and characterize the inhibitory volatile compounds produced by these bacterial isolates.

PRESENTER(S): Jessica Barrera-Solis and Andrew Egresa
AUTHOR(S): Andrew Egresa, Jessica Barrera-Solis, C.Eduardo Vallejos, and Kevin Begcy
FACULTY MENTOR(S): Andrew and Kevin Egesa And Begcy

Stomata Response Characteristics and Impact on Photosynthesis in select common bean genotypes.

Our preliminary analysis of Calima and Jamapa showed a difference in the leaf stomatal density and the sizes of the stomatal apertures between the two genotypes from Andean and Mesoamerican genotypes, respectively. Yet, the estimated levels of their stomatal conductance were observed to be similar. Although the large stomata in Calima compensated for the lower stomatal density by providing a larger surface area for CO_2 diffusion, other studies have demonstrated that small stomata are advantageous due to the quick responses required for a rapidly changing environment, characteristic of the natural environment. Therefore, we set out to determine whether stomatal size in common beans influences stomatal response in conductance as affected by light CO_2 and temperature in the environment. We first analyzed the stomatal response to illumination in common beans from the Andean and Mesoamerican gene pools, estimated the stomata aperture sizes per unit leaf area, and confirmed the differences between the two plants' stomatal conductance changes with illumination, CO_2 levels, and temperatures. We hope to find out the reason with understanding the anatomical structure and how stomata behave under certain restricted conditions.

PRESENTER(S): Stephen Patten
AUTHOR(S): Stephen Patten, Andrew Crowl, Grant Godden, Nico Cellinese
FACULTY MENTOR(S): Nico Cellinese

Phasing Alleles Allows for Accurate Ploidy Estimates and Provides Insights into the Evolution of North American Lobelia (Bellflower Family: Campanulaceae)

Polyploidization, the process by which the genome of an organism is duplicated, is a common phenomenon in plants and has been implicated as a driver of genetic diversification and trait evolution. Therefore, characterizing the timing and effects of polyploidy is of great interest to evolutionary biologists and botanists. Alleles, or variant forms of a gene, may provide important data for better understanding polyploidization events and gene flow between species. To this end, we attempted to phase alleles from genomic sequence data across a large sampling of North American species of Lobelia (bellflower family). Our method uses short DNA sequence reads, which are mapped onto larger pre-existing consensus sequences to separate (phase) the gene copies. We successfully phased alleles from >900 individual plants and used this data to infer genome size and evolutionary relationships between species. Phasing alleles from polyploids remains an understudied technique but shows great promise as a tool to better understand this important phenomenon.

PRESENTER(S): Gissel Garcia
AUTHOR(S): Gissel Garcia, Justin Ellenburg, Boone M. Prentice
FACULTY MENTOR(S): Boone Prentice

Metabolic insight into glioblastomas: mapping 1-methyl nicotinamide in tumor tissues using imaging mass spectrometry.

Prior clinical data have contextualized the correlation between overexpression of nicotinamide N-methyltransferase and reduced levels of S-adenosylmethionine in glioblastoma stem cells. These low methionine levels enable tumor cells to experience accelerated growth. To further investigate this oncogenic disruption, we aim to map the spatial distribution of 1-methyl nicotinamide within mouse models of glioblastomas using a label-free molecular imaging technology, matrix-assisted laser desorption/ionization (MALDI) imaging mass spectrometry. Given that 1-methyl nicotinamide is renally excreted, its abundance in the kidney makes this tissue a great candidate to optimize imaging mass spectrometry detection of this compound. Our methodology primarily consists of fine-tuning the matrix application process to enable sensitive detection of this metabolite in kidney, brain, and then ultimately in human glioblastoma tissue samples. Briefly, herein we apply a homogenous layer of α-Cyano-4- hydroxycinnamic acid (CHCA) matrix to the sample using a robotic sprayer (M5 TM Sprayer), which is subsequently analyzed using a Fourier transform ion cyclotron resonance (FT-ICR) mass spectrometer in positive ion mode. Our findings when using this methodology have resulted in successful detection of 1- methyl nicotinamide and its distribution within kidney mouse models.

PRESENTER(S): Chrislian Daza
AUTHOR(S): Chrislian Daza
FACULTY MENTOR(S): Hyo Kang

Personalized Virtual Assistants: Enhancing Student Productivity

Many college students face challenges associated with procrastination and time management. While the existing body of literature predominantly focuses on identifying factors contributing to these issues, such as individual procrastination tendencies and personality traits, there is a relative scarcity of studies exploring solutions to assist college students in improving their time management skills. To address this gap, the study examines a technological solution through a series of design activities and tests its effectiveness. The research encompasses three interconnected activities. In Study 1, a survey involving 100 college students was conducted to examine students' procrastination tendencies, the current system they use for time management (e.g., Google Calendar), difficulties faced with existing systems, and features desired for future technology. In Study 2, I designed an AI-powered mobile productivity app named Taskerly based on the survey results. Unlike previous productivity apps that mainly focused on task organization, Taskerly incorporates three unique features. It includes an AI virtual assistant that provides personalized suggestions, task duration estimates, and customizable appearance. For instance, Taskerly offers estimated completion times for assignments based on user input and suggests utilizing free time between classes according to their course schedule. Currently underway is Study 3, which aims to evaluate the final design. Twenty students will participate in user testing, evaluating their willingness to use Taskerly in the future, personal attachment, and the usability of the app. Collectively, this research contributes valuable insights into the design of future AI-empowered virtual assistants to aid college students in effectively managing their time.

PRESENTER(S): Abhinav Penmetcha
AUTHOR(S): Abhinav Penmetcha, Omolola Suleiman, Divya Patel, Jason Brunson
FACULTY MENTOR(S): Jason Brunson

Can machine learning improve prognosis following lung transplantation?

Despite improvements in efficacy, survival time post-lung-transplant lags behind other solid organ transplants. We hypothesize that machine-learning (ML) approaches can identify determinants and better predict survival compared to statistical models. We compared survival regression, Cox proportional hazards, bagging tree, and random forest models using 11,176 post-lung-transplant patients' data collected by the United Network of Organ Sharing from 2017 to 2023. Each model was fit using the randomly-partitioned training half of the data using 233 variables collected for each patient and validated on the testing half. Models were evaluated monthly for five years using Brier scores to measure the accuracy of probabilistic predictions and ROC AUC plots to measure separability. Accuracy was poor for the first 6 months for all but the bagging model. The Cox model improved starting month 5 and survival regression at month 13. The ML models' accuracy generally declined, though the bagging model improved near months 19 and 39. The ML models demonstrated high separation (0.98-1.00) every month. The Cox and regression models reached this at months 6 and 16, respectively. Overall, the ML models achieved lower accuracy than the statistical models. All models demonstrated high separability long-term, though the ML models maintained this for short-term survival.

PRESENTER(S): Duane Hardy
AUTHOR(S): Duane Hardy
FACULTY MENTOR(S): Masanori Fujimoto

Optimizing Soil Microplastics Extraction Protocols Using a Freezer-based Separation Method

Microplastic (MP) extraction from soil lacks a standardized protocol. Existing methods encounter challenges with organic matter (OM) removal, separating high-density polymers, and sediment build-up during filtration, hindering MP quantification. This study aimed to develop an expedited MP extraction protocol from soils while minimizing MP losses. Soil samples of 100g with ~5% OM spiked with 25 PVC, LDPE, PET, PS, and PP fragments (5/polymer), sized >1mm - <2mm, in 500mL sealable glass jars then 100mL of 10% sodium hypochlorite added for OM removal. A freezer-based method was tested using an oil-based separation approach, where 10mL of olive-oil was added to samples, shaken, then placed upside down and left to freeze at -20° C for 6+ hours. With sediment remaining below liquid/oil phases, the jar was effectively removed, exposing frozen block, upper phases were excised, melted, and vacuum filtered through 20μm filter paper. Results showed 57% recovery rate total MPs, requiring one filtration, compared to 53% using density separation with $CaCl_2$ without freezing and required multiple filtrations due to sediment build-up. The freezer-based method effectively reduced sediment build-up by allowing sufficient removal of upper phases, indicating potential for a streamlined MP extraction method.

CENTER FOR UF UNDERGRADUATE RESEARCH

PRESENTER(S): Sejal Ramlogun, Micah Bowen, David McLeod
AUTHOR(S): Sejal Ramlogun, Micah Bowen, David McLeod, Frederick Kates
FACULTY MENTOR(S): Frederick Kates

Artificial Intelligence for Tobacco and E-Cigarette Cessation in Adults and Adolescents

Smoking is a leading cause of preventable death and disease. Its use creates a dangerous and complex addiction due to its impact on almost every body system as well as the socioeconomic impacts that arise due to it. In recent years, there has been a rise in smoking and e-cigarette use among adolescents. With these devastating consequences in the balance, innovative tobacco control techniques using Artificial Intelligence, such as conversational AI and Machine Learning, are showing the potential to bolster successful tobacco cessation. With recent developments also comes the potential to apply these new technologies to adolescents who started smoking recently, in order to intercept these negative health behaviors early on. We will be conducting a systematic review of available literature and data, synthesizing our findings into multiple specific interventions for tobacco and e-cigarette cessation. Research on innovations in Artificial Intelligence, Machine Learning, pattern recognition, and smartphone interactivity will be used to formulate proposed interventions as well as identify possible limitations of the technology and areas to be improved or expounded upon in future research. With additional research, AI and smartphone applications for tobacco and e-cigarette cessation can enable more individuals to access educational tools and resources for quitting smoking.

PRESENTER(S): Ella Alexander, Mia Escudero, Alexander Gonzalez, Jessica Liu, Poorvi Narendranath
AUTHOR(S): Ella Alexander, Mia Escudero, Alexander Gonzalez, Jessica Liu, Poorvi Narendranath, Elizabeth Olivo, Dr. Kevin Otto
FACULTY MENTOR(S): Kevin Otto

An In Vivo Behavioral Analysis of Ultramicroelectrode Devices

Neurological disorders affect approximately 15% of the worldwide population, leading to both physical and cognitive disability in affected individuals. The development of neural interfaces can improve the quality of life for these individuals. This research focuses on the development of ultramicroelectrode devices with increased intracortical microstimulation (ICMS) efficacy. It addresses the chronic effects of the foreign body response (FBR) on ICMS by minimizing the size of implants in the brain. We used an animal model to conduct an auditory and stimulatory behavioral paradigm. Rodents were conditioned to respond to auditory stimulus and then transitioned after electrode implantation to responding to the simultaneous multi-electrode ICMS. Longitudinally, the rodents were able to sense the electrical stimulation at lower current. For example, one animal has had a 43% decrease in the total current needed to elicit a behavioral response to stimulation since the start of the ICMS study. Finding solutions to minimize the FBR will allow for improvements to chronic lifespan and signal quality of neuroprosthetic devices. Bridging the gap between device size and effectiveness, this study highlights an immediate impact in mitigating the FBR in rodent subjects.

This material is based upon work supported by the National Institutes of Health under Grant NIH 1U01NS126052-01 “Engineering the Neuronal Response to Electrical Microstimulation”

Source for introduction:

Van Schependom, Jeroen, and Miguel D’haeseleer. “Advances in Neurodegenerative Diseases.” Journal of Clinical Medicine, vol. 12, no. 5, Feb. 2023, p. 1709. PubMed Central, https://doi.org/10.3390/jcm12051709.

PRESENTER(S): Isabella Fleites, Fapianey Alexandre
AUTHOR(S): Isabella Fleites, Fapianey Alexandre, John Thompson, Cory Watson, Mackenzie Bolen, Tara Cooper, Argyle Bumanglag, Terrence Gatton, Elena Garcia, Maria Ramirez, Brittnie Pang, Jackie Lee, Bianca Parra, Sara Burke
FACULTY MENTOR(S): Sara Burke

Evaluating an Exogenous Ketone Supplement to Rescue Age-Related Cognitive Deficits

Glucose is a sugar molecule metabolized by the body as the main energy source of the brain. As our brains age, cerebral metabolic rates of glucose decline, resulting in cognitive deficits. Ketone metabolism, however, remains the same across the lifespan, and the brain will break down ketones for energy in the absence of glucose. Inducing ketosis (a non-pathological increase of ketone levels in the bloodstream) helps mitigate the neuronal stress that is associated with normal aging by providing the brain with an alternative energy source to glucose. Ketosis is typically achieved by a high-fat, low carbohydrate ketogenic or "keto" diet. Since older populations face difficulty maintaining a strict ketogenic diet, our study investigates whether, with an otherwise normal diet, exogenous ketone supplementation will induce ketosis and whether this ketosis will mitigate age-related cognitive decline. We hypothesize that animals, particularly aged animals, receiving our ketone supplement will perform better than their control counterparts on age-affected cognitive assessments.

Four groups of Fischer-344 brown Norway hybrid rats (young females, young males, aged females, and aged males) the supplement, and ketone levels were recorded at 0, 2, 4, and 24 hours postprandial after 1, 4 and 7 days on the supplement. Supplementation was found to achieve ketosis levels comparable to those derived from a keto diet. Animals then underwent assessments of spatial learning, memory, and visual discrimination via mnemonic description and navigation tasks. In a pilot cohort of animals, statistical comparison to controls showed improvements across all groups receiving the supplement, leading us to speculate that cognitive performance is enhanced in old age as a result of an exogenous ketone supplement to a normal diet. Behavioral assessments of a second and third cohort of rats are under way to determine whether firm statistical conclusions can be drawn of the supplement's efficacy in aged animals.

PRESENTER(S): Tyler Montgomery
AUTHOR(S): Chandra K. Maharjan, Tyler Montgomery, Umasanker De, Bristy Rani Podder, Haney Liu, Myeongcheol Kim, Lei Wang, Michael Dougherty, Zeng Jin, Madison Carelock, Tanzia Tithi, Seyedehalaleh Anvar, Nan Hua, Rohan P. Master, Anuj P. Master, Christian Jobin, Kep
FACULTY MENTOR(S): Weizhou Zhang

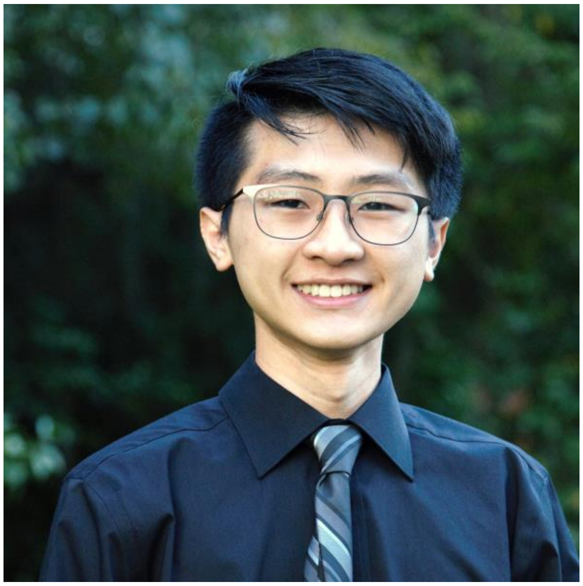
Role of Intestinal Epithelial Interleukin-2 in Gut Immune Homeostasis

Chronic gut inflammation contributes to a higher risk of developing colorectal cancers (CRCs) in a person's lifetime. Interleukin-2 (IL-2), a pleiotropic cytokine, plays an unequivocal role in intestinal inflammation, as it is required for regulatory T cell-mediated gut immune tolerance. Exaggerated IL-2 signaling, however, can promote inflammation by driving cytotoxic CD8 T-cell proliferation. The known cellular sources of intestinal IL-2 include CD4 T-cells and group-3 innate lymphoid cells. Published transcriptomic datasets revealed positive expression of IL-2 transcripts in intestinal epithelial cells (IECs). We demonstrated that IECs are novel producers of IL-2. IECs from mice with conditional knockout (cKO) of IL-2 exhibit reduced IL-2 mRNA and protein expression compared to their wild type (WT) counterparts. Epithelial IL-2 promotes colitis in mice, evidenced by WT mice developing more severe colitis compared to cKO mice following the administration of dextran sodium sulfate (DSS). Consistent with this, epithelial IL-2 was found to promote rectal adenomas in an azoxymethane (AOM)/DSS-induced CRC model. Immunophenotyping of WT vs cKO mice showed that epithelial IL-2 suppresses colonic CD4+CD8αα+ intraepithelial lymphocytes (IEL) and enhances TCRγδ CD8αα+ IEL numbers. Ongoing mechanistic experiments seek to understand how the immune cells of interest regulate epithelial IL-2 driven colitis and tumorigenesis.

PRESENTER(S): Abigail Willer
AUTHOR(S): Abigail F. Willer, Madison E.A. Harman, Christina M. Romagosa
FACULTY MENTOR(S): Christina Romagosa

Diet composition of three non-native lizards in the Florida Keys

Cuban knight anoles (Anolis equestris), giant Madagascar day geckos (Phelsuma grandis), and tokay geckos (Gekko gecko) are non-native to the Florida Keys. All are arboreal, generalist lizards of a similar size that are known to consume invertebrates and small vertebrates. Each individual lizard was necropsied, and their gastrointestinal tracts (GI) were extracted. The GI tracts from 33 knight anoles, 33 giant day geckos, and 30 tokay geckos were washed and each distinguishable diet item was identified morphologically to the lowest taxonomic level possible. Nearly 100% of lizards consumed at least one insect, with Hymenoptera and Coleoptera being the most consumed orders. Knight anoles consumed the most fruit, while giant day geckos consumed the least. Mammals were identified in all three lizard's diets via hair morphology, but the presence of only hair is likely due to accidental ingestion. Documenting diet composition is a necessary step towards quantifying the impacts of non-native lizards and can help managers identify risk to specific diet taxa. More research is needed to understand the influence of additional factors such as habitat and phenology. This research illustrates the importance of considering compounding species interactions rather than evaluating invasion risk on an individual basis.



PRESENTER(S): Jarvis He
AUTHOR(S): Jarvis He, Hannah Roberts, Allen Martinez, Abigail Lopa, Nicholas Eisman, Sean Niemi, Amor Menzesw
FACULTY MENTOR(S): Sean Niemi

Device for Extreme-environment Continuous and Optimal Directed Evolution Research

Continuous directed evolution (CDE) can increase biomanufacturing performance of microorganisms by generationally increasing the viability of bacterial strains under a range of environmentally stressful conditions. Current turbidostats can continuously monitor cell culture via optical density and fluorescent intensity measurements but are unable to simulate microgravity. This is of significance because this environment may negatively impact biomanufacturing performance. Culturing cells in microgravity is conducted in High Aspect Ratio Vessels (HARVs) and Random Positioning Machines (RPMs). Such devices generate Low Shear Modeled Microgravity (LSMMG), but they must be stopped to take measurements, have no ability to exchange media during rotation, and suffer from gas exchange limitations. This introduces a niche for a device capable of both continuous culture and simulation of extreme environments, including partial and microgravity. Here we propose a Device for Extreme-environment Continuous Directed Evolution Research (DECODER), a platform capable of real time monitoring of the cell culture, recording parameters such as the optical density and fluorescence intensity. Such parameters provide feedback to a control system, allowing automated feedstock addition and removal, resulting in CDE capabilities. Simulation of micro- and variable gravity is accomplished via 2D clinostat rotation, while the level of gravity is altered via a tilt table.

PRESENTER(S): Paraman Galipalli
AUTHOR(S): Paraman Galipalli
FACULTY MENTOR(S): Arthur Porto

Evaluating The MAWS Model With Respect To Marine Images

Effective monitoring and classification of marine life is crucial for understanding ecosystem health, informing conservation efforts, and ensuring sustainable ocean practices. MAWS, a new machine learning model developed by Facebook, is trained on a diverse range of Instagram images, offering potential applicability beyond its original scope. In this study, we assess the efficacy of MAWS in classifying images of marine species. Notably, MAWS utilizes an unsupervised training approach, discerning relationships on its own rather than relying on explicit instruction. This feature is beneficial for scenarios with less exhaustive datasets and fewer images per category. Our evaluation utilizes such a set, with underwater images of various marine taxa that have been cleaned up and provided by the Florida Museum of Natural History, but with relatively few images per taxon. Results demonstrate MAWS' capability to classify marine species relatively accurately across phylum, despite not being optimized for this domain. It primarily seems to struggle with things of the same phylum or things with similar textures. Further exploration of MAWS' performance in specialized domains could unveil its broader applicability in various niche fields, particularly if modified towards the particular field enabling it to be more accurate and efficient for regular use.

PRESENTER(S): Aribah Ali; Lorenzo Quiceno
AUTHOR(S): Aribah Ali; Lorenzo Quiceno, Rachana Kandru
FACULTY MENTOR(S): Ajay Mittal

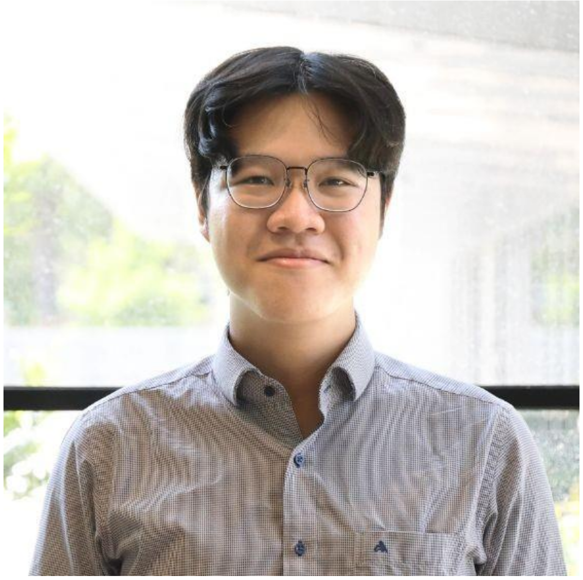
The Implementation of Medical Interpreters on Enhancing Health Outcomes for Spanish Patients Seeking Prenatal Care

Medical interpreters play a significant role in fostering effective communication and assisting patient understanding for individuals with limited proficiency in English. Language barriers reduce healthcare access for non-English speakers, limiting their treatment adherence due to poor communication from providers. The primary objective of this literature review is to explore the relationship between implementing medical interpreters in healthcare settings and improving patient health outcomes. By examining existing literature, this review highlights patient compliance and health literacy in Spanish-speaking immigrants seeking prenatal care. We focus on prenatal care to promote a healthy start for both Spanish-speaking mothers and their newborn. As the second most spoken language in the United States, it is important for medical providers to understand symptoms, medical history and concerns of Spanish-speaking patients in order to accurately diagnose and share treatment plans. With the assistance of medical interpreters, patients may be more satisfied with healthcare delivery and thus comply with their treatment plans. With this literature review, we seek to further understand the contribution of medical interpreters and mitigate health disparities by enhancing the quality of prenatal care for Spanish-speaking populations.

PRESENTER(S): Neha Iyer
AUTHOR(S): Neha Iyer, Joyce C. Morales Aparicio, Stephanie Karst
FACULTY MENTOR(S): Joyce Morales

The role of the GPBAR1 (TGR5) receptor in bile acid-mediated antiviral response against MNV

Norovirus is an enteric virus responsible for approximately 20% of gastroenteritis in the world. For an enteric virus with a large global impact, there are many underlying questions regarding their pathogenic mechanisms. Gut microbiota are comprised of trillions of bacteria that have many effects on the mammalian host. Previous studies demonstrated that depletion of microbiota with antibiotics prior to murine norovirus infection (MNV) in adult mice results in higher viral titers in the proximal small intestine compared to titers in control mice, indicating that gut microbiota play a protective role during MNV infection. However, because adult mice do not develop symptoms in response to MNV infection, our lab developed a neonatal mouse model to test the role of microbiota in disease. Preliminary data show that MNV-infected neonates pretreated with antibiotics develop more severe diarrhea than control mice, indicating that gut microbiota play a protective role against MNV disease. Based on earlier studies, we hypothesize that a specific class of microbiota-derived metabolites, namely bile acids, are responsible for this protective effect. We predict that microbiota-derived bile acids bind their cognate receptor called TGR5 activate an antiviral immune response. This is consistent with a study showing that TGR5 engagement activates interferon (IFN) responses that inhibit other viruses. Overall, intestinal microbiota and TGR5 activation both protect from severe MNV diarrhea, so we hypothesize that microbiota-derived bile acids bind TGR5 and induce an antiviral IFN response which suppresses MNV infection and disease.



PRESENTER(S): Phuoc Nguyen-Cuu
AUTHOR(S): Phuoc Nguyen-Cuu
FACULTY MENTOR(S): Ignacia Mercadal

Risk and Subsidies

Billions of dollars are spent annually to support farmers through the Price Loss Coverage and Agricultural Risk Coverage subsidies programs. Of these two, farmers can only choose one every period. Recent models in the literature shows that, given sufficiently low annual yield variability, in the long term farmers and consumers are better off if more farmers elect the Price Loss Coverage program. Groups of farmers recently afflicted by extreme weather events are possibly swayed towards the Agriculture Risk Coverage program due to its yield protection characteristic. This can result in loss of benefits by farmers and consumers in the long term. Using share data on program election, this paper examines whether natural disasters affect the way farmers estimate the benefits of each program. Findings suggests that, controlling for expected payouts, recent experiences with natural disasters do not affect farmers decisions.

PRESENTER(S): Ava Mingrone
AUTHOR(S): Ava Mingrone, Vanessa Hull
FACULTY MENTOR(S): Vanessa Hull

The Effects of Wind Energy on Raptors

As wind energy expands in the U.S with new Wind Energy Areas being established in the Gulf of Mexico, the concern grows about its impact on wildlife. The effect of wind farms on birds is evident through cases of habitat displacement and collisions. However, the consequences of wind energy for birds needs to be further explored and acknowledged. This global literature review will compile data specific to the effects of wind energy on raptors. To begin, I input key terms into the Web of Science database including “birds and ‘wind energy,’” and ‘wind turbines,’” and and ‘wind farms.’” The results were 2,473 articles. I filtered through the articles to ensure that only articles with empirical evidence on wind energy and its effect on birds were included. I was left with 292 articles and did a final filtering to include only articles focusing on the effects of wind energy on raptors. To summarize the articles I am separating them based on criteria such as region and species. I will then determine what evidence of wind energy impact each article showed, the type of impact studied, and the method used to measure it. Combined knowledge about the effects of wind energy on raptors can allow for new policy and measures when developing wind energy that can mitigate its effects on the species.

PRESENTER(S): Qiyue Wang
AUTHOR(S): Qiyue Wang
FACULTY MENTOR(S): Michelle Phillips

Exploring the Impact of Online Supermarkets: A Cross-Country Analysis

With the advancement of technology, online supermarkets have emerged as a new option for customers to purchase groceries, particularly the convenience delivery service during the pandemic. Collecting data from seven countries, covering 2016 to 2023, this study aims to investigate the impact of online grocery shopping on traditional brick-and-mortar supermarkets and the factors influencing consumers' preferences between online and in-store grocery shopping. Using ordinary least squares regression analysis, the results indicate that the rise of online supermarket expenditure has caused some impact on traditional in-person grocery shopping. Additionally, factors such as the COVID-19 pandemic and age have led to an increase in online grocery expenditure. At the same time, gasoline prices and internet usage negatively correlate with changes in online shopping expenditure. In conclusion, technological advancements provide consumers with more possibilities for shopping habits.

PRESENTER(S): Marianne Stephenson
AUTHOR(S): Marianne Stephenson
FACULTY MENTOR(S): Cameron Jack

Assessing Potential Fungicides for Treatment of Chalkbrood Disease in Honey Bees (Apis mellifera)

Chalkbrood is the most common fungal disease affecting the brood of western honey bees (Apis mellifera). This disease occurs when honey bee larvae ingest spores of the fungus Ascosphaera apis, which grow within and feed on the larval body until it is completely enveloped by the fungus, becoming a "chalkbrood mummy." The presence of these mummies is the telltale sign of the presence of chalkbrood in a hive. Since chalkbrood affects honey bees in the early stages of their life cycle, its presence can limit the productivity of a colony by lowering the number of emerging worker bees. Although chalkbrood is not currently considered to be a serious threat to honey bee colony health, it is necessary for beekeepers to be able to effectively manage and protect against the spread of A. apis, especially given the widespread nature of the disease. However, there are currently no registered chemical treatments available to control chalkbrood. In our study, we our examining the effects of four different common fungicides - boscalide, chlorothalonil, propiconazole, and pyraclostrobin – on the growth of A. apis to assess their potential for being used as chemical treatments against chalkbrood in the future.

PRESENTER(S): Joshua Valan
AUTHOR(S): Valan J, Farrior H, Lysandrou A.E., Phalin B, Hunt J, Solomon L, Janner A, Mathias K, Teitelbaum S, Lewis B
FACULTY MENTOR(S): Ben Lewis

Examining Relationships Between Obsessive-Compulsive Symptoms and Substance Use Disorder (SUD) Outcomes in a Treatment Population

Obsessive-Compulsive Disorder (OCD) is characterized by uncontrollable and recurring thoughts and/or repetitive behaviors. OCD-related subclinical symptomatologies are recognized as frequently co-occurring with substance use disorders (SUDs). The analyses were constructed to identify the prevalence of OCD symptoms in the treatment population, describe OCD symptomology change across treatment, and characterize associations with substance craving. The sample included 1,078 patients at the Florida Recovery Center. Data were collected at key points during SUD treatment. Using recommended cutoff scores for the Obsessive-Compulsive Inventory-Revised (OCI-R), the sample was divided into 3 symptomatology groups: Low, Subclinical, and Clinical. Improvement in OCD symptoms was observed in both the Subclinical and Clinical groups ($ps < .001$). Furthermore, the magnitude of these effects was large. Importantly, at treatment discharge, only 24% of individuals in the Clinical symptomatology group had scores remaining at or above the cutoff. Symptom severity was significantly associated with craving in all groups, however, the magnitude of these associations varied. Although OCD symptom remission was anticipated, the large magnitude of reductions seen in the current data was surprising. The group-contingent differences in associations between symptomatology and craving indicate that reductions in OCD symptoms throughout treatment may be important factors in supporting and maintaining abstinence.

PRESENTER(S): Jonathan Barz
AUTHOR(S): Jonathan Barz, Lyanna DeLeon, Karina Mendez, Michelle L. Gaynor, Makenzie E. Mabry, Pamela S. Soltis, & Douglas E. Soltis
FACULTY MENTOR(S): Makenzie Mabry

Projected distributional shifts due to climate change for Rhexia (Melastomataceae)

The genus Rhexia, known as Meadow Beauty, is native to North America with a high concentration in the southeastern coastal plain. These plants favor acidic, poorly drained soils often found in wet meadows, pine flat-woods, and disturbed habitats like roadsides. Rhexia species are unique for their temperate distribution in eastern North America. This study investigates the potential impact of climate change on the habitat suitability of Rhexia species. Researchers are developing ecological niche models (ENMs) to analyze the environmental preferences of Rhexia based on factors like precipitation, temperature, soil, and elevation. These models will project how suitable habitats might shift under different climate change scenarios. A key element of the study is comparing the niche suitability changes between polyploid and diploid Rhexia species. ENMs are valuable tools in conservation and predicting how species' ranges might change due to climatic events. This project specifically aims to identify potential geographic shifts in suitable Rhexia habitats and areas that could become vulnerable to invasion under future climate change scenarios.

PRESENTER(S): Cory Gettinger
AUTHOR(S): Cory Gettinger, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Pamela Soltis

Assessing the Response to Climate Change of Florida Hardwood Forests via Ecological Niche Modeling

Florida hardwood forests are part of the North American Coastal Plain biodiversity hotspot and may be at risk in portions of their range due to shifting climatic conditions. These forests are ecologically important and provide ecosystem services to surrounding areas. The purpose of this project is to use ecological niche modeling with projected climatic models to estimate the location of future suitable ecological niche space for two native species, Bignonia capreolata and Cercis canadensis. Occurrence data from iDigBio and GBIF data repositories were used. Rstudio and HiperGator were used to write scripts to extract data from iDigBio and GBIF. Synonyms for both species were used to download and clean data from both data repositories, which were then used in conjunction with climate change curve data to predict future occurrences. These predictions can be used for developing sustainable land management practices that focus on the conservation of biodiversity and ecosystem health in Florida hardwood communities. The modelling techniques used for Bignonia capreolata and Cercis canadensis will also be combined with similar projections for other Florida hardwood species to gain a more comprehensive prediction of how overall forest structure may change with respect to climate change.

PRESENTER(S): Allan Frasheri
AUTHOR(S): Allan Frasheri
FACULTY MENTOR(S): Jon Rick

The Construction of Social Reasons: How Humean Constructivism Can Account for the Social Nature of Normativity

Where does moral value come from? Metaethical constructivism is a theory in metaethics which sees value as being 'constructed' by valuing agents (ie. humans), instead of existing mind-independently within the world. Humean metaethical constructivism is one variant of constructivism, developed by Sharon Street, which attempts to incorporate a Darwinian account of value in the constructivist project. According to Street, what we value is a function of our individual perspectives, influenced by our contingent evolutionary and personal history. Humean constructivism has been the target of multiple criticisms, most recently by Laura Engel. These critiques claim that Humean constructivism ignores the influence of social norms/interactions in determining what we value. As an alternative theory which can address these critiques, Engel develops her theory of "layered constructivism", which posits the existence of a collective perspective from which value can be constructed in addition to our individual ones. However, this puts her theory at odds with the basic framework of constructivism, which only sees individual agents as the sources of value. After demonstrating the untenability of layered constructivism, I show that Humean constructivism can actually explain the existence of social values without the pitfalls of the former.

PRESENTER(S): Abilene Roberts
AUTHOR(S): Abilene Roberts, Cristian F. Rodriguez, Mateo Baez Suarez, Hannah V. Ceballos Sarmiento, David Gonzalez, Juan C Cruz*, Johann Osma*, Luis H. Reyes*, Carolina Muñoz C.*
FACULTY MENTOR(S): Juan C Cruz

Low-Cost Microfluidic Platforms for the Synthesis of Magnetoliposomes

Nanoscale drug delivery systems, notably magnetoliposomes, significantly enhance treatment effectiveness by improving drug specificity, bioavailability, and minimizing toxicity. However, the synthesis of such nanocarriers is commonly challenged by high costs and substantial reagent consumption. Our work introduces a cost-efficient approach for the design, simulation, manufacture, and testing of microfluidic devices aimed at magnetoliposome synthesis, circumventing the need for a clean room. We employ laser ablation in polymethyl methacrylate (PMMA) to create devices with a serpentine channel, featuring two inlets and one outlet. This method is meticulously optimized through simulations in COMSOL Multiphysics and validated by experimental testing. Our novel calibration process for laser cutting significantly enhances sample efficiency, reduces waste, and offers precise control over the device's features. This includes the facilitation of real-time fluid monitoring and the distribution of products homogeneously. By providing a scalable and economical solution for producing magnetoliposomes, our study makes a significant advancement in the field of nanoscale drug delivery.

PRESENTER(S): Lucas Pereira
AUTHOR(S): Lucas Pereira, Douglas E. Soltis, Pamela S. Soltis, and Makenzie E. Mabry
FACULTY MENTOR(S): Douglas Soltis

Ecological Niche Modeling of Hardwood Forest Species Asplenium platyneuron and Hamamelis virginiana

Florida is home to 3,038 vascular plant species and harbors much of the botanical biodiversity in the United States. Its hardwood forests are no exception; hammocks in northern Florida contain the highest concentration of trees and shrubs in the continental U.S. While the region's hardwood forests are currently stable, the effects of climate change threaten to alter natural patterns such as fire cycles, and consequently, the distribution of species that live in these forests. To examine climate change's impact on hardwood forests, we created ecological niche models for Asplenium platyneuron (ebony spleenwort), a small fern found in eastern North America and southern Africa, and Hamamelis virginiana (witch hazel), a deciduous shrub native to the eastern U.S. Both species, present in northern Florida and across eastern North America, enabled us to predict niches that may shift northward with rising temperatures. We will use global occurrence data from iDigBio and GBIF to build these models on the University of Florida's HiPerGator compute cluster. Ultimately, ecological niche modeling of these species can be used to observe habitat stability and predict changes in distribution patterns for Florida's hardwood forests.

PRESENTER(S): Ahmed Assad, Natalia Jaramillo, Johanna Rizo
AUTHOR(S): Ahmed Assad, Natalia Jaramillo, Johanna Rizo; Rachana Kandru
FACULTY MENTOR(S): Ajay Mittal

Understanding pharmacogenomics measures in breast cancer research considering minority factors

Pharmacogenomics is a relatively new field of healthcare that combines medicinal formulation with a person's genetic makeup, offering the potential for highly individualized treatments. Currently, one of the most common methods for treating breast cancer is tamoxifen therapy, which is a selective estrogen receptor modulator (SERMs). Although the treatment has a relatively high efficacy, great improvements have been made by incorporating pharmacogenomics into its approach. Understanding similar mechanisms is pivotal for future research in the field. This literature review examines the efficacy of pharmacogenomics as a personalized treatment strategy in breast cancer management, particularly in minority groups. The objectives are to assess the current state of pharmacogenomic applications in breast cancer, identify genetic markers that predict treatment response, and evaluate the impact on patient outcomes. Minority factors, such as race, will also be considered when evaluating customized therapies to determine precision medicine equity. Background information details the evolution of pharmacogenomics, its role in drug metabolism and efficacy, and its growing importance in oncology, highlighted by the variability in patient responses to breast cancer medications. This review is crucial as it encapsulates contemporary research findings, elucidates genetic determinants of treatment response, and explores the potential for pharmacogenomics to revolutionize breast cancer therapy, leading to more effective and less toxic treatment regimens. Furthermore, the review highlights critical information on health disparities within pharmacogenomics, allowing researchers to work towards achieving more equitable and effective healthcare outcomes in the field.

PRESENTER(S): Abdel Kareem Hilo
AUTHOR(S): Abdel Kareem Hilo
FACULTY MENTOR(S): Sung min Han

"Analyzing the manipulation of C. elegans Mitochondria via the mitochondrial unfolded protein response "

Mitochondria, the cell's powerhouse, are crucial for energy production, redox and ion homeostasis, and cell death regulation. Dysfunction in mitochondria is linked to diseases and aging. To maintain protein balance, mitochondria trigger the mitochondrial unfolded protein response (MitoUPR), especially under stress, mediated by ATFS-1, a transcription factor enhancing the expression of detoxification and protein homeostasis enzymes. Interestingly, MitoUPR activity declines post-development, though reasons remain unclear. My project aims to stimulate MitoUPR in adult stages, hypothesizing a negative feedback mechanism inhibits response to mitochondrial stress with age. Using the model organism Caenorhabditis elegans, known for its short lifespan and transparent body for monitoring gene expression via GFP, we plan to manipulate ATFS-1 activation. By employing RNA interference (RNAi) techniques to selectively suppress specific genes, and manipulating the RNAi essential protein Rde-1, we aim to explore the consequences of reactivating MitoUPR in adulthood, potentially impacting lifespan and mobility. This approach may reveal how lifelong MitoUPR activity influences organismal health and stress resilience.

PRESENTER(S): Luke Sutor
AUTHOR(S): Luke Sutor
FACULTY MENTOR(S): Amelia Winger-Bearskin

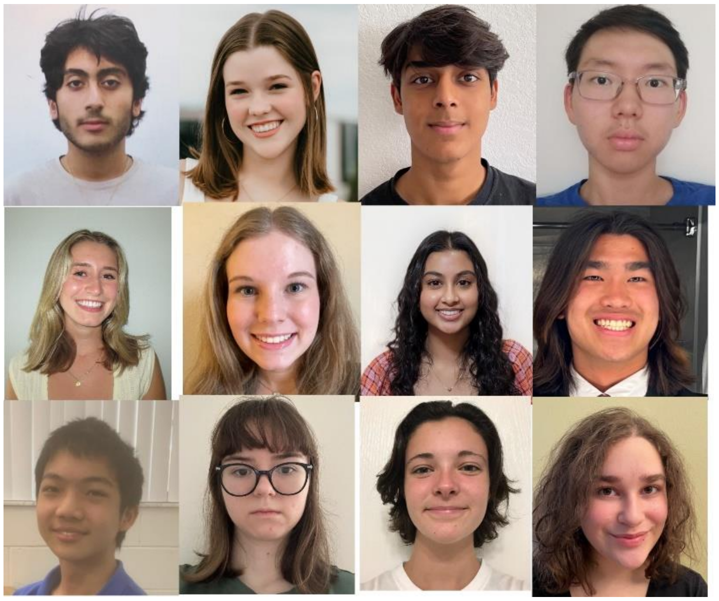
Programmatic Pitch: Diffusion-based music synthesis

Diffusion models have firmly established their excellence for image generation tasks, as evidenced by the success of renowned models such as DALL-E, Midjourney, and Stable Diffusion. This advanced development of diffusion models for visual content raises an interesting question: can diffusion models be adapted for audio generation tasks? In this study, we introduce a novel diffusion model architecture designed to generate mel-spectrograms, which can subsequently be converted into audible music. Given the exceptional capability of diffusion models to produce high-quality images, their application to mel-spectrogram generation is particularly promising. Mel-spectrograms, being visual representations of sound, align closely with the diffusion models' primary application of image generation. Our proposed diffusion model deviates minimally from the conventional architectures employed for visual content, making this research especially useful for examining the potential for cross-domain application between image and audio generation. The proposed model has been trained on a meticulously curated dataset comprising over 186 hours of Lofi audio, offering the model diverse samples for generalized learning.

PRESENTER(S): Bella Fiorucci
AUTHOR(S): Bella Fiorucci
FACULTY MENTOR(S): Jodi Schorb

The Sound and Shape of Carceral Aesthetics in American Prison Poetry

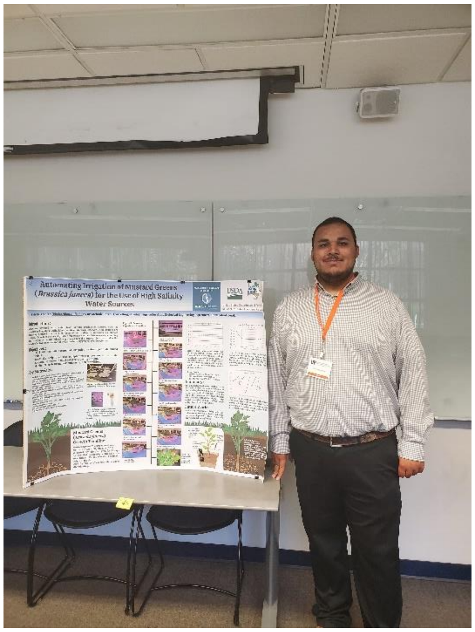
My central research focus seeks to define a poetics of the carceral; to accomplish this goal, I study the relationship between inmate poets, the space of the prison, and the soundscapes their works create. [add in – this work responds to....] I argue that inmate authors articulate the prison experience in unique ways by reconstructing and experimenting with sound to push back against a dehumanizing carceral space. I explore the creation of carceral space through the material of the prison in three primary ways: how Etheridge Knight's live poetry album, Reginald Dwayne Betts' poetic transformation of legal documents, and Betts' spoken word Spotify album. I begin by foregrounding the work of Etheridge Knight, whose recording in Indiana State Prison of his collection, Poems from Prison (1968), invites us to think more about how sound conveys the confines of the prison experience. Similarly, Reginald Dwayne Betts uses the material prison to create soundscapes of his experience. The sensory experience of prison and the recreations of that experience allow us to understand the architecture of carceral space. My work identifies new directions for analyzing how inmate artists transform the experience of carceral space and inscribe the material life of the contemporary American prison into poetry.



PRESENTER(S): Arshan Majdi Falasiri, Daisy Joy Jones, Rushil Kothur, Wonchae Lee, Liliana Marritt Lusvardi, Lachley Grace McCubbin, Ananya Mundrathi, Rich Duc-Tri Nguyen, Isabella Maria Rodrigues, Olivia S Schwartz, Richard Sun, Milana Viktorivna Tratsevska
AUTHOR(S): Arshan Majdi Falasiri, Daisy Joy Jones, Rushil Kothur, Wonchae Lee, Liliana Marritt Lusvardi, Lachley Grace McCubbin, Ananya Mundrathi, Rich Duc-Tri Nguyen, Isabella Maria Rodrigues, Olivia S Schwartz, Richard Sun, Milana Viktorivna Tratsevska
FACULTY MENTOR(S): Walter Leite

Using Large Language Models To Create Stories For Elementary Students

The recent development of large language models (LLM) has allowed the possibility of developing educational technologies where elementary school students provide prompts to create stories they want to read. The objective of this study is to create AI-based assistants to generate stories for elementary school students that are grade-appropriate and aligned with a well-validated reading curriculum. We worked with the GPT 4.0 model of OpenAI to create decodable stories for specific reading lessons in the curriculum, which include target words and common irregular words, but exclude words not covered in the lesson. The story-creation methods developed in this project have the potential to facilitate the development of oral reading fluency of all students, including those from underserved groups.



PRESENTER(S): Kyle Kalarchian
AUTHOR(S): Kyle Kalarchian, Dr. Melanie Correll
FACULTY MENTOR(S): Dr. Melanie Correll

Automating Irrigation of Mustard Greens (Brassica juncea) for the Use of High Salinity Water Sources

Crops are irrigated with water from various freshwater sources such as underground aquifers, wells, lakes, ponds or streams. However, these sources are becoming depleted due to high demand and saltwater intrusion as climate changes. To reduce the use of pristine freshwater sources, this research is building and testing an automatic irrigation system as part of a larger project that studies the effects of saltwater as a source of irrigation for leafy greens, Brassica juncea.

FACULTY MENTORS

College of Agricultural and Life Sciences

Adam C.N. Wong
Adam Dale
Adam Searles
Andrea Lucky
Andrea Lucky
Andrew and Kevin Egesa And Begcy
Andrew Carlson
Ann Wilkie
Anna Braswell
Braham Dhillon
Brett Scheffers
Cameron Jack
Catalin Voiniciuc
Christina Romagosa
Diana Taft
Dr. Julie Maupin-Furlow
Eban Bean
Emma Matcham
Erica Goss
Gerardo Nunez
Graciela Lorca
Jason Scheffler
Jenee Duncan
Jeongim Kim
Jessie Fernandez
Jianping Wang
Jonathan Judy
Juan Andrade
Julie Maupin-Furlow
Kathryn Sieving

UF Center for Undergraduate Research
UNIVERSITY of FLORIDA

Kevin Folta
Kimberly Moore
Kimberly Wiley
Lisa Taylor
Lori Warren
Mariola Ferraro
Masanori Fujimoto
Matthew Hallett
Melissa Vilaro
Melissa Vilaro
Miguel Acevedo
Naim Montazeri
Pam Soltis
Patrick Wilson
Peggy Borum
Peggy Borum
Rachel Mallinger
Raquel Dias
Razieh Farzad
Samuel Martins
Sarah Brunnig
Satya Swathi Nadakaduti
Tie Liu
Vanessa Hull
Vanessa Hull
Wendy Dahl
Won Suk Lee
Zhiyong Cheng

College of Dentistry

Bruna Garcia
Dayane Oliveria
Frank Gibson
Jia Chang
Jia Chang
Jorge Frias-Lopez
Kesavalu Lakshmyya
Lin Zeng
Mateus Rocha
Seunghee Cha

College of Design, Construction, and Planning

Charlie Hailey
Ryan Sharston
Sarah Gamble
Shabboo Valipoor
Vandana Baweja

College of Education

Ana Puig
Erica McCray
Joni Splett
Taryrn Brown
Walter Leite

College of Family, Youth, and Community Sciences

Xiaoya Zhang

UF Center for Undergraduate Research
UNIVERSITY of FLORIDA

College of Health and Human Performance

Amy Mobley
Chris Hass
Diba Mani
Diego Guarin
Elisabeth Barton
Liana Hone
Nichole M. Scaglione
Orlando Laitano
Stephen Coombes
Terence Ryan
Thomas Clanton

College of Journalism and Communications

Benjamin Johnson
Marcia DiStaso
Myiah Hutchens

Center for Undergraduate Research
UNIVERSITY of FLORIDA

College of Liberal Arts and Sciences

Abigail Fagan
Adam Ginsburg
Adam Veige
Adrienne Strong
Alexander Angerhofer
Alyssa Zucker
Amlan Biswas
Ana Longo
Andreas Keil
Anita Anantharam
Anna Peterson
Anthony Gonzalez
Autumn McClellan
Boone Prentice
Brad Barbazuk
Chenjie Zeng
Christopher Dutton
Christopher Dutton
Christopher McCarty
Christopher Smith
Chunjing Jia
Conor O'Dwyer
Darragh Devine
David Grant
Dr. Stepien Tracy N/A
Edith Kaan
Edward Braun
Eleni Bozia
Elizabeth Lada
Ellen Martin
Emma MacKie
Eric Kligerman
Erin Westgate
Feihong Wang

Center for Undergraduate Research
UNIVERSITY of FLORIDA

Florin Curta
Gabriel Prieto
Gareth Fraser
Heather Ray
Hubert Wagner
Ignacia Mercadal
Imre Bartos
Jaehan Bae
James Davidson
James Gillooly
James Hamlin
Jamie Tayar
Jason Dittmann
Jeffrey D. Rudolf
Jodi Schorb
John Biro
Jon Rick
Julie Maupin-Furlow
Justin Ellenburg Boone Prentice
Kate Ratliff
Keith Choe
Kim Valenta
Leslie Murray
Lindsey Rodriguez
Lindsey Rodriguez
Lori Knackstedt
Malcolm Maden
Marit Ostebo
Mark Meisel
Martin Heesacker
Mary Watt
Matthew Blake Strickland
Matthew Eddy
Michael Harris
Michael McDonald

Michal Kowalewski
Michelle Phillips
Mina Elhamiasl
Mingjie Liu
Molly Gardner
Natalie Ebner
Neil Sullivan
Nicole Colon-Rosa
Peter Collings
Philip Janzen
Ratree; Kevin Wayland; Tang
Rebecca Butcher
Renata Serra
Rodrigo Borges
Ronald Castellano
Sandy Chang
Sarah Moeller
Seth Bernstein
Shanting Chen
Sheryl Kroen
Steven Bruner
Steven Manchester
Steven Noll
Thomas Bianchi
Triana Almeyda
Valerie DeLeon
Won-tak Joo
Xiaoya Zhang
Zachary Slepian

College of Medicine

Ajay Mittal
Alfonso Martín-Peña
Barry Setlow
Ben Lewis
Brittany Bruggeman
Carl Atkinson
Catherine Flores
Chalermchai Khemtong
Charlene Pringle
Christina Von Roemeling
Christopher Samouce
Clive Wasserfall
Coy Heldermon
Damon Lamb
Daniel Kopinke
David Borchelt
David Winchester
Dominick Lemas
Dr. Barry Setlow
Edward Scott
Erica Dale
Gemma Casadesus
Habibeh Khoshbouei
Heather Vincent
Henrique de Assis Lopes Ribeiro
Jason Brunson
Jeffrey Harrison
John Ligon
Jörg Bungert
Joyce Morales
Julie Bradley
Lara Nicolas
Larissa J. Strath. Ph.D
Lauren McIntyre

Lei Zhou
Lindsay Lloveras
Loic Deleyrolle
Martin Cohn
Matthew Burns
Matthew Gentry
Maurice Swanson
Maximo Marin
Megan Stanifer
Michelle Gumz
Mingyi Xie
Naykky Singh Ospina
Ramon Sun
Rene Opavsky
Robert Maile
Rolf Renne
Rui Xiao
Ryan Nixon
Sara Burke
Sara Jo Nixon
Steeve Boulant
Stephanie Karst
Stephanie Staras
Sung Min Han
Thomas Mareci
Todd Brusko
Torrey Baines
Vinod Vijayakurup
Walter O'Dell
Weizhou Zhang
Wesley Smith
Zhe Ma

College of Nursing

Lakeisha Cousin

College of Pharmacy

Brandon Warren
Chengguo Xing
Chenglong Li
Gustavo Seabra
Jay McLaughlin
Mei He
Yousong Ding

Center for Undergraduate Research
UNIVERSITY of FLORIDA

College of Public Health and Health Professions

Barbara Smith
Catherine Striley
Frederick Kates
Heather Stark
Hongwu Wang
Joeseph Bisesi
John Williamson
Joy Gabrielli
Laurie Gauger
Linda Cottler
Meryl Alappattu
Sharon DiFino
Shinichi Someya
Susan Nittrouer
Tracie Baker
Yulia Strekalova
Yulia Levites

College of the Arts

Amelia Winger-Bearskin
Angelos Barmpoutis
Craig Smith
Hyo Kang
Laura Dallman
Melissa Hyde
Morgan Yacoe
Xan Burley

College of Veterinary Medicine

Aaron Mickle
Adam Stern
Chris Martyniuk
Jon Kim
Roy Curtiss III
Shifeng Wang

Department of Earth, Environmental, and Planetary Sciences

Yan Liang

Department of Natural History

Alan Franck

Environmental Engineering and Sustainable Infrastructure

Katherine Deliz

Equal Access Clinic Network

Ajay Mittal

ESA/AURA Astronomer

Nimisha Kumari

Florida Museum of Natural History

Andrea, Neill Torvinen, Wallis
Arthur Porto
David Blackburn
David Blackburn
Doug and Pam Soltis
Doug Soltis
Douglas, Pamela, Makenzie Soltis, Soltis, Mabry
Keith Willmott
Larry Page
Makenzie Mabry
Megan Ennes
Nico Cellinese
Nicolas Gauthier
Pam Soltis
Pamela Soltis
Pamela and Douglas Soltis
Pamela Soltis
Robert Guralnick
Scott Robinson

Center for Undergraduate Research
UNIVERSITY of FLORIDA

Herbert Wertheim College of Engineering

Ana Maria Porras
Ana Martin-Ryals
Andrew Altieri
Angelika Neitzel
Ant Ural
Ashish Aggarwal
Carl Denard
Carl Denard
Chang Liu
Cheryl Resch
Chris McDevitt
Christine Angelini
Christine Schmidt
Christopher Petersen
Curtis Taylor
Damon Woodard
Daniel Ferris
David Julian
Domenic Forte
Douglas Spearot
Dr. Whitney Stoppel
Eakta Jain
Edward Phelps
Eric Schwartz
Erin Patrick
Hugh Fan
Janise McNair
Jeremiah Blanchard
Jeremy A. Magruder Waisome
Jing Du
Katherine Deliz Quiñones
Katie Basinger-Ellis
Kevin Otto
Kiley Graim

Kyla McMullen
Kyle Allen
Kyle Riding
Lisa Anthony, Ph.D.
Matthew Schiefer
Matthew Traum
Megan Butala
Melanie Correll
Nancy Ruzycki
Nicholas Napoli
Piyush Jain
Prabhat Mishra
Ranga Narayanan
Ruogu Fang
Sanaz Motamedi
Sean Niemi
Sindia Rivera-Jimenez
Sungyoon Jung
Umesh Persad
Walter Murfee
Wayne Giang
Wesley Bolch
Whitney Stoppel
Xiang Yan
Xin Tang
Yeongseon Jang
Youping Chen
Z. Hugh Fan

Institute of Food and Agricultural Sciences

Bryony Banning

OSU college of engineering

Katelyn Swindle Reilly

Thayer School of Engineering

Jacob Buffo

UF Department of Neurosurgery

Jianping Huang

UF Health Cancer Center

Carolyn Tucker
Christian Jobin
Daiqing Liao
Richard Bennett
Yi Guo

UF/IFAS Extension

Yilin Zhuang

Universidad de los Andes Facultad de Ingenieria (College of Engineering)

Juan C Cruz

University Libraries

Aida Miro-Herrans
Neil Weijer

University of Florida Department of Pediatrics, Critical Care Medicine

Kourtney Guthrie

USDA-ARS Chemical Research Unit, Gainesville, Florida

Anna Block

The Florida Undergraduate Research Conference (FURC) is an annual research conference where Florida undergraduates share their research through poster presentations. The conference aids students in professional development, with presentation experience, peer networking, a graduate school fair and a series of workshops.