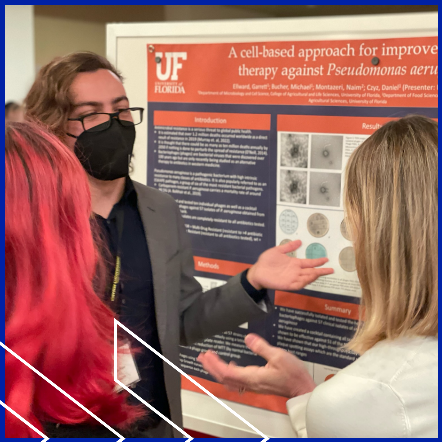
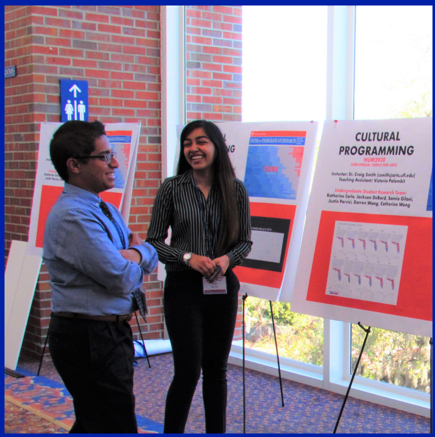
23RD ANNUAL SPRING UNDERGRADUATE RESEARCH SYMPOSIUM

APRIL 7, 2022 | 1PM-4PM

Stephen C. O'Connell Center





CENTER FOR UF UNDERGRADUATE RESEARCH

Undergraduate Research for All

GO GATORS | GO RESEARCH

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Welcome

We are delighted to be back in person for the 23rd Annual University of Florida Undergraduate Research Symposium. With a record number of posters (434) and presenters (565) we have moved to the Stephen C. O'Connell Center. 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.

The number of presenters has grown 32% since we were last in person. This large number of presenters is a reflection of the team research conducted by many of our students. Of note are the 91 first-year University Research Scholars who will be presenting the research they have conducted in their Course Based Undergraduate Research Courses, through 43 posters and one oral presentation.

This year CUR sponsored twelve students to present their research at Association for Research on Nonprofit Organizations and Voluntary Action, Society for Neuroscience, 2021 Symposium on Music Teacher Education, Biomedical Engineering Society Annual Meeting, AAPS, 2021 PharmSci 360, Association for Research on Nonprofit Organizations and Voluntary Action, Acoustical Society of America Conference, Association for Research on Nonprofit Organizations and Voluntary Action, American Academy of Neurology 2022 Annual Meeting, and the American Association for Cancer Research Annual Meeting.

Additionally, over 1100 students have taken advantage of the opportunity to register for the research courses offered by each College this past fall semester.

Each of these students has benefitted from mentoring provided by exceptional faculty and graduate student researchers. We thank them for their efforts on behalf of these students. Faculty mentors are listed following the abstracts.

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
Center for Undergraduate Research

67 UF Students Presented at the 11th Annual Florida Undergraduate Research Conference

UF Center for Undergraduate Research
UNIVERSITY of FLORIDA

23rd Annual

Spring Undergraduate Research Symposium

April 7, 2022

Stephen C. O'Connell Center

Program in Brief

11:00 am – 12:30 pm **Poster Set Up**

1:00 pm – 1:30 pm **Welcome Remarks**
Dr. Anne Donnelly, Director, UF Center for Undergraduate Research
Dr. Dionne Nicole Champion, College of the Arts, Center for Arts and Medicine

1:30 pm – 2:15 pm **Poster Session A**

2:30 pm – 3:15 pm **Poster Session B**

3:15 pm – 3:30 pm **Live Performance**
Global Borders and Belonging: Investigating Health Access Through Arts-Based Research, URSP Scholars Reem Abdelghany, Oluwagbemisola Awonusonu, Arielle Benayoun, Reese Jett, Rohan Joshi, Kaitlyn McCarty, Nicole Morgan

3:30 pm – 3: 45 pm **Announcement of Best Paper Contest Winners**
Mrs. Jennifer Moses, JUR Editor

3:45 pm- 4:00 pm **Closing**

UNDERGRADUATE BEST PAPER AWARD WINNERS

Arts and Humanities

Stefany Marjani

FACULTY MENTOR: JILL SONKE

Analyzing pre-health students' views on Health Humanities and an applied virtual experience during the COVID-19 pandemic.

Health Humanities is a growing field that uses the humanities, arts, and social sciences to develop observational, analytical, empathetic, and reflective skills necessary in healthcare practice. Although current research explores health humanities for pre-health students enrolled in related programs, there is no data of their motivations, perceptions, and associations in universities without established programs, such as in the University of Florida (UF). This study seeks to assess this information gap at UF and serve as valuable support for future curricula. Furthermore, the study analyzes whether the COVID-19 pandemic affected those perceptions. The study counts with pre- and post-surveys, as well as a virtual health humanities workshop. A total of 123 students completed the pre-survey, and 8 out of those students attended the workshop and completed the post-survey. Quantitative and qualitative data were analyzed using descriptive and thematic analysis. Results include that (1) most students perceived health humanities to be beneficial for them and others, (2) patients do not expect providers to excel in both the sciences and humanities, but students thought it is beneficial, (3) the pandemic taught students the importance of humane care, (4) students would enroll in a health humanities program at UF, and would like the university to develop such a program. Most narrative responses acknowledged health humanities' necessity through five major themes: experience and knowledge, patient-centered care, community-centered care, enhancement of the health professions, and cultural and social awareness. This study will inform the first Health Humanities course and program at UF, advice other universities' health humanities approach to their pre-health students, and support longitudinal health humanities studies before, during, and after attending professional schools.

Social, Behavioral, & Educational Sciences

Katherine Carlo

FACULTY MENTOR: GUSTAVO CORTES

The Impact of the Smoot-Hawley Tariff on State Level Capital Market Efficiency.

Since the Smoot-Hawley tariff's passing, economists have debated its role in stimulating the Great Depression. Due to the tariff's extremity, examining its impact on the U.S. economy is valuable for understanding the role of modern protectionist measures. This paper aims to analyze how the Smoot-Hawley tariff's increased rates affected the efficiency of the capital markets. While researchers have analyzed the impact of the Smoot-Hawley tariff at the aggregate level, there is little research on its significance at the regional and state levels. This project aims to address this gap by analyzing trade and employment data to match tariffs to specific states and calculate a Smoot-Hawley exposure factor. Linear regressions were produced between five capital market efficiency variables and this exposure factor to estimate the relationship between the state exposure to the tariff change and capital market failures during this period. Regression analysis found weak to no correlations between the variables and the exposure factor, demonstrating that Smoot-Hawley did not have a significant influence on the Great Depression's state-level capital market failures based on the variables studied.

Connor Goodwin

FACULTY MENTOR: MIRIAN M. HAY-ROE

Black Soldier Fly Larva (Hermetia illucens) Frass vs. Red Wiggler (Eisenia fetida) Castings on (Capsicum annum) "Early Jalapeno" Seedling Growth.

Black soldier fly larvae (BSFL) Hermetia illucens have shown some promising signs in their ability to rapidly process organic waste into a usable organic frass input. However, little is known about the effectiveness of the frass, when compared to biofertilizers produced by other organic waste consumers, such as, red wiggler worms (RW) Eisenia fetida. This study compared the waste consumption rate, compost nutrient concentration, and compost application by BSFL and RW on jalapeno seedlings. The BSFL were shown to consume organic waste at a clearly higher rate than RW, while producing compost with higher N, P, K nutrient concentrations. Furthermore, an application test showed BSFL compost generating more seedling growth than a control with no biofertilizer. However, with no additional maturing processes the BSFL compost was not as effective for seedling growth, when compared to its RW biofertilizer counterpart.

LIVE PERFORMANCE

Global Borders and Belonging: Investigating Health Access Through Arts-Based Research

URSP Scholars

Reem Abdelghany ,Oluwagbemisola Awonusonu, Arielle Benayoun, Reese Jett, Rohan Joshi, Kaitlyn McCarty, Nicole Morgan

Faculty Mentor

Jeffrey Pufahl
Center for Arts in Medicine

In this virtual exchange course, students at UF, the University of Groningen (Netherlands), and Sao Paulo State University (Brazil) collectively investigated connections between health and health access in three different countries. Through ethnographic and participatory action research methods, students conducted interviews with community members and collectively compiled global health data, media, and personal reflection and discussion. Through a collaborative play-building process guided by the course instructors, students organized and transformed their research into an ethnographic documentary play. This performance is a short segment of work created during the project.

Anumaan - AI Ethics

Presenter(s): Jonathan Kahn, Michael Gold

Authors: Michael Gold, Jonathan Kahn, Ashish Aggarwal

Faculty: Prof. Ashish Aggarwal

<u>Analyzing Student Perception of Artificial Intelligence</u>

As the importance of Artificial Intelligence and its societal impact increases, it has become increasingly crucial for engineering educators to integrate AI topics into their curricula. The goal of this integration is to cultivate students' understanding of the theoretical and applied aspects of technology and its broader ethical implications on society. Thus, given that several information sources influence a students' understanding of AI, it can be valuable to explore students' default understanding of AI and their perception of its implications.

To accomplish this, 244 responses were collected via a survey administered to students in introductory programming courses from two semesters in 2021 to identify how they understand AI and its potential impacts and ethical implications. We qualitatively analyzed the data for individual questions using an inductive approach and identified major themes related to the question posed.

We found that students' level of understanding impacted whether they thought AI would surpass human capabilities and whether they thought AI would become more of a liability or asset to human life. 87% of responses described what AI was, while only 17% explained the process of how AI carries out its functions, purposes, or applications.

From this analysis, we were able to explore the spectrum of patterns of students' understanding of AI and their perception of its functioning and ethical implications. These results can help educators identify the gaps in students' knowledge and create a more effective curriculum to cultivate an informed understanding of the technology.

Presenter(s): Dylan Tallon, Jacob Nakamura

Authors: Jacob Nakamura, Dylan Tallon

Faculty: Professor Ashish Aggarwal

Exploring Engineering Students' Ethical and Algorithmic Decision Making Using Qualitative Analysis

As the use of artificial intelligence continues to expand into more important roles, it is more crucial than ever to understand the role of ethics in AI and to integrate these topics into engineering education. As an example, the advent of self-driving cars poses many significant ethical dilemmas that must be addressed. Thus, it can be useful to research how students perceive such dilemmas.

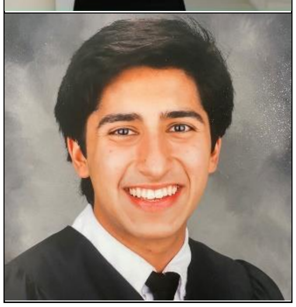
To analyze how students reason about ethical and algorithmic decision-making, we conducted a survey which asked engineering students to respond to two scenarios involving a highway accident. In the first scenario, the car driver must choose whether to continue straight and hit a truck that is slowing down, swerve right and hit a motorcyclist wearing a helmet, or swerve left and hit a motorcyclist without a helmet. The second scenario replaces the student with an autonomous automobile, for which the student designs the algorithm/outcome. In total, 244 responses were collected and qualitatively analyzed using an inductive approach to identify major themes in students' responses.

We found that in the first scenario, most students would choose to hit the truck, with the 2nd most popular choice being to hit the helmeted motorcyclist. In the second scenario, most students left the decision to the driver, but the helmeted motorcyclist was again 2nd most popular.

When faced with the same dilemma, students chose different solutions for traditional and autonomous vehicles. These discrepancies reveal students' perceptions and thought processes surrounding the function and role of AI.

Engineering Microfluidic Devices for Tumor Cell Isolation





Presenter(s): Alex Johnson, Rohan Joshi, Madison Chubb

Authors: Alex Johnson, Madison Chubb, Rohan Joshi, Kierstin Smith, Minh-Chau Le, Z. Hugh Fan

Faculty: Dr. Hugh Fan

Engineering Microfluidic Devices for Tumor Cell Isolation

Cancer is a leading cause of death internationally. One cancer biomarker is circulating tumor cells (CTCs), which detach from a primary tumor and enter the bloodstream, potentially creating secondary metastatic tumors as they circulate around the body. CTCs are imperative in early cancer detection, malignancy assessments, and treatment plans. However, CTCs are extremely rare among billions of healthy blood cells, so significant research has gone into innovating methods for isolating CTCs efficiently. We are developing microfluidic devices composed of multiple channels and microfeatures to trap and collect cells. The devices were fabricated by using polydimethylsiloxane (PDMS), a silicone polymer. We combined the pre-polymer base with a curing agent in a 10:1 ratio when fabricating these devices. Once the PDMS had cured, it was removed from the mold, cut, and bound to a glass slide after UV ozone treatment. This process ensures the device is ready to capture tumor cells. The microfluidic devices used in this study capture and isolate tumor cells via two mechanisms: size-based microfiltration and immunoaffinity. With microfiltration, target cells are captured by the device based on physical size due to their inability to flow through the microfilters in the device. Immunoaffinity assists in cell capture as antibodies immobilized on the filter surfaces specifically bind to surface antigens on the tumor cells. Our experiments sought to determine the impact of immunoaffinity-based capture in the isolation of tumor cells in the microfluidic devices, and potentially apply them to studies of CTCs in the future.

Environmental Values and Practices

Presenter(s): Joseph Benjamin

Authors: Benjamin, Joseph

Faculty: Dr. Anna Peterson

Student Volunteerism in Community Gardens

A community garden (CG) is a piece of land in which community members come together to grow plants, often food. Historically, gardening programs in the United States have been a response to economic shocks, emphasizing personal responsibility by growing one's own food to overcome economic issues. Frequently, their purposes are to create social capital and more sustainable food options, with many other ancillary benefits in health, education, value formation, and financial gain. Volunteers are necessary to achieve this. However, student volunteerism in a CG carries many challenges. College towns have a large proportion of transient college-aged residents because of the dominant role that a university holds in a city. These volunteers, being transient, may not contribute to or benefit from the community building central to a CG's purpose. This is exacerbated by a town-gown divide, the long-standing tensions between the university and the rest of a city. This paper draws from field notes and informal interviews in a community garden located in a college town to investigate these issues. A Weberian ideal type for student volunteers is constructed, identifying four key characteristics: consistency, willingness to learn, social competency, and self-sufficiency. This ideal type is then compared to reality in the garden, providing insight into why universities should prepare student volunteers to maximize impact and bridge the town-gown divide.

Presenter(s): Sophia Brecko

Authors: Sophia Brecko

Faculty: Anna Peterson

Implementing Traditional Ecological Knowledge in Engineering Design

This paper investigates how and when traditional ecological knowledge (TEK) can guide or supplement engineering designs. The information and data to answer this question will be provided by an extensive literature review focusing on TEK and examples of how it has been implemented in modern science, as well as a survey of graduate engineering students and professors at UF.

TEK is rooted in indigenous tribes and cultures, and passed down orally through generations. The value of this knowledge stems from the cultures' intimate interactions with and understanding of their environment, which provide a more holistic perspective. TEK philosophy differs greatly from Western ideas as it considers humans as intertwined with nature, rather than separate from it. However it is not humans passively interacting with the environment; it is humans supplementing nature in order for both to benefit. TEK also comes with limitations that engineers must consider. Firstly, it only has a local range, and therefore rarely has direct widespread application. It can also easily be misapplied and result in failure if not thoroughly understood, which occurs due to lack of documentation, reliance on oral transmission through generations, and the death of many indigenous cultures.

The aims of this study are to (1) accumulate examples of TEK implementation in design in order to establish when it is appropriate and convenient to utilize and (2) gather data on engineers' values and practices, as well as their expert knowledge in the field.

Presenter(s): Noah Wachsman

Authors: Noah Wachsman

Faculty: Dr. Anna Peterson

Comparing Parking Demand to Gainesville Parking Minimums

Parking represents a major conflict between environmental values and convenience in cities. Parking has been linked to increased heat emission (EPA, 2015), increased car use (DeSombre, 2018), and decreased density (Shoup, 1999, 2014, 2017). Although some businesses may seek to forgo adding parking to buildings, many cities, such as Gainesville, require some minimum amount of parking for any new development. Through analyzing 4 different commercial zones, total parking in the city was only estimated to be about 3.6% below zoning requirements, however areas varied between providing 39.2% and 148.1% of required parking.

When comparing these facilities to recommended amounts in parking demand studies, smaller commercial areas that were closer to downtown Gainesville and the UF campus fell short of expected demand. However, when compared to cities such as Ventura, CA and Windsor, CT, these smaller commercial areas closely matched the expected need. Meanwhile, larger shopping centers farther away from UF's campus and downtown more closely reflect the guidelines of studies on larger suburban shopping areas, suggesting that the relationship between retail space and parking demand is not a linear relationship as the Gainesville Zoning Code would imply. Thus, while the Gainesville minimum parking requirements do closely match parking demand on an aggregate level, individual areas vary in parking demand through more than merely size.

Presenter(s): Nicole Granda

Authors: Nicole Granda

Faculty: Dr. Anna Peterson

<u>Looking Danger in the Eye: Environmental Activism in Colombia and Brazil</u>

Latin America is currently the most dangerous place to be an environmental activist. These activists are frequently threatened with violence, and those of indigenous ancestry are disproportionately at risk. Yet, despite the constant threats to their lives, they continue to fight for the protection of the land and natural resources around them. Environmental activism in Latin America is intrinsically tied to social justice; activists believe in protecting the land for its own sake. However, they also believe that it should be preserved so those living there do not have to face pollution, climate change, or other problems that reduce the quality of life in a region already facing vast economic inequality. Colombia and Brazil provide a unique lens through which to view these issues: they feature some of the highest biodiversity in the world, and their Amazonian regions are especially perilous for environmental defenders. Colonialism has undoubtedly impacted the activism in these countries by creating a cycle of resource extraction at the expense of the environment and indigenous activists alike, emboldening those who rely on these resources to threaten violence against environmental defenders. Thus, this research uses Colombia and Brazil as case studies to examine the values and practices underlying Latin American environmental activism, with an emphasis on indigenous groups. By analyzing academic articles, news stories, and documentaries, this research explores what goals characterize environmental activism in the region, as well as how these goals conflict with other actors to result in unprecedented violence against activists.

Presenter(s): Simone Liang

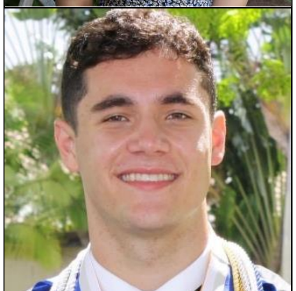
Authors: Simone Liang

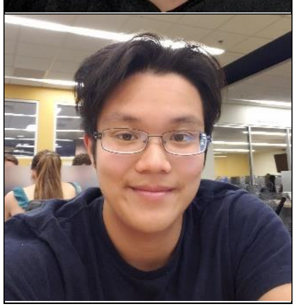
Faculty: Dr. Anna Peterson

<u>The Ethics of Civil Disobedience</u>

What are the ethical implications of acts of civil disobedience? In what situations is a government's heavy-handed response to protests warranted, if at all? This study strives to offer answers to these questions and more through case studies of civil disobedience, centered specifically around protests related to environmental and climate concerns. The 2016 Standing Rock protests will be studied to better understand protestor attitudes and values regarding conscientious breach of law, passive resistance, and rejection of existing power structures. A comparative analysis will also be conducted with the 2011 Occupy Wall Street Movement, which emerged in response to economic inequality and corrupt political practices, in order to examine contextual variables that may account for variance in public opinion and government response to civil disobedience. Analysis of police resistance, authorization of violent force, and arrests made under the aforementioned social movements will be conducted to consider the ethical consequences of government suppression.

Exploring Your Genome



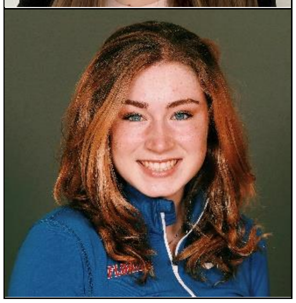
Presenter(s): Kayla Booth, Michael Cline, Christopher Crowe, Quang Vo

Authors: Kayla Booth, Michael Cline, Christopher Crowe, Quang Vo, Marcus Peerboccus

Faculty: Dr. Jennifer Drew

<u>An Adaptor Protein to Adapt Your Diet: SH2B1</u>

Variations in DNA base pairs, known as single nucleotide polymorphisms, may provide insight regarding possible correlations between genetic variants and dietary habits among individuals. In this research project, our group investigated the rs7498665 allele of the SH2B adaptor protein 1 gene from a sample of 620 students from the University of Florida. Past studies have indicated a relatively significant degree of correlation between possession of this allele and elevated BMI scores among individuals. In this study, coined the Great Florida Spitting Contest, participants provided their genetic information through saliva samples and completed a 16-question KIDMED survey used to gauge their adherence to the standard Mediterranean diet. Using the chi-squared statistical test, we measured the statistical significance of any correlations found between the SH2B1 rs7498665 allele and possible patterns in dietary habits. In doing so, we aim to discover a connection between genetic variants of this allele and quality of diet among college-age individuals. Such data will allow for better management of health and diet based on one's genome.

Presenter(s): Alexandra Crespin, Olivia Jones

Authors: Alexandra Crespin, Olivia Jones, Jessica Brezina, Matthew Felix, Matthew Reich

Faculty: Dr. Jennifer Drew

The DNA Made Me Do It: Tracking the Associations Between 14394840 RPTOR rs7503807 and Poor Dietary Habits

This study investigates potential associations between specific genetic variants and dietary habits. Data are collected from a sample of over 500 college-age students through an ongoing UF Microbiology and Cell Science research study called the Great Florida Spitting Contest (GFSC). The GFSC takes saliva samples from participants and genotypes them through an array. Participants' dietary habits are gauged using the KIDMED survey, which assesses an individual's compliance to the balanced and healthy Mediterranean diet. We will be analyzing a specific variant of the RPTOR gene, 14394840 RPTOR rs7503807, for associations with poor dietary habits as they are defined by the KIDMED survey. The RPTOR gene codes for the regulatory protein which partially controls the mammalian target of rapamycin complex 1 (mTOR1), thereby influencing cell growth and function. Previous studies have already suggested connections between RPTOR variants (including 14394840 RPTOR rs7503807) and obesity-related traits. If our investigation of this particular variant indicates an association with poor dietary habits, it could explain those correlations found between the variant and obesity in earlier studies. Previous research has already indicated that certain variants are associated with taste preferences like sweet or bitter. If we can make novel connections between this genetic variant and a college-aged individual's diet, we might be able to designate this variant as a risk factor for unhealthy eating tendencies. This study will establish a link between genetics and dietetics that could ultimately be used to provide genetics-based diet recommendations suited to the individual.

Presenter(s): Allison Comite

Authors: Allison Comite, Daniel Gluckman, Ashley Guarino, Himashi Liyanarachchi, and Elizabeth Molchan

Faculty: Dr. Jennifer Drew

Investigating the Relationship Between Your Genome and Your diet

Single-nucleotide polymorphisms (SNPs) are substitutions of one nucleotide at a specific position in the genome that eventually become common within the population. Genes are considered to have significant influences on many aspects of our lives, including dietary habits. We hypothesize that particular SNPs may cause an individual to be more prone to adhering to a healthier dietary lifestyle compared to others In this project, we will be looking at the gene CSMD1 and the SNP rs2449215 and determining if there is an association between dietary habits and the presence of this SNP. In order to measure how healthy the participant's eating habits are, we will be using the KIDMED survey. This survey measures how adherent someone is to the Mediterranean diet. The gene studied, CSMD1, has been linked with increased sugar intake and metabolic syndrome. The SNP in particular, rs2449215, has been associated with an 0.86-gram increase in daily sugar intake. Thus we believe that the presence of this SNP may correlate to a lower KIDMED score. Participants were asked to complete their own KIDMED survey after providing their informed consent, and their saliva samples were collected in order to genotype each individual. The results of this project are still being analyzed and will be presented at the Undergraduate Research Symposium.

Presenter(s): Emily Steffen, Zaid Syed

Authors: Emily Steffen, Zaid Syed, Romina Valerio, Safet Skopljak, Sam Kochis

Faculty: Dr. Jennifer Drew

You Really Are What You Eat: The Relationship Between the FARP1 Gene and Dietary Patterns

Several studies have reported the existence of a relationship between certain single nucleotide polymorphisms, health complications, and dietary patterns; however, these connections remain unknown for many polymorphisms. The broader intention of our research is to provide the general population with a greater comprehension of how genetics may impact dietary habits in an effort to improve health and promote scientific discourse under the principles outlined in the "Great Florida Spitting Contest" research study. In order to accomplish this, we explored the potential connection between the FARP1 gene and dietary habits. The FARP1 gene is a coding gene that affects several important processes including the production of microtissues in the liver. The rs9584805-G variant of this gene in particular has been observed to increase the lipid content in liver cells which may contribute to non-alcoholic fatty liver disease. Our research group hypothesized that given the FARP1 gene's potential association to nonalcoholic fatty liver disease (influenced by poor dietary habits, high cholesterol, and high triglyceride intake), the rs9584805-G variant may increase the frequency at which an individual consumes fatty diets. The data for this research was derived from the ongoing GFSC research study in which participants provided a sample of their DNA for genotypic evaluation and responded to the KIDMED dietary habits survey. This survey indicates how closely an individual adheres to a Mediterranean diet. Associations between the FARP1 gene and adherence to a Mediterranean diet were investigated using the chi-squared analysis statistical test. Results and conclusions will be presented at the symposium.

Florida Plants and Climate Change

Presenter(s): Emanuele Epifani

Authors: Emanuele Epifani, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Pamela Soltis and Douglas Soltis

Future Species Distribution of the Florida rosemary, Garett's mint, and Scrub Wild Olive

The North American Coastal Plain has been exhibiting receding environmental transformation due to human activities and global warming. In this study, we aim to model the projected distributions of three Florida scrub plant species in response to climate change. Ceratiola ericoides, also known as the Florida rosemary, grows on dry, well-drained sandy soils throughout Florida. Dicentra christmanii (Garett's mint) is a rare species of flowering plant which is only known to grow within openings in oak scrub on the Lake Wales Ridge. Finally, Cartrema floridanum, known as Scrub Wild Olive, is a small evergreen tree that grows within inland sandy forests. Observational data for these species was collected from The Atlas of Florida Plants and GBIF. Through georeferenced occurrence points, niche suitability models are developed to assess the current and projected ranges of the three species. By predicting the distribution of these species, we ask what the effect of climate change will be on Florida scrub?

Presenter(s): Mark Johnston

Authors: Mark Johnston, Makenzie Mabry, Douglas Soltis, Pamela Soltis

Faculty: Dr. Doug Soltis, Dr. Pamela Soltis

Creating ENM Projections for Future Distributions of Carya floridana, Crocanthemum nashii, and Pinus clausa to Predict the Response of Florida Scrub Flora to Climate Change

Recent research has demonstrated that species native to Florida scrub habitats may experience major changes in potential distribution as a result of drastic human-induced climate change. Increasing temperatures are predicted to cause increased aridity, potentially altering the extent of Florida's existing scrub habitats. In this research, we will model how the distributions of various scrub species are influenced by human-induced climate change. This is important as it gives researchers a way to determine the future status of Florida's biodiversity. Florida is one of the most bio-diverse states, and thus it will be helpful to conservation efforts in the present and in the future to know how the future distributions of Floridian flora may differ from their current states. We focused on three species representing three different families native to Florida's scrub habitats: Carya floridana of the Juglandaceae (walnut tree) family, Crocanthemum nashii of the Cistaceae (rock rose) family, and Pinus clausa of the Pinaceae (pine tree) family. We obtained specimen locality data from GBIF and other online data repositories and removed duplicates and outliers, as well as other problematic records. We obtained our environmental variable layers from BioClim and SoilGrids, and used variable inflation factors to avoid multicollinearity between environmental variables. We then constructed an ecological niche model by fitting the species' observed coordinate data to the chosen environmental variable layers using a maximum entropy (MaxEnt) model. These models will be used to make projections describing where each species might occur in the future in response to climate change.

Presenter(s): Emerson Parks

Authors: Emerson L. Parks, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Dr. Pamela Soltis and Dr. Douglas Soltis

<u>Ecological Niche Modeling of Bonamia grandiflora, Liatris ohlingerae, and Mimosa floridana</u>

Plants native to Florida are experiencing growing threats to their survival, largely attributed to climate change. Specifically, Florida scrub plants face a unique risk, as they thrive in dry, sandy conditions that may not be well supported as Florida experiences more large weather events such as hurricanes. The species of native Florida scrub examined in this study includes Bonamia grandiflora, Liatris ohlingerae, and Mimosa floridana. Bonamia grandiflora and Liatris ohlingerae are both listed as endangered by the state of Florida. Data for each of the species were collected and organized through the platform R. The raw data were collected for each of the species by retrieving herbarium specimen records for each species and its synonyms from the Global Biodiversity Information Facility (GBIF) and Integrated Digitized Biodiversity Collections (iDigBio). Data were refined by removing duplicate records and records georeferenced at botanical gardens and other inaccurate origins, as well as by reducing the relevant data points to those occurring in Florida. Before data cleaning, 1373 data points were identified for Bonamia grandiflora, 1036 data points were identified for Liatris ohlingerae, and 295 data points were identified for Mimosa floridana. After data cleaning, 100 data points were retained for Bonamia grandiflora, 75 data points were retained for Liatris ohlingerae, and 89 data points were retained for Mimosa floridana, This data analysis will be used to create an ecological niche model to reflect where these species may viably occur today and in the future as they respond to climate change.

Presenter(s): Reya Patel

Authors: Reya Patel, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Florida Museum of Natural History, Pamela Soltis and Douglas Soltis

Ecological Niche Modeling of Florida Scrubs: Polygala lewtonii, Polygonella basirimia, and Quercus inopina

The Florida scrub habitat comprises an endangered region in the state found in coastal and inland sand ridges. While the scrub flora is adapted to these arid environments, it faces threats of extinction from commercial development and the rising danger that climate change poses to our ecosystems. Our research centers on modeling the present and future distributions of specific species of sand-scrub habitat in order to predict how they will respond to changes in the environment. This research will, as a result, have important implications for current and future conservation efforts, dictating how conservationists aim to preserve Florida's rich biodiversity. Polygala lewtonii, Polygonella basirimia, and Quercus inopina were chosen as three specific scrub species that are endangered in Florida. We modeled the distributions of these scrub species by first using data repositories iDig Bio and GBIF in order to obtain occurrence records. From this, we received 944 records for Polygala lewtonii, 1288 for Polygala basiramia, and 164 for Quercus inopina. We then used computational methods to clean the data, allowing us to remove undesired locations, outliers, and even reduce bias via spatial thinning. From this, we were left with 46 cleaned records for Polygala lewtonii, 10 for Polygala basiramia, and 82 for Quercus inopina. Then georeferencing was utilized to improve the locality information for additional specimen records. We additionally used Maxent to develop ecological niche models for these species to identify suitable habitats. This approach will allow us to assess the distributions of these species of scrub plants in the present and future, having real-world implications for conservation efforts made for the Florida scrub.

Presenter(s): Kayla Sahadeo

Authors: Kayla Sahadeo, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Pamela Soltis and Douglas Soltis

Assessing the response of Florida scrub endemics to climate change: Hypericum cumulicola, Dicerandra frutescens, and Chionanthus pygmaeus

As studies look deeper into the impacts of climate change, it has become evident that plants are being influenced by changing environments and loss of habitat. Many Florida sand-scrub species have decreased in population over time and are now classified as endangered at both the state and federal levels. We studied three specific Florida sand-scrub plant species: Hypericum cumulicola, Dicerandra frutescens, and Chionanthus pygmaeus. These sand scrub species are all located in a limited region of central Florida. Each of these species depends on periodic wildfires to reduce competition with larger, woody plants; fire suppression has made it more difficult for these species to mature and reproduce. In addition, their habitat has been reduced through development and urbanization. Future changes in climate may also affect their distributions. Georeferenced occurrence points were downloaded from iDigBio and GBIF and used to create models of their spatial distribution. Both present and predicted future species distribution models (SDM) were developed to assess how climate change will affect the ranges of these species in coming years.

Presenter(s): Veronica Selden

Authors: Veronica Selden, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Dr. Pamela Soltis and Dr. Douglas Soltis

Assessing the response of three Florida scrub endemics to climate change: Eryngium cuneifolium, Lechea cernua, and Polygonum dentoceras

Florida sand scrub is an endangered ecosystem restricted primarily to the sand ridges of Florida. Thirty-four percent of the original extent of Florida sand scrub has been lost due to urbanization and agricultural development, and half of the remaining scrublands are unprotected, leaving them vulnerable to further fragmentation and loss as Florida's population continues to grow. In addition to these challenges, Florida scrub faces effects of anthropogenic climate change. This ecosystem sports a high number of endemic species, which are particularly vulnerable to habitat loss due to their restricted ranges. Using records downloaded from Integrated Digitized Biocollections (iDigBio) and Global Biodiversity Information Facility (GBIF), we developed ecological niche models for three Florida endemic scrub plants, Eryngium cuneifolium, Lechea cernua, and Polygonum dentoceras. Initially, Lechea cernua had 736 occurrence points, Eryngium cuneifolium had 199, and Polygonum dentoceras had 1523. After data cleaning and spatial correction, 81 records were kept for Lechea cernua, 30 for Eryngium cuneifolium, and 68 for Polygonum dentoceras. From these models we then predict future distributions under alternative climate scenarios. Due to the narrow geographic ranges, specific habitat requirements, and presently declining numbers of these species, we expect to see their ranges shrink as climate change degrades suitable habitat. The predicted future ranges may be used to inform decisions on which areas of land to set aside for protection in order to preserve these unique species.

Presenter(s): Charisse Sproha

Authors: Charisse A. Sproha, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Pamela Soltis and Douglas Soltis, Florida Museum of Natural History

Ecological Niche Modeling of Asimina tetramera, Paronychia chartacea, Prunus geniculata

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 and many of the species are listed as endangered, specifically the four-petal pawpaw (Asimina tetramera), the papery witlow-wort (Paronychia chartacea), and the scrub plum (Prunus geniculata). This study aims to develop ecological niche models for each of these three endangered plant species. Additionally, models will be projected to future climate models to explore if species ranges expand, contract, or remain the same. We used global databases to download occurrence points for the species and environmental variables. The models can then be used to make predictions about the vulnerability of the Florida scrub resulting from climate change.

Presenter(s): Niccolo Turillo

Authors: Niccolo Turillo, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Dr. Douglas Soltis and Dr. Pamela Soltis

Predicting Florida's Scrublands' Response to Climate Change by Modeling Clitoria fragrans, Clinopodium ashei, and Cladonia perforata

With the advent of digitized biological occurrence data widely available on the internet as well as advances in computer modeling, the time has never been more ripe to analyze plant habitats on a wide scale. In this study, we seek to better understand how climate change will affect Florida’s flora by studying its potential impact on three species’ distributions who grow primarily in Florida scrublands. Clitoria fragrans, Clinopodium ashei, and Cladonia perforata are two species of plants and one species of lichen, respectively, which grow in the sandy soil of Florida’s scrub and are considered threatened or endangered either statewide, federally, or both. Using occurrence records containing locations and dates collected over decades, we examine these species’ distributions in the present day. Then, with the aid of the University of Florida’s HiPerGator computer cluster, we predict niche suitability as our climate warms. Our initial download of occurrence data included 395 instances of Clitoria fragrans, 477 instances of Cladonia perforata, and 986 instances of Clinopodium ashei. After sorting the data to include only georeferenced points, the number of instances were reduced to 54, 26, and 91 for Clitoria fragrans, Cladonia perforata, and Clinopodium ashei, respectively. The changes in these species' habitats is not only important for these species alone, but also indicative of how Florida's scrublands might evolve as a whole in response to global warming.

Presenter(s): Julia von Sohsten

Authors: Julia von Sohsten, Douglas Soltis, Pamela Soltis, Makenzie Mabry

Faculty: Pamela Soltis and Douglas Soltis

Ecological niche modeling and the response of Florida scrub plants: Garberia heterophylla, Persea humilis, Sabal etonia

Since the mid 20th century, we have begun to witness major changes in our planet's climate due to anthropogenic changes. As these changes progress, we also expect to see potential changes in population patterns of plant and animal species. Plant, animal, and human populations alike will have to alter their existing population patterns to adapt to new climate norms. This research project aims to predict where the populations of Garberia heterophylla, Persea humilis, and Sabal etonia, three species of plants, will inhabit in the next 50 years using current climate change projections. These plant species are endemic to Florida and exist primarily in the Florida scrub, which is a highly endangered Florida ecosystem. Due to their narrow environmental range, these species are even more susceptible to changes in population patterns. Using georeferenced data from iDigBio, Biodiversity Information Serving Our Nation (BISON), and the Global Biodiversity Information Facility (GBIF) we performed ecological niche modeling to predict the niche suitability for these species using R. The raw occurrence data included 1835 observations for Garberia heterophylla, 1498 observations for Persea humilis, and 2304 observations for Sabal etonia. Once the data was cleaned it included 356 records for Garberia heterophylla, 162 records for Persea humilis, and 167 records for Sabal etonia. Creating current and future models will allow conversationalists to better understand, and therefore plan, for the changing patterns of these three species.

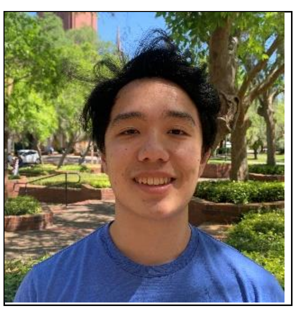
Presenter(s): Malaica Ashley

Authors: Malaica Ashley, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Dr. Pamela Soltis and Dr. Douglas Soltis

Assessing the Response of Conradina brevifolia, Euphoria cumilicola, and Conradina grandiflora to Climate Change

As the state of the planet deteriorates, climate change is impacting plants and other organisms all over the world. Therefore, the purpose of this study was to gather data on how three specific species occurring in sand-scrub habitats in Florida might be impacted by climate change: Conradina brevifolia, Euphoria cumilicola, and Conradina grandiflora. A code was written so that occurrence data for each species could be downloaded and compiled from multiple databases, such as Integrated Digitized Biocollections (iDigBio) and Global Biodiversity Information Facility (GBIF). Synonyms, collected from the Atlas for Florida Plants (Wunderlin et al. 2022), were also employed to make sure all the data for each species was collected. This data was then cleaned so that it could be plugged into the program GeoLocate which facilitates the georeferencing of natural history collections. Initially, including synonyms, 239 to 1162 occurrence points remained for each species (C. cumulicola= 1162, C. brevifolia= 239, C. grandiflora= 631). Ultimately, there were 48 records for Euphorbia cumilicola, 51 records for Conradina brevifolia, and 122 records for Conradina grandiflora remaining. This data will be used to produce ecological niche models for each species and to make projections where each species might occur in the future in response to climate change.



Presenter(s): Mickey Kwa

Authors: Mickey Kwa, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Pamela Soltis and Douglas Soltis

Investigating the Future of Asclepias curtissii, Ilex ambigua, and Nolina brittoniana

Global warming and human interference with the environment will significantly change the abiotic conditions of various ecosystems in the coming decades. In order for conservation efforts of our native flora to be effective, it is necessary to predict the potential effects of changing abiotic conditions on the habitat ranges of various species. Through the use of plant databases such as iDigBio and the Global Biodiversity Information Facility, modeling and analysis of the scrub species Ilex ambigua, Asclepias curtissii, and Nolina brittoniana (of which the latter two are endangered and endemic to Florida) is being conducted to predict the prevalence and distribution of these species in potential future climate conditions. The data were filtered to remove occurrence points that were likely duplicates or cultivated species and occurrence data lacking latitude and longitude data will be georeferenced for use in the models. The results of this study will demonstrate the extent to which current protected areas and conservation efforts will be sufficient, or insufficient, in maintaining the biodiversity of these and other Florida scrub species.

Foodomics – What Is In The Food We Eat And Use To Treat Patients?

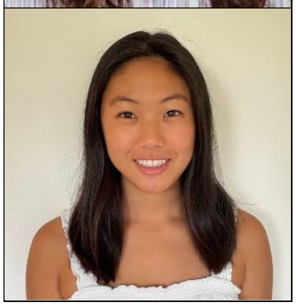
Presenter(s): Peter Beall, Shelby Ducut, Ethan Cecil

Authors: Peter Beall, Shelby Ducut, Ethan Cecil

Faculty: Dr, Peggy Borum

<u>Foodomics Database and Dietary Supplement Label Database</u>

For Precision Ketogenic Therapy, documented precise composition of supplements is necessary to implement the PKT diet prescription. We gather this nutrient information by physically going to stores and recording nutrition data labels. However, manufacturers may make changes in their products over time, so these nutrient runs need to be done periodically to keep the database updated. The Dietary Supplement Label Database (DSLD) developed by the Office of Dietary Supplements (ODS) at the National Institutes of Health (NIH), catalogs all information printed on labels of dietary supplement products sold in the United States. Our goal was to determine whether the information on the ODS website accurately reflects the data obtained from local stores. If this held true, the ODS website could be used as an alternative and reduce the need to continuously collect foodomics data from local stores. We gathered data in January and February 2022 from products in local markets. Comparison of these data with what is in the ODS database showed differences in nutrient values for several products. This suggests that the ODS website cannot be the only source of vitamin and mineral data because it is crucial to have the exact nutrient amount that patients would be consuming from the products purchased in stores. However, the ODS website can be a reliable resource to find new supplement options that may be available in local markets when our frequently used supplements do not meet a patient's needs.

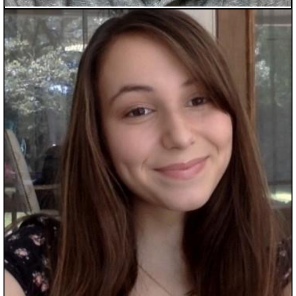
Presenter(s): Julia Lancaster, Juliana Kong

Authors: Juliana Kong, Julia Lancaster

Faculty: Peggy R Borum, S. Parrish Winesett, Samantha Waterman, R. Mitchell Faloona

Foodomics, SR Legacy, and Foundation Foods Databases

Patients undergoing Precision Ketogenic Therapy (PKT) are required to keep close track of the specific nutrient composition of everything that they eat. The PKT Program provides these families with PKT using precise nutrient amounts from the Foodomics Database. The nutrient information for non-branded foods in the Foodomics Database comes from a database (SR Legacy) maintained by the USDA that is being retired and replaced with a new database called Foundation Foods. This study compares the macronutrient data available in the SR Legacy with that in the new Foundation Foods for 62 of the foods commonly used in recipes by patients undergoing PKT. It was hypothesized that there would be slight differences in the protein, fat, and carbohydrate composition per 100g of these items, but more differences were found than expected. There was a difference in specificity of foods between the two databases. For example, instead of just "onions" (SR Legacy), the Foundation Foods database consisted of different types of onions (red, white, and yellow). For 44 of the 62 items which were analyzed, no data were currently available in the Foundation Foods, but this may be because the database is new and is not yet complete. In conclusion, the lab cannot yet transition fully to the Foundation Foods due to the lack of available items, but data from the newer database should be used when possible due to its increased specificity and precision.


Presenter(s): Ethan Cockey, Leamarie Mattia, Lucas Stoev, Blake Ward, Ainsley Wiechens

Authors: Peggy R. Borum, R. Mitchell Faloona, Samantha Waterman, S. Parrish Winesett, Ethan Cockey, Leamarie Mattia, Lucas Stoev, Blake Ward, Ainsley Wiechens

Faculty: Dr. Peggy R. Borum

<u>Foodomics Database and Branded Foods Database</u>

Precision Ketogenic Therapy (PKT) for patients with epilepsy that have not found relief through medication requires diets to be carefully monitored. Any errors in nutritional values can lead to seizures. Since companies modify their products, their nutritional amounts change. It is necessary for us to know when they change to avoid inducing seizures. Our team of researchers specifically focused on branded foods that are being used in the treatment of current patients. We did food runs by taking pictures of the nutrition facts labels of these foods and recorded their nutrition facts. The U.S. Department of Agriculture Food Data Central (FDC), collects similar information, which could eliminate the need for our food runs. We compared food run data from January 2022 to data from the Branded Foods to determine any macronutrient concentration differences between the data sets in grams per 100 grams of food. We created a spreadsheet for these Branded Foods with columns for protein, carbohydrates, and fat and indicated when there was a difference in the food run data and the Branded Foods data by marking it with a 1. Many foods were not in the Branded Food database, so we created a separate column to indicate if it was present or not. For foods that were there, there were frequent differences between the Branded Foods data and the data from our January 2022 food runs. Preliminary data suggest that the Branded Foods database cannot replace the need for frequent food runs at local markets.

GPCRs

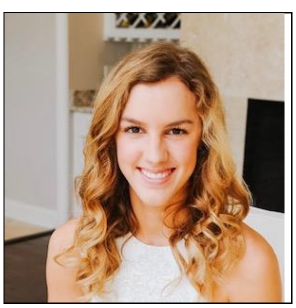
Presenter(s): Anjli Deven

Authors: Anjli Deven, Kara Anazia, Arka Ray, Matthew Eddy

Faculty: Dr. Matthew Eddy

Biophysical Investigation of Sodium Sensitivity in a Human Muscarinic Acetylcholine Receptor

The M2 muscarinic receptor (M2R) belongs to a special class of signaling proteins called G protein-coupled receptors (GPCRs). The M2-muscarinic receptor is expressed in cardiac muscle and pairs with the parasympathetic nervous system to modulate the cardiac potassium channels in the regulation of heart rate. M2R is activated by the orthosteric ligand acetylcholine. In addition to its orthosteric ligand, studies have shown sodium to be an effective allosteric modulator for M2R, but the extent to which sodium allosterically modulates M2 signaling cascade remains unclear. In this study, we employ site-directed mutagenesis and biophysical techniques to gain mechanistic information of how a key residue in the sodium binding pocket alters the conformational dynamics of M2R and its response to sodium. A specific amino acid mutation of aspartic acid residue to asparagine in position 69 (D692.50N) was administered. This ensures that the negative charge of Asp that binds with the positive charge of sodium is removed when Asn is introduced. The wild-type receptor and D692.50N mutant will be expressed in yeast (Pichia pastoris) and expression yields will be analyzed using Western Blot analysis. Future experimentation will quantify the yield and thermal stability of the mutation. Approximately 30-50% of medicinal drugs target GPCRs due to their message translation mechanism. A better understanding of the M2 muscarinic receptor's sodium binding site and its signal transduction mechanism will allow for the production of more time-sensitive and cost-effective drugs that influence the GPCR signaling pathway.



Presenter(s): Jordan Harrow

Authors: Jordan Harrow, Emma Mulry, Amanda Pritzalf, Arka Prabha Ray, Kara Anazia, Frank Devore, Matthew Eddy

Faculty: Dr. Matthew Eddy

Optimizing Site-Specific PEGylation in Gal3c-PEG Conjugates

Protein-PEG conjugates improve the functionality of therapeutics by increasing protein stability and lengthening the duration of drug circulation. Galectin-3 is a carbohydrate binding protein that influences inflammation, cancer, and viral infections, suggesting potential in therapeutics. However, Galectin-3c (Gal3c), the carbohydrate binding domain in Galectin-3, has weak interactions with carbohydrates due to its hydrophobic nature and the general hydrophilicity of carbohydrates. This low binding affinity limits the success of Gal3c as a therapeutic. Attaching PEG to Gal3c could improve carbohydrate interactions with Galectin-3 because of the hydrophilic nature of both the carbohydrate and PEG, which could improve medications within inflammation and cancer therapies. In order to create an optimal Gal3c-PEG conjugate, different binding sites on Gal3c were tested by mutating native amino acids to cysteine, a highly reactive amino acid. These mutant proteins were successfully expressed and experienced similar expression levels to wild-type Gal3c. PEG polymers were attached at specific sites of Gal3c to create conjugates. The thermal melting temperature of each Gal3c-PEG conjugate was determined using Circular Dichroism to characterize the fold and stability of each conjugate and therefore evaluate the functional viability of PEGylation at each Gal3c binding site. Thus far, mutation of Thr175 to cysteine in Gal3c created a conjugate that was unable to bind to lactose during conjugate purification, suggesting that the mutation of Thr175 is an ineffective PEGylation site due to PEG's interference with protein binding and therefore functionality. More Gal3c binding sites will be tested to find a successful, stable binding site for Gal3c-PEG conjugates.

Presenter(s): Chloe Van Horn

Authors: Chloe Van Horn, Kara Anazia, Arka Ray, Matthew Eddy

Faculty: Principal Investigator, Dr. Matthew Eddy

Sodium Ion Influence on A2B Receptors

G Protein-Coupled Receptors (GPCRs) are proteins in cell membranes that respond to extracellular signals. They have been successfully targeted by drugs treating pain, inflammation, and metabolic disorders, indicating their importance in creating improved therapeutics. This experiment investigates the effect of sodium ions (Na+) on the function of a specific GPCR, A2B Adenosine Receptor (A2BAR), which influences physiological systems, including the heart, eyes, and immune system. Sodium is an endogenous ion ubiquitous throughout the body and an important GPCR allosteric modulator. However, more information is needed regarding the structural basis for sodium modulation of A2BAR.

We first produced functional and folded receptors using site-directed mutagenesis to remove a predicted glycosylation site N163Q to help with expression. We also generated constructs that are predicted to have altered response to sodium by replacing a highly conserved residue that mediates the sodium response in related adenosine receptors, (D52N) to inhibit sodium binding. The resulting DNA is then extracted and sent for sequencing to ensure the mutation was successful. Additionally, the yeast vector containing our new plasmids and mutations is transformed into yeast (Pichia pastoris) cells. Western Blot Tests were performed to characterize the protein and determine the yield of expression.

This experiment is still in progress, however we can predict potential results. If sodium binding hinders the function of A2B receptors, this could be a target for drug development, as hindering sodium binding could result in improved function. Conversely, if sodium binding improves A2B function, then stimulating sodium binding could improve extracellular signaling responses.

Presenter(s): Siri Gavini

Authors: Siri Gavini, Apollonia Lysandrou, Ben Lewis, Scott Teitelbaum, Liana Hone

Faculty: Dr. Liana Hone

<u>Examining the Relationship between Anxiety and Cravings in a Sample of Patients Entering a Treatment Recovery Center</u>

Previous research has been conducted regarding anxiety-related substance use. In this study, we aimed to examine the correlation between anxiety and alcohol and drug cravings in a sample of patients entering treatment at a recovery center. We hypothesized that increased anxiety would be related to increased alcohol and drug cravings. Data were collected from $N = 1,013$ patients from the Florida Recovery Center and measures included the Generalized Anxiety Disorder Questionnaire (GAD7) and the Penn Alcohol Craving Scale (PACS), adapted to include drug cravings. The sample consisted of 652 men and 360 women, aged 18 to 83 ($M=40.39$, $SD=13.79$). The range of scores on the GAD7 was 1 to 3 ($M=1.46$, $SD=0.90$). The range of scores on the Penn Alcohol Craving Scale was 0 (never) to 6 (nearly all of the time; $M=2.26$, $SD=1.80$). The correlation between anxiety and cravings was significant, $r\ (1,011) = 0.50$, p<0.001. This poster replicates a well-established correlation between anxiety and cravings in a large sample of patients entering treatment. Reducing anxiety could be an important target for interventions to reduce cravings in early recovery.

Human Factors and Automated Systems

Presenter(s): Spencer Fasulo, Ariel Gabriely, Finn Wilson

Authors: Spencer Fasulo* , Ariel Gabriely* , Finn Wilson* , Sherrilene Classen, Wayne C.W. Giang

Faculty: Dr. Wayne Giang

<u>Can ADAS Systems Help Drivers with Parkinson's?</u>

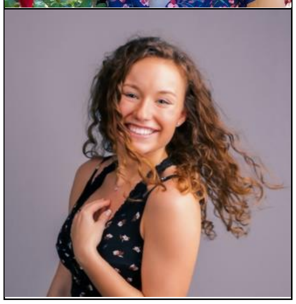
Introduction: As an intermediary step to fully self-driving cars, many vehicle makers have automated parts of the driving task through Advanced Driver Automation Systems (ADAS). ADAS can help improve safety by helping drivers maintain safe headway distances and stay within the lane. These systems may help persons with Parkinson's Disease (PD) continue driving even with the decline of perceptual, cognitive, and motor capabilities that accompanies the disease.

Objectives: To determine whether there were differences in the number of driving errors (e.g., speed, lane maintenance, signaling) when ADAS was engaged for drivers with PD.
Methods: This on-road study was conducted in Gainesville, FL. 32 participants diagnosed with mild to moderate PD drove on the same planned route, which included suburban and highway roadways. The drive was divided into two segments, with order randomly assigned: one segment with ADAS engaged, and one segment with it disengaged. A driver rehabilitation specialist was present in the car during the drive to record driving errors.

Results: Results will be examined using descriptive statistics to determine the number of speeding errors, lane maintenance errors, and signaling errors in both ADAS conditions and whether ADAS impacted the number of errors.

Conclusion: We expect to find that when the ADAS is engaged, there will be fewer speeding, lane maintenance, and signaling errors. Fewer errors is associated with safer driving, which may allow individuals with PD to retain mobility and independence for longer throughout the disease's progression.

Integrative Mechanobiology Lab



Presenter(s): Izabela Zmirska, Makenna Myrick

Authors: Izabela Zmirska, Makenna Myrick, Miao Huang, Juan Guan, Xin Tang

Faculty: Dr. Xin Tang

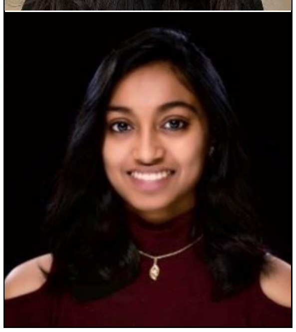
<u>Developing New Tools to Study Cancer Mechanobiology</u>

The Integrative Mechanobiology Lab develops new biophysical tools to study how mechanical, electrical, genetic, and biochemical signals affect the function and structure of living cells and tissues in health and in disease. Currently, our lab is focusing on developing new optical techniques and devices to study cancer mechanotransduction at previously inaccessible spatial-temporal regimes.

The response of cancer cells to chemical stimuli is a relatively well studied field. However, little is known about the effects of mechanical stimuli on cancer cells. This project aims to investigate the relationship between the spatial-temporal distribution of mechanosensitive Yes-associated (YAP) protein and cell mechanics, such as cell stretching and traction. The YAP protein is noteworthy because it influences cancer metastasis. We use CRISPR/Cas9-engineered human normal cells (B2B) and lung cancer cells (PC9) in this investigation to determine whether there was a significant difference in cytoplasmic-to-nuclear distribution of the YAP protein in response to diverse physiologically-relevant mechanical stimuli. To determine the effects of mechanical stimuli, both cell strains were cultured in hydrogels with different substrate stiffnesses (2 kPa, 10 kPa, and 40 kPa) along with being cultured directly on glass substrates (70 GPa). Within PC9 cells, it was found that a difference in substrate stiffness alone had no significant difference of YAP nuclear-to-cytoplasm ratio. When one-time tension and compression or cyclic tension and compression stimuli were applied on singular PC9 cells, there was also no significant difference in YAP nuclear-to-cytoplasm ratio. Currently, the investigation of cyclical stretching on multiple PC9 cells is underway to determine whether it creates any significant difference on the nuclear-to-cytoplasm ratio.

Intrinsically Disordered Proteins: IA3





Presenter(s): Saanvi Kamat, Jennifer Russell, Rishika Cherukuru

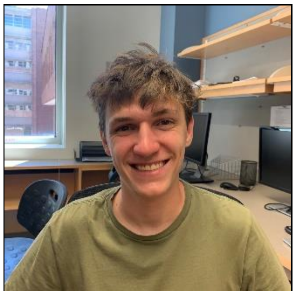
Authors: Rishika Cherukuru, Saanvi Kamat, Jennifer Russell

Faculty: Dr. Gail Fanucci

<u>Effect of Charge Segregation (K) on the Structure and Hydration Environment of IA3</u>

IA3 is an intrinsically disordered protein (IDP) from S. cerevisiae known for its inhibition of Aspartic proteinase A. The lack of secondary or tertiary structure in IDPs confers non-specificity of binding and thus allows each protein to be capable of several functions. IDPs are commonly composed of both positively and negatively charged amino acids and hence are polyampholytes. Fractional charge is a parameter that affects aspects such as hydration environment and protein structure. However, previous studies have shown that merely measuring the fraction of charged residues (FCR) to study these aspects is insufficient. Thus, the charge segregation (κ) of such systems can be used as an additional parameter to provide better information. Larger values of κ are associated with more clumped conformations whereas lower values are associated with well-mixed, or charge-balanced sequences, which are usually more extended conformations. In this project, we use site-directed mutagenesis to produce 6 IA3 mutations: N52E, E68N, K24L, L60K, D46K, and K61D. The mutations are paired in a manner that will change κ while leaving FCR constant. The effects of the changes in κ in the expressed proteins are studied via Electron Paramagnetic Spectroscopy and Circular Dichroism techniques. The utility of κ in predicting hydration environment and protein structure will be discussed in this work.

Investigation of Cell Dynamics During Microvascular Growth



Presenter(s): Riley A. Colquitt, Lauren A. Spalding

Authors: Riley A. Colquitt, Lauren A. Spalding

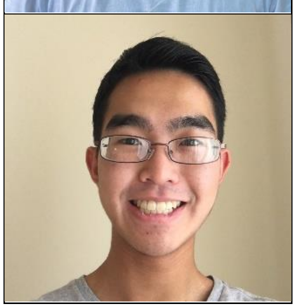
Faculty: Associate Professor, Walter L. Murfee

<u>Investigating the Effect of Aging on Stromal Vascular Fraction Neovessel Formation</u>

Stromal vascular fraction (SVF) is a heterogeneous collection of cells. Based on the potential to stimulate new blood vessel growth, termed angiogenesis, SVF delivery has emerged as a potential therapy for various diseases. So far, SVF-induced angiogenesis has been shown to be affected by factors such as concentration, surgical priming, and the presence of additional stem cells. A knowledge gap still exists, however, regarding whether positive SVF effects might be influenced by aging. The objective of this paper was to evaluate the effect of aging on SVF-derived neovascular microvascular networks. Mesentery tissues and inguinal adipose tissues from adult (9 months) and aged (24 months) Wistar rats were harvested. SVF was isolated from the adipose tissues and seeded on adult mesentery tissues, which were cultured for 3 days in media with 10% serum. To visualize blood vessels, mesentery tissues were fixed using methanol and immunolabeled for PECAM, an endothelial cell marker. Adult and Aged SVF was seeded onto adult tissues according to 2 groups and angiogenic effects were characterized by comparing the following metrics: the vascularized area, high-vascular-density area, and vascular hubs per area. Independent analyses were conducted by 2 students. While additional data is needed for statistical analysis, initial comparisons suggest that adult SVF groups display an increased vascularized area and high-vascular density area compared the aged SVF groups. Our results support the feasibility of comparing angiogenic metrics across groups and variability between students for specific metric highlight the importance and challenge of defining rules for quantifying physiological structures.

Microviridins



Presenter(s): Tiffany Zhou, Connor Griffiths, Liam O'Connor, George Wu

Authors: Connor Griffiths, Liam O'Connor, George Wu, Tiffany Zhou

Faculty: Steven Bruner

<u>Structural and Biochemical Studies of Microviridin N-Acetyltransferases</u>

Cyanobacteria are a rich source of natural products, which are complex secondary metabolites that can have pharmaceutical potential. Microviridins are ribosomally synthesized and post-translationally modified peptide (RiPP) natural products that have unique, cage-like structures. Microviridins are known to specifically inhibit serine proteases, which is important for treating diseases caused by misregulation of proteolysis, including cardiovascular diseases, cancers, and bacterial and viral infections. The majority of microviridin-producing cyanobacteria encode for a MdnA precursor peptide and MdnB and MdnC enzymes that create a tricyclic structure, and some additionally encode for the MdnE transporter protein and the MdnD N-acetyltransferase. This study focuses on MdnD due to limited structural and mechanistic information known about these enzymes. Target genes from Cyanothece sp. PCC 7822, Scytonema sp. HK-05, and Planktothrix sp. PCC 11201, were cloned into expression vectors and transformed into E. coli cells for protein expression. We will attempt to determine the three-dimensional structures of these MdnD homologs through X-ray crystallography. Furthermore, we will be testing their activity against different deacetylated microviridin analogs to gain insight into the functionality and mechanism of MdnD acetylation. If time permits, any acetylated analogs that we generate will be tested against human proteases to determine their potential therapeutic viability for treating diseases caused by upregulation of proteases.

Photosynthesis CURE




Presenter(s): Ella O'Brien, Ethan Lantzy, Isabella Lantzy, Isabel Larrobis

Authors: Ethan Lantzy, Isabella Lantzy, Isabel Larrobis, Ella O'Brien, Sarah da Silva Benevenute, and Gerardo H. Nunez

Faculty: Gerardo Nunez

<u>Stomata morphology diversity among blueberry species</u>

Studying different parts of plants could be crucial for the future of agriculture. Stomata are small pores that control gas exchange and transpiration. Therefore, they play an important role in plant yield and water use efficiency. Blueberry (Vaccinium spp.) cultivation has major economic and environmental impacts in Florida. However, information on morphological traits of stomata in this crop is still scarce. The objectives of this research were to compare stomata size and abundance among 1) shade-developed and light-developed leaves, 2) leaves of northern and southern highbush blueberry plants, 3) leaves of wild and domestic blueberry plants, and 4) leaves of older and recently released SHB varieties. We hypothesized that stomata size and abundance are affected by genetic and environmental factors in wild and cultivated blueberry genotypes. To test our hypothesis, seventeen Vaccinium genotypes including southern highbush blueberry, northern highbush blueberry, and subtropical wild Vaccinium spp. were evaluated. From each plant, two fully developed leaves were collected from the top and mid-to-low parts of the canopy. Each leaf was coated with clear nail polish on the abaxial and adaxial sides. After drying, the nail polish was removed and placed on a glass microscope slide. Photographs were taken using a light microscope at 40X and 100X magnification to record data on stomata number and size, respectively. Images were analyzed using ImageJ. Significant variability in stomata size, shape, and number was observed among the studied genotypes.

Ride the wave! Research how the brain processes languages

Presenter(s): Esha Chakraborti, Neal Chauhan, Anna Julia Demasi, Eva Frost, Melanie Gonzalez, David Liu, Ella Thrasher

Authors: Esha Chakraborti, Neal Chauhan, Anna Julia Demasi, Eva Frost, Melanie Gonzalez, David Liu, Ella Thrasher

Faculty: Dr. Eleonora Rossi

Ride the Wave! Language Processing in the Brain

In this CURE class, we learned the basic principles of human electrophysiology. We talked about the neurophysiological basics of EEG and the techniques used to understand human brain processes. One such technique is the ERP, or Event-Related Potential, which is a brain wave produced in direct response to a presented stimulus. For our studies, we are using the ERP technique to understand the way that human brains process language.

We are using an EEG system to measure the electrical activity of the brain in a non-invasive way, and a large part of our study was learning how to operate the system. We learned how to collect, analyze, and process data from an electroencephalogram (EEG). There are important considerations that we have to take in order to produce the cleanest data possible. We will discuss these considerations in our poster presentation. Another main focus of our CURE class was to learn the technique for applying an EEG cap on a participant. We had to learn how to correctly apply the cap on participants to reduce the impedance of the brain signals so that the data will be clean.

The three main studies that we have begun collecting data for are the Memory Oscillation Study, Global-Local Study, and the Helping Study. We will discuss a basic overview of these studies in our presentation.

RIISC Lab Research

Presenter(s): Ashley Kung

Authors: Ashley Kung, Liana Hone, Nichole Scaglione

Faculty: Dr. Liana Hone

<u>The Dynamic Between Student Perceptions of Parent Approval and Their Behavior Related to Alcohol and Sex</u>

Parental approval is an important predictor of students' alcohol-related risk behaviors. Research suggests that students' reports of parental approval are more accurately associated with their drinking habits than parents' self-reports of approval. In fact, perceived parental approval has been positively associated with drinking problems in first-year college students. To further inform prevention efforts aimed at minimizing alcohol-related risk, we examined associations between perceived parental approval of drinking, drinking context, and alcohol-related sexual risk. First-year college women (N=235) completed a web-based survey and reported their perceived mother's and father's approval of drinking on a scale of -3 to 3, frequency of drinking in different contexts (i.e., where and with whom), and frequency of engaging in sex after drinking. Students perceived both mothers (M=-1.79, SD=1.02) and fathers (M=-1.67, SD=1.12) generally disapproved of drinking. Perceptions of both mother, r(230)=0.16, p=0.013, and father, r(222)=0.17, p=0.014, approval were positively associated with student binge drinking; more frequent drinking in dorms/at home, at bars/other public places, and with family members; and more frequent alcohol-related sexual risk (ps<.01). These findings suggest that students' perceptions of parents' approval of drinking could influence where and with whom college students drink, as well as their engagement in sex after drinking. Future studies could explore why student-perceived parental approval has a stronger effect on some drinking contexts than others, and its role in alcohol-related sexual-risk among college women.

Simmons Research Lab Project 1

Presenter(s): Jordan Gebaide

Authors: Jordan Gebaide

Faculty: Dr. Denise Simmons

The Experience of Asian Women in Civil Engineering

Leaders in the Civil Engineering field are increasingly coming to understand the importance of diversity in the workplace, and have emphasized supporting underrepresented minorities throughout their education and by fostering more inclusive work environments. Utilizing cultural capital accrued from social ties is an effective means of building interests and formulating strategies to foster persistence and resilience, especially for minority individuals. Previous studies explored how minorities in STEM use social ties to inform career goals and accrue social capitals, though specific attention was not given to the experiences of Asian women in civil engineering. This presentation is part of a larger qualitative research project that explores the experiences of Asian women in civil engineering and how they develop various forms of capital to form an intention to enter the workforce. To reinforce the interview protocol and better capture participants' nuanced responses, a literature review was conducted to highlight the needs for diversity and inclusion in civil engineering, stereotypes of Asian women in engineering, and the significance of cultural capital in supporting this population. These findings will be used to inform the following stages of the larger project such as tailoring the questions in semi-structured interviews and deductively analyzing interview transcripts. The finding of this project will make implications for educators and recruiters to revamp and strengthen the support system for Asian women in civil engineering to foster interests in the field and successfully transition to the workplace.

Special Studies in Construction Information Systems

Presenter(s): Anna-Marie Ruano, Lauren McConkey, Jack McNally

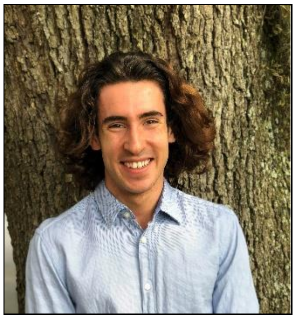
Authors: Rita Elias, Lauren McConkey, Anna-Marie Ruano, Jack McNally

Faculty: Dr. Raja Issa

Automation of House Building using Dynamo and Generative Design

It is often expensive and time-consuming for designers to generate different house design solutions while optimizing important aspects such as floor area, solar heat gain, roof area, and other factors relating to energy efficiency. Generative Design simultaneously optimizes several factors while reducing time and financial strain. This study aims at automating the design process of single-family houses using Dynamo software and Generative design in Autodesk Revit. Generative design studies in Revit are based on the Non-Dominated Sorting Genetic Algorithm (NSGA-II), which works by running possible design solutions that fit within set parameters, comparing these solutions with one another, and ultimately ranking the design solutions. An extensive literature review has been performed to assist the establishment of parameters and variables. The design parameters included specifications for floors, walls, roofs, and windows. Additionally, the development of a Dynamo graph has begun to create a foundation for iteration and optimization. The boundary lines of the floor plan with variable dimensions were first created in Dynamo to serve as a reference for other geometric components, i.e., floors and walls. Multiple Dynamo nodes were used such as "FloorByOutlineTypeAndLevel", "Walls.ByCurveAndLevel", "FamilyInstance.ByFace", "Roof.ByOutlineTypeAndLevel", and number sliders to generate floors, walls, windows, and roof, respectively. Afterwards, the Dynamo graph is exported into Generative Design in Revit to develop and run the Generative Design study and generate different feasible design solutions. The findings of this study will improve the design process by optimizing various parameters in home design and allowing for efficient iteration of design possibilities with minimal expense.

Stoppel Lab



Presenter(s): Jack McNamara

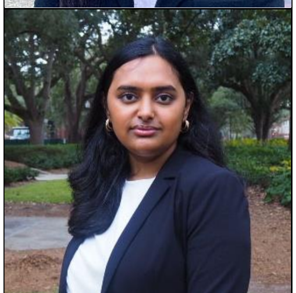
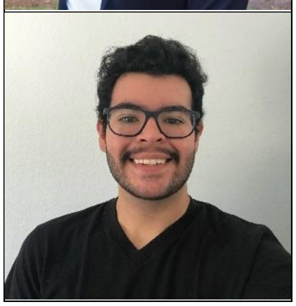
Authors: Jack McNamara, Henry Lutz, Marisa Pacheco, Whitney Stoppel

Faculty: Dr. Whitney Stoppel

Effect of Varying Boiling Times on Polymer Chain Lengths and formation of Silk Fibroin Particles

Our research hypothesizes that silk fibroin nanoparticles (SFNPs) will be effective in delivering piscine Hb to hypoxic tissues like those found commonly around tumors. The first step in progressing this research will be acquiring control of SFNP size. The process of acquiring this control will come from experimentation with how long the silk cocoons of the Bombyx mori silkworm are boiled. As the silk is boiled in a solution of sodium carbonate, the water soluble gumming agent, sericin, dissolves into the solution leaving the silk fibroin core of the silk to be isolated. Factors that will be studied as we modulate the boiling times of these fibers will be the extent to which the silk fibers are degummed, how the protein structures of the molecule are affected, and how the molecular weights of the polypeptide chains of the fibers are affected. It is expected that these factors all have significant influence over the biocompatibility of the SFNPs we produce as well as their interplay with the piscine Hb to be employed later on in the research. In order to produce SFNPs that are viable as a biomaterial, these variables in production must be better understood.

Terpene Synthases

Presenter(s): Adriana LaVopa, Alisha Das, Santiago Velez

Authors: Alisha Das, Adriana LaVopa, Santiago Velez, Emma Stowell, Jeffrey Rudolf

Faculty: Dr. Jeffrey Rudolf

Exploring the Biosynthetic Potential of Tpn2, a Bacterial Diterpene Synthase from Kitasatospora sp. CB02891

Terpenes are a diverse group of biological molecules that span a range of structures and functions, having applications in fields from medicine to fragrances to biofuels. While terpenes and terpene synthases from plants and fungi have been researched extensively, bacterial terpenes and their synthases remain largely understudied. In this study, we explore the catalytic activity of Tpn2, a bacterial type II diterpene synthase from Kitasatospora sp. CB02891. Tpn2 is part of a metabolic pathway that cyclizes the linear, 20-carbon geranylgeranyl diphosphate (GGPP) into terpentecin, an antibiotic and antifungal terpenoid. Tpn2 is responsible for producing terpentedienyl diphosphate, which undergoes dephosphorylation by Tpn3 to produce terpentetriene, the hydrocarbon precursor of terpentecin. Previous research shows that changing the wild type glycine residue at the 485 position to an aspartate changes the molecule produced by Tpn2. We hypothesized that substituting additional amino acids in this position will also change the activity of Tpn2. In this project, we examine the catalytic activity of a Tpn2 G485E mutant, where the glycine has been substituted for a glutamate.

Presenter(s): Talia Abbate

Authors: Talia Abbate, Erika Moore

Faculty: Dr. Erika Moore

Macrophage Phenotypes: Investigating Effect of M1-M2 Macrophage Interactions on Polarization Behavior

Macrophages are an innate immune cell of great research interest due to their key role in inflammation and wound healing processes. Influenced by signals present in the cell microenvironment, macrophages can be polarized into a spectrum of different phenotypes . One extreme is pro-inflammatory M1 macrophages, and the other pro-regenerative M2 macrophages. It is important to gain a better understanding of factors that affect macrophage polarization to "tune" the immune response and create a positive regenerative effect in cases of chronic inflammation or injury. The goal of this project is to determine whether soluble factors or cell-cell communication between M1 and M2 macrophages have an influence on their polarization behavior. For example, if the majority phenotype is M2, would these cells influence the M1 macrophages to re-polarize to the M2 phenotype? To investigate this, M1 and M2 macrophages were co-cultured at various ratios and fixed at Day 0, 1, and 2 to analyze presence of M1 and M2 phenotype over time. This was accomplished via immunostaining for the M1 marker, iNOS, and M2 marker, CD206. Due to issues, only the CD206 marker was stained for, but in fluorescent microscopy images it could be seen in both M1 and M2 macrophages. Therefore, no differentiation could be made between them, and it was concluded that CD206 is not an ideal marker for clear visualization of M2 macrophages only. For future work, the experiment will be re-run, staining for iNOS to ensure this marker is sufficient in identifying only M1 macrophages, and to obtain preliminary results.

Presenter(s): Nicolas Abchee

Authors: Nicolas Abchee, Liana Hone, Nichole Scaglione

Faculty: Dr. Liana Hone

The Association between Relationship Status and Drinking Among First-Year College Women

College students are typically at an age where they are exploring relationships and experimenting with alcohol use. The present study investigated the effects of relationship status on drinking habits in a sample of 235 first year women from a large Northeastern public university. These women were aged 18-19 (M = 18.06, SD = 0.24). A baseline survey was conducted to acquire information on participant relationship status and drinking. Independent samples t-tests results revealed that students not in a relationship reported greater frequency of drinking, peaks of drinking, frequency of binge drinking, and daily drinking patterns than their counterparts who were not in a relationship, ps < 0.023. This indicates that being in a relationship might be a protective factor in risky drinking and that women not in a relationship might be an especially important group for potential interventions aimed to reduce alcohol consumption.

Presenter(s): Sofia Acevedo

Authors: Sofia Acevedo

Faculty: Dr. Jeanette Andrade

Effects of a spice-blended honey muffin on salivary inflammation markers in adults with chronic kidney disease (CKD), and or overweight or obese

Obesity and chronic kidney disease (CKD) are characterized by a persistent state of inflammation that can be modulated by diet. Spices, such as turmeric and cinnamon, at a high concentration (>2g) may reduce this inflamed state. Studies, though, focus on the impact spice supplements has on inflammation instead of spiced-infused whole foods. Therefore, the purpose of this study is to evaluate the impact honey-spiced muffins has on salivary inflammation markers; C-reactive protein (CRP) and interleukin-6 (IL-6) among adults who are obese and/or have been diagnosed with CKD. The honey-spiced muffins contain a total of 3g of turmeric and cinnamon, 2g of honey and aligned with CKD nutrition recommendations for potassium, phosphorus and sodium while also ensuring that the muffin was appropriate for those with diabetes and other comorbidities. A 10-day feasibility trial took place with 14 participants. During the study, participants consumed a 60-gram honey-spiced muffin daily and completed a muffin consumption checklist to assess compliance. At baseline and post-intervention, participants provided a 2ml saliva sample, urine sample to assess albumin to creatinine ratio and complete a 30-day food frequency questionnaire and spice habits intake. Results from this trial will aid researchers in expanding to a larger randomized clinical trial and health professionals to provide recommendations for incorporating spices into the diet

Presenter(s): Mohamad Adada

Authors: Mohamad Adada

Faculty: Dr. Alison Reynolds

Rhetoric, Policy, and Medicine: An Analysis of the Effects of COVID-19 on Florida Policymaking

As with most institutions in the United States, healthcare is subject to its own unique set of issues, which pertain largely to the quality of and access to medical care and were initially cultivated at the federal level. However, due to the political structure of the U.S., statewide governments have a large hand in the control of medical care as well. In 2020, the faculties of the U.S.'s state governments were put to the test; with the onset of the COVID-19 pandemic, greater emphasis was placed on the installment of public health measures like Coronavirus testing, mask-wearing, and vaccination, in response to the shortcomings of clinical care. The regulation of the newly incorporated public health measures summoned a greater need for the role of government in medicine, which was, and continues to be, mediated largely by the language used by local governments. The following meta-analytical study aims to assess the role of political rhetoric in the regulation of healthcare amid COVID-19, specifically within the state of Florida. Applying a rhetorical lens to the politico-medical intersection has yielded four overarching means of regulation: legislation, executive order, speech, and action. While present in varying concentrations, these four political extensions of rhetoric have each played a role in managing the health and livelihood of Florida residents amid the COVID-19 pandemic, and the acknowledgment and assessment of these extensions have immediate implications towards understanding the issues of the U.S. healthcare system in other states and on a federal level.

Presenter(s): Yasmine Adams

Authors: Yasmine Adams, Clarence C. Gravlee

Faculty: Dr. Clarence C. Gravlee

Weight of an Image: Vicarious Racism in the Age of Social Media

Since the death of Trayvon Martin, we have seen an increase in the dissemination of violent imagery of anti-Blackness, including police brutality on social media. While most of these forms of violence and anti-Blackness are not new, the technology used to capture and share this imagery is. Several studies have looked at the consequences of vicarious racism within people's immediate social networks—showing associations between specific exposures such as anti-Black police violence and outcomes such as hypervigilance. However, with the rise of social media, vicarious racism and the possible trauma it can cause can now come from almost anywhere. Using participant observation and semi-structured interviews, we explore how Black undergraduate students perceive, experience, and handle exposure to vicarious trauma through social media coverage of anti-Blackness. The things we find ourselves exposed to can affect us, and the effects can be harmful. This project hopes to provide more insight and be another step on this journey of healing and resistance.

Presenter(s): Pauline Aguinalde

Authors: Pauline Aguinalde

Faculty: Dr. Caitlin Gallingane

What's Better: Screen or Paper? An Inquiry on How Reading Medium Affects Comprehension

The rise of modern education technology has been rapidly increasing in recent years. Along with this change, students have been expected to read on a variety of reading mediums in the classroom, particularly on the computer screen or on paper. An abundance of research on the effect of the reading medium has been conducted with participants of higher elementary grades, although a very limited amount of literature is available concerning younger grades (K-3). Because reading does not come innately to young children, they are susceptible to factors that affect their comprehension. Thus, this inquiry aimed to explore: How does reading medium (print versus screen) affect young children's comprehension?

Participants were recruited from a 3rd grade ESOL classroom. Students were instructed to read a text through both mediums, asked comprehension questions, and were timed on their reading speed. It was found that comprehension was not significantly affected by the reading medium. Instead, it was found that students read with much more ease on paper due to tracking issues that were present when reading on screen. The time difference of almost an entire minute (with paper-based text having a shorter reading time) may have significant implications for computer-based assessments for students at this level.

Presenter(s): Hibah Ahsan

Authors: Hibah Ahsan, John Leri, Darlene Kertes

Faculty: Dr. Darlene Kertes

CpG Site Methylation is Associated with Gene Ontology Terms and Transcription Factor Binding Sites of Central Nervous System Cell Lines

DNA methylation is an epigenetic mechanism that can regulate gene expression and consequently, downstream biological function. The cortisol response to stress, which is associated with developmental outcomes, may affect physiology via the methylome. The current study sought to determine if the cortisol response to stress during infancy (12-months of age; N = 68) was associated with CpG site DNA methylation within transcription factor binding sites (TFBs) and gene transcripts that are involved in biological function. An epigenome wide analysis identified 836 CpG sites at which DNA methylation was associated with the infant cortisol response to stress. Using ENCODE and GTEx databases, 247 CpG sites were identified that were located within both genomic regions of transcription and TFBs present in central nervous system cell lines. The 247 CpG sites were located within genes that were overrepresented among 75 Gene Ontology terms that described neuronal signaling and synaptic plasticity. These results indicate that the infant cortisol response to stress is associated with DNA methylation at CpG sites that may impact the expression of genes involved in neurogenic function, which could mediate the developmental corollaries of the cortisol response.

Presenter(s): Brianna Alderman

Authors: Brianna L. Alderman, Roger D. Blair

Faculty: Roger Blair, PhD

Preserving Potential Entry is Not the Holy Grail in Vertical Merger Enforcement

In 2020, the Department of Justice (DOJ) and the Federal Trade Commission (FTC) jointly issued the newest version of the Vertical Merger (VM) Guidelines. This newer version of the VM Guidelines was intended to inform the business and legal communities of how the DOJ and FTC evaluate proposed vertical mergers. After less than 15 months, however, the FTC rescinded the VM Guidelines and thereby created considerable uncertainty. Although the DOJ left the 2020 VM Guidelines in place, Acting Assistant Attorney General Richard A. Powers indicated that DOJ would participate in revamping the Guidelines.

In our view, there was much not to like about the VM Guidelines. Now, there is an opportunity to correct some of the most serious misadventures that are present in the VM Guidelines. One such problem is a misplaced concern with protecting potential entry. Depending on the pre-merger market structure, horizontal mergers that eliminate a potential entrant may be problematic. But vertical mergers do not pose the same risks. Our concern is that procompetitive vertical mergers may be blocked because the Agencies believed that vertical integration might chill entry.

We will identify this misplaced concern in the 2020 VM Guidelines, and explore the consequences in more detail with our analysis of the Illumina-Grail matter. We will discuss the importance of entry and the competitive concern with entry barriers through the Illumina-Grail merger and our analysis of misplaced concern for potential entry in a vertical context.

Presenter(s): Sarah Alderman

Authors: Sarah Alderman, Haolan Zheng, Dr. Wayne C.W. Giang

Faculty: Dr. Wayne Giang

ACC and the Effect of Automation on Driving Performance

Adaptive Cruise Control (ACC) manages longitudinal control of a vehicle by maintaining a set distance behind a lead vehicle for greater safety and convenience. However, drivers must still monitor for limitations of ACC and maintain lateral control of their vehicle. Training may help drivers use their ACC appropriately. This study explores the effects of ACC, training, and age on drivers' lateral control.

Twenty younger (18-25) and nineteen older (65+) drivers received basic (owner's manual) or comprehensive (basic + roles and responsibilities information + levels of automation) training, and completed seven drives, with and without ACC active. We examined differences in standard deviation of lane position (SDLP) with mixed effects linear regression models with ACC condition, age, and training and their interactions as factors and participant as a random factor. Models were selected using backwards selection and differences were examined using planned contrasts.

ACC condition and the age-training interaction were significant. SDLP is smaller in ACC off conditions than ACC on conditions. Older adults with basic training have larger SDLP than those with comprehensive training.

Lateral control appears worse when ACC is active; one possibility is that ACC decreases the workload of the driving task and subsequently the driver's visual attention demand. As less visual information is gathered, drivers' lateral control may suffer due to less accurate estimations of their lane position. Alternatively, comprehensive training may result in higher perceived risk for older drivers, encouraging more frequent visual sampling. Future work should examine interactions of training and ACC with visual attention.

Presenter(s): Fapianey Alexandre

Authors: Fapianey Alexandre, John Thompson, Mackenzie Bolen, Tara Cooper, Argyle Bumanglag, Terrence Gatton, Elena Garcia, Maria Ramirez, Brittnie Pang, Jackie Lee, Bianca Parra, Sara Burke

Faculty: Sara Burke, PhD

Exogenous Ketone Body Therapy As a Treatment for Age-related Cognitive Decline

A growing percentage of the population is over 65 and the cognitive health span of older adults has not kept pace with the increasing life expectancy. Recent research has established that inducing non-pathological nutritional ketosis through carbohydrate restriction is an effective method of improving cognitive function in older adults and other animals. Community dwelling populations, however, have difficulty maintaining a ketogenic diet. Thus, our study aims to test the effectiveness of exogenous ketones as dietary supplements for improving cognition. Young and aged male and female Fischer-344 brown Norway hybrid rats were given beta-hydroxybutyrate (BHB) and medium-chain triglyceride (MCT) oil supplement in their food and blood glucose and BHB levels were recorded at 0, 2, 4, and 24 hours postprandial after 1, 4 and 7 days of the supplement to assess age and sex effects on the bioavailability of BHB. The supplement lowered blood glucose and increased BHB in all groups and no significant age or sex effects were found. After this pilot study, the process was repeated, and spatial learning, memory, and visual discrimination (cognitive abilities often implicated in human aging) were assessed before and after via mnemonic description tasks. Analysis of the resulting data will determine whether the sample mean performance on cognitive tasks improved when rodents were in ketosis.

Presenter(s): Rakan Alshaibi

Authors: Rakan Alshaibi, Sylvain Dore, Josh Lua

Faculty: Dr. Sylvain Doré

Role of Soluble Tumor Necrosis Factor Receptors in inflammation caused by Ischemic Stroke, Intracerebral Hemorrhage, and Traumatic Brain Injury

Inflammation is characteristic of neurodegenerative diseases including Ischemic Stroke (IS), Subarachnoid Hemorrhage (SAH), Intracerebral Hemorrhage (ICH), and Traumatic Brain Injury (TBI). In stroke pathology, cerebral infarction is modulated by the pro-inflammatory cytokine Tumor Necrosis Factor (TNF). The inflammatory effect of the cytokine is influenced by the availability of membrane-bound receptors and microglial activation in the early onset of neurodegenerative disease. Studies demonstrate a measured effect of this cytokine, with a prolonged and excessive activation correlated to long-term physiological and cognitive impairments. For this reason, TNF is a target of future stroke therapies and of limiting neuroinflammation. Concentrations of the pleiotropic cytokine TNF are affected by the availability of both membrane-bound and soluble receptors. The soluble TNF receptor is essential for apoptotic signaling through varying pathways, in some cases opposing the effects of membrane receptors. Studies demonstrate both agonistic and antagonistic effects of the soluble receptors on TNF upregulation with respect to factors such as disease, the onset of ischemia, and the affected brain region. A review of the role of TNF soluble receptors in neurodegenerative diseases may facilitate the development of novel therapies for reducing infarct size, neurological limitations, and stroke onset.

Presenter(s): Emily An

Authors: Emily An, Ellen E. Martin, Kelly Deuerling, Jonathan B. Martin

Faculty: Dr. Ellen Martin

Variability in chemical weathering in southwest Greenland based on Sr isotopes of stream waters and sediments

Continued retreat of the Greenland Ice Sheet (GrIS) over the past 12,000 years exposed extensive landscapes along the western coast of Greenland, creating nonglacial streams that are disconnected from the GrIS and have different water chemistries compared to proglacial streams that drain glacial meltwater and sediment that have been attributed to distinct weathering processes. This research utilizes the isotopic ratio of 87Sr/86Sr as a proxy for weathering extent to understand the impact of retreat of the GrIS on the chemistry of waters transported to the ocean. Stream water was collected along a 170 km transect from the ice sheet to the coast in southwest Greenland and analyzed for 87Sr/86Sr using column chromatography and mass spectroscopy. Previously observed variations in this ratio were attributed to increased exposure age and weathering extent near the coast. Near the ice, 87Sr/86Sr values of stream waters are higher than bedload values indicating preferential weathering of highly weatherable trace minerals. Stream water 87Sr/86Sr decreases toward bedload values at the coast as trace minerals are weathered out and chemical weathering of the primary rock-forming minerals dominates. New data presented here reveals temporal and spatial patterns of preferential weathering across proglacial and nonglacial streams through the GrIS melt season. Possible explanations for variability include early spring weathering of aeolian dust deposits on winter snow, weathering reactions within lakes, and variations in subglacial source waters throughout the season. This research is part of the Water Institute's Significance of Ice-Loss to Landscapes in the Arctic (SILA) project.

Presenter(s): Praveen Anbu

Authors: Rohan Reddy Kalavakonda, Praveen Anbu, Reiner N. Dizon, Swarup Bhunia

Faculty: Dr. Swarup Bhunia

Pasteables: A Flexible and Smart "Stick-and-Peel" Wearable Platform for Methane Sensing

With global warming looming as a significant problem for this century, it is essential to consider the impact of cattle on greenhouse emissions [1]. Cattle emit a large amount of methane, which contributes 28 times more strongly to warming the atmosphere than carbon dioxide emissions [1]. Thus, it is crucial to examine and understand the carbon footprint of raising cattle. Current methods generally require large and expensive testing machines [1]. Sometimes, the test equipment is rolled out in trailers or set up in a farm space [1]. Therefore, these testing methods are limited to studying the emissions from cattle in an artificial test environment for a specific amount of time and livestock activity [1]. Since the cows remain fixated in the testing space, the scope of measuring other parameters is reduced [1]. We propose a flexible, re-configurable multi-sensing platform, called "Pasteables," which would be very useful in this situation. Pasteables is a stick-and-peel device that attaches to the subject's body and can create an on-body network of smart wearables. Pasteables is designed with a flexible hardware-software configuration to be reusable and applicable in diverse use cases. The platform is equipped with wireless connectivity for sending data to a mobile device or to cloud services. Pasteables can increase cost efficiency and portability of measuring methane emissions in cattle by acting as a wearable sensing platform that can be attached to the cows and collect data at all times. Researchers could also expand on the platform to perform additional testing simultaneously (i.e., cattle movement or CO_2 emissions).

[1] Quinton, A. (2019, June 27). Cows and climate change. UC Davis. Retrieved March 17, 2022, from https://www.ucdavis.edu/food/news/making-cattle-more-sustainable

Presenter(s): Melissa Andalia

Authors: Dongjiang Chen, David Tran, Melissa Andalia

Faculty: Dr. David Tran

<u>Identification and Validation of a Response Signature to Immune Checkpoint Inhibitors in Human Glioblastoma</u>

Glioblastoma is the most frequent and lethal brain cancer in adults and one of the least immunogenic tumors. Emerging data indicate that TTFields, the new antimitotic treatment for GBM, stimulate immunity via the type-1 interferon (T1IFN) pathway of STING and AIM2 inflammasomes. We conducted a phase 2 study combining pembrolizumab, TTFields, and maintenance TMZ in 25 patients with newly diagnosed GBM (ndGBM). We applied single-cell RNA sequencing to serial PBMC samples and tumor microenvironment (TME) and anchor the analysis with a novel computational approach to identify the molecular determinants of response and immune escape. The objective is to understand the global regulatory gene network as predictor biomarkers of response to ICIs, identify novel targets to enhance ICI response, define the gene signature that correlates with objective responses in exceptional responders and establish the mechanism of immune escape in non-responders. Preliminary, using single-cell and bulk RNA-sequencing of PBMCs at the initial stage of the treatment, we detected robust post-TTFields activation of adaptive immunity in patients with GBM via a T1IFN based trajectory and identified a gene panel signature of TTFields effects on T-cell activation and clonal expansion. When combining pembrolizumab, of 19 patients with follow-up >=9 months, the median PFS was >=11.2 months vs. 6.7 months in the control. The additional serial PBMC and tumor samples will be further analyzed in the current study. Collectively, these studies show early evidence of efficacy in ndGBM, further analysis will be updated to reveal the responsive signature for triple combination therapy.

Presenter(s): Abigail Anderson

Authors: Abigail Anderson, Jake Boles, Drew Gillett, Rebecca Wallings, and Malú G. Tansey

Faculty: Dr. Malú Tansey

Loss of Progranulin (PGRN) results in Increased Pan-Cathepsin Activity

Introduction: Mutations in the progranulin (PGRN) encoding gene, GRN, cause familial frontotemporal dementia (FTD) and neuronal ceroid lipofuscinosis and is also implicated in Parkinson's disease. These mutations result in decreased PGRN expression. PGRN is highly expressed in peripheral immune cells and microglia and regulates cell growth, survival, repair, and inflammation. As well, PGRN is implicated in regulating lysosome function, however, the exact role of PGRN in lysosomal function and how this contributes to inflammation and degeneration is not entirely understood. To better understand the role of PGRN in regulating lysosome function, I examined how loss of GRN impacts lysosomal and cathepsin activity.

Methods: Using mouse embryonic fibroblasts (MEFs), I performed immunocytochemistry and immunoblotting assays to analyze fluorescent signal from LAMP1 (lysosomal marker) and BMV109 (marker for cathepsin activity).

Results: GRN-/- MEFs exhibit increased expression of pan-cathepsin activity relative to GRN+/+ MEFs, and significantly impacts expression of LAMP1.

Conclusion: The significant increase in pan-cathepsin activity in the GRN-/- MEFs confirms that PGRN loss does alter cathepsin expression, which may be a result of compensatory mechanisms happening within the cell. Further investigations will include assessing LAMP1 and BMV109 expression in microglia from GRN-/- mice, in the hopes to understand the role of PGRN in lysosomal function in immune cells of the central nervous system and the diseases in which it is implicated.

Presenter(s): Oren Anderson

Authors: Oren Anderson, Hannah Roberts, Sean Niemi, Amor Menezes

Faculty: Dr. Amor Menezes

<u>A Low-Cost Extreme Environment Continuous Directed Evolution Bioreactor</u>

Continuous Directed Evolution (CDE) bioreactors automate the application of different selection environments in a directed evolutionary process; however, these environments are limited to typical laboratory conditions and do not account for extremes of temperature, gravity, radiation, acidity, and salinity. Providing such environments during directed evolution is important when engineering extremophiles for healthcare, space biomanufacturing, and desert sustenance applications. Here, we design and utilize a novel extreme environment bioreactor that realizes continuous directed evolution, simulates microgravity, and continuously senses culture optical density, fluorescence, temperature, rotation rate, and other time varying parameters. Our CDE bioreactor can apply: partial gravity levels on the continuum between approximately 0g and unit Earth gravity (1g); high salinity (up to 30% salt content); extreme temperatures (4C to 80C); and a variety of gaseous atmospheres. Precision environment control is provided via a nonlinear controller that runs on an Arduino nano. Additionally, our design is low cost due to a combination of in-house CNC machining and vendor optimization. This enables massively-parallel CDE experiments. We have validated our bioreactor and performed culture growth experiments in a range of candidate CDE conditions. Our developed bioreactor sets the stage for extreme environment continuous directed evolution for a fraction of today's bioengineering cost.

Presenter(s): Ayesha Anklesaria, Crystal Diaz, Nina Franklin, Joashilia Jeanmarie, Racheal Jones, Megan Meehan, Daniela Ordoñez, Sebastian Rioux

Authors: Ayesha Anklesaria, Crystal Diaz, Nina Franklin, Joashilia Jeanmarie, Racheal Jones, Megan Meehan, Daniela Ordoñez, Sebastian Rioux, and Autumn McClellan

Faculty: Dr. Autumn McClellan

Examining Racial Bias in Perceived Worthiness of Housing Aid Candidates

The decline of overt instances of racism and claims of a post-racial society defy the experiences of people of color, who continue to experience racial bias. Furthermore, recent disruptions due to the COVID-19 pandemic have contributed to housing insecurity. While there are many studies which examine racial discrimination in housing, employment, and the criminal justice system, there are far fewer studies which examine racial discrimination in prosocial or helping behaviors. The present study seeks to understand the role of aversive racism in perceptions of worthiness of candidates for charitable housing assistance.

The research team developed a survey experiment based on two fictional biographies for housing assistance candidates (one biography intends to demonstrate a high level of need for housing assistance and the other to demonstrate a lower level of need); these biographies were either shown without a photo or were accompanied by an AI-generated photo of a white woman or a black woman, thus creating six experimental conditions (2 biographies x 3 photo options). Data was collected from Amazon's Mechanical Turk from individuals who were at least 18-years-old and residing within the United States. After providing information about their attitudes and behaviors related to charitable organizations and giving, respondents were shown one of the experimental conditions and asked to evaluate the worthiness of that candidate to receive housing assistance.

The research team will analyze the data, looking for statistically significant differences in the perceptions of worthiness among the six experimental conditions as evidence of aversive racism.

Presenter(s): Ryan Aponte

Authors: Ryan Aponte, Robin Fintz, Dr. Kevin Tang

Faculty: Dr. Kevin Tang

The Environmental, Genetic, and Demographic Factors of Linguistic Diversity

Languages are changing at a rapid rate and in an evolving world, populations continue to interact, allowing for the borrowing of linguistic features, such as consonants, between cultures. We ask whether sound inventories could also be affected by climatic, demographic, or genetic factors that are known to influence human evolution, while modeling a probable origin of human language using data from over 400 populations.

As discovered by past research, languages change under the influence of many factors. In a 2011 study, Atkinson derived an origin of language and built a model that suggested linguistic diversity declines with increasing distance from the origin (Science). Following the serial founder effect, as humans moved out of Africa, Atkinson concluded that linguistic differentiation declined like genetic differentiation. Jaeger's revision of Atkinson's model (2012) also found that smaller populations correlate with reduced phonemic diversity.

When integrating climatic factors into Atkinson's model, they minimally affect the expected origin of West Africa. Our model may have not been significantly affected because the climatic factors we considered had conflicting effects or these factors have little influence on linguistic diversity on a global scale. Other factors, like genetics, may be more likely predictors of linguistic diversity. Additionally, highlighting influences on different components of linguistic diversity, like number of tones, may disentangle the competing factors. A more complex definition of diversity that operates at different levels of granularity could yield a more holistic understanding of language evolution.

Presenter(s): Vasiliki Apostolou

Authors: Apostolou, Martinez, Hoffman, Tibbetts

Faculty: Dr. Scott Tibbetts

Cell type-specific and virus-specific staining of B cell lymphomas associated with gammaherpesvirus infection

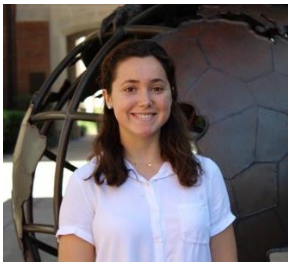
The focus of my project has been on defining the virus and cellular markers that are expressed in tumors that arise in mice infected with murine gammaherpesvirus 68 (MHV68).

MHV68 is genetically and pathogenically similar to human gammaherpesviruses and provides a robust host-virus in vivo system for studying lifelong latent infection and tumorigenesis. Although MHV68 infection of wild-type mice is asymptomatic, infection of CD8 T cell-deficient mice, results in a high penetrance of lymphoproliferative disease (LPD) and lymphomas that primarily manifest in the spleen.

Initial studies in the lab have generated more than 100 sets of samples. The high sensitivity of in situ hybridization methods like RNAscope allow us to define the presence of virus genome in these tumor samples, and appreciate changes in the spleen architecture.

To carry out these studies, I have stained for virus markers, along with key cellular markers such as B220 (B cells), as well as markers of normal spleen architecture such as CXCL 13 (follicular dendritic cells). In doing so, I have identified the disruption of the germinal center structures and central role of B cells in tumor development.

These studies have set the foundation for defining MHV68-asssociated malignancies by determining that virus infection results in both virus-negative and virus-positive tumors, most of which exhibit B cell markers. After having completed staining our sample cohort, we are now working with a hematopathologist to define the specific subtypes of tumors that are induced by MHV68 infection and their relationship to human gammaherpesvirus malignancies.



Presenter(s): Jostin Armada, Marina Fernandez-Campa

Authors: Jostin Armada, Marina Fernandez-Campa, Marisa O. Pacheco, Bruce Spiess, Whitney L. Stoppel

Faculty: Dr. Whitney Stoppel

Engineering Silk Nanoparticles to Optimize their Physiochemical Properties

Polymeric nanoparticles can be used to address biological problems by encapsulating and releasing bioactive molecules in a regulated manner. Formation of these nanoparticles from silk fibroin is useful due to the stabilization properties of the polymer and its degradation into small peptides and amino acids in vivo. This work aims to leverage the unique physiochemical properties of silk fibroin to encapsulate all-natural oxygen carriers. We aim to produce nanoparticles that exhibit a Gaussian distribution in the 200-500 nm range. The silk fibroin is isolated from Bombyx mori cocoons, and the nanoparticles are formed via phase separation with polyvinyl alcohol (PVA), which is induced via probe sonication. The amplitude of sonication, silk processing conditions, and relative concentrations of silk and PVA contribute to the final particle size. To establish our design parameters, we used a sonication amplitude of 25% for 30 seconds followed by a 15 second resuspension step using silk degummed for 60 minutes. Samples were analyzed via a scanning electron microscopy (SEM) to assess particle size and morphology. While changes in average sizes were observed as a function of these variables, various levels of polydispersity tend to exist across samples. Work is being done to examine the interactions between the nanoparticles and dilute constant-mass hemoglobin, which were observed in preliminary investigations. Future work aims to fully optimize a complete set of nanoparticle parameters and to begin incorporating active biomolecules like salmon hemoglobin or perfluorooctyl bromide (PFOB).

Presenter(s): Ami Asar

Authors: Ami Asar

Faculty: Dr. Duncan Purves

Does educational justice demand free college for all?

The issue of free public higher education is a matter of economic debate in welfare states, such as the United States of America, where the government is responsible, at least in part, for the social and economic well-being of its citizens. Current policies in the United States result in members of certain communities being systematically denied access to higher education. This issue is exacerbated by the consistently increasing cost of public higher education in the United States and the growing sum of student loan debt. In light of these concerns, many are proponents of an economic policy providing free public higher education for all. This paper will argue that one simple and attractive argument for the conclusion that educational justice requires free public college for all fails.

Presenter(s): Tatiana Aviles

Authors: Tatiana Aviles, Shu-Min Hsu, Josephine F Esquivel-Upshaw, Arthur Clark, Fran Ren, Chaker Fares, Patrick H Carey 4th

Faculty: Dr. Josephine Esquivel-Upshaw

Hydroxyapatite Formation on Coated Titanium Implants Submerged in Simulated Body Fluid

Dental implants have become a popular restorative option to support dental prostheses. Most dental implants are made from titanium because of this metal's biocompatibility. Effective implants must adhere to surrounding bone in a process known as osseointegration to ensure that treatment is successful. The goal of our pilot study was to determine what coating affixed to the surface of titanium would potentially enhance its ability to integrate to surrounding bone through the formation of hydroxyapatite (HA). The coatings assessed included silicon dioxide (SiO_2) through plasma-enhanced chemical vapor deposition, titanium nitride (TiN) through rf-magnetron sputtering, and quaternized titanium nitride (QTiN) through rf-magnetron sputtering followed by quaternization. The study also included a positive control group treated with sodium hydroxide (NaOH) and a control group of uncoated titanium. Each coated titanium disc was independently submerged in simulated body fluid (SBF) over a period of 28 days, with fluids replenished every 48 hours. The layer of HA that developed was calculated using baseline mass comparisons and further analyzed using scanning electron microscopy (SEM) and energy dispersive analysis x-rays (EDX). Of the coatings evaluated, the quaternized titanium nitride coating produced a slightly higher yield of HA. Our current investigations consider the effect of gravity on HA deposition on coated titanium samples submerged in SBF. The coatings in consideration include silicon carbide (SiC), quaternized silicon carbide (QSiC), QTiN, and the same controls as above. HA deposition will be analyzed incrementally over 7, 15, and 30-day periods and using SEM and EDX as in the pilot study.

Presenter(s): Nabiha Azaz

Authors: Nabiha Azaz

Faculty: Dr. Taryrn Brown, Dr. Alix Johnson

Examining the Relationship Between First-Gen Students' Networks and Their Higher Education Journey

This study seeks to discover the relationships that were the most impactful and meaningful in the higher education journeys of first-generation students at the University of Florida while they were attending high school. Personal network maps and student interviews were used to identify the key relationships during students' time in high school that left a lasting impact on their post-high school journey. Five main relationship types were helpful to students: friends, family, teachers, counselors, and self-advocacy. This paper specifically focuses on the positive impact that friendship/peer support had on first-generation students while they navigated high school and the college-going process. The findings show that peer support and peer mentorship allowed first-generation students to not only gather information and advice and work through the college application process together, but their peers also helped with their emotional well-being during this time. This study can help stakeholders and educators understand the importance of friendship and peer support among first-generation students while they are in high school and the positive impacts it has on improving their college access.

Presenter(s): Grace Baker, Cathleen Rabideau, Marley Concha, and Sara Grove

Authors: Grace Baker, Marley Concha, Sara Grove, and Cathleen Rabideau

Faculty: Dr. Jennifer Doty

How Online Risk Taking and Cyberbullying Influenced Mental Health Among Middle School Adolescents During The COVID-19 Pandemic

Middle school-aged adolescents' mental health was heavily affected by the increase in internet use due to the COVID-19 pandemic. Previous research has shown that there is a growing trend among increased internet usage and decreased mental health; however, there is little literature discussing internet risk during the pandemic. Analyzing the pandemic's influence on problematic internet use concerning adolescent mental health is important in understanding risk factors for adolescents. The Cyberbullying Prevention Collaborative Study we used involved 104 surveyed participants. All participants were aged 10-14 (mean age of 11.7); 55.8% were female, and 67.3% were White. The participants responded to 14 survey questions in 3 "waves": Pre-pandemic (wave 1) from November 2019, mid-pandemic (wave 2) from April - June 2020, and post-pandemic (wave 3) from March 2021. We compared the participants' changes in mental health from wave 1 to wave 3, involving 69 participants, and the correlation between online risk-taking and cyberbullying in wave 2 and mental health in wave 3 which included 50 participants. Preliminary findings from waves 1 and 3 suggest a small, but statistically significant decrease in mental health outcomes. Data analysis through linear regression indicates a significant negative relationship between risk behavior and mental health. Linear regression predicts an insignificant change in mental health in response to cyberbullying. As a result of these findings, increased protections for adolescents on social media, and conversations between parental figures may be necessary to prevent online risk behaviors, such as sharing sensitive information and engaging in sexually suggestive messaging.

Presenter(s): Nathaniel Ball

Authors: Nathaniel Ball, Steve Park Research Group

Faculty: Dr. Gloria Kim

3D Printing of Hydrogels

Hydrogels are fascinating subjects of research, due to their wide variety of properties, compositions, and applications. In this paper, three classes of hydrogels are created and tested and for their suitability in 3D printing: A biogel designed for biocompatibility and use in artificial skin, a hydrogel made of gelatin and κ. carrageenan, and a Pluronic F-127 hydrogel integrated with a metal-organic framework (MOF). Since the three types show substantial difficulties in realizing their potential through 3D printing, possible paths forward are discussed so future research might successfully print these materials.

Presenter(s): Hailey Ballard

Authors: Hailey Ballard, Claire Layton, Magda Francois, Ke Xu, Dominick Lemas

Faculty: Dr. Dominick Lemas

Rural trends in healthcare quality provided by UF Health

There is growing evidence that rural disparities impact adverse pregnancy outcomes including preeclampsia and preterm birth, which are associated with increased risk of maternal mortality. Many pregnant women must travel to a non-rural county to receive prenatal, delivery, and postnatal care. This study utilized 28,530 electronic health records (EHRs) from the University of Florida Health (UF Health) System as well as analysis using R to investigate quality of care provided to both rural and non-rural mothers over a ten-year period. Results indicate that rurality status significantly impacted admittance into the newborn intensive care unit (NICU) following delivery. Of the 28,496 records analyzed, 13,026 mothers lived in non-rural counties, and 15,470 lived in rural counties. A higher percentage of NICU infants were from mothers living in rural counties (29%) compared to non-rural counties (17%), with a p-value of <0.001. Additionally, mothers living in rural counties were about twice less likely to attend initial and routine prenatal visits, regardless of if these visits were covered by insurance. 23% of non-rural mothers did not attend an initial prenatal visit, compared to 41% of rural mothers (p-value <0.001). This was almost identical to routine prenatal visits, with 22% of non-rural mothers compared to 41% of rural mothers not attending a routine prenatal visit. This project discovered that rural mothers are more likely to be ‘left behind’ by UF Health when compared to mothers living in non-rural counties.

Presenter(s): Alexandra Barbosa

Authors: Alexandra Barbosa

Faculty: Dr. Josephine Allen

Sex Specific Differences in the Response of Endothelial Cells to Simulated Microgravity

The effect of microgravity on vascular endothelial cells has been studied utilizing simulated microgravity models on Earth. A great deal of research has been done to understand and characterize the response of endothelial cells to simulated microgravity; however, there is a dearth of information of the role of cell sex in governing the cellular response. This research aims to characterize these sex specific differences in endothelial cells when cultured in this extreme environment. Both female and male human umbilical vein endothelial cells (HUVECs) are cultured on microcarrier beads within the NASA developed Rotating Wall Vessel (RWV) bioreactor which simulates microgravity. Analysis includes rt-PCR for changes in genomic expression, ELISA for secretome analysis, and fluorescent staining of structural proteins for visual comparison.

Presenter(s): Allison Barkdull

Authors: Allison Barkdull, Lexin Chen, Akash Mathavan, Karina Martinez-Mayorga, Coray M. Colina

Faculty: Dr. Coray Colina

Evaluating Computationally Efficient Models of the Mu-Opioid Receptor

The mu-opioid receptor (MOR) is a transmembrane protein and the primary target for pain-modulating drugs. Modern opioid drugs come with detrimental side-effects such as physical dependence and addiction. Understanding structural properties and dynamics of the MOR is key in finding opioid drugs with reduced side-effects. Evidence suggests that interactions with different ligands can cause significantly different conformational changes and downstream effects in the MOR in a process called functional selectivity. Molecular dynamics simulations allow researchers to study changes in protein conformation at an atomistic level. However, modeling systems including the MOR embedded in the lipid bilayer can be computationally expensive. This study evaluates how different systems can be used to model the MOR while reducing computational costs. Simulations were performed of the free MOR in water, the MOR in water with harmonic restraints applied to all transmembrane residues, and the MOR in an explicitly modeled lipid bilayer using NAMD 3.0 alpha and the CHARMM36 force field. Structural properties of the MOR were shown to be different in each system with the free MOR having a higher root mean squared deviation (RMSD) than the MOR with an explicitly modeled lipid bilayer. The simulations with harmonic restraints had a similar RMSD in the transmembrane region as the system with the explicitly modeled lipid bilayer. This suggests that a simulation model of the MOR in water with restraints applied to the transmembrane region may be able to model some of the structural features of the MOR without simulating an explicit lipid bilayer.

Presenter(s): Oscar Barrera

Authors: Oscar Barrera, Imre Bartos

Faculty: Dr. Imre Bartos

Ancestral Black Holes of Binary Merger GW190521

GW190521 was the most massive black hole merger discovered by LIGO/Virgo so far, with masses in tension with stellar evolution models. A possible explanation of such heavy black holes is that they themselves are the remnants of previous mergers of lighter black holes. Here we estimate the masses of the ancestral black holes of GW190521, assuming it is the end product of previous mergers. We find that the heaviest parental black holes has a mass of 62 (+21, -19) $M_{\odot}$ (90% credible level). We find 78% probability that it is in the 50 $M_{\odot}$ –120 $M_{\odot}$ mass gap, indicating that it may also be the end product of a previous merger. We therefore also compute the expected mass distributions of the "grandparent" black holes of GW190521, assuming they existed. Ancestral black hole masses could represent an additional puzzle piece in identifying the origin of LIGO/Virgo/KAGRA's heaviest black holes.

Presenter(s): Stephanie Barsoum

Authors: Stephanie Barsoum, Alana Jackson

Faculty: Professor Alana Jackson

Efficacy of a music program in reforming the identity of incarcerated girls: A mixed-methods pilot study

Incarceration often changes the way individuals perceive themselves and invokes an identity crisis. Loss of autonomy and threat of victimization deteriorate identity through a phenomenon known as prisonization. Incarcerated juveniles also fall victim to the labelling theory, and the "deviant" label imposed upon them by the court system informs their self-perception. Links between low self-esteem and deviant behavior have been established and thus necessitate the consideration of self-esteem as a pillar of rehabilitative programming. Both self-esteem—which is closely associated with sense of identity—and life satisfaction are crucial metrics through which identity can be empirically measured, and they serve as indicators of quality of life within the facility. Rehabilitative and institutional betterment programs hold promising opportunities to observe these metrics, yet limited resources are rarely allocated to these areas. Evidence-based practices that enhance the character qualities associated with reduced recidivism encourage viewing rehabilitative programming as essential rather than supplementary. Music programs have proven to be successful in fostering the rehabilitation of incarcerated populations through improvements in self-esteem, confidence, social skills, mental well-being, and other similar metrics. This study employs a mixed methods approach in analyzing the capacity of a music program to change the self-perception of incarcerated girls in a juvenile residential facility through questionnaires and interviews. The intervention will last eight weeks, and participants will engage in music composition and performance activities with instrumental supplementation. If consistent with previous studies, improvements in self-esteem and life satisfaction are expected to be observed.

Presenter(s): Toshita Barve

Authors: Barve, Toshita V., Godfrey, Keating R., Kawahara, Akito Y.

Faculty: Dr., Keating Godfrey

Effect of behavioral conditions on silk characteristics in the Indian meal moth (Plodia interpunctella)

In Lepidoptera, silk has diverse uses from cocoon construction and prey capture, to protection from predators. However, research on lepidopteran silks has been limited to model organisms, such as the silkworm moth (Bombyx mori). In order to expand the scope of silk research, we studied the effects of larval behavior on silk production in the Indian meal moth (Plodia interpunctella). P. interpunctella produce silk under two different behavioral conditions: wandering and pupating. In the pilot study, wandering silk and pupal silk were shown to have differences in width. Thus, we quantified the difference in silk width over the behavioral conditions that the silk had been produced. Silk width was assessed by slide mounting and imaging both types of silk using a Leica DM6000 compound microscope. Silk images were analyzed using ImageJ to measure fiber width and an analysis of variance was run on the data in R. Our results show a statistically significant difference in silk width between wandering and pupal silk. Determining how behavioral conditions affect silk production is important for understanding natural variation in silk and silk phenotypes.

Presenter(s): Emily Beasley

Authors: Emily Beasley

Faculty: Professor Xan Burley

Hold Your Own

The purpose of this study is to determine the effects of resilience and perseverance regarding dancers' behaviors. These ideas will discuss whether human behavior is influenced more by the surrounding environment throughout one's life, or genes (epigenetics). In the efforts of my study, I will focus on the ideas of resilience and perseverance throughout the college, as well as the impacts on mental health from the Covid-19 pandemic. I plan to recognize the natural reactions as well as the influenced decisions of dancers using these themes as they navigate their way through the current Covid-19 pandemic.

By definition, resilience is defined as the capacity to recover quickly from difficulties, and the ability of a substance or object to spring back into shape—which serves as a metaphor in the dance. Furthermore, perseverance is outlined as persistence in doing something despite difficulty or delay in achieving success. I plan to incorporate both of these concepts to determine the effects on dancers during the Covid-19 circumstances, and how Covid-19 potentially acts as a form of authority by generating vigilance and grit, compared to a motivator of more empathy and care. At the University of Florida, the School of Theatre and Dance has created protocols to ease the minds of both students and staff members. I believe that these unnatural, but necessary norms bring out and challenge the resilience that we may innately hold as humans.

Presenter(s): Elise Belkin

Authors: Elise Belkin

Faculty: Dr. David Fedele

Protective Processes for Youth with Sickle Cell Disease

Children with sickle cell disease (SCD) are at risk for lower quality of life and worse health outcomes. It is important to identify resilience processes that support healthy adaptation in this population. Resilience-promoting processes that are generally associated with better outcomes may vary in effectiveness based on demographic or individual factors. This study aims to determine whether secondary control engagement (SCE) coping moderates the relationship between poverty status and health-related quality of life (HRQOL) for youth with SCD. Participants included 63 youth ages 8-18 with SCD who were part of a larger SCD study. Participants completed measures to assess use of SCE coping and HRQOL. Their caregivers reported family income and composition, which were used to determine status above or below the poverty threshold. A hierarchical regression examined whether SCE coping moderated the association between poverty status and HRQOL. The overall model was not significant, nor were the main effects of poverty status and HRQOL or the interaction. These results imply that secondary control engagement coping does not selectively benefit children with SCD according to poverty status. It is important to consider other protective factors that may contribute to resilience promotion in the population of youth with SCD.

Presenter(s): Munir Ben Jemaa

Authors: Munir Ben Jemaa, Scott McCullough

Faculty: Dr. Scott McCullough

Automorphisms of a Free Spectrahedron

The purpose of this project was to investigate the automorphisms of what is arguably the simplest example of a free spectrahedron whose automorphisms have not yet been classified. A spectrahedron is the scalar solution set of a Linear Matrix Inequality (LMI), generalizing the notion of a polytope from linear programming. They are the basis for semidefinite programming (SDP) within convex optimization. Free spectrahedra are their matricial analogs, and have more structure and are hence more tractable. Free spectrahedra have connections to quantum information theory and systems engineering, and the study of their automorphisms has close ties to noncommutative algebra. The investigation was conducted by testing conjectures in MATLAB numerically and constructing rigorous mathematical proofs involving the theory of analytic functions in one and several variables based on the results of these tests. It was concluded that the only automorphisms of the spectrahedron are trivial ones, i.e. maps of a very specific form.

Presenter(s): Scott Bentz

Authors: S. Bentz, J. Norkett, B. Begley, B. Anthony, V. Miller

Faculty: Dr. Victoria Miller

The Microstructural Evolution of Bronze During Laser Forming

Laser forming is a non-contact method of manufacturing currently being explored for its ability to create complex 3D geometries with one process. A laser is used to induce localized heating on a metal sheet. This creates a heat gradient, adding thermal stresses to the metal, and when done cyclically, enough stresses can be generated that the metal can permanently bend with no spring back. During this process, a heat affected zone is formed along the heat gradient, creating a complex microstructure. Other studies have been conducted to attempt to describe bend angle resulting from laser forming, yet they do not include any microstructural component even though laser forming has direct influence on microstructure. This progress report describes the initial efforts to create an empirical model describing the bend angle to laser parameter relationship that considers microstructural factors. After developing a testing system with the laser to bend metal coupons one pass at a time, multiple samples will be bent with the only difference being one additional laser pass. This creates snapshots in time to show what will happen during a multi-pass bending operation. Each sample will be polished on its side to create a cross sectional view of the microstructure to be observed through EBSD, and their bend angle will be calculated through profilometry. With the microstructural evolution of laser forming revealed, a new bending model could be fit to better predict the bend angle.

Presenter(s): Luka Bjellos

Authors: Luka Bjellos

Faculty: Dr. Eric Schwartz

Fitting an Autonomous Maritime System with Autonomous Helicopter Capabilities

This project entails the research and development of landing apparatus to fit onto maritime systems (AMS) to allow takeoff and landing of autonomous helicopters. It includes research on various types of helicopter and drone landing pads, analyses of mechanical properties of materials, CAD modeling performed through SolidWorks, and finite element analysis performed through SolidWorks. The design being used is a cantilevered platform attached to the University of Florida Machine Intelligence Lab's NaviGator AMS in preparation for the 2022 Maritime RobotX Challenge in Sydney, Australia.

The platform will be constructed using 6000 Series aluminum beams and sheet metal, designed to withstand a single quadrocopter and payload. The platform will be attached to the stern of the NaviGator AMS using existing support structures.

The results of this study have applications in the civilian and military sectors, including but not limited to the installation of stationary drone landing pads on the sides of buildings, or the ability to fit wall-mounted landing pads to warships, armored vehicles, or aircraft.

Presenter(s): Nicholas Blumenthal

Authors: Nick Blumenthal, Malcolm Maden

Faculty: Professor Malcolm Maden

<u>Characterization of Immune Cell Signaling in Acomys cahirinus and Mus musculus in Response to Skin Wounding</u>

Prior studies have detailed the unique mammalian regenerative capability of the African spiny mouse Acomys Cahirinus (Acomys) that lacks the distinct scarring observed among other mammals across numerous tissues including skin, muscle, spinal cord, heart, and kidney. As such, delineating mechanisms which confer this unique regenerative capability offer an opportunity to further understand and extrapolate the regeneration process to non-regenerating mammals such as humans. Through comparative analysis of epithelial wounds between regenerative Acomys and non-regenerative relative Mus Musculus (Mus), arrays characterized cytokine signaling variation in wound response. Numerous cytokines, including several of pro-fibrotic nature, were detected in Mus wound homogenates whilst Acomys exhibited one-third of those present, demonstrating a lack of active inflammatory networks. 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 were performed using cultured dermal fibroblasts and epithelial keratinocytes that indicated another factor uniquely expressed by Acomys keratinocytes. Assays were then performed to investigate whether respective wound homogenates are inhibitory to simulated fibroblast regeneration. Mus homogenate proved to considerably impede cellular migration than equivalent concentrations of Acomys homogenate, suggesting the contribution of pro-inflammatory factors to the fibrotic phenotype 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. These responses enhance the Acomys wound response promoting functional regeneration.

Presenter(s): Jessica Boehlein

Authors: Jessica Boehlein

Faculty: Dr. Erika Moore

Microfluidics Device to promote Angiogenesis and Vessel Growth in a Polyethylene Glycol (PEG) based Hydrogel

Microfluidics is a rapidly growing field of science referring to the behavior, control, and manipulation of fluids that are geometrically constrained to a small scale. By applying this concept to biomaterials, one can study the effects of shear stress on cells encapsulated into biomaterial hydrogels within the device. Previous studies have shown the ability to form microfabricated vascular structures within the biomaterials by adding mechanical shear stress forces. Because the field of tissue engineering attempts to develop de novo tissues in vitro, microfluidic environments better replicate in vivo conditions. This allows the cells to develop naturally and consistently. In the Moore Lab, we use a polyethylene glycol (PEG) based hydrogel to encapsulate cells as PEG-based hydrogels can replicate an in vitro ECM for the cells and promote vessel development and growth. For my project, I have designed and created a microfluidics device that will introduce mechanical shear forces on the cells encapsulated in our PEG hydrogel. My ongoing work will focus on shear stress for cells encapsulated in the PEG hydrogel to model in vivo flow and enhance tissue engineering efforts.

Presenter(s): Ruben Botello-Escalante

Authors: Larissa J Strath, PhD, Ruben Angel Botello-Escalante, Jessie E. Somerville, Sarah M. Peeling, Julia P. Cochran, Valerie Sainterant, Jessica A. Peterson, PhD, Natalie Ebner, PhD, Yenisel Cruz-Almeida, MSPH, PhD

Faculty: Dr. Yenisel Cruz-Almeida

Comparing Vitamin D and Calcium Status with Pain and Physical Function Outcomes in Community-Dwelling Adults

Chronic pain is a significant problem in society, especially in the aging population. Recently, the effect that diet patterns and various micronutrients contribute to the pain experience has become on f increasing interest due to its adaptability and side effect free intervention profile. Here, we sought to investigate the relationships that Vitamin D and calcium have with various self-reported pain, disability and health related measures, quantitative sensory testing, and physical functioning tasks. In our sample (n=44) of older individuals with knee pain, we saw significant correlations between calcium and physical functioning tasks such as balance. Those with optimal levels of calcium were able to detect vibratory stimuli at lower thresholds as well as withstand greater amounts of pressure in the rectus femoris muscle compared to those with hypercalcemia. Those with optimal levels of Vitamin D reported less role limitations due to their physical and mental health and less knee pain compared to those classified as insufficient and deficient. Those with optimal levels of Vitamin D also completed the walking task faster, and reported less pain throughout the walking task compared to the other groups. Taken together, there is evidence to suggest that Vitamin D and calcium may contribute to the pain experience by affecting both pain severity as well as enhancing/impairing physical functioning.

Presenter(s): Jessica Boyette

Authors: Hongwan Li, Sripriya Nannu Shankar, Chiran T. Witanachchi, John A. Lednicky, Julia C. Loeb, Md. Mahbubul Alam, Z. Hugh Fan, Karim Mohamed, Jessica A. Boyette, Arantzazu Eiguren-Fernandez, Chang-Yu Wu

Faculty: PhD Candidate, Sripriya Nannu Shankar

Environmental Surveillance for SARS-CoV-2 in Two Restaurants from a Mid-scale City that Followed U.S. CDC Reopening Guidance

Since mask use and physical distancing are difficult to maintain when people dine indoors, restaurants are perceived as high risk for acquiring COVID-19. The air and selected environmental surfaces in two restaurants in a mid-scale city located in north central Florida that followed the Centers for Disease Control and Prevention (CDC) reopening guidance were sampled three times from July 2020 to February 2021. Sixteen air samples were collected for 2 hours using air samplers, and 20 surface samples by using moistened swabs. The samples were analyzed by real-time reverse transcriptase-polymerase chain reaction (RT-PCR) for the presence of SARS-CoV-2 genomic RNA. A total of ~550 patrons dined in the restaurants during our samplings. SARS-CoV-2 genomic RNA was not detected in any of the air samples. One of the 20 surface samples (5%) was positive. That sample had been collected from a plastic tablecloth immediately after guests left the restaurant. Virus was not isolated in cell cultures inoculated with aliquots of the RT-PCR-positive sample. The likelihood that patrons and staff acquire SARS-CoV-2 infections may be low in restaurants in a mid-scale city that adopt CDC restaurant reopening guidance, such as operation at 50% capacity so that tables can be spaced at least 6 feet apart, establishment of adequate mechanical ventilation, use of a face covering except while eating or drinking, and implementation of disinfection measures.

Presenter(s): Isadora Braga

Authors: Isadora Braga, Guillaume de Lartigue

Faculty: Professor Guillaume de Lartigue

Activation of meal sensitive hindbrain neurons to prevent hyperphagia on high-fat diet-fed mice

Obesity is a major healthcare issue, affecting over 40% of the US population. Bariatric surgery, which involves remodeling of the gastrointestinal (GI) tract is the current most effective treatment. Rapid voluntary changes in behavior after bariatric surgery highlight vagal signaling as a key negative-feedback mechanism from the gut to the nucleus of the solitary tract (NTS) in the hindbrain. Here we studied this gut-brain circuit as a target for preventing diet-induced obesity and hyperphagia.

We used FosTRAP mice to genetically label and target neuronal responses to discreet meal-related stimuli. In experiment 1, we compared neural responses to the vagally-signaled satiety hormone cholecystokinin before and after the onset of obesity within the same animal. We observed that high fat-diet (HFD) reduced sensitivity to cholecystokinin, suggesting that gut-brain communication is impaired in the pathogenesis of obesity.

In experiment 2, we investigated whether meal-responsive NTS neurons, remain capable of inhibiting food intake in hyperphagic HFD-fed mice. A cre-dependent chemogenetic virus (hM3Dq) was injected into the NTS of FosTRAP mice that received 4-hydroxytamoxifen and intragastric infusion of a liquid diet (Boost, 1kCal, 500ul). Chemogenetic stimulation of meal-responsive NTS neurons resulted in reduced food intake in FosTRAP mice at 0 and 2 weeks of HFD consumption.

This study demonstrates that HFD impairs vagal signaling to the NTS; however, bypassing the vagus nerve and activating the first downstream region that receives metabolic GI signals is sufficient to prevent hyperphagia in HFD-fed mice.

Presenter(s): Kristina Suarez, Brandon Causing

Authors: Brandon Causing*, Kristina Suarez*, Mark Terasaki, Jason Cory Brunson

Faculty: Dr. Jason Cory Brunson

<u>Geometric Topology of Glomerular Capillaries</u>

Glomeruli are bundles of capillaries through which blood is filtered in the kidneys, whose structure has been previously studied. One widely-described structural feature is lobularity—organization into strongly intra-connected lobes that are weakly inter-connected. Lobularity has been attributed to developmental processes and implicated in renal dysfunction but has not been rigorously defined. We propose a mathematical measure of lobularity and test whether it can distinguish biological glomeruli from a simplified model of capillary development. We traced mathematical graph models of 12 mouse glomeruli. Using circuit analysis to infer flow directionality and to represent each glomerulus as a Reeb graph, we then computed extended persistent homology. Finally, we summarized the cycle features and their global-local outlier scores using skewness, the sharing statistic, and the Gini coefficient. We are using a random graph model based on mechanisms of angiogenesis to generate "null" distributions of these statistics. Our 12 glomeruli had 80–246 branchings and 118–367 vessels. Qualitative inspection of persistence diagrams revealed 1–3 exceptionally persistent cycles, indicating 2–4 lobes. Test statistics, for example Gini coefficients of cycle persistences (0.493±0.0529) and of outlier scores (0.707±0.0463), were narrowly distributed. Ongoing work compares these values to those computed for random angiogenic models to estimate p-values. Following this study, we will validate our conclusions on holdout data from manual encodings of previously diagrammed murine glomerular networks. Future work will seek a purely graph-theoretic measure of lobularity.

Presenter(s): Andrew Brim

Authors: Andrew Brim, Steven Bruner

Faculty: Dr. Steven Bruner

Structure-based analysis of SRP54 mutations that lead to congenital neutropenia

This project aims to elucidate the structure and functional impacts of SRP54 mutations through protein crystallography. The necessity of elucidating the structure of SRP54, both in mutant and wild types, stems from the impact of mutant proteins on normal immunological function. Mutations in the srp54 gene have been shown to cause severe congenital neutropenia and Schwachman-Diamond-like syndromes. SRP54 is an enzymatic component of the signal recognition particle (SRP) with GTPase activity and specific mutations are proposed to cause protein disorder leading to dysfunction. The details of how these protein mutants lead to a disease state is not known and an understanding of the mechanism can potentially aid the development of therapeutics. So far, we have worked with the SRP54 mutant delThr117 from a model bacterium, P. falciparum, The wild-type structure of PfSRP54 has been reported. We expressed delT117PfSRP54 in E. coli cells and purified the protein using chromatography techniques. With large quantities of high-purity protein available, we have screened delT117PfSRP54 for crystallization, which have yielded crystals that have been sent to Argonne National Laboratory for x-ray diffraction. The results show diffraction to 1.5Å, which will allow for the generation of high-resolution models. For future work, we will focus on the production of different mutants in the srp54 gene and probe in silico for causes of disorder and screened for small molecules that may be utilized for therapeutic applications.

Presenter(s): Alana Brinley

Authors: Alana Brinley, Jesus Preciado, Tie Liu

Faculty: Dr. Tie Liu

How do Plants Balance Growth and Respond to Stresses?

The plant shoot meristem consists of distinct cellular layers with organized stem cells that undergo differentiation to form leaves, stems, and flowers. As agricultural intensification increases, it's crucial to understand meristem functionality as a means to improve crop yield and quality. The SHOOT MERISTEMLESS (STM) gene is a master regulator of the shoot meristem and plays a major role in the "stemness" of cells within the shoot apex. This project aims to study the exogenous effects of superoxide accumulation in cells at the shoot apex by inducing superoxide accumulation in the meristem. Accumulation is visualized using an nitrotetrazolium blue stain in stem-cell depleted stm mutant and overproliferating (GR-STM) lines. The histological approaches and microscopic visualization are used to analyze meristematic cell composition. The second aim of this study is to analyze genetic interactions with STM and hyper-accumulating free radical mutants by crossing LOL (Lesions Simulating Disease-Like) - a standard superoxide response mutant with STM. Any defects in meristem integrity are further analyzed using histological approaches. Determining the connection between stress-responsive signaling and meristem development can improve plant stress response management and prevent the hyperaccumulation of reactive oxygen species (ROS) in the meristem.

Presenter(s): Michael Brown

Authors: Dr. Jessica L. McQuerry, M.D., Dr. Stephanie Ihnow, M.D., Michael Brown

Faculty: Dr. Jessica L. McQuerry

Opioid Use and Postoperative Pain in Children with Femur Fractures

Few studies have prospectively explored opioid use and postoperative pain in children with fractures amid growing concern regarding opioid diversion and misuse. We aimed to characterize postoperative opioid use and pain scores following treatment for pediatric femur fractures to establish evidence-based analgesic protocols. Ten children presenting to UF Health Shands Hospital Emergency Room with a femur fracture were enrolled. In-hospital validated pain scores (Wong-Baker FACES and FLACC Pain Rating Scales), opioid use data, and perioperative data were collected using medical records. Validated pain scores and opioid use data on post-discharge days 1 to 3, 7, 14, 28, and at 3 months and 6 months were collected using a text message-based survey. In-hospital mean pain ratings steadily decreased (5.7 ± 2.9 preoperatively, 2.8 ± 2.7 on postoperative day 1), as did narcotic intake (6.9 ± 6.7 morphine milligram equivalents (MMEs) preoperatively, 1.5 ± 4.1 MMEs on postoperative day 0). A significant difference ($p = 0.046$) was found with opioid and over-the-counter doses taken post-discharge. Patients used 17.2% of prescribed opioids (mean, 1.5 ± 1.8 doses used and 8.7 ± 2.8 doses prescribed). Our preliminary data supports over prescription. Data will continue to be scrutinized to validate our findings and establish protocols.

Presenter(s): Nina Brown

Authors: Nina Brown, Andrew Song, Zachary Slepian, Jiamin Hou, Matthew Craigie, & Daniel J. Eisenstein

Faculty: Dr. Zachary Slepian

Measurement of the Baryon-Dark Matter Relative Velocity During the Milky Way's Formation

In the primordial universe, density perturbations create baryonic acoustic oscillations. These induce a relative velocity between baryonic and dark matter. This relative velocity has been invoked as a mechanism to separate gas from dark matter and thus form globular clusters. It has also been suggested that if the relative velocity is high enough, it will suppress the formation of satellite galaxies, reducing the tension between observations and theory for cold dark matter. In this work, we compute the relative velocity around the Milky Way to assess if it is high enough to produce these consequences, using the 2-Micron All-Sky Redshift Survey (2MRS) data and a Green's function's formalism.

Presenter(s): Matthew Brown

Authors: Matthew E. Brown, Juan M. Arnoletti, Lindsey K. Sachs, Kayla Q. Nguyen, Jin-Ju Lee, Collin C. Lahde, Elise J. Kern, and Todd M. Brusko

Faculty: Dr. Todd M. Brusko

Human CD4+CD25+ Regulatory T Cells Deficient of CD226 Demonstrate Increased Purity and Lineage Stability Following Ex Vivo Expansion for Adoptive Treg Therapy

Regulatory T cell (Treg) adoptive cell therapy (ACT) represents an emerging strategy for restoring immune tolerance in autoimmune diseases. Tregs are commonly purified using a CD4+CD25+CD127lo/- gating strategy, which yields a mixed population: 1) cells expressing the canonical thymically-derived Treg (tTreg) transcription factors, FOXP3 and Helios, and 2) peripherally-induced FOXP3+Helios- Tregs (pTregs). Our prior work identified the autoimmune disease risk-associated locus and costimulatory molecule, CD226, as being highly expressed not only on effector T cells but also, interferon-gamma (IFN-g) producing pTregs. Thus, we sought to determine whether isolating Tregs with a CD4+CD25+CD226- strategy yields a population with increased purity and suppressive capacity relative to CD4+CD25+CD127lo/- cells. After 14d of culture, expanded CD4+CD25+CD226- cells displayed a decreased proportion of pTregs relative to CD4+CD25+CD127lo/- cells, as measured by FOXP3+Helios- expression and the epigenetic signature at the FOXP3 Treg-specific demethylated region (TSDR). Furthermore, CD226- Tregs exhibited decreased production of the effector cytokines, IFN-g, TNF, and IL-17A, along with increased expression of the inhibitory cytokine, TGF-B1. Lastly, CD226- Tregs demonstrated increased in vitro suppressive capacity as compared to their CD127lo/- counterparts. These data suggest that the exclusion of CD226-expressing cells during Treg sorting yields a population with increased purity, lineage stability, and suppressive capabilities, which may benefit Treg ACT for the treatment of autoimmune diseases.

Presenter(s): Michael Bucher

Authors: Garrett Ellward, Michael Bucher, Naim Montazeri, Daniel Czyz

Faculty: Dr. Daniel Czyz

A cell-based approach for improved phage therapy against Pseudomonas aeruginosa

The threat posed by antimicrobial resistance is extensive and far-reaching. Over 1.2 million deaths are caused by resistant bacteria every year, and the prevalence of and lethality caused by these microbes have been steadily increasing. With very few antibiotics being developed, the resistance is projected to continue to increase. Consequently, the number of deaths is expected to reach ten million by 2050. As such, the need for alternative therapies to combat resistant infections is necessary. Our project serves to isolate novel bacteriophage viruses (phages) to target and kill Pseudomonas aeruginosa, a highly resistant bacterium. Phages are viruses that can infect and kill resistant bacteria. They are ubiquitous in the environment, represent the most prolific organism on earth, and are present in high concentrations in sewage. Therefore, we use untreated sewage to isolate these phages. Further, we have developed high-throughput screening methods that allow us to test for the host range of these viruses quickly and accurately. Currently, we have isolated ten unique phages that we are currently characterizing phenotypically by electron microscopy and genotypically by whole genome sequencing. Collectively our phage cocktail can target 51 out of 57 clinical isolates of P. aeruginosa. Additionally, we have assessed the phage cocktail in conjunction with antibiotics to test for synergistic effects. We are currently planning the applicability of our phages in companion animals, burn wound patients, and aquaculture.

Presenter(s): Jordan Buisch, Julia St. Amant

Authors: Jordan Buisch, Julia St. Amant, Cameron Jack, Cody Prouty

Faculty: Dr. Cameron Jack

Testing the efficacy of Artemisia oil against small hive beetle (Aethina tumida), a devastating honey bee (Apis mellifera) pest

Small hive beetles (SHB), Aethina tumida, are a devastating pest species of honey bee (Apis mellifera) colonies and beekeepers. They often invade hives, consume honey bee products and brood, and serve as a vector of several pathogens and parasites. Currently, there are no effective in-hive chemical treatments available to beekeepers to control this pest. The purpose of this project was to assess the toxicity of a derivative essential oil of Artemisia spp. on SHB. Laboratory-reared adult SHB were exposed to Artemisia oil orally via sucrose syrup and pollen, with no significant change in mortality. Additionally, SHB were placed on beeswax containing the Artemisia oil and showed a significant increase in mortality compared to untreated beeswax. A topical application of Artemisia oil was also tested on SHB and honey bees, however the oil displayed a significant increase in mortality in bees at a 100% concentration. Therefore, while Artemisia oil treated beeswax may be a possible treatment for SHB in honey bee hives, more research related to its delivery is necessary before this could be used by beekeepers. As the Artemisia oil was relatively non-toxic to SHB orally, it is not a good candidate for attract and kill strategies. Our research provides valuable insights to the potential of Artemisia oil as a method of SHB control while maintaining honey bee colony health. Further toxicological screening research is required to identify safe and effective active ingredients against this destructive pest.

Presenter(s): Nicole Burg

Authors: Nicole R Burg, Ambika Shakya, Amlan Biswas

Faculty: Amlan Biswas, PhD

Simulation and experimental evidence of dielectrophoresis in manganite thin films

Manganite thin films of $(La_{1-y}Pr_y)_{1-x}Ca_xMnO_3$ (LPCMO) which have been grown on $NdGaO_3$ (NGO) substrates exhibit a state where fluid-like ferromagnetic metallic (FMM) regions can coexist with a charge-order insulating background. It has been shown experimentally that these regions can be realigned using electric fields; a process which could be used in practice to effectively manipulate extremely small ferromagnetic regions. One of the main physical principles which can explain this phenomenon is dielectrophoresis, that is when neutral particles in a fluid experience a net-force due to a locally non-uniform electric field. A C++ code was written to simulate the time dependent dynamics of the FMM regions. Electrodes and circular FMM regions are generated on a grid and the relaxation method is used to find the potentials of the configuration statically. Using the fact that force on the regions is proportional to the gradient of the squared electric field, the regions can be repositioned and their movement over time can be observed. The simulations support the effects that have been observed experimentally, which show an evolution in dI/dV characteristics from electron transport in a disordered ferromagnet to tunneling behavior. This behavior indicates that there is electric field induced percolation giving rise to the conditions for electron tunneling through the insulating regions separating neighboring FMM regions. In addition, a system to measure changes in current at high resistance junctions is being developed to further confirm this explanation.

Presenter(s): Reinaldo Cabrera Perez

Authors: Reinaldo Cabrera Perez, Caroline Levine, Sharareh Miltenberger, Sparsha Muralidhara, Eleonora Rossi

Faculty: Dr. Eleonora Rossi

Personal Network Analysis Across Bilinguals Lifespan: Relationships and Language Usage

Social network analysis investigates the relationships that individuals have with other people in their lives. The present study adds to the emerging area of research that investigates bilingualism through the lens of personal social networks. We designed an experiment to investigate the relationships between bilingual language use and social use of the two languages in different social settings, and over lifespan with the goal to understand if language(s) use shapes individuals' social networks. Through a social network interview, we tested Spanish/English bilinguals who acquired both languages before the age of seven. Participants provided the names and details about the linguistic interactions with people across the family, school, and professional domains during two different life ranges: 0-13 and 14-present. Additionally, participants completed a short battery of cognitive tasks (i.e., Stroop, Flanker) to assess their cognitive control. The cognitive control tasks have yet to be analyzed. We hypothesized that a larger network size and greater variety in language usage would be correlated with greater cognitive control capabilities. Preliminary data (N=50) suggest a general trend in language use such as a stronger bilingual network early in life and a shift to a less dense bilingual network later in life, aligning with a typical language shift for heritage speakers in the US who enter the educational system.

Presenter(s): Ron Cahlon

Authors: Ron Cahlon, Mostafa Reisi Gahrooei

Faculty: Dr. Mostafa Reisi Gahrooei

Decentralized Emergency Communications Network With Bayesian Inference

Harsh environmental conditions, namely natural disasters, often damage central infrastructure and lead to disruptions in communication systems. These disruptions may have catastrophic impacts on the recovery efforts and exacerbate harm on human life. With a lack of communication infrastructure, rescue teams are unable to locate and communicate with nearby victims. In this paper, a decentralized Mobile Ad hoc Network is used to enable communication and advance search operations. The system provides direct data connection among devices in the affected areas and stores location information on a global blockchain ledger. A novel framework for rescue operations is introduced, using multivariate Bayesian inference, to optimize likelihood of successful search efforts in real time. This paper reviews existing approaches, introduces the novel Gaussian process framework and describes integration of the technology with current rescue protocols.

Presenter(s): Isabella Campbell

Authors: Isabella Campbell, Haolan Zheng, Dr. Wayne Giang

Faculty: Dr. Wayne Giang

Do older and younger drivers differ in how they read training material for an Adaptive Cruise Control system?

Adaptive Cruise Control (ACC) is a common advanced driving assistance system that changes the driver's role from completely manual driving to one that involves supervision of an automated system. This role change is rarely made clear to drivers during training and may lead to misunderstanding and misuse of ACC. Older drivers have been found to use different information sources to learn about in-vehicle automation than younger drivers. However, it is unknown whether the two age groups differ in how they use the same training material to learn about automation. The objective of this study was to investigate whether older (65+, n=19) and younger adults (18-25, n=20) differ in how they read text-based training material for ACC. Data of reading patterns, including reading speed on each page, fixations (steady gazes at a single location), and saccades (rapid eye movements between two), were collected using a Tobii Pro Nano. Participants were randomly allocated to one of two training groups: basic (n=20; owner's manual) and comprehensive (n=19; basic training + driver's responsibilities + levels of automation). Descriptive statistics and data visualizations were generated using Python. Age-related reading patterns were observed for both training groups: older participants had a higher number of fixations and saccades and took longer to read the material than younger participants. The type of training material provided did not affect reading metrics. Understanding age-related differences in reading behavior of training material is an essential step for the development of effective training material to help older adults learn new driving technologies.

Presenter(s): Madilena Campbell

Authors: Madilena Campbell, Dr. Alison Adams

Faculty: Dr. Alison Adams

Farmworkers and Pandemic Events: A Research Needs Assessment Among Florida Farmworker Outreach Professionals

Following the advent of COVID-19 in the US, researchers scrambled to assess how the pandemic was affecting vulnerable populations such as farmworkers. This swell of research provided insights into the challenges facing essential workers. My study builds upon and extends this research by assessing health and care needs for farmworkers in Florida in the wake of this pandemic.

Florida farmworkers are critical to Florida's economy but face high levels of risk in their jobs. Farmworkers experience higher incidences of underlying conditions that may make them more vulnerable to the effects of the disease and are less likely to receive long-term management from health care providers. However, it remains unclear how pandemic events can pose an environmental injustice to farmworker communities. To investigate this issue, I draw on environmental justice and farmworker literatures to ask: 1) what are the barriers to medical care and intervention among farmworkers during pandemic events, and 2) how do farmworkers perceive medical intervention in context of COVID-19.

To answer these questions, I conducted interviews with farmworker outreach professionals (n=7) in Florida. These interviews were manually transcribed and analyzed using a qualitative line-by-line coding approach.

Results indicate that, in addition to established occupational risks associated with COVID-19, there was initial difficulty in distributing vaccines to Florida farmworkers. Importantly, study participants reported significant levels of vaccine hesitancy among Florida farmworkers, indicating a need for improved education and communication about medical interventions during health crises.

Presenter(s): Kenan Carames, Mahtab Eskandar

Authors: Kenan Carames, Mahtab Eskandar, Dr. Wayne Giang

Faculty: Dr. Wayne Giang

Remote Participatory Design and Shared Decision Making for Older Adults with Mild Cognitive Impairment and Automated Vehicles

Inclusive design can ensure the benefits of vehicle automation are accessible to everyone. Older adults with mild cognitive impairment (w/MCI) have been identified as a population who may benefit from fully automated vehicles and have specific user needs. The user experience of these highly automated vehicles should be personalized for the individual w/MCI to improve trust in the vehicle and encourage adoption of the technology. This personalization may involve multiple parties, such as the user's care partners and clinicians who will assist in assessing the specific needs of the user w/MCI through a process called shared decision making (SDM). SDM has been used for medical decision-making where multiple parties offer their preferences and reach a decision based on mutual agreement but has not been applied to automation personalization. Four remote participatory design sessions were conducted to explore the needs of users w/MCI for a combined in-vehicle and phone application system for a highly automated vehicle. This poster will focus on findings about the role of SDM in personalizing the user experience of the system. To prepare for the design sessions, researchers created prototypes using Figma. During the sessions, the participants helped refine the prototypes. Surveys were also distributed after each session to evaluate the remote participatory design methodology. The results include the final designs from the sessions along with the post-session survey results. This study contributes towards the design of inclusive automated systems, explores a new style of SDM, and evaluates the efficacy of remote participatory design sessions.

Presenter(s): Katherine Carlo

Authors: Katherine Carlo

Faculty: Dr. Gustavo Cortes

The Impact of the Smoot-Hawley Tariff on State Level Capital Market Efficiency

Since the Smoot-Hawley tariff's passing, economists have debated its role in stimulating the Great Depression. Due to the tariff's extremity, examining its impact on the U.S. economy is valuable for understanding the role of modern protectionist measures. This paper aims to analyze how the Smoot-Hawley tariff's increased rates affected the efficiency of the capital markets. While researchers have analyzed the impact of the Smoot-Hawley tariff at the aggregate level, there is little research on its significance at the regional and state levels. This project aims to address this gap by analyzing trade and employment data to match tariffs to specific states and calculate a Smoot-Hawley exposure factor. Linear regressions were produced between five capital market efficiency variables and this exposure factor to estimate the relationship between the state exposure to the tariff change and capital market failures during this period. Regression analysis found weak to no correlations between the variables and the exposure factor, demonstrating that Smoot-Hawley did not have a significant influence on the Great Depression's state-level capital market failures based on the variables studied.

Presenter(s): Dylan Carman

Authors: Dylan R. Carman, Long T. Nguyen , Nicolas C. Macaluso, Brianna L.M. Pizzano, Piyush K. Jain

Faculty: Dr. Piyush Jain

Thermostable BrCas12b Leverages One-pot Discrimination of SARS-CoV-2 VOCs

Current SARS-CoV-2 detection platforms lack the ability to differentiate among variants of concern (VOCs) in an efficient manner. CRISPR/Cas (Clustered Regularly Interspaced Short Palindromic Repeats/CRISPR-associated) based detection systems have the potential to transform the landscape of COVID-19 diagnostics due to their programmability; however, most of these methods are reliant on either a multi-step process involving amplification or elaborate guide RNA designs. Here we describe a complete one-pot detection reaction using a thermostable Cas12b effector endonuclease from Brevibacillus sp. to overcome these challenges detecting and discriminating SARS-CoV-2 VOCs in clinical samples. The BrCas12b was incorporated into a reverse transcription loop-mediated isothermal amplification (RT-LAMP)-based one-pot reaction system, coined CRISPR-SPADE (CRISPR Single Pot Assay for Detecting Emerging VOCs) for discriminating SARS-CoV-2 VOCs, including Alpha (B.1.1.7), Beta (B.1.351), Gamma (P.1), Delta (B.1.617.2), and Omicron (B.1.1.529) and validated in 206 clinical samples. CRISPR-SPADE achieved 92.7% sensitivity, 99.4%specificity, and 96.7% accuracy within 10-30 minutes for discriminating the SARS-CoV-2VOCs, in agreement with S gene sequencing. Interestingly, for samples with high viral load (Ctvalue $\leq$ 30), 100% accuracy and sensitivity were attained. To facilitate dissemination and global implementation of the assay, a lyophilized version of one-pot CRISPR-SPADE reagents was developed and combined with an in-house portable multiplexing device capable of interpreting two orthogonal fluorescence signals. The ultra-thermostable BrCas12b offers relaxed primer design for accurately detecting SARS-CoV-2 VOCs in a simple and robust one-pot assay. The lyophilized reagents and simple instrumentation further enable rapid deployable point-of-care diagnostics that can be easily expanded beyond COVID-19.

Presenter(s): Alaina Carpenter

Authors: Alaina Carpenter, Smit Patel, Keshav Iyer, Giselle Almanzor, Sylvain Doré

Faculty: Dr. Sylvain Dore

Is HO1 enzymatic activity actually responsible for its alleged neuroprotection?

Heme oxygenase 1 (HO1) is the inducible isoenzyme of HO that degrades heme to produce ferrous iron, carbon monoxide, and biliverdin/bilirubin, all of which could alleviate oxidative stress in the brain. HO2 is the other active isoform that is most constitutively expressed – highlighting the necessity of such enzymatic activity in every single cell. This article evaluates the use of nonselective HO inhibitors, combined with the use of HO-/- and HO overexpressors to analyze the HO1 pathway and its effectiveness as a therapeutic target for acute and traumatic brain injuries (TBI) and other neurological diseases. The articles we discussed focus on the numerous ways to modulate HO1 with HO knockouts, transgenic systems, or overexpression systems to assess the selectivity of the results in hemorrhagic stroke, ischemic stroke, TBI, vascular dementia, and Alzheimer disease. Many preclinical trials recognize HO1 as a viable therapeutic agent because of its neuroprotective properties, as well as its ability to improve functional and anatomical outcomes in mice and rats with induced intracerebral hemorrhage, ischemic stroke, and TBI. By showing that HO1 is a viable target for therapeutic intervention, research can focus on the exact mechanisms and pathways that are altered to provide neuroprotective effects and how more selective HO inhibitors impact these effects. There is a need for selective HO1 drugs that target specific cells, organs, and HO isoforms to maximize brain protection.

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Presenter(s): Zachery Casella

Authors: Zachery Casella, Diba Mani

Faculty: Dr. Diba Mani

Are You More Prone to Migraines after Experiencing a Traumatic Brain Injury?

Background: Migraines are a neurovascular disorder that affects 12% of the total population. Traumatic brain injuries (TBI) are defined as a violent blow to the head that damages the brain. It is estimated that 10 million people suffer from a TBI each year.

Objective: A summary of self-reported measures and imaging technique in TBI patients with migraines.

Data Sources: PubMed and Google Scholar were used to find articles that related to patients that had a TBI in the past and had recurring migraines.

Study Selection: My search strategy used the following key terms: traumatic brain injury, migraines, treatments, accidents, detection, imaging techniques, and management. Articles were used if they contained information on a form of measure used on TBI patients with recurrent migraines or imaging procedures.

Study Design: Systematic review.

Results: Seven original research articles and 9 reviews were used overall. All the self-reported measures: HIT-6, Patient Health Questionnaire 9, and Nine Item Screener displayed a positive correlation of having higher scores with worsened migraine symptoms in TBI patients. HIT-6 test reported higher rates of headache in mild TBI patients 58% of the time compared to the control. Imaging techniques like MRI and diffusion tensor imaging showed abnormalities in brain regions associated with migraine pathophysiology of TBI patients.

Conclusions: TBI patients incur more migraines after injury than the normal population. The main reason is due to neuroinflammation causing an increase in grey matter and elevated CCL2 levels in certain brain regions, corpus callosum and fornix/septohippocampal circuit, connected to migraine etiology.

Presenter(s): Brandi Caughorn

Authors: Brandi Caughorn, Ara Jo

Faculty: Dr. Ara Jo

The Relationship Between Provider Lifestyle Advice, Healthcare Utilization, and Clinical Outcomes in Patients with Cardiovascular Disease: A Cross-Sectional Study

The purpose of this study was to examine a significant association between lifestyle advice from a health care provider, utilization of healthcare, and clinical outcomes in the cardiovascular disease patient population. The study analyzed the national database, National Health and Nutrition Examination Survey (NHANES), for the years of 2017-2018. It focused on adults over 35 years of age who responded to self-reported questions of coronary heart disease diagnosis and congestive heart failure diagnosis. The study found that the measures of BMI, waist circumference, and average systolic blood pressure were significantly higher for patients with CVD who received lifestyle advice from their doctor compared to patients with CVD who did not. Additionally, a higher percentage of patients with CVD who received lifestyle advice from their doctor were reducing the amount of salt and fat or calories in their diet than patients with CVD who did not. Lastly, patients with CVD who received lifestyle advice from their doctor were significantly more likely to receive healthcare over the past year than patients with CVD who did not. Overall, this study concludes that clinical outcomes and primary care utilization differ between those who received lifestyle advice intervention from their doctor compared to those who had none. Future studies are needed to investigate whether lifestyle advice intervention by a doctor affects emergency hospital use for improved health outcomes and hospital use efficiency.

Presenter(s): Flavia Cavicchioli

Authors: Flavia Cavicchioli, Izzy M. Cesarotti, Madison Fangman, Josh Lua, Raymond Hautamaki, Sylvain Doré

Faculty: Dr. Sylvain Dore

Carbon monoxide therapy using hybrid carbon monoxide-releasing/Nrf2-inducing molecules through a neuroprotective lens

Carbon monoxide (CO) has long been known for its toxicity. However, in recent decades, new applications for CO as a therapeutic compound have been proposed, and multiple forms of CO therapy have since been developed and studied. Previous research has found that CO has a role as a gasotransmitter and promotes anti-inflammatory and antioxidant effects, making it an avenue of interest for medicine. Such effects are possible because, at least in part, of the Nrf2/HO1 pathway, which has become a target for therapy development because its activation also leads to CO release. Currently, different forms of treatment involving CO include inhaled CO (iCO), carbon monoxide-releasing molecules (CORMs), and hybrid carbon monoxide-releasing molecules (HYCOs). In this article, we review the progression of CO studies to develop possible therapies, the possible mechanisms involved in the effects of CO, and the current forms of therapy using CO.

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Funding: This work was partially supported by grants from the NIH, the DOD, and the UF-COM-Anesthesiology.

Presenter(s): Flavia Cavicchioli

Authors: Flavia Cavicchioli, Sylvain Doré

Faculty: Dr. Sylvain Dore

Therapeutic use of exogenous CO for the treatment of concussions and traumatic brain injuries

Although carbon monoxide (CO) is usually associated with negative medical scenarios, for a number of years, our NeuroICU Lab has been exploring the possibility that low levels of exogenous CO can be neuroprotective, and further test its potential as a therapy to limit cell death, oxidative damage and inflammation. Like nitric oxide (NO), CO can be a vasodilator, and interestingly, it has a longer half-life than its counterpart. Thus, through an extensive review of the literature, we explore how CO could ameliorate the negative primary and secondary effects associated with TBI. As we know, there are only a few interventions to lessen TBI's pathogenesis. Many of them have been designed to address how to mitigate the shear stress or brain cells, to limit the potential bleeding and subsequent ischemic damage, to relieve the intracranial pressure, and to prevent further complications from the impact, such as seizures, etc. We propose that CO therapy shortly after the acute injury could improve many of the TBI-associated anatomical and clinical hallmarks and further reduce the risk of long-term damage. Various pathways and ways to safely deliver CO are presented here. Of note, several CO delivery therapies are currently being tested in preclinical studies, and only a few clinical trials are ongoing. Various means by which the patient is exposed to exogenous CO, such as inhaled CO (iCO), or various CO-donors, called CO-releasing molecules (CO-RM) – in order to deliver at the right location enough CO to be protective and not too much to affect the levels of carboxy-hemoglobin that can be toxic. Together, exogenous CO is a novel and promising form of treatment with pleiotropic protective effects for the brain after either a concussion or a TBI and remains to be rigorously tested and validated in the most rigorous protocols as new therapeutic alternatives.

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Funding: This work was partially supported by grants from the NIH, the DOD, and the UF-COM-Anesthesiology.

Presenter(s): Allison Cerlanek

Authors: Allison Cerlanek, Nicole Robey, Timothy Townsend

Faculty: Dr. Timothy Townsend

Examining the removal of per- and polyfluoroalkyl substances (PFAS) from artificial landfill leachate using biochar from recycled wood.

The abundance of per- and polyfluoroalkyl substances (PFAS), a family of chemicals of emerging concern, in municipal solid waste (MSW) landfill leachate is challenging operators to seek on-site pretreatment methods before discharging the leachate to wastewater treatment plants (WWTPs). This study explores the PFAS sorption capability of construction-demolition wood biochar, a carbonaceous product of pyrolysis, if it were applied as an in-situ treatment layer in a newly constructed Class D MSW Landfill. Nine PVC lysimeters were constructed and filled in layers. Triplicate control columns contained MSW and drainage layers, while triplicate experimental columns contained MSW, biochar, and drainage layers. Water was added to the lysimeters and allowed to percolate through the waste. The resultant leachates were characterized for pH, chemical oxygen demand, ammonia-nitrogen, metals, and 10 PFAS. PFAS sorption efficacy varied by compound. Biochar-amended lysimeters showed attenuation of specific compounds, including 78% removal of PFOA compared to the control columns in the first week of leachate collection. However, other species, such as PFHxA and PFBA, were found in similar or significantly higher concentrations in the biochar-amended lysimeter leachate. For example, leachate from lysimeters containing one variety of biochar contributed PFHxA at 96% higher concentrations than the control lysimeters in the same week. These data indicate that biochar can attenuate PFAS from landfill leachate, but biochar made from wood with additives, such as adhesives and coatings, may contribute PFAS. Further investigation into PFAS presence in lumber is required before applying biochar from construction-demolition debris as a PFAS sorption layer.

Presenter(s): Nisha Chachad

Authors: Nisha Chachad, Magda Francois, Ke Xu, Hailey Ballard, Adetola Louis-Jacques, MD, Lindsay Thompson, MD, Nicole Cacho, DO, MPH, Alice Rhoton-Vlasak MD, Michelle Cardel, PhD, Dominick Lemas, PhD

Faculty: Dr. Dominick Lemas

<u>The Impact of Pre-Pregnancy Body Mass Index and Perinatal Stress on Maternal Health Outcomes</u>

Obesity during pregnancy has been associated with child and maternal health outcomes; however, its impact on perinatal resilience remains poorly characterized. The Connor-Davidson Resilience Scale (CD-RISC) and Adult Subjective Sociometric Scales ask participants to rate their self-perception of factors that may impact maternal mental health. Our objective is to examine the impact of pre-pregnant BMI on resilience and sociometric self-perception. Participants were recruited for a longitudinal investigation of how breastfeeding impacts maternal-infant outcomes during the third trimester of pregnancy and one year postpartum. Pre-pregnant BMI was determined from pre-pregnant weight and maternal height collected at third trimester study visits. The comparison groups were normal weight (BMI < 26) versus participants with obesity (BMI > 29). Questionnaires were collected at third trimester, two week, and two month study visits. Mean scores were calculated for each visit to examine trends across BMI groups. Statistical significance was determined using a t-test. Of 72 consenting participants, 45 (62.5%) met qualifications for the main BMI groups and had fully completed CD-RISC questionnaires. Levels of completion were similar between groups. Of remaining participants, 31 (68.9%) were normal weight and 14 (31.1%) had obesity. Statistical analysis revealed no significant difference in mean CD-RISC scores between BMI groups for all three visits, but there were significant differences in sociometric self-perception. This information suggests the impact of maternal obesity on perinatal stress may not be clearly reflected by CD-RISC scores alone. However, participants with obesity exhibited lower self-perception of their social status, which may lead to negative perinatal mental health outcomes.

Presenter(s): Alexandra Chavez

Authors: Alexandra Chavez, Elder Garcia Varela, MA, MS, CHES, Dr. Amy Rossi Mobley, PhD, RD, FAND

Faculty: Dr. Amy Mobley

Exploring Hispanic/Latinx Caregivers Perceptions on Early Childcare Center's Nutrition Communication Strategies

The objective of this qualitative study was to explore Hispanic/Latinx caregivers' perceptions about childcare provider-caregiver nutrition communication practices regarding children ages 0-3 years old and to identify areas for improvements in existing communication practices at childcare centers. Hispanic/Latinx caregivers with at least one child aged 0-3 years old participated in semi-structured interviews based on the Social Cognitive Theory about their perceptions of current nutrition communication strategies and nutrition practices at their childcare center. The interviews were conducted in both English and Spanish by bilingual research assistants. Interviews were audio-recorded, transcribed verbatim, and analyzed using inductive content analysis. Participants completed a survey comprised of demographic and acculturation questions based on the Bidimensional Acculturation Scale. A total of 8 caregivers participated in this study, most of whom were female and the average age was 34.5 years old. The results suggested that time, lack of direct communication with providers, and pandemic restrictions have been barriers in the nutrition-related communication between childcare providers and caregivers. Caregivers expressed openness to receiving nutrition education materials (i.e., online materials, pamphlets, and in-person training) that include topics like "picky eating" and healthy recipes for their children. Caregivers were also interested in learning about adapting traditional dishes to be "healthier" and addressing cultural eating behaviors that no longer align with healthy eating habits. Caregivers suggested that nutrition communication practices at their centers could be improved by providing nutrition education on a weekly basis and improving the digital platforms their centers use to communicate with them.

Presenter(s): Matthew Chertok

Authors: Robert Martinez, Hannah Roberts, Chase Kellogg

Faculty: Professor Amor Menezes

A Multistate Cellular Program for Intelligent Drug Delivery

Because targeted drug delivery in the human body is complicated by timing and location requirements, there is a need for medications that can be effectively delivered to local diseased tissue. Cells containing engineered genetic circuits can be administered to an affected site to produce a desired therapeutic under a programmed set of conditions [1]. However, there is a tradeoff between program complexity and cellular fitness because cells must use additional resources to produce the proteins that a circuit encodes [2]. To date, binary-input components are prevalent in cellular programming; this requires a cascade of orthogonal genes that simultaneously increases program complexity and places substantial metabolic stress on a cell [2]. Here, we propose a multistate genetic device to reduce the number of components needed to accomplish the intended logic. This device can take more than two inputs, thereby reducing the number of genetic layers required. We validate the stability and sensitivity of our design with an in silico model of circuit performance using parameters fit to experimental data. Applications of this device include on-demand, adjustable-dose drug delivery with engineered bacteria.

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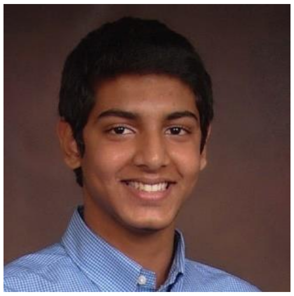
Presenter(s): Elizabeth Chmielewski

Authors: Elizabeth Chmielewski, Brianna Hawryluk, Chloe Gingerich, Morgan McKinney, Patricia Ramos, Tracy Scheffler*

Faculty: Dr. Tracy Scheffler

Surface color variation between Angus and Brahman longissimus lumborum muscle

Meat color is an important factor in consumer purchasing decisions. Muscle metabolic properties affect meat color attributes. Previously, we demonstrated that postmortem metabolism and mitochondrial (mt) function differs between Angus and Brahman. Thus, our objective was to evaluate color, myoglobin (mb), and metabolic characteristics in Brahman and Angus longissimus lumborum. Steers (n=14 per breed) were harvested and samples collected at 1h, 24h, 48h, and 14d postmortem. At 48h, steaks were removed, and surface color was measured using a colorimeter. We determined the concentration of mb, the major pigment found in meat, as well as enzyme activity (lactate dehydrogenase, LDH-A, LDH-B; complex IV, CIV), and protein expression (mb, citrate synthase (CS), and CIV). Based on colorimeter values, steaks from Angus were redder and expressed greater color saturation. The mb concentration was numerically higher in Angus at 1, 24, and 48h, whereas protein expression of mb was significantly higher in Angus at 1h, but not 24h. CS protein expression was not different between breeds, indicating no difference in mt content. CIV protein expression tended to be higher in Brahman, whereas CIV activity exhibited no significant difference between breeds, but was numerically higher in Brahman. LDH-A and LDH-B activity at 1h and 14d was significantly higher in Brahman, indicating greater capacity to regenerate NADH and maintain a bright cherry red color. Thus, greater mb concentration in Angus evidences greater capacity for oxygen storage, whereas lower CIV may contribute to decreased mt activity, suggesting an altered balance between oxygen storage capacity and mt oxygen consumption contributed to differences in steak color between breeds.



Presenter(s): Anand Chundi

Authors: Bianca Punch, Anand Chundi, Song Liang, Xiaolong Li, Keerati Ponpetch

Faculty: Dr. Song Liang

Assessing Environmental Characteristics of Emerging Endemic Areas for Human Schistosoma spp. in Sub-Saharan Africa (SSA)

Schistosomiasis is an important waterborne neglected tropical disease, infecting more than 240 million people in 78 tropical and subtropical countries, with up to 780 million at risk of infection. The majority of disease burden, more than 90% of all human cases, occurs in Sub-Saharan Africa (SSA), where the disease is largely caused by Schistosoma mansoni and S. haematobium. Recently, reports of emerging endemic areas for both species of parasites have posed increasing public health concerns on the future trend in human infections and the impacts of environmental change. The proposed study aims to assess environmental characteristics of emerging endemic areas for the two human schistosomes.

This study will consist of two components. First, a georeferenced database on co-endemicity of S. mansoni and S. haematobium transmission through a comprehensive literature review will be developed; also developed will be a georeferenced environmental database including water resources, ambient temperature, rainfall, land-use, vegetation etc. Second, environmental characteristics associated with the endemic areas will be explored through quantitative analysis such as statistical models.

Presenter(s): Juliette Clavier

Authors: Juliette Clavier, Barbara K. Smith, PT, PhD

Faculty: Barbara Smith, PT, PhD

Do sleep breathing disorders in amyotrophic lateral sclerosis influence respiratory plasticity responses to acute intermittent hypoxia?

Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease that leads to respiratory failure and death. A recent study in ALS found increased Tidal Volume (VT) and respiratory muscle activity following treatment with Acute Intermittent Hypoxia (AIH), an intervention known to elicit neuroplasticity. In other neurologic conditions, chronic intermittent hypoxia from sleep breathing disorders (SBD) might precondition responsiveness to AIH. Our aim was to identify SBD in early-stage ALS and analyze how SBD severity impacts respiratory plasticity responses to AIH. Patients underwent single exposures of AIH (15 intervals, 1 min 10% O_2; 2 min normoxia) and SHAM hypoxia, along with a home sleep study. Within-session VT, minute ventilation (MV), and respiratory rate (RR) percent changes from baseline to 60 minutes post (Δ) were calculated, along with ΔAIH-ΔSHAM (DD) to yield a corrected AIH response. Apnea Hypopnea Index (AHI) from sleep reports sorted patients (n=8) into groups of no-mild versus moderate SBD severity. Shapiro-Wilks tested for normality, and unpaired T-tests or Mann-Whitney evaluated differences between AHI groups. VT-DD ($p=0.0847$) and MV-DD ($p=0.0571$) responses to AIH trended larger in the moderate group, compared to no-mild SBD. RR responses to AIH did not differ based on SBD. The group differences in VT-DD and MV-DD suggest that moderate SBD could precondition ALS patients to experience more robust respiratory plasticity following a single AIH exposure. Our findings indicate the presence of SBD must be considered when interpreting respiratory plasticity responses to AIH. Further subject recruitment is needed to validate these results.

Presenter(s): Erika Clesi

Authors: Erika Clesi

Faculty: Dr. Stephen Perz

Pumping Water from Florida Springs: Do We Have the Narrative Right?

For decades, there has been a heated debate surrounding how much water bottling companies should be allowed to pump from Florida's springs. Notably, Florida has 33 first-magnitude springs, which is more than any other state or country. These springs include those privately owned, like Ginnie Springs, and state parks, like Ichetucknee Springs and Rainbow Springs. On average, first-magnitude springs discharge about 100 cubic feet of water per second, which equates to over 64 million gallons of water discharged per day.

Research found during this study has shown that significant water withdrawal has reduced or stopped the flow of springs historically. The purpose of this project is to examine the public's perceptions surrounding bottling companies, like the Zephyrhills Bottling Company and Seven Springs Company, which extract groundwater from Florida springs.

While this study has revealed many negative perspectives concerning the bottling industries' withdrawal of water, it has also uncovered other issues, such as how the state of Florida does not tax water that is pumped by these companies across the state, how permits are relatively low cost to obtain, and how the bottling industry contributes to only a small percentage of water withdrawal in Florida.

Presenter(s): Nicholas Cocoves, Marisa Nelson

Authors: Tony Diaz, Andrew Ortega, Henry Tingle, Peter Ifju, Nicholas Cocoves, Marisa Nelson, Nate Keyes, Brandon Bulenes

Faculty: Dr. Peter Ifju

The "Bathydrone" for Underwater Survey and Mapping

A system for drone-based underwater mapping (bathymetry) was developed at the University of Florida. The system, called the “Bathydrone,” is encased in a miniature boat-shaped hull attached by tether to a flying drone to direct it. The vessel is equipped with a sonar device on the bottom of the hull to scan bottom and side topography of underwater surfaces. Following testing, this data is analyzed to produce underwater topographical maps as well as contours of bottom surface hardness. Testing of the vessel was conducted on a 5-acre, roughly square pond at the University of Florida Plant Science and Education Unit in Citra, Florida. Prior to testing the system, ground truthing data for the underwater surface features were acquired manually at over 200 points across the pond using an RTK GPS unit attached to a depth pole to precisely measure locations. The accuracy and resolution of the system was assessed by comparing its data to the ground truthing data. Through testing, advantages of the Bathydrone system became clear; it is easy to implement and initiate surveys from land without using a boat. The system is inexpensive and lightweight, and subsequently convenient to transport. The Bathydrone can be used at speeds up to 10 mph, and is suitable for waters with swift currents. The Bathydrone also has no control surfaces underwater, so it tends not to snag on aquatic vegetation. Our group has been able to scan an area over 10 acres in one battery charge and less than 25 minutes.

Presenter(s): Carlos Colon-Ortiz, Abdul-Vehab Dozic, Lauren E. Ellis, Andrew Sforza, Jerry Holland

Authors: Bonnie NC President, Abdul Vehab-Dozic, Ronnie E Bolden II, Lauren E Ellis, Carlos Colon-Ortiz, Andrew Sforza, Wesley E Bolch

Faculty: Dr. Wesley Bolch

<u>3D Reconstruction of Kidney Nephron from H&E-Stained Histology Slides for Alpha Radiopharmaceutical Therapy</u>

Tissue-based models have historically been represented in 2D images with geometric shapes and angles. These models have limitations for radiation therapy simulations to study phantom dosimetry of human-based tissue models. In this stage of our experimentation, our team in the Advanced Laboratory for Radiation Dosimetry Studies (ALRADS) developed a prototype model based on histology slides of the nephron structure of the adult kidney. The prototype model was developed using 3D Slicer (Version 4.11) and Rhinoceros 7 software to recreate a 3D polygon mesh model to account for the complex volume structure of the nephron. The purpose is to recreate a realistic phantom model which can be used for radiopharmaceutical of alpha-particle emitters and other kinds of radiation therapy. The development of polygon mesh models is a recent development that will greatly improve radiation therapy treatments with more accurate measurements while performing computer simulations.

Presenter(s): Morgan Colwell

Authors: Morgan Colwell, Henry Young MD

Faculty: Dr. Henry Young

Assessing the effect of health literacy and payer status on willingness to receive CAM

Introduction: The opioid epidemic has significantly impacted the United States with an estimated 10.1 million people that misused opioids in 2018. There are complementary and alternative medicines (CAM) modalities that can be used as opioid sparing approaches to effectively treat pain. In this study, we assess the effect of payer status on willingness to receive CAM treatment.

Methods: The population includes adults in the emergency department at UF Shands Hospital. Participants were given a survey that investigates payer type, pain level, and willingness to utilize different CAM treatments. Descriptive statistics were used to analyze this data.

Results: There were 293 participants. In analysis of demographics, age, dental pain as a type of pain, and African American race were found to be statistically significant by payer type. When analyzing concerns of receiving CAM treatments, cost was the only concern found to be significant by payer type with uninsured individuals being more concerned about cost (54%). Overall, willingness was high among all individuals regardless of payer type. Uninsured individuals who didn't expect opioids were the most willing. Among Medicaid patients, willingness was significantly higher among those who expected opioids than those who did not expect opioids (64% vs 49%).

Conclusions: Overall, all payer types had a high level of willingness to receive CAM treatments however the willingness differed based on if the individual expected to receive opioids. CAM treatments are underutilized in the emergency department, but these results support that most participants would be willing to try it if given the option.

Presenter(s): Ricardo Cordero, Emily Barlow, Evelyn Hunter

Authors: Ricardo Cordero, Emily Barlow, Evelyn Hunter, Christopher P. Robinson, Matthew M. Andoniadis, Steven A. Robicsek, Shelley C. Heaton, Sylvain Doré

Faculty: Dr. Sylvain Dore

Assessing heightened occurrence and severity of stroke through the deviation of biomarkers in COVID-19

The SARS-CoV-2 virus causes multiple pathophysiologic effects on the body and can damage various organ systems, including the cardiovascular and nervous systems. This work takes common pathologic biomarkers observed in patients without COVID-19 who have suffered a stroke and discusses the data, relevance, and significance of such markers in patients who are positive for COVID-19 and have cerebral ischemia. These biomarkers may predict an increased risk and severity of COVID-19 for patients who have suffered a stroke. This review was conducted using PubMed, EMBASE, PRIMO, and Google Scholar to assess the differences in biomarkers, including fibrinogen (and fibrin), D-dimers, IL-1, IL-6, PGE2, LDH, APLA, CRP, and platelet counts. The aim was to assess differences in biomarkers and cerebrovascular events reported in patients with COVID-19 infection. Several studies have compared data between patients who tested negative and positive for COVID-19 with stroke; significant differences in biomarkers have been reported between these groups. Biomarker deviations and health developments in patients suggest that COVID-19 infection triggers eicosanoid and cytokine storms that elevate the risk of stroke, as well as other cerebrovascular events. As research further clarifies the mechanisms by which biomarkers affect the cerebrovascular system, clinical interventions may need to consider the status of active SARS-CoV-2 to mitigate risk and improve outcomes for stroke and related disorders.

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Presenter(s): Madelyn Corliss

Authors: Madelyn Corliss

Faculty: Dr. David Vaillancourt

Evaluating Spatial Filtering on Diffusion MRI Data Harmonization in Parkinsonism

Background: Parkinsonism is an umbrella term encompassing several disease pathologies that share common motor symptoms. The most prevalent diagnosis is Parkinson's disease, followed by multiple system atrophy, and progressive supranuclear palsy. Early detection and differentiation between types of Parkinsonism remains an issue in clinical practice.

Objective: MRI has the potential to aid the diagnosis of Parkinsonisms. A major hurdle is combining and harmonizing the data across different MRI vendors. The objective of this study was to determine if a full width half maximum gaussian spatial filter helps harmonize data sets collected from different scanners.

Methods: Using 17 different MRI scanners, data was collected from 1,002 subjects. First the data was spatially filtered using different sizes (no filter, 2mm, 4mm, 6mm). Data was then preprocessed and transformed to Montreal Neurological Institute (MNI) space. Next, support vector machine learning tested the training and validation accuracy of predicting diagnosis at each spatial filter setting.

Results: The training and validation data for weighted sensitivity, specificity, and accuracy were similar for all filter conditions. Differences between the weighted sensitivity, specificity, and accuracy of the training groups for all filter sizes was less than 0.1 and less than 0.2 for validation groups.

Conclusions: Training and validation predictions did not differ across spatial filters, suggesting the accuracy of the algorithm is robust at different spatial filter sizes. In conclusion, the size of the spatial filter applied to diffusion MRI data does not result in a change in the outcome of the machine learning approach.

Presenter(s): Catalina Corral

Authors: Catalina Corral, Carson Torhorst, Zoe White, Chanakya Bhosale, Norman L. Beatty, and Samantha M. Wisely

Faculty: Dr. Samantha Wisely

Prevalence of Trypanosoma cruzi in Rodents in North-Central Florida

Trypanosoma cruzi is a vector-borne protozoan parasite and the etiological agent of Chagas disease in humans. The parasite is vectored by triatomine “kissing” bugs and the common triatomine vector in Florida is Triatoma sanguisuga. Trypanosoma cruzi also infects domestic pets and wildlife, including two common rodent species found in Florida, the Eastern wood rat (Neotoma floridiana) and the cotton mouse (Peromyscus gossypinus). In South America and the Southwestern U.S., rodents are cited to facilitate human infection in peridomestic environments because of their frequent interactions with humans and vectors. In Florida, however, little is known regarding the prevalence of T. cruzi in rodents and the epidemiological significance of these infections. In this study, blood samples from trapped rodents of nine species from North-Central Florida were collected according to IACUC standards. This extracted nuclear DNA from hosts was screened for 166 base pair segments of T. cruzi satellite DNA using a multiplex quantitative polymerase chain reaction (qPCR). One cotton mouse (n=170, 0.59%, 95% CI [0.0%-1.7%]) and one Eastern gray squirrel (n=36, 2.8%, 95% CI [0.0%-8.2%]) were found to be infected. Several explanations exist for these negative results. Low prevalence may be due to T. sanguisuga having a 30-minute post-blood meal defecation delay, which allows the vector and host to move away from each other. Also, the nocturnal activity of the rodent host decreases the likelihood that a vector can take a blood meal and potentially transmit the parasite. This study provides key insight into how T. cruzi is interacting with Florida rodents.

Presenter(s): Tomas Cort

Authors: Tomas A. Cort, Erik M. Anderson, Kyoungrae Kim, Brian J. Fazzone, Zach Salyers, Victoria R. Palzkill, Eric M. Kunz, Kerri A. O'Malley, Scott A. Berceli, Terence E. Ryan, Salvatore T. Scali

Faculty: Dr. Terence Ryan

<u>Influences of Renal Insufficiency and Ischemia on Mitochondrial Bioenergetics and Limb Dysfunction in a Novel Murine Iliac Arteriovenous Fistula Model</u>

Objective: Hand disability is common in renal failure patients receiving hemodialysis, but the biological mechanisms remain poorly understood. Arteriovenous fistula (AVF) creation causes extremity hypoperfusion and limb dysfunction, but the interactive influences of renal insufficiency and AVF-mediated ischemia are currently unknown. Using a novel murine AVF model, our objective was to characterize mitochondrial and limb function outcomes in mice with and without renal insufficiency.

Methods: Male 8-week-old C57BL/6J mice were fed either an adenine-supplemented diet to induce renal insufficiency (CKD) or a casein-based control chow (CON). After two weeks of dietary intervention, mice were randomly assigned to undergo iliac AVF surgery (N=12/group) or a sham operation (N=5/group). Measurements of aortoiliac hemodynamics, hindlimb perfusion, and hindlimb motor function were collected for two weeks. Mice were sacrificed on post-operative day 14 to assess muscle histopathology and mitochondrial function.

Results: Adenine-fed mice had significantly reduced glomerular filtration rate and elevated blood urea nitrogen, confirming CKD. Aortic and inferior vena cava measurements of velocity and vascular diameter increased after AVF creation, and AVF groups had a deficit in paw perfusion. The average respiratory capacity of CKD mice was impaired compared to CON mice, but this difference was minimized after AVF creation. AVF cohorts had diminished grip strength and gait compared to sham.

Conclusion: Results from the present study indicate that renal insufficiency causes a baseline myopathy that is exacerbated after ischemic injury of access creation.

Presenter(s): Elizabeth Courey

Authors: Elizabeth Courey, Deepthi Varma, Alissandre Eugene, Sandra Sullivan, Nicole Cacho, Leslie Parker

Faculty: Dr. Deepthi Varma

<u>Lactation Experiences of Black Mothers of Infants in the Neonatal Intensive Care Unit: A Mixed Methods Study</u>

A widespread disparity in breastfeeding rates exists between White and Black mothers in the United States. Previous research indicates Black mothers whose infants are in the neonatal intensive care unit (NICU) face different barriers than White mothers; barriers which negatively affect their success at long-term lactation. However, few research studies have been conducted to understand the unique barriers faced by Black mothers of infants admitted to the NICU. It is important to understand these barriers in order to develop effective interventions that could improve the lactation success of Black mothers. Therefore, this study aimed to understand the unique lactation experiences of Black mothers whose infant was admitted to the NICU at UF Health. The data collection is ongoing. This project presents the results of the five completed semi-structured qualitative interviews. All interviews were audio recorded, transcribed and then analyzed using the Rapid and Rigorous Qualitative Data Analysis (RADaR) technique. Prominent themes emerged were lactation beliefs and experiences, support systems, and acceptance of technology to improve lactation experiences. Prominent barriers reported were privacy concerns in the clinical setting, mobility while pumping, insurance, prior lactation education, access to lactation information, and time constraints. These findings shed light to the importance of fostering more supportive clinical lactation practices and mHealth technology tailored to the needs of Black mothers of infants in the NICU.

Presenter(s): Lola Coutelle

Authors: Lola Coutelle

Faculty: Dr. Creed Greer

<u>The Effectiveness of Different Sanctions in the Reintegration of Opioid Offenders</u>

The United States is currently in an opioid crisis, an epidemic of increased misuse of highly addictive prescription opioid medications. With the increased abuse of opioids, more individuals with opioid addictions come into contact with the criminal justice system. The current study intends to discover whether incarceration, reentry programs, or rehabilitation programs are most effective in reintegrating offenders into normal society following the respective sanction. In this secondary research analysis of existing research, data is analyzed and grouped into common themes. Five main themes emerge: finances, social relationships, stigmatization, access to resources, and mental health. The five themes emerged in all three sanctions for criminal activity, other than rehabilitation programs, which do not show significant evidence of stigmatization as a major theme in offenders' reintegration. Of the three responses to criminal activity, the available research reveals that rehabilitation has a more beneficial result with regards to offenders who are reintegrating into normal society following their completion of the rehabilitation program.

Presenter(s): Christopher Crouch

Authors: Ninad Gaikwad, Christopher Crouch

Faculty: Dr. Prabir Barooah

Energy Resiliency of a House using MPC based controller

With the increasing number of natural disasters such as hurricanes increasing the frequency of grid outages, homes with photovoltaic panels (PV) combined with standalone and electric vehicle (EV) batteries can provide resiliency. With a standard PV and battery system combined with automated decision making and specific load controllers, the efficiency can be increased significantly during time periods of no grid power. Necessary loads can be serviced for longer durations while the remaining loads can be serviced when there is extra power available.

This paper provides an intelligent controller that maximizes the on time of priority electric loads and secondary loads, when possible, through Solar PV, battery storage, and an EV while power from the grid is not available. A Model Predictive Controller (MPC) architecture is implemented that utilizes available measurements and forecasts to make the most optimal decision for batteries and loads. The loads of the home are divided into 8 priority levels with level 1 (Critical Loads) loads being refrigerator and lights and fans of specific rooms. Controlled AC operation is also included in the system in order to not violate starting power requirements which are 3-6 times higher that operating power. All these loads are observed through a Pecan Street data set which are compared against a baseline unintelligent PV+Batte+EV system in an average American house. The optimization problem is formulated as a mixed integer linear program (MILP) due to the on/off nature of the loads.

Presenter(s): Luiza Cunha, Mariah Vesely

Authors: Luiza Cunha, Mariah Vesely, Apollonia Lysandrou, Hugh Farrior, Amanda Janner, Scott Teitelbaum, Ben Lewis

Faculty: Dr. Ben Lewis

Spirituality and its Association with Abstinence Self-Efficacy during SUD Treatment

Background: Previous findings suggest that spirituality is associated with better outcomes in substance use disorder (SUD) treatment. However, whether spirituality accounts for significant variance in such outcomes when other predictors (depression, anxiety, ACEs, etc) are accounted for has not been well-investigated. The current study focused on characterizing the strength of spirituality as a predictor of abstinence self-efficacy (ASE) within a sample of individuals receiving treatment for SUDs. We hypothesize that spirituality will significantly predict ASE, and maintain this significance when included in a model with covariates.

Methods: Patients with SUD (N=967, 36% women) at the UF Health Florida Recovery Center completed patient health assessments at intake, after 30 days of treatment, and at discharge. Our model's covariates included age, gender, ACE, depression, social support, sleep, emotional experiences, and mindfulness. Longitudinal mixed models were used to examine spirituality's strength as a predictor of ASE.

Results: Baseline spirituality was a significant predictor of ASE (R2 = 0.04, p<0.001). Spirituality's strength as a predictor of ASE remained significant (p = 0.031) across time but with modest unique contribution to variance after accounting for other covariates.

Conclusion: Consistent with our hypotheses, our results revealed significant associations between spirituality and ASE across treatment. However, spirituality's overall effect diminished when included in the full covariate model, accounting for roughly 1% of ASE's variance.

Presenter(s): Ashley Dann

Authors: Ashley Dann, Courtney Sprain, Katie Bristol, Joseph Meert

Faculty: Dr. Courtney Sprain

New absolute paleointensity estimates for ~1.88 Ga mafic dykes from India

The timing of inner core nucleation is not fully understood. Recent studies have reported this event occurred half a billion years ago, while others report estimates closer to 4 billion years ago. Today, the geomagnetic field is predominantly generated by chemical convection associated with the growth of the inner core. It is possible that the nucleation of the inner core modified the strength of the magnetic field and may be observable in paleomagnetic data. Currently, there is insufficient Precambrian (~4.6 Ga to 0.05 Ga) paleointensity data to determine whether a signal related to inner core nucleation exists. To better assess this, in this study we collected high-quality Precambrian paleointensity data from igneous dikes from the Bastar craton, Dharwar craton, and the Malani igneous suite in India. We studied these rocks because they are well-dated, and past studies have shown that they are reliable recorders of Earth's paleomagnetic field. Paleointensity experiments used the double heating Thellier method following the modified IZZI protocol as this method has built-in checks for non-ideal grain sizes and alterations. Preliminary paleointensity estimates are consistent with previous studies on Precambrian magnetic field strength and support a young age for inner core formation.

Presenter(s): Alexandra Davis

Authors: Alexandra Davis, Danilo da Silva, Dr. Graciela Lorca

Faculty: Dr. Graciela Lorca

Effect of L. johnsonii N6.2 RNA on Mammalian Cell Lines

The probiotic Lactobacillus johnsonii N6.2 has been shown to attenuate the onset of type 1 diabetes in diabetes-prone rats. A possible mechanism of this immunologic response to L. johnsonii N6.2 involves extracellular vesicles (EVs) produced from the bacteria called nanovesicles (NVs). Electron microscopy images confirmed that L. johnsonii N6.2 produces NVs. Recent literature has shown that EVs from bacteria have been shown to elicit similar responses to the bacteria itself. The putative bioactive components in the NV's cargo are proteins and nucleic acids. Thus, it is important to isolate each component and analyze them independently. To evaluate the specific role of RNA on host microbe interactions, RNA was extracted from these NVs. Lipofectamine will be used to create cationic liposomes containing the L. johnsonii N6.2 RNA for transfection. β-Lox5 human pancreatic cells are grown to confluence and treated with several conditions. After incubation, immune effects will be analyzed through techniques such as RNA extraction and Quantitative Reverse Transcriptase PCR following several genes, including DDX60, OAS1, and CPY1B1.

Presenter(s): Tade Davis

Authors: Tade Davis

Faculty: Dr. Barbara Mennel

Boundaries of Terror: Andrej Zulawski's Possession

Andrej Zulawski's film Possession (1981) shows the disintegration of a marriage and descent into madness of the two protagonists, Anna and Mark. A pervasive sense of limits characterizes the film, highlighting the contradictory nature of eroticism, subjectivity and religion, and the late Soviet period. The film's dual status as an art and cult film considers the limits of the definitions of genre itself. The theoretical concepts in the writings of French theorists Georges Bataille, Julia Kristeva, and Simone Weil on eroticism, abjection, and the phenomenology of God respectively illuminate how limits and boundaries help the Self distinguish itself from the Other. This differentiation relates to the film's themes of deteriorating relationships, intimacy and sexual perversion, deceit, body horror, and faith.

Presenter(s): Dominique Day

Authors: Dominique Day, Aishwarya Kunta, Nadia Kabbej, Erika Atencio, Erinn Rosenkrantz, Pamala Clevenger, Coy Heldermon

Faculty: Dr. Coy Heldermon

The Gastrointestinal Microbiota and Breast Cancer

The different etiologies that contribute to the development of breast cancer are constantly being studied. Similarly, there is extensive research determining the significance of gut health as it relates to overall physiological health. Little research, however, has been done on the intersection between gastrointestinal microbiota health and how it may contribute to the development and prevention of breast cancer. Diet and lifestyle play a big role in gut microbiome health, and dysbiosis within the microbiome puts individuals at risk for compromised immunity and increased susceptibility to disease. Additionally, healthy gut flora has been linked to DNA damage repair which may be instrumental in the prevention of various cancers. In order to investigate the connection between microbiota health and the development of breast cancer, we will be analyzing the differences in gut microbiome amongst postmenopausal women with and without invasive breast cancer diagnoses. Analysis will be conducted via 16s rRNA sequencing of stool samples provided by participants. Studying these microorganisms will allow us to determine how they may contribute specifically to breast cancer through processes such as estrogen metabolism. Similarities and differences amongst the gastrointestinal microbiomes of the participants will suggest the roles of microbiota diversity and certain microorganisms in breast cancer development, as well as possible avenues for treatment and prevention.

Presenter(s): Katherine deClaire

Authors: Katherine deClaire

Faculty: Dr. Neil Weijer

Disorderly Conduct: Women's Health and Women's Rights (1883-1930)

The Victorian Era (1837-1901) is stereotypically characterized by propriety and sexual repression. Yet, during this time conduct literature for girls containing information on sex education as well as care for one's body was widely circulated and read in response to fears over the spread of promiscuity, STDs, and prostitution. The authors of this literature exhibit acknowledgement of the need for women's education on these subjects rather than previously-enforced ignorance, and they also defined aspects of femininity and motherhood in tandem with sexuality in an effort to guide girls on "proper" womanhood. These books reinforced and shaped thought on gender roles which appear to have had persisting influence on the movements for female suffrage and labor rights that continued into the twentieth century.

I investigate this issue using two conduct books as well as material from the collection of labor activist Margaret Dreier Robins (1868-1945). This investigation exposed many common values between the former medium and Dreier Robins's reform efforts as head of the National Women's Trade Union League, such as the importance of a gender-defined society, the centrality of collectivism and motherhood to the definition of femininity, as well as the harmful endorsement of eugenics in the production of healthy and democratic future generations. While more individualistic feminism triumphed in popularity after WWI, this investigation does shed light on the source of persisting gender roles and exhibits the unfortunate necessity of relating women's rights to a "greater" good in order to achieve their reform, which continues to this day.

Presenter(s): Mariyah Dhanani

Authors: Mariyah Dhanani, Nicole Lofaro

Faculty: Graduate Assistant, Nicole Lofaro

Evaluating Anti-Asian Bias and the COVID-19 Pandemic

“Othering” within literature describes a dominant group overpowering a non-dominant group in some way, labeling others to be different than one’s self (Weis, 1995). In the United States, those who believe they have “civic belonging” may contribute to racial bias and increased crime rates against specific races. According to data compiled by the Center for the Study of Hate and Extremism, anti-Asian hate crimes have increased by 339 percent from 2020 to 2021, coinciding with the height of the COVID-19 pandemic. Keeping this “othering” theory in mind, this study explores how fear regarding the COVID-19 pandemic might be associated with the increase of anti-Asian rhetoric. An Implicit Association Test (i.e., IAT) and a randomized vignette were used to compare people’s attitudes towards Asian-Americans versus European-Americans, both independently and in regards to the COVID-19 pandemic. For exploratory purposes a perceived vulnerability to disease, intolerance to uncertainty, fear of coronavirus, and self-report race attitude scale were also included. We found that participants who read a vignette about an Asian-American restaurant owner were more inclined to aid both financially and sympathetically than participants who read about a European-American restaurant. However, it was found that the more intolerant participants were towards uncertainty, the less money they would donate to restaurant owners overall. Those who were more intolerant towards uncertainty were also less likely to promote restaurants within the local community. Participants who feared COVID-19 more were less likely to eat at restaurants as well. Findings from this study may provide insight for any researchers or practitioners to understand the nature of implicit and explicit biases pertaining to Anti-Asian attitudes, as well as further understand how attitudes concerning fear and intolerance impact intended behaviors that bias might influence.

Presenter(s): Randi Dias

Authors: Randi Dias, Aren Singh Saini, Walter O'Dell

Faculty: Dr. Walter O'Dell

Assessing Lung Vasculature Development and Application to Early Preterm Gestation Patients

Individuals who were born prematurely undergo many difficulties from the time they are born to their adult lives. Obstructive lung diseases are a common occurrence in patients who were born prematurely. Unfortunately, the development of lungs in premature infants is an area in the science world that has not been fully studied. Therefore, this study's objective is to determine trends in lung vessel growth as a patient advances in age, and discover quantitative measures that provide clinical insight regarding improving the quality of life of premature infants. This is a retrospective study where x-ray computed tomography (CT) scans were analyzed by using in-house software built upon the NIH ImageJ platform. For each scan, the lung volume was automatically identified and the pulmonary vessel trees extracted and characterized to quantify the total number of vessels in the left hemi-lung. The radius and length of each vessel tree were also recorded. CT scans of 16 pediatric patients were analyzed (7 prematurely born and 9 full-term). The vessel growth of full-term patients trended to increase as a patient aged, while vessel growth for premature patients decreased with age. The data also indicated a significantly larger difference in the number of vessel branches over time between female preterm and full term subjects. Limitations such as variations in image quality, children's age, and changes in CT technology over time are being addressed to improve confidence in the results. Future works will include analysis on a larger data set and novel approaches to automatic vessel extraction from chest CTs.

Presenter(s): María Domínguez

Authors: Edith Kaan, Jorge Valdés Kroff, Souad Kheder, Gabriela Rivera, María Domínguez

Faculty: Dr. Souad Kheder

Cognitive Control Effects of Code-Switching

Code-switching, the alternation between different languages in a single sentence or conversation, is common amongst bilinguals. According to the Control Process Model (Green & Wei, 2014), varied language contexts, such as types of code-switching (insertional or dense), involve different engagement of cognitive control. Prior research has reported a conflict facilitation effect on Flanker trials after reading written code-switched compared to unilingual sentences (Adler et al., 2020). Our aim is to investigate whether the processing of different types of code-switches affects conflict resolution (adaptation) in a non-verbal task. To test this, the experiment alternates pre-recorded code-switched and unilingual sentences with congruent and incongruent Flanker trials. Participants will be Spanish-English bilinguals in the US who learned Spanish from birth and English before the age of 12. Participants will listen to three blocks of language contexts: insertional and dense Spanish-English code-switching, or Spanish only. After each sentence type, participants perform Flanker trials (congruent [>>>>>] or incongruent [>><>>]) to which they respond by pressing a button to indicate the direction of the middle arrow. Reaction times as well as accuracy on the flanker responses will be collected to measure the conflict adaptation effect. Statistical analysis will be performed to compare the adaptation effect between the three language contexts. This study will help us determine whether varied bilingual speech involves various types of control processes, how these control processes transfer to domain general cognitive control, and how they adapt to different conflicting situations within the same individual.

Presenter(s): Wellington Dos Santos

Authors: Ara Jo, Wellington Dos Santos, Lisa Scarton, LaToya O'Neal, David Cheng

Faculty: Dr. Ara Jo

Prevalence and body composition of undiagnosed type 2 diabetes in patients with cancer

Introduction/Background: Patients with cancer and T2DM are associated with diverse body composition and obesity. Current guidelines provide health professionals with information to perform tests on suspected patients, but research on body composition among cancer patients with prediabetes and undiagnosed diabetes are limited.

Methodology: The study used a national population-based cross-sectional data from NHANES between 2011-2018. The study focused on adults age between 20 and 64 who have any type of cancer and who have information of hemoglobin A1C and/or diagnosis of diabetes by a doctor. Those who missed one of the necessary variables were excluded.

Results: The mean age of individuals in our sample were 49, 43, and 41 years respectively among those with prediabetes, diagnosed T2DM, and undiagnosed T2DM. Most of the individuals were female within the normal, prediabetes, and diagnosed T2DM categories. Differences between body mass index, total body fat mass, total lean mass and fat, total body fat percentage, and waist circumference were nonsignificant (P > .05 for all) between all categories of diabetes among cancer patients.

Discussion: Our findings were not supportive to explain differences in appearance of cancer patients to assist in the detection of diabetes. The absence of body composition differences among cancer patients may negatively impact their diabetes testing and contribute to the increase in undiagnosed T2DM.

Conclusion: Body composition differences should not be used to assist in the detection of diabetes among cancer patients. Thus, current guidelines for diabetes testing should focus on providing health professionals with information on best practices for testing timelines and procedure utilization.

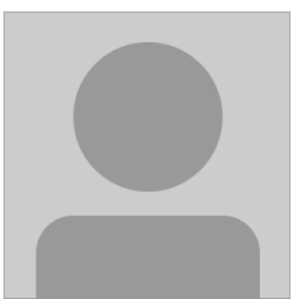
Presenter(s): Salma Drew

Authors: Salma Drew, Noah Benscher, Dr. Zhe Ma

Faculty: Dr. Zhe Ma

Generating Bacterial Artificial Chromosome ORF67 Mutants to Explore the Role of ORF67 in KSHV Pathogenesis

Kaposi's Sarcoma-Associated Herpesvirus (KSHV) is the etiological agent of multiple severe malignancies Kaposi's Sarcoma (KS), Primary Effusion Lymphoma (PEL), and Multicentric Castleman Disease (MCD). These malignancies are characterized by lifelong KSHV infections, and the virus can develop into lethal cancers using recognized innate immune strategies. Previously, our lab identified the cGAS/STING pathway as a key anti-KSHV immune pathway, and further identified KSHV viral protein orf67 as a potential repressor of this pathway. We hypothesize that ORF67 blocks cGAS-STING dependent immunity to facilitate KSHV infection. To test this hypothesis, we aim to study the role orf67 in KSHV infection by generating KSHV orf67 FLAG-tagged and STOP mutants using the BAC16 (Bacterial Artificial Chromosome) model containing the KSHV genome. Using the method of two-step red-mediated recombination, we inserted a FLAG tag at the N-terminus of orf67 and we separately inserted a 3XSTOP sequence after the start codon of orf67 to silence orf67 expression in the KSHV genome. After validation by pulse-field gel electrophoresis and sequencing, we plan to build HEK293 and iSLK stable cell lines containing these mutants to study the effects of the mutation in vitro. The FLAG-tagged mutant will provide powerful tools to monitor the expression of orf67 in protein analysis. Furthermore, the STOP mutant will be essential in carrying out loss-of-function assays of KSHV orf67. Both constructs will be crucial to elucidate the role of ORF67 in KSHV pathogenesis and provide insight into potential therapeutic routes.



Presenter(s): Sabrina Dugan

Authors: Sabrina Dugan

Faculty: Dr. Nawari Nawari

Energy Use in Accessible and Inclusive Environments At The University of Florida

The University of Florida leads colleges across the nation in inclusive design. Energy Use in Accessible and Inclusive Environments focuses on bringing all people together through unified accessibility spaces at the University of Florida. This research expands into a broad scope of mapping technologies, such as Arc GIS Pro, to create a 2,000-acre map of The University of Florida and electric wheelchair charging stations across campus. This enables all people to get from point A to point B, promoting equal opportunities. Arc GIS Pro calculates the energy use from an electric wheelchair and then transfers this data into different buffer zones, revealing the possibilities for expansion of transportation in an electric wheelchair. Taking the energy use calculations and applying them to a distance analysis to determine where there are opportunity zones to put electric wheelchair charging stations across campus significantly furthers the development of an inclusive environment. The University of Florida has the opportunity to further expand the possibilities for the disabled community and make The University of Florida a more inclusive campus.

Presenter(s): Mackenzie Dyrda, Ananya Mellacheruvu

Authors: Mackenzie Dyrda, Ananya Mellacheruvu, Joie Cavazos MD, Charlene Pringle CPNP-AC/PC, FCCM

Faculty: Dr. Charlene Pringle

Association of enteral nutrition and dexmedetomidine usage in critically ill children requiring NIV: A multi-center study

Intro: There is a growing movement towards placing pediatric patients in the PICU on non-invasive ventilation (NIV). Pediatric patients on NIV are often supported by the sedative dexmedetomidine (Precedex) to improve tolerance to NIV. Recent studies have shown dexmedetomidine as a neuroprotective sedative option, and that increased nutrition delivery to critically ill patients has improved clinical outcomes. This study was the first to bridge the gap between the influence of enteral nutrition on the dosage of dexmedetomidine on pediatric patients on NIV.

Methods: A retrospective chart review was conducted on 289 patients admitted to UF Health Shands PICU requiring NIV from April 1, 2019, to March 1, 2020, to determine if enteral nutrition decreased the daily requirement for Dexmedetomidine.

Results: For day 0, there was an odds ratio of 4.14 (p<0.0001) of being fed and not receiving dexmedetomidine, which remained consistent on day 1 with an odds ratio of 2.79 (p=0.0163). There was a significant association between dexmedetomidine dose requirement and not being fed during the first two days of NIV.

Discussion: These findings can be utilized in patient care plans to improve health outcomes by decreasing daily need for dexmedetomidine through administering adequate nutrition within the first 24 hours of admission. This is now being replicated as a multi-center study through the NutriNet subgroup of the Pediatric Acute Lung Injury & Sepsis Investigators (PALISI) network in order to reduce the potential influence of local biases, with the incorporation of prematurity and diagnosis of neutropenia as additional variables.

Presenter(s): Olivia Edwards

Authors: Olivia Edwards, Alicia Burris, Josh, Lua, Diana J. Wilkie, Miriam O. Ezenwa, Sylvain Doré

Faculty: Dr. Sylvain Dore

Influence of haptoglobin polymorphism on stroke in sickle cell disease patients

This work outlines the current clinical research investigating possible ways in which the haptoglobin (Hp) genetic polymorphism and stroke occurrence are implicated in sickle cell disease (SCD) pathophysiology. Hp is a blood serum glycoprotein responsible for binding and removing toxic free hemoglobin from the vasculature. The Hp gene is encoded by either or both of the two whole alleles, HP1 and HP2, and is further varied by the amino acid variation within HP1. This polymorphism leads to six different phenotypes: 1S-1F, 1F-1S, 1F-1F, 2-1S, 2-1F, and 2-2. The role of Hp in patients with SCD is especially critical in combating blood toxicity, inflammation, oxidative stress, and even stroke. Ischemic stroke occurs when a blocked vessel decreases oxygen delivery in the blood to cerebral tissue and is commonly associated with SCD. Due to sickle hemoglobin S's malformed red blood cells, blockage of blood flow is much more prevalent in patients with SCD. This manuscript is the first to evaluate the role of the Hp polymorphism in the associated biomarkers and incidence of stroke in patients with SCD. Overall, the data compiled here suggest that further studies should be conducted to reveal and evaluate potential clinical advancements for gene therapy or Hp infusions.

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Department of Biobehavioral Nursing Science, University of Florida College of Nursing, Gainesville, FL.

Funding: This work was partially supported by grants from the NIH, the DOD, and the UF-COM-Anesthesiology.

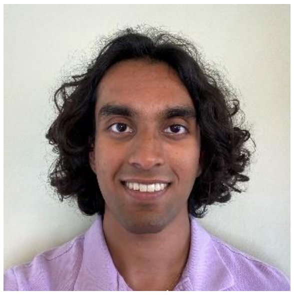
Presenter(s): Sydney Edwards

Authors: Sydney Edwards, Dr. Nate Veldt, Dr. Christina Faherty

Faculty: Dr. Christina Faherty

Analysis of the effects of bile salts exposure on Shigella flexneri using a graph theoretic approach

Shigella flexneri is a bacterial pathogen that invades the colonic epithelium and causes shigellosis, a disease characterized by fever, vomiting, and watery or bloody diarrhea (Alves da Cruz Gouveia, Torres Camara Lins, and Alves Pontes da Silva, 2020). Shigellosis is associated with a high disease burden, with over 180 million cases reported in 2010 (Kotloff et al., 2018). Within Shigella research, there is a need to better understand the role of bile exposure in Shigella pathogenesis. Shigella resists bile salts during transit through the small intestine and forms a biofilm (Nickerson et al., 2017). However, lingering questions remain regarding how bile salts exposure alters differential gene expression. Past RNA-sequencing analysis identified genes induced and repressed in the presence of bile salts. To better understand changes in gene expression, we utilized a graph theoretic framework to elucidate patterns in the RNA-sequencing data. Specifically, we examined patterns of gene expression with LambdaCC, an optimization method that locates communities of genes within the dataset. LambdaCC identified a unique clustering pattern of differentially expressed genes following bile salts exposure, in which genes of similar function clustered together alongside seemingly unrelated genes. Additionally, LambdaCC categorized clusters of genes within the same operon or genes with related function. Utilizing LambdaCC, we uncovered a novel transcriptional regulator and have begun to characterize the role of this regulator in biofilm-formation and virulence through mutational analysis. Future work will examine additional hypothesized transcriptional regulators using assays to determine bile salts resistance, biofilm formation, and virulence gene expression.



Presenter(s): Kanishka Ekanayake

Authors: Kanishka Ekanayake, Josh Lua, Madison Fangman, and Sylvain Doré

Faculty: Dr. Sylvain Dore

<u>Potential role of soluble toll-like receptors 2 and 4 as therapeutic agents in stroke and brain hemorrhages</u>

Hemolysis is a physiological condition in which red blood cells (RBCs) lyse, releasing their contents into the extracellular environment. Hemolysis can manifest several diseases and conditions, such as sickle cell disease, hemorrhagic stroke, and trauma. Heme and hemoglobin are among the unique contents of RBCs that are released into the environment. Although these contents can cause oxidative stress, especially when oxidized in the extracellular environment, they can also initiate a proinflammatory response because they bind to receptors such as the Toll-like receptor (TLR) family. This team effort review seeks to clarify the mechanism by which TLRs initiate a proinflammatory response to hemoglobin, it oxidized derivative, heme, as well as the possibility of using soluble TLRs (sTLRs), or decoy receptors, as therapeutic agents. Furthermore, this work explores the option of using sTLRs in hemorrhagic disorders in which mitigating inflammation is essential for clinical outcomes, including hemorrhagic stroke and its subtypes, intracerebral hemorrhage (ICH) and subarachnoid hemorrhage (SAH).

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Funding: This work was partially supported by grants from the NIH, the DOD, and the UF-COM-Anesthesiology.

Presenter(s): Bar Elmaleh

Authors: Bar Elmaleh

Faculty: Dr. Eddy Matthew

Investigating lipid organization in membrane mimetics and engineering new materials to manipulate lipid-protein interactions

Membrane mimetic systems provide native-like environments for studies of membrane proteins such as G protein-coupled receptors in aqueous solutions and are important tools for structural biologists and biophysicists. The most widely used membrane mimetics are lipid nanodiscs, which are self-assembled molecular models of phospholipids encircled by an amphipathic helical protein known as the membrane scaffold protein (MSP). Most phospholipids are known allosteric modulators of membrane protein function and the spatial arrangement of these lipids is key to understanding protein-lipid interactions which modulate the protein conformation. The application of a synthetic nanodisc system provides a stable environment for investigating protein-lipid interactions and the effect of different lipid compositions within the system while maintaining the structural and functional integrity of the membrane protein of interest. Although nanodiscs are routinely used in many experiments, little is known about the spatial organization of lipids within them. NMR-based observations of the non-uniform distribution of different lipids within nanodiscs and evidence that the membrane scaffold proteins influence the spatial organization of lipids within nanodiscs are shown here. Finally, my efforts in sample preparation for the nanodisc studies and engineering new membrane mimetics with interesting functional properties that will enable new kinds of biophysical experiments will be discussed.

Presenter(s): Cole English

Authors: Cole English, Emma Ivantsova, Christopher L. Souders II, Christopher J. Martyniuk

Faculty: Dr. Christopher Martyniuk

Molecular and behavioral responses to the antineoplastic ifosfamide in zebrafish (Danio rerio) embryos and larvae

Alkylating antineoplastics are employed in various chemotherapeutic treatments. These chemicals enter the environment through hospital effluent and are detectable in surface waters. Ifosfamide is one such agent, yet few studies have assessed its threats to aquatic organisms. To address this gap, the three major objectives of this investigation concerning the zebrafish embryo and larvae model are: (1) Characterize the acute toxicological, teratogenic, and mutagenic potential of ifosfamide as manifested in morphological deformities, (2) Determine if there exist acute behavioral and anxiogenic potential of the agent, and (3) Assess changes in mRNA levels associated with oxidative stress and apoptosis following acute environmentally relevant ifosfamide exposure. Zebrafish larvae were exposed over seven days to ifosfamide at environmentally relevant concentrations, and morphological deformities such as pericardial edema, swim bladder abnormalities, yolk sack edema, spinal curvature, notochordal pathologies, facial and caudal malformations, and encephalic irregularities were assessed. Significant changes in deformity and morality rates were not observed at low exposure concentrations. However, the Visual Motor Response (VMR) assay revealed evidence for larval hyperactivity at low, environmental levels (0.1 μg/L). Molecular mechanisms underlying ifosfamide exposure will be discussed. Experimental conclusions will permit extension to the larger class of alkylating antineoplastics employing ifosfamide as a model to guide future investigations into the toxicological, teratogenic, and mutagenic potential of the drug class.

Presenter(s): Kyra English

Authors: Kyra English, James Austin

Faculty: Dr. James D. Austin

Genomic Structure of an Endemic Rodent: The Perdido Key Beach Mouse

The Perdido Key beach mouse (PKBM), Peromyscus polionotus trissyllepsis, is a federally-endangered species that inhabits the coastal dunes of Perdido Key. Three public lands on Perdido Key that are separated by roads and other development represent discrete PKBM populations. Habitat fragmentation and tropical storms have contributed to the extirpation of each population at least once, and subsequent translocations of both wild and captive-bred individuals across parks have been conducted. During June 2021, the U.S. Fish and Wildlife Service ethically collected ear clips from live-trapped mice and gathered 40 founders for the creation of a new conservation breeding colony. Our objective was to genotype PKBM using a large number of genomic single nucleotide polymorphisms (SNPs) to assess the genetic representation of new colony founders relative to the rest of the population and explore spatial autocorrelation of relatedness within and between populations. Results suggest that despite efforts to restore dune habitat and increase connectivity between public lands, the three PKBM populations still demonstrate strong genetic structuring (pairwise Fst values ranged from 0.183 to 0.289). There was evidence of some long distance movements of individuals but limited gene flow. The founders chosen do appear to effectively represent existing genetic variation in the wild. Mantel correlograms also reveal some significant isolation by distance within each public land. The results of our study provide an updated assessment of PKBM genetic structure and insight into the genetic representation of wild populations that will be included in the new conservation colony.

Presenter(s): Sasha Farid, Ryan Athay

Authors: Sasha Farid, Ryan Athay

Faculty: Linda B. Cottler Ph.D., MPH, FACE

Reducing Bias in Convenience Sampling for the NDEWS Rapid Street Reporting Study

Early surveillance of substance use trends and new forms of synthetic drugs are vital in detecting potentially dangerous indicators as they emerge. The National Drug Early Warning System (NDEWS) Rapid Street Reporting (RSR) study aims to assess past 12-month substance use, many of which are novel psychoactive substances, and any experienced adverse effects from individuals in the community. The rapid survey is conducted over a weekend period across 17 US cities, referred to as sentinel sites. This study uses convenience sampling for recruitment with protocols in place to limit selection bias. To achieve a more representative study sample of the general population for each sentinel site, the sampling practice emphasizes the inclusion of diverse participants, guided by the cities' demographics. Prior to each visit, we conduct extensive research on potential venue sites and sentinel site's demographics (i.e., race/ethnicity, socioeconomic status, gender). Venue sites are public spaces that have been vetted through our census research. Locations include sidewalks in front of prominent businesses, public parks, libraries, farmers' markets, bus stations, etc. Supplementary venue site information includes populous times, socioeconomic status and demographics of individuals most present in those locations as identified through social media and blogs. Venue locations were grouped by proximity using Google Maps. During the study, interviewers use the compiled data to make guided decisions for recruitment sampling to reduce selection bias. A total of 71, 151, and 223 participants were enrolled from San Francisco, CA, Atlanta, GA, and Tampa, FL, respectively. Additional site visits are planned through 2024.

Presenter(s): Ilana Farrell

Authors: Ilana Farrell, P. Chris Wilson

Faculty: Dr. P. Christopher Wilson

Impacts of Dissolved Organic Carbon on the Bioavailability of an Atrazine to Non-target Aquatic Macrophytes

Dissolved organic carbon (DOC) is an important property that can influence the bioavailability of herbicides to non-target aquatic plant communities. This study evaluated the impacts of DOC, as fulvic acid (FA), on the bioavailability of atrazine to the aquatic plant Lemna minor (duckweed). Plants were exposed to six atrazine concentrations from 0 to 750 ng/mL and three FA concentrations from 0 to 15 mg/L in a factorial study under static conditions. Fronds were counted on days 0, 3, 5, 7, and 14. Photosystem efficiency was measured as Fv/Fm on day 14. Growth rates for the different conditions were calculated and the effects of FA at each ATZ concentration was compared (ANOVA, Dunnett's, P = 0.05). Atrazine NOAECs and LOAECS within each FA treatment concentration (0, 5, or 15 mg/L) were identified (ANOVA and Dunnett's test, P = 0.05). The 5 mg/L FA provided protection against atrazine toxicity at the 30 ng/L atrazine as evidenced by higher growth rates relative to the controls with no fulvic acid on day 14. Growth rates in treatments containing 15 mg/L FA were further reduced by 9.9%, 32.3%, and 32.1%, respectively, in the 30, 60, and 125 ng/mL atrazine treatments indicating enhanced toxicity due to the FA. The NOAECs and LOAECs were 0 ng/mL and 15 ng/mL (atrazine with no FA); 30 ng/mL and 60 ng/mL (atrazine + 5 mg/L FA); and 15 ng/mL and 30 ng/mL (atrazine + 15 mg/L FA), indicating that FA provided some protection from toxicity at lower concentrations of atrazine.

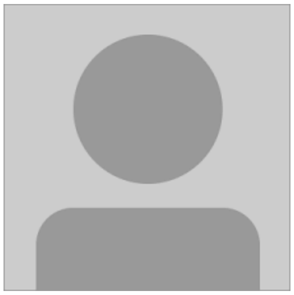
Presenter(s): Nicholas Federico

Authors: Nicholas Federico, Robert Guralnick, Michael Belitz

Faculty: Dr. Robert Guralnick

Species Traits Determine The Effect Of Urbanization On Insect Abundances And Richness

Continued and rapid development of urban environments presents many challenges to organisms living in ecosystems surrounding and within cities. Although insects are the most abundant and diverse class of animals, little is known about how insects respond to urbanization across varying life history traits, except for a few well studied groups such as butterflies. We aim to assess the impact of urbanization across a selection of phototactic insects, and determine what characteristics best explain which species thrive and which species are most negatively impacted by urbanization. We assess the impact of urbanization at nine sites spanning an urban to rural gradient using a list of 43 species for which trait data were collected, selected from by-catch of light traps intended for moths. We tested the impacts of urbanization on insect abundance and richness and examined which life history traits best predicted abundance across the urbanization gradient. We predicted an overall loss of abundance and richness with increasing urbanization, with smaller, generalist species being the least impacted. We also predicted that multivoltine species and species with above ground larval habitats would be less affected by urbanization,Urbanization decreases both species abundance and richness, and that species with larval habitat below ground were the most negatively impacted by urbanization. Additionally, predatory insects are the most impacted by urbanization, as well as species that are multivoltine, contrasting our prediction. Our results suggest that species which are more generalist, univoltine, and with above-ground larval habitats are best suited to the challenges posed by urbanization.



Presenter(s): Virag Feher

Authors: Virag Feher

Faculty: Dr. Edit Nagy

The Communist Party: the "Influencer" of the Youth in Hungary and East Germany

This research paper focuses on the printed press intended for the youth by the communist government between 1945 and 1990. The communist governments of Hungary and East Germany educated the youth on the communist ideals by indirectly expressing their opinions through everyday activities. Hungary and East Germany were both controlled by the Soviet Union and were influenced by its communist ideology from 1945 to 1989. Naturally, both countries underwent extensive political, social, and economic changes including; the building of the Berlin Wall in 1961, the youth movements that took place in 1968, and the eventual change of the socialist regime in 1989. The purpose of this research was to analyze how the communist government's relationship with the press was the key to instilling communist propaganda into the youth. The youth were given special attention by the government in the form of youth organizations that were created to promote communism among the youth. Throughout topics such as traveling, pop culture, and music, the journalists had the opportunity to indirectly influence opinions based on the tone and language they used to discuss them. Along with the propaganda, the newspapers also provided space for progressive topics that did not go against the principles of communism, including social sensitivity and anti-war sentiments. Anti-Western Europe and anti-America sentiments also had a strong presence in youth newspapers, to promote communism. The research materials were collected from Hungarian and East German newspaper articles from 1945-1990, to show how the propaganda and the language of the texts changed.

Presenter(s): Diana Feier, Aryeh Silver

Authors: Diana Feier, Aryeh Silver, Michael Andrews, Dongtao A Fu, Changlin Yang, Guimei Tian, Marianna Dajac, Jeffrey Harrison, Matthew Sarkisian, Duane Mitchell, Loic P. Deleyrolle

Faculty: Dr. Loic Deleyrolle

Geospatial Analysis of Immune Infiltrates in Glioblastoma

Introduction: Conventional cancer therapies most effectively eliminate highly proliferative fast-cycling cells (FCCs) but leave behind residual slow-cycling cancer stem cells (SCCs) that evade treatment and ultimately seed disease recurrence. We reported the existence of SCCs that exhibit enhanced invasiveness, tumorigenicity, and resistance to therapy in glioblastoma (GBM). The increased tumorigenicity of these GBM SCCs suggests that they may be able to alter their immune microenvironment to promote their survival to a much greater extent than FCCs.

Objective: The objective of this study is to quantify and compare the immune microenvironment around SCCs and FCCs within a GBM tumor through a geospatial analysis.

Methods: Mice were implanted with unsorted tumor cells containing both FCCs, tagged with red fluorescence protein (RFP), and SCCs, tagged with green fluorescence protein (GFP). The brains were harvested and frozen in OCT at endpoint. Using NanoString's GeoMx Digital Spatial Profiler (DSP), regions of interest (ROIs) were selected containing populations of either FCCs or SCCs, and the immune microenvironment was analyzed.

Results: There was a statistically significant divergence between the FCC and SCC immune microenvironments within the same tumor. SCCs saw upregulation of macrophages and myeloid-derived-suppressor cells (MDSCs), which contribute to an immunosuppressive milieu. FCCs saw upregulation of T cells and hematopoietic stem cells (HSCs), which are part of the immune response against tumor cells. These results demonstrate that there is translational potential to hinder tumor proliferation through the targeting of specific immune tumorigenic pathways used by SCCs.

Presenter(s): Mary Feraudo

Authors: Jeanette Mary Andrade, Aljazi Bin Zarah, Mary Feraudo

Faculty: Dr. Jeanette Andrade

<u>Development and Relative Validity of the Chronic Kidney Disease Short Food Frequency Questionnaire (CKD SFFQ) to Determine Diet Quality and Dietary Habits among Adults with Chronic Kidney Disease</u>

Limited instruments are available to determine diet quality among US adults with chronic kidney disease (CKD). The purpose of this study was two-fold: (1) to develop a food frequency questionnaire, CKD SFFQ, for adults with CKD and (2) to validate the CKD SFFQ against two 24-h recalls in determining diet quality (DQ). A 57-item CKD SFFQ was developed through a content validation method. Adults with CKD (n = 46) completed the CKD SFFQ and 2-24-h recalls. Statistical analyses included descriptive statistics, frequencies, t-tests, Pearson correlations, and Bland-Altman plots. All data were analyzed using JMP SAS v15 with statistical significance detected at p < 0.05. Results showed no differences for the overall DQ (p = 0.11) and the nine whole-food components (p = 0.07 to p = 0.44) when comparing the CKD SFFQ to the 2-24-h recalls. Pearson correlation coefficients ranged from -0.39 (refined grains) to 0.60 (greens and beans). Bland-Altman plots showed overall good agreement and there was a systematic trend towards higher estimates with the CKD SFFQ, particularly for overall DQ, total proteins, and dairy. The majority of participants rarely or never consumed grains, fruits, vegetables, seafood, and plant proteins. The CKD SFFQ was demonstrated to be an acceptable method to determine DQ for adults with CKD.

Presenter(s): Katrina Fernandez

Authors: Katrina Fernandez, Nicholas Newell, Kayli Sieber, Hua Yan

Faculty: Dr. Hua Yan

Localization of odorant receptor coreceptors in Camponotus floridanus antennae

Social insects form colonies composed of behaviorally and/or morphologically distinct castes, each typically having its own role in maintaining the health and safety of the colony. Social insects communicate via a complex neuronal network that expresses odorant receptors (ORs), and their behavior and interactions within and beyond the colony are highly dependent on their ability to detect and distinguish different odorants. The OR-expressing neurons (ORNs) can be found along the length of antennae, with a tendency to increase in number towards the distal flagella. Odorant receptor coreceptors (Orco) form units with ORs and provide a prolonged, sensitive response to odorant-OR binding. Via hybridization chain reaction (HCR)-mediated RNA FISH, we determined the colocalization of Orco and ORs in the antennae of the ant species Camponotus floridanus. Our findings suggest that Orco is expressed more abundantly in the most distal flagella and decreases in density in the proximal direction of the antennae. This study can be expanded through quantification of Orco expression via cell counts and comparison of OR-Orco co-expression and localization between castes.

Presenter(s): Kylie Fernandez

Authors: Kylie Fernandez, Susan Nittrouer

Faculty: Dr. Susan Nittrouer

The Effects of Socioeconomic Status and Parental Knowledge on Parental Language Input: A Review

How parents talk to their young children (i.e., parental language input) has tremendous effects on how well children acquire language. This review will focus on socioeconomic status and parental knowledge of child development as factors that influence parental language input. Studies included in this review were required to analyze the effects of parent-child interactions on language development in children 0 to 5 years of age with at least 15 parent-child dyads participating and obtaining at least one measure of linguistic outcome. The results of this review found that socioeconomic status and parental knowledge of child language development both have a large effect on the parental language input that facilitates child language development. These factors work in conjunction to determine the quantity and quality of parental language input. Parental self-efficacy was also determined to be an additional factor that can affect the quantity and quality of parental language input. Socioeconomic status is rigid and hard to change, so other factors must be considered when creating interventions to facilitate language development. Improving parental knowledge of child development should be prioritized when developing new interventions, as this factor is most likely to see sustained improvement long after intervention. New measures of parental knowledge of child language development should be tested to assess that relationship in a valid manner.

Presenter(s): Aqueena Mary Fernandez

Authors: Aqueena Fernandez, Rebecca Henderson, Seth Downing, Ryan McCarty, Carol Mathews, Joseph McNamara

Faculty: Dr. Joseph McNamara

It's Just Nerves: Comparing Parent and Child Perspectives on Anxiety

Previous studies have investigated how cognitive behavioral therapy (CBT), a psychological treatment, can be used to treat anxiety disorders (James, 2020). However, less work has been done to investigate perspectives on its efficacy and process, specifically child versus parental viewpoints. The present study sought to contribute to the literature a comparison on these two groups' perspectives on anxiety and how it "becomes a problem." Participants (n=20) meeting diagnostic criteria for anxiety were recruited for qualitative interviews about receiving CBT. Interviews lasting approximately 1 hour were conducted, recorded, and subsequently transcribed. NVivo software was utilized to perform thematic coding and to permit the identification of recurring patterns and significant quotes that captured the impact of therapy on participants' conception of their anxiety symptoms. Analysis of the data resulted in the discovery that child insight into their cognitive processes is intricate and more thorough than previously thought. On the other hand, parents were much less knowledgeable about the therapy as a whole and their understanding of how anxiety manifests. This research is significant because it addresses gaps between parent and child perceptions of anxiety. Children think, feel, and react differently to various stimuli compared to adults. As a result, when kids experience anxiety, parents may feel helpless or confused. This research has the potential to bridge this division and to contribute to the literature. The hope is that with this information, parents and providers are able to better aid their children in coping with anxiety.

Presenter(s): Natalia Fernandez

Authors: Natalia Fernandez, Xiaoshu Pan, Peixin Huang, Hinrich Staecker, Mei He

Faculty: Dr. Mei He

Constructing CRISPR-Cas9 Complex for Targeted Gene Editing: Illuminating Exosome-Mediated Gene Editing for Sensorineural Hearing Loss Therapy

CRISPR-Cas9 technology comprises an emerging class of tailorable, robust gene editing agents for altering mutations in genetic diseases like sensorineural hearing loss (SNHL). However, several hurdles in delivery, editing efficiency, immunogenicity and off-target ratio have significantly constrained clinical applications. It is reported that the CRISPR-Cas9 ribonucleoprotein (RNP) or mRNA transiently delivered by synthetic nanoparticles had fewer off-target ratio, but more desirable editing efficiency compared to those by viral vectors. Exosomes are biological membrane vesicles with a size range of 30-150nm comparable to the synthetic nanoparticles but superior in biocompatibility, targeting ability and stability. Encapsulation of CRISPR-Cas9 complex into exosomes has been reported to be promising in editing genes of interest. However, how to effectively encapsulate gene editing agents into exosomes for robust but safe gene editing events in vivo remains an open question. Proposing to develop new CRISPR-Cas9 systems to target diseased genes such as the G-C mutation at MYO7A in congenital SNHL has not been reported elsewhere to our best knowledge. Therefore, in this project we hypothesized that using CRISPR-loaded exosomes can effectively target the pathogenic MYO7A mutation in vivo. The gene editing efficiency for MYO7A mutation knock-out has been validated in vitro using Shaker-1 mouse fibroblasts which showed good on-target rate. The repair of MYO7A gene and its correlation with in vivo auditory restoration via exosome delivery will be further evaluated in Shaker-1 mouse deaf model and is envisaged as a rational and promising goal to reach for a novel gene therapy strategy for SNHL.

Presenter(s): Adam Fernandez

Authors: Adam Fernandez, Yinhao Jia, Dr. Janani Sampath

Faculty: Dr. Janani Sampath

<u>Protein stability and unfolding under different temperatures from MD simulations</u>

Proteins, biomacromolecules necessary for life, are widely used for therapeutic applications. Proteins are composed of building blocks called amino acids. The 20 different amino acids, with a multitudinous set of arrangements, allows differing charge localization and affinities at certain parts of each protein. As a result, proteins fold up on themselves into formations called secondary structures. These structures crucially aid the proteins by giving them shape and function. If a protein loses its secondary structure by some external stressor, the protein loses its functionality, and thus its usefulness. To study how proteins fold under differing temperature conditions, we ran all-atom molecular dynamics simulations. Using the CHARMM36 forcefield and TIP3P water model, we looked at egg white lysozyme, insulin, and polycystin-1, a human gene susceptible to mutations that can cause an autosomal dominant kidney disease. These proteins were chosen because of their secondary structures and size differences. We found that as denaturation occurs, the number of hydrogen bonds decreases while the root mean square deviation, and radius of gyration, increase. Additionally, secondary structure analysis confirms the effect of high temperatures diminishing the presence of structures such as alpha helices and beta sheets. This analysis will help our understanding of protein unfolding, which can in turn allow us to design polymer conjugates targeted to suppress denaturing.

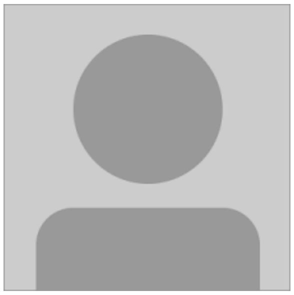
Presenter(s): Michael Fero

Authors: Adam Ginsburg, Michael Fero

Faculty: Dr. Adam Ginsburg

Paschen Alpha Modeling for PASHION and MIRIS

The interstellar medium (ISM) dust hides HII regions and supernova remnants behind the wavelength-dependent extinction of ionized gas. This project focuses on Paschen-α, which can penetrate the interstellar medium (ISM) dust better than H-α. While the Galaxy has been surveyed very thoroughly in optical recombination line emission (H-α), there were no surveys sensitive to extended emission at high extinction prior to the MIRIS mission. The Multi-purpose Infra-Red Imaging System (MIRIS) is a Korean small satellite that surveyed the Galactic plane in the Paschen-α band in 2013. Our work aims to improve upon their results while building tools for the proposed future PASHION small satellite mission. We have modeled the filter response functions to simulate observations for the planned PASHION mission to improve the poor results of the MIRIS mission. Estimates of the unresolved background flux for the images were obtained using the TRILEGAL model. We used the flux of stars in the H and K bands from 2MASS JHK observations to select stellar atmosphere models and interpolate them into the expected Paschen-α band. We will show predicted background maps and an initial application of a modeling approach to remove the continuum from the PASHION and MIRIS Paschen-α images.



Presenter(s): Mason Ferrer

Authors: Jianping Wang, Mason Ferrer, Nicholas Dufault

Faculty: Dr. Jianping Wang

Mutagenesis in Cultivated Peanut (Arachis hypogaea) to Create Aspergillus niger Resistant Germplasm

Cultivated peanuts (Arachis hypogaea) are the second most important legume growing in over 100 countries worldwide as an energy, protein, and other nutrient food source. Black crown rot is caused by Aspergillus niger, a fungus that thrives in hot, humid conditions, which mirror ideal conditions for peanut cultivation. Growing peanut cultivars with desirable genetic resistance to A. niger has remained promising and challenging for peanut breeding programs.

By using ethyl methyl sulfonate (EMS), a chemical mutagen commonly used in plant models, we can increase genetic diversity within the peanut germplasm in hopes to create mutants with resistance to A. niger. Thus, new peanut genetic materials can be screened under an Aspergillus infected environment to select for mutants that exhibit resistance or increased tolerance to A. niger.

Two peanut cultivars are treated with a 0.6% EMS solution for three hours to induce mutagenesis. Seeds are then germinated before lesioning the crown of the plant and inoculating them with an A. niger spore suspension (5 × 104 spores/mL) to select for mutated plants that are able to survive and grown in despite the presence of A. niger. These mutants are then asexually propagated and tested again to confirm resistance to A. niger before being allowed to go to seed to test for heritability of resistance. Seeds exhibiting increased tolerance or resistance to A. niger can then be included in a peanut breeding program for Aspergillus resistance cultivar development.

Presenter(s): Caitlin Field

Authors: Caitlin Field

Faculty: Dr. James Davidson

The Multivalent Meanings of Shoes Within Historic American Mortuary Contexts (18th to the early 20th century)

This project looks at the inclusion of shoes in mortuary contexts in the United States from the 18th to the early 20th centuries. My sample is constructed using a non-exhaustive list of historic cemeteries (n=33) across time, space, race/ethnicity, gender, and age-at-death cohorts. Specifically, I examine burial contexts to document the presence or absence of shoes (intact shoes, and/or shoe leather, heals, shoe buttons, grommets, shoe buckles) with men, women, and children, across racial/ethnic groups. I also refer to the archival record, concentrating on the economic, gendered, and cosmological significance of shoes in mortuary contexts, with a special focus on their meanings within and between these specific cultural groups (e.g., black and white communities in the 19th century American South). This project will help fill a research gap within the field of archaeology, namely the inclusion of shoes as economic and spiritual symbols in burials of individuals of different cultural backgrounds in the United States through time.

Presenter(s): Chloe Fields

Authors: Chloe Fields, Brianna Akers, John Williamson

Faculty: Dr. John Williamson

The Effects of Transcutaneous Vagus Nerve Stimulation (tVNS) on Cognition in Older Adults

By the year 2050, about 88.5 million Americans are projected to be age 65 or older (Harada et al., 2013). With an aging population, concerns surrounding cognitive decline are growing. Even if a person does not develop a neurodegenerative disease, such as dementia, age-related cognitive decline is still a concern (Harada et al., 2013). With our aging population, finding a solution to age-related cognitive decline is more important than ever. Several studies have shown that transcutaneous vagus nerve stimulation (tVNS) is a promising method to improve cognition. For example, studies have shown that tVNS improves associative memory and divergent thinking (Colzato et al., 2018; Jacobs et al., 2015). This presentation will review existing literature on cognitive aging and tVNS and discuss the implications of tVNS findings and future directions.

Colzato, L. S., Ritter, S. M., & Steenbergen, L. (2018). Transcutaneous vagus nerve stimulation (tVNS) enhances divergent thinking. Neuropsychologia, 111, 72–76. https://doi.org/10.1016/j.neuropsychologia.2018.01.003

Harada, C. N., Natelson Love, M. C., & Triebel, K. L. (2013). Normal cognitive aging. Clinics in geriatric medicine, 29(4), 737–752. https://doi.org/10.1016/j.cger.2013.07.002

Jacobs, H. I., Riphagen, J. M., Razat, C. M., Wiese, S., & Sack, A. T. (2015). Transcutaneous vagus nerve stimulation boosts associative memory in older individuals. Neurobiology of aging, 36(5), 1860–1867. https://doi.org/10.1016/j.neurobiolaging.2015.02.023

Presenter(s): Allyson Fleischer

Authors: Allyson Fleischer, Dr. Kate Fogarty

Faculty: Dr. Kate Fogarty

The Moderating Effect of School Connectedness on the Relationship Between Adverse Childhood Experiences and Overt Delinquency in Florida's High School Students

Background: The trauma youth experience from adverse childhood experiences (ACEs) can lead to emotional, social, and physical issues (Boullier & Blair, 2018). Studies have shown an association between ACEs and overt teenage delinquency. Overt delinquency is an issue for both the student and the community, necessitating the study of preventative measures (Bates & Swan, 2017). While research identifies protective factors on the ACEs-delinquency relationship as well as school connectedness as an independent or predictor variable, there has not been much exploration into school connectedness as a moderating factor for ACEs on delinquent outcomes. This study will examine school connectedness as a moderator or protective factor on the ACEs-overt delinquency relationship. Methods: Data were collected from 11,275 teenagers [male 5,543, female 5,642; age range = 14–19 years] through the 2020 Florida Youth Substance Abuse Survey. Results: Moderation analysis demonstrated that ACEs are positively associated with overt delinquency, but school connectedness was negatively associated with both. The moderation effect of school connectedness on association between ACEs and delinquency was verified with gender accounted for. Students who experienced higher school connectedness reported less instances of overt delinquent behavior than adolescents who experienced lower school connection, when ACEs are equal. Conclusion: This study suggests that researchers and teachers need to consider ACEs and school connectedness as a warning sign for overt delinquency in their student population. In addition, the type of connection to school and gender should be considered to clarify the effect of school connectedness on delinquency in adolescents who experienced ACEs.

Presenter(s): Ellen Fleming

Authors: Ellen Fleming, Pei-Ling Yu, Diego Leitão, Janete Brito, Beatriz F. de Toledo, Jeremy Brawner, Jingya Yang, Gary Vallad, Willian Terra, Samuel Martins

Faculty: Dr. Samuel Martins

<u>Assessing the impact of suppressive and conducive soils in the co-infection of tomato plants with Meloidogyne enterolobii and Fusarium oxysporum</u>

Suppressive soils with a greater amount of microbial diversity may decrease the likelihood of disease development. The objective of this work was to compare disease progression in two types of soils following co-inoculation of 4-week-old tomato plants with Fusarium oxysporum f. sp. lycopersici race 3 and Meloidogyne enterolobii. Soil was collected from a commercial tomato production field and a single-cultivation strawberry field. Soil treatment consisted of: control (uninoculated), inoculated with nematode eggs (N), and inoculated with N and Fusarium (F). Six replicates per soil type were monitored over 46 days before harvesting and the number of eggs per gram of root was determined. The control plants' roots showed no eggs present. Although not statistically significant, an increase of 80% in the number of eggs in strawberry soil compared to tomato soil was found. Additionally, a 1.3-fold increase was found in the number of eggs in strawberry soil with added F. oxysporum compared to strawberry soil with N only. Comparing tomato soil with eggs and tomato soil with eggs and F. oxysporum showed no difference. Lastly, a 3-fold decrease in the number of eggs in tomato soil containing N + F was determined when compared to strawberry soil of the same inoculation treatment. These results provide evidence that the tomato soil is suppressive, which may be associated with the diversity of microbials established in the soil after successive tomato cultivation. The experiment will be repeated and the microbial community will be assessed to identify community differences that associate with soil suppressiveness.

Presenter(s): Tori Ford

Authors: Tori M. Ford, Makenzie E. Mabry, Douglas E. Soltis, Pamela S. Soltis

Faculty: Drs. Pamela and Douglas Soltis

The Projected Impact of Climate Change on the Wild Relatives of Eggplant (Solanum melongena)

With global crop production facing enormous threats due to the impacts of climate change, plant biologists are tasked with finding ways to produce resilient crops that can withstand the challenges posed by increasingly stressful environmental conditions.Adding to this daunting task is the need for increased food production not only in the face of climate change, but also in response to a reduction in arable land and an increase in the human population. Crop wild relatives (CWRs) provide a novel source of genetic diversity that can be used to meet these demands. We focus on 12 CWRs of eggplant (Solanum melongena), an underappreciated crop with a global production of around 50 million tons annually, and a net value of more than US$10 billion a year, making it the fifth most economically important Solanaceous crop after potato, tomato, pepper, and tobacco (FAO, 2014). Using plant occurrences downloaded from iDigBio, GBIF, and BISON along with environmental predictors of soil profiles and bioclimatic variables (sourced from SoilGridsV2 and WorldClim) we develop environmental niche models to identify CWRs which 1) have wide niche suitability outside their modeled ranges and 2) may be more tolerant to changing climate conditions. We hope results from this study highlight the importance of CRWs and potential utility in future crop security efforts through neo domestication and genome editing methods.

Presenter(s): Zachary Freeman

Authors: Zachary Freeman, James Thorpe, John Stanton

Faculty: Dr. John Stanton

Applications of "Iterative" Natural Orbitals

Natural orbitals, championed by Per-Olov Löwdin, are of particular interest in quantum chemistry, as they offer routes to reducing the cost of correlated calculations via truncation of the virtual space (i.e. exclusion of minimally occupied virtual orbitals). Several schemes that approximate these natural orbitals have been investigated in the literature, such as the frozen natural orbitals—pioneered by Barr and Davidson—that are employed by Bartlett and Krylov, and the pair natural orbitals discussed by W. Meyer and used in the CBS thermochemical protocol of Petersson and coworkers. However, the natural orbitals proposed by Löwdin are obtained by diagonalization of the full one-particle density matrix, necessarily mixing the occupied and virtual space. Their construction must then be an iterative procedure, which is discussed here in the context of both RHF and ROHF reference wavefunctions.

We compare the behavior of these iterative natural orbitals (INOs) to that of the more typically used canonical orbitals for the calculation of equilibrium geometries and harmonic frequencies for a handful of small molecules, and we investigate possible virtual space truncation schemes similar to those proposed by Bartlett and Krylov as applied to the HCN isomerization potential energy surface.

Presenter(s): Garrett Fullerton

Authors: Garrett Fullerton, Simon Kato, Dhanashree Rajderkar, John Rees, Pina Sanelli, and Ruogu Fang

Faculty: Dr. Ruogu Fang

MAGIC: Multitask, Automated Generation of Contrast-free CT Perfusion Brain Imaging via Generative Adversarial Network

CT perfusion (CTP) is an imaging modality that is commonly used in clinical practice to characterize the perfusion of blood throughout the brain and is a valuable tool in detecting abnormalities in the brain parenchyma. To produce these series, an iodinated contrast bolus is injected intravenously to image the transit of the bolus through the brain's vasculature. Despite its benefits, CTP imaging presents concerns to both providers and patients, including the cost of the procedure and excessive radiation exposure. Compared to CTP, noncontrast-enhanced CT imaging (NCCT) is used to generate a single 3D projection of the brain's anatomic structure and does not contain many of the concerns associated with CTP. In this project, we present a deep learning (DL) model for the synthesis of CTP imaging from the corresponding NCCT series. Our model, Multitask Automated Generation of Intermodal CT Perfusion maps (MAGIC), uses a modified generative adversarial network (GAN) architecture to simultaneously synthesize multiple perfusion maps. We present additional novelties to the design of this network, including physiologically inspired training loss terms. We also present a tunable Physicians-in-the-Loop module as an exploratory diagnostic tool for physicians to further analyze the brain's hemodynamic activity. To the best of our knowledge, this is the first study to utilize a multitask, GAN-based architecture to learn the encoding between NCCT and CTP imaging domains. This project aims to augment the diagnostic power of a NCCT scan with an emphasis on enabling more rapid triage of acute ischemic stroke.

Presenter(s): Raquel Garcia

Authors: Raquel Garcia, Emma Suzuki Spence, Steven T. Cassidy, Bethany A. Zumwalde

Faculty: Dr. Bethany Zumwalde

Using stomata size and density to distinguish polyploids in the multiple cytotype cactus Cylindropuntia leptocaulis (Cactaceae)

Polyploidy, also known as whole genome duplication, has long been recognized as a key mechanism of speciation in the plant family Cactaceae. This process can result in reproductive isolation, changes in genetic diversity, breeding system discrepancies and can affect developmental processes and gene regulation. Species with multiple ploidal levels have been discovered in cacti,supporting the idea that there might be many cryptic species within morphologically similar and recently diverging lineages. Previous studies in cacti and other plant groups have shown that stomatal measurements may be used as a proxy to identify polyploids from their diploid progenitors by having larger cells, resulting from an increase in chromosome number. Here, we use the cactus Cylindropuntia leptocaulis to investigate the effects of polyploidy on stomatal size, as this species is comprised of three currently known ploidal levels (2x, 3x, and 4x) with distributions that vary across the Sonoran and Chihuahuan deserts. Stomata peels were imaged from 80 total individuals representing 14 populations of varying ploidy across the geographic distribution of the species. The software ImageJ and Fiji were used to measure stomatal density, length, width, and area for subsequent analyses. Preliminary analyses show the utility of stomata to identify triploid plants within mixed ploidy populations, and that diploid plants have smaller stomata with higher densities than triploid and tetraploid plants

Presenter(s): Amanda Gerulski

Authors: Amanda Gerulski, Jeffrey Pufahl

Faculty: Dr. Jeffrey Pufahl

Applied Theatre for ADHD

ADHD is characterized by issues in attention, hyperactivity, and impulsivity. The most prevalent continuation of symptoms into adulthood includes inattention and poor executive functioning. Executive functioning has a significant impact on one's ability to control impulsivity and concentration as well as a substantial impact on social skills due to emotional dysregulation and lack of interpersonal relationship problem-solving. Theatrical role-playing has been used to combat the effects of several mental illnesses and disorders. Role-playing increases self-awareness and allows for objective observations about a situation, and improvisational theatre uses role-play and has been shown to improve social connectedness. This project looked at the impact and significance of Applied Theatre exercises in ADHD management. This was completed through three Applied Theater workshops with adults diagnosed with ADHD. Exercises aimed to strengthen the executive functioning and social skills of participants in order to improve ADHD symptom management. Results showed that through exploration of improvisational theatre and role-playing, participants experienced an increase in executive functioning and social skills.

Presenter(s): Katherine Ghivizzani

Authors: Katherine Ghivizzani

Faculty: Dr. Edward Braun

Comparing Ultra-Conserved Elements in Galliformes Genomes

My project studied evolutionary relationships between members of the avian order Galliformes using chromosomal indicators. Ultra-conserved elements, or UCEs, are segments of DNA within the genome that are consistently passed down throughout species with very little or no change to their sequence. There are two variations among UCEs that can tell us a lot about the relationships between species within the same order: variation in the DNA sequences flanking the UCEs, and variation in the physical placement of UCEs. I used a computer program to download nine complete Galliformes genomes from the NCBI database. Using the same program, I ran code that allowed me to create contigs of the extracted UCEs that I then built phylogenetic trees from. Further analysis elucidated a complete picture of evolutionary history and relatedness among the nine species being studied.

Presenter(s): Yasmine Gillespie

Authors: Yasmine Gillespie1, Ke Xu1, Elizabeth Flood-Grady2 , Magda Francois1, Dominick J. Lemas1, Adetola Louis-Jacques, MD; Lindsay Thompson, MD; Nicole Cacho, DO

Faculty: Dr. Dominick Lemas

<u>Participant recruitment outcomes for the Breastfeeding and Early Child Health (BEACH) study</u>

BACKGROUND: As much as 86% of clinical trials do not reach recruitment targets [1]. Recruiting an adequate number of participants has posed to be a challenge. Participant recruitment can be expensive and time consuming, recruiting by mail or by phone have become less effective [2].

OBJECTIVE: The objective of this study is to evaluate how recruitment outcomes in a longitudinal birth cohort vary according to recruitment channels such as social media, flyers, and word-of-mouth.

METHODS: We evaluated recruitment outcomes in the Breastfeeding and Early Child Health (BEACH) study using self-reported data. This includes counts of: total encounters, phone screenings, consents, and study completion. Recruitment channels included social media sites such as Facebook as well as flyers, and word-of-mouth. We analyzed recruitment outcomes according to recruitment channels as well as clinical demographics such as participants BMI, age, and ethnicity.

RESULTS: In total we collected data on 4483 participant encounters and consented 78 individuals. Of the 1975 prospective participants with encounter data, social media has been the most successful in recruiting participants of an above average prepregnant BMI of greater than 29 kg (obese) and between 26 kg and 29 kg (overweight). It also showed that social media was able to recruit participants that were outside of the average age group of 30 which also tends to be a hard-to-reach population.

Conclusion: Our results demonstrate that social media is a successful way to recruit breastfeeding individuals. Future directions would include a more in-depth investigation of the data collected from social media.

Presenter(s): Daniel Gitlin

Authors: Daniel Gitlin, Erin Patrick, Stephen Hagen

Faculty: Dr. Stephen Hagen

Dynamics of PROPS fluorescence patterns in Escherichia coli with varying extracellular pH

Kralj et al. (2012) proposed a novel method for measuring membrane potential in Escherichia coli, through the expression of a proteorhodopsin optical proton sensor (PROPS) protein and observation of its fluorescence. Experiments by Krajl et al. using this system found a wide variety of time-dependent fluorescence behaviors, such as fluorescent “blinking”, within a homogenous population of E. coli within the same electrical environment. This finding presents a challenge to use of PROPS as a membrane potential indicator, as the dynamics of the fluorescing behavior are not understood. Our work studies the dynamics of this blinking fluorescence in the context of different pH cellular environments, in hopes of better characterizing patterns of PROPS fluorescence and improving its utility as a cell membrane potential indicator. This is done through extensive fluorescence microscopy and imaging of PROPS-expressing BL21 E. coli, through which the intensity and periodicity of the fluorescent blinking can be better characterized. After induction with arabinose and all-trans retinol, individual cells of PROPS-containing BL21 are imaged using fluorescence microscopy with a Cy5 filter, allowing for determination and analysis of blinking patterns using time-series imaging. By testing the PROPS fluorescence sensor in E. coli we aim to verify the robustness of the sensor and characterize the effect of extracellular pH on the dynamics. These data will be of use to future experiments in the field of bacterial membrane potentials.

Presenter(s): Matthew Gold

Authors: Matthew Gold, Megan Cantrell, Jonathan Orsini

Faculty: Professor Megan Cantrell

Analyzing Talent Trends in Generation Z College Students

Generation Z, the new and unique generation is taking over college campuses and workplaces. This study provides an insight into the Clifton Strengths talent theme trends of Generation Z college students based on the archival data from a major tier-one public research university in the southeastern United States. A sample of 592 students, over the course of seven semesters, were administered the CliftonStrengths Assessment as a part of their course. Results from this assessment were collected and analyzed, looking at the participants' generation, differences based on sex, and comparing the participants' generation to older generations in both academic terms and in general. This information has been examined to determine if a talent theme trend for Generation Z does exist, and how this information would be used to enhance the learning and workplace environments for the future. The results indicate that Generation Z college students have the top five talent themes of Achiever, Restorative, Empathy, Strategic, and Futuristic, which provide an insight into the inherent talents this generation possesses to be utilized in their lives. A ranking of talent themes for the whole studied population was determined, along with rankings based on sex and higher education was also established. Significance, using the chi-square test of independence, was found in males being more likely to have one or more Clifton Strengths in the Influencing domain, and two or more in the Strategic Thinking domain.

Presenter(s): Griffin Golde, Issey Suzuki

Authors: Griffin R. Golde, Issey Suzuki, Duy T. Nguyen, Diego I. Pedro, Gabriel J. Rosa, Matthew A Kis, Jared Bowman, Brent Sumerlin, W. Gregory Sawyer

Faculty: Dr. Gregory Sawyer

<ins>3D In Vitro Recapitulation of Tumor-immune Interaction in Liquid-like Solids</ins>

Cancer immunotherapy offers potentially lifesaving treatments to cancers, but the identification of new therapeutic strategies is hampered by a lack of functional preclinical models. Fundamental research in biology has been trapped by the engineering blueprints of ubiquitous 2D infrastructure, where cells are constrained to grow in a monolayer as ghosts of their original biology in a plastic dish. Three-dimensional (3D) cell models have been shown to better replicate the relevant in vivo conditions of a tumor microenvironment such as cell-cell interaction, migration, differentiation, and drug sensitivity. To our knowledge, there is no existing platform that provides a complete picture of interactions between immune cells, tumors, and the tumor microenvironment which is well-known to promote immunosuppressive barriers and correlated cancer progression. Here, we functionalized and bioconjugated a liquid-like solid (LLS) microgels with extracellular matrix proteins as a platform to reveal the interactions of cancer and immune cells, cellular adhesion, growth, and migration in 3D. The ability to visualize a tumor microenvironment and its components will shed light on tumor progression and the dynamic immuno-regulatory ecosystem.

Presenter(s): Alejandro Gonzalez

Authors: Victoria Leroy, Jun Cai, Zhenxiao Tu, Alejandro Gonzalez, Joseph Hartman, Jennifer Mulligan, Carl Atkinson, Gilbert R. Upchurch, Jr., and Ashish K. Sharma

Faculty: Dr. Ashish Sharma

Lipoxin A4 mitigates ferroptosis via FPR2 signaling during lung ischemia-reperfusion injury

Ischemia-reperfusion injury (IRI) after lung transplantation entails dysregulation of inflammation-resolution pathways leading to primary graft dysfunction. We investigated the role of ω-3-derived specialized pro-resolving lipid mediators, i.e. Lipoxin A4 (LxA4), and formyl peptide receptor (FPR2) signaling in the resolution of lung IRI. We used an established murine model of lung hilar ligation for IRI using C57BL/6 wild-type (WT) and FPR2-/- mice that underwent sham surgery or IRI (1hr left lung ischemia followed by 6- or 24hrs reperfusion). Lung function was measured using an isolated, buffer-perfused apparatus. Cytokine levels were measured in bronchoalveolar lavage (BAL) fluid, and neutrophil infiltration was assessed by immunohistochemistry. Post-lung transplant BAL from human patients was analyzed by liquid chromatography-mass spectrometry that demonstrated a significant increase in LxA4 on day 7 compared to days 0 and 1. In the murine model, we observed a significant increase in hallmarks of ferroptosis i.e. induction of lipid peroxidation (malonyldialdehyde), inhibition of glutathione peroxidase 4 (GPX4) as well as nuclear factor erythroid 2 (Nrf2) after IRI. Treatment of WT mice with recombinant LxA4 significantly attenuated lung dysfunction (decreased airway resistance and pulmonary artery pressure, and increased pulmonary compliance), inflammation (IL-17, TNF-☐, CXCL1, HMGB1), injury (neutrophil infiltration) and ferroptosis (decreased MDA as well as increased Nrf2 and GPX4 expressions) compared to IRI alone, that was abolished in LxA4 treated-FPR2-/- mice. Collectively, our results indicate that lung IRI is regulated by ferroptosis which can be prevented by LxA4/FPR2-mediated signaling.

Presenter(s): Vanessa Gonzalez

Authors: Vanessa Gonzalez, Jaime Jimenez, Ruchir Mishra, Bryony C. Bonning

Faculty: Dr. Bryony Bonning

<u>Identification of peptides that bind the gut of the southern green stink bug, Nezara viridula</u>

The southern green stink bug (Nezara viridula) is a major pest of agricultural crops and is particularly difficult to control. In addition to having a tank-like body that reduces penetration of insecticides, it has highly efficient digestive enzymes that degrade chemical, protein or nucleic-acid based molecules deployed against it. Pesticidal proteins derived from certain bacteria have evolved to withstand insect digestive enzymes. However, relatively few of these proteins are known to work well against the stink bug. We plan to improve pesticidal protein toxicity by adding a gut binding peptide as an artificial anchor to a pesticidal protein. As a first step toward this goal, we isolated 7 amino acid peptides that bind to the surface of the stink bug gut by screening a phage display library. Fifty, third instar N. viridula nymphs were fed for two days on a 20% sucrose diet containing the Ph.D. C7C phage library solution. Guts were then removed by dissection and bound phages eluted for ssDNA extraction. The eluted phages were then amplified, and a second round of phage enrichment completed in the same manner. The isolated circular ssDNA from rounds 1 and 2 of phage enrichment sent for next generation sequencing. Bioinformatics analysis was conducted to identify highly enriched and stable peptides, with false positive peptides eliminated. The candidate N. viridula gut binding peptides will be used for modification of a bacteria-derived pesticidal protein for improved toxicity.

Presenter(s): Herman Gonzalez

Authors: Herman Gonzalez

Faculty: Dr. Dapeng Wu

Federated Learning for Intensive Care and Surgical Risk Assessment: A Scoping Review

Background:

Artificial Intelligence (AI) thrives in a realm of innovation and an abundance of data. However, this data is often sensitive due to regulatory or privacy concerns. In recent years, Federated Learning (FL) techniques have been developed to take traditional Machine Learning (ML) algorithms and train them in a decentralized fashion. Healthcare is especially poised to reap the data privacy benefits of FL.

Objective:

Summarize the deployment of Federated Learning in healthcare in the last five years, especially in relation to surgery and intensive care patients.

Data Sources:

Scoping review searches were conducted in March 2022, using PubMed, to identify primary source studies.

Study Selection:

Studies were selected that were published in English during the past 5 years, regarded human adults, and pertained to Federated Learning and either surgery or intensive care patients. Based on these criteria, 40 studies (29 related to surgery, 11 related to intensive care) were selected for screening.

Data Extraction:

After intaking citations into Covidence, they were screened independently by two investigators to verify the study selection inclusion criteria. Moreover, original trials are included, but meta-analyses or other reviews are excluded.

Presenter(s): Jamie Good

Authors: Jamie Good, Raymond Russo

Faculty: Dr. Raymond Russo

An Examination of Tightly-Curved Subduction Zones

We present mutually-orthogonal components of seismic moment release for the tightly-curved Caribbean, Banda, Hellenic, Marianas, and Scotia subduction zones. The relative proportions of released energy within each zone are used to determine the deformative moments taken up by two primary modes of bending: (1) down-dip and (2) along-strike due to shortening, increasing the curvature of the subduction zone both at the surface and at depth. These two types of bending produce earthquakes with mechanisms consistent with slab motion. Harvard's Centroid-Moment Tensor catalog (1977-present) records the focal mechanisms of intermediate depth (70-200 km), ≥4.7 magnitude earthquakes in the study regions. Surficially, these earthquakes are concentrated in the slabs' most concave areas. When partitioned and quantified, the recorded seismic energy of these earthquakes are clear indicators of both types of slab deformation. Using the selected earthquakes' moment tensor matrices, we perform a 3D transform of tensors in MATLAB such that the rotated reference frame consists of axes oriented downdip (z), along-strike (x), and out the back of the slab (y). Each component's budget of seismic moment release is then contoured in GMT, producing models of slab deformation energy in three-dimensions. We conclude that heterogeneities, which are seen on each axis, are concentrated in the most arcuate areas of subducting slabs, indicating that lateral deformation is accounted for by highly-variable, small-scale deformation in three directions.

Presenter(s): Connor Goodwin

Authors: Dr. Mirian Hay-Roe

Faculty: Dr. Mirian Hay-Roe

Black Soldier Fly Larva (Hermetia illucens) Frass vs. Red Wiggler (Eisenia fetida) Castings on (Capsicum annum) “Early Jalapeno” Seedling Growth

Black soldier fly larvae (BSFL) Hermetia illucens have shown some promising signs in their ability to rapidly process organic waste into usable organic frass compost. However, little is known about the effectiveness of the frass as a biofertilizer. Other organic waste consumers, such as red wiggler worms (RW) Eisenia fetida have a history of producing extremely fertile biofertilizer inputs. As such, this study compares the waste consumption rate and compost nutrient concentration between BSFL and RW composters. Additionally, BSFL compost, RW compost, and a fertilizer-free control treatment were applied to jalapeno seedlings. Application results were subsequently compared, after three weeks, using stem length, stem width, number of leaves, and chlorophyll content. Upon completion of these trials, BSFL was shown to consume organic waste at a clearly higher rate than RW, while producing compost with higher N, P, and K nutrient concentrations. Furthermore, during the application trial, both BSFL and RW compost improved jalapeno seedling growth more than the control treatment. However, with no additional post-processing, the BSFL compost was not as effective for seedling growth, when compared to its RW biofertilizer counterpart. These experimental results help establish the effectiveness of using BSFL in organic waste management while addressing the potential value of the frass byproduct. The nutrient concentration analysis demonstrates that BSFL frass could potentially make a highly effective biofertilizer. However, the application results suggested that more post-processing may be needed to have it be as productive as an established biofertilizer, like RW compost.

Presenter(s): Gabrielle Gorwitz

Authors: Gabrielle Gorwitz, Asmaa Fatani, Joonhyuk Suh, Yu Wang, Mark Segal, Wendy Dahl

Faculty: Dr. Wendy Dahl

<u>Diet Quality and Gut Microbiota Composition of Individuals with Kidney Failure</u>

The progressive loss of kidney function leads to an accumulation of uremic molecules in the blood which contributes to further progression of disease and reduced quality of life. Due to disease-related restrictions, individuals with kidney failure may not meet dietary recommendations. This cross-sectional study aimed to explore the relationships between diet quality and serum levels of microbiota-derived uremic molecules in individuals with kidney failure. Diet was assessed by three 24-hr diet recalls and the Dietary Screening Tool (DST), an indicator of diet quality. Uremic molecules (p-cresyl sulfate, indoxyl sulfate, phenylacetylglutamine and trimethylamine-N-oxide) were quantified by Liquid Chromatography–Mass Spectrometry (LC-MS) methodology. Fecal samples were collected for future microbiota composition analyses by16S rRNA gene amplicon sequencing. The associations between diet quality and uremic molecules were tested. Adults currently receiving dialysis (n=12; 48.4 ± 11.9 years; 8 male, 4 female) were recruited. Energy (19.9 ± 9.0 kcal/kg [body weight]/d) and protein (0.8 ± 0.4 g/kg/d) intakes were below the levels recommended by the National Kidney Foundation of 25-35 kcal/kg/d and 1.0-1.2 g/kg/d, respectively. Of the participants, 50% scored <60 on the DST, categorizing them at nutritional risk. An inverse association between diet quality by DST score and serum p-cresol sulfate was found (r = -0.61). Diet quality may indeed be a significant factor influencing baseline microbiota profile and serum levels of certain microbial-generated uremic molecules in this patient population. Ultimately, there needs to be more research exploring the relationships between uremia and diet quality, and the potential mediating effects of the microbiome.

Presenter(s): Philip Grandoff, Sydney Schneider

Authors: Philip Grandoff, Sydney Schneider

Faculty: Dr. Jeanette Andrade

Confounding Variables on the Relationship Between the Consumption and Deficiency of Vitamin D

Vitamin D deficiency has prevalence within the United States, with possible relations to age, race, sun exposure, dietary habits, and chronic diseases. This study explored, among US adults, the relationship between self reported vitamin D status, vitamin D intake, and variables including sun exposure, chronic disease, and supplementation. 1637 participants completed an online 38 item questionnaire. Frequency counts, percentages, unpaired T tests, and linear regressions were performed. Statistical significance was determined at p<0.05. 60% of participants were never informed they were vitamin D deficient. 36.6% of participants took a vitamin D supplement at least once daily, and participants consumed on average 347.05 ±307.8 IUs of vitamin D. No relationships were seen between vitamin D intake from foods/beverages and vitamin D deficiency status. Females consumed less vitamin D foods than males (p<0.05). Multivariate linear regression showed significant positive correlations for chronic kidney disease (0.05, CI 95% 0.01-0.40; p=0.04), depression (0.07, CI 95% 0.03-0.17; p<0.001), diabetes (0.06, CI 95% 0.02-0.23; p=0.02), and vitamin D supplement use (0.17, CI 95% 0.05-0.08; p<0.001) on vitamin D status. Significant negative correlations were discovered with age (-0.08, CI 95% -0.06 to -0.01; p=0.01) and sun exposure (-0.09, CI 95% -0.04 to –0.01; p<0.001) on vitamin D status. Overall, consumption of vitamin D from foods/beverages were below recommendations and relationships were seen with chronic diseases and vitamin D deficiency. Health professionals should develop nutrition education programs for individuals to inform them about the consumption and preparation of high vitamin D foods to reduce the prevalence of deficiency.

Presenter(s): Naomi Greenberg

Authors: Naomi Greenberg, Dr. Samuel Martins

Faculty: Dr. Samuel Martins

"How Are Time and Student Performance Affected In A Collaborative Teaching Environment?"

Contrary to popular lecture styles, a collaborative learning environment fosters group learning and a high degree of in-class participation. The purpose of this study was to determine how a collaborative learning environment and two-stage testing would affect academic performance. Students collaborated on the two-stage exams after first completing the exam individually (stage one). The second stage of the exam, students were divided into groups and collaborated to complete the exam a second time. While the time it to complete the exam individually did not predict the student's grade, a negative correlation (P=0.0416 r=-0.351) was found between student's grades and the time it took to complete the exam as a group. Those groups that completed the exam faster tended to have higher grades suggesting that students work more efficiently for better results when working together on an exam. Additionally, while only 79% of students felt it was faster to complete the exam as a group, 97% of students completed the exam faster as a group than they did individually. Students tended to receive a better grade if they'd completed the group stage of their exam faster indicating a relationship between faster group work and enhanced performance.

Presenter(s): Nicolas Grimaldi

Authors: Nicolas S Grimaldi, Yue Luo, Xiaojie Lu, Sherry Ahrentzen, Boyi Hu

Faculty: Dr. Boyi Hu

Safety and accessibility assessment of a kitchen repurposing design: A gait and task efficiency analysis

As an aging society, it is essential to address the needs of our trending demographic. An expected increase in the number of functional disabilities places many at a potential health and inaccessibility risk in terms of housing. In this study, we proposed and analyzed the related accessibility and safety improvements associated with a repurposed design of a standard kitchen. Virtual reality simulations of a standard and repurposed kitchen are implemented. Participants' gait and task efficiency performance were measured as they perform activities of daily living. Improvements in efficiency, through overall decreases in traversed distance and shorter completion times for sub-tasks, indicate a clear advancement in accessibility. On the other hand, a lack of significant reductions in direct falling risks, through similarities in SPARC and acceleration RMS measurements, might warrant future investigation. Additionally, upper-body and psychometric measures should be taken into account for further investigations to provide a more comprehensive evaluation.

Presenter(s): Paxton Guerin

Authors: Paxton Guerin, Dr. Bryan James, Dr. Josephine Allen

Faculty: Dr. Josephine Allen

Nucleic Acid - Collagen Complex (NACC) Biomaterials Exhibit Tunability through Solution Conditions

Collagen and DNA are fundamental biomacromolecules in the body and biomedicine. These two molecules have various significant physiological applications ranging from extracellular matrix (ECM) structure to the regulation of protein synthesis. Their stability and structure are directly affected by the ionic composition of surrounding physiological buffers, and the effect of ion type and concentration is understood for type I collagen and DNA individually. When mixed, the two molecules rapidly and spontaneously self-assemble into Nucleic Acid-Collagen Complexes (NACC). NACC demonstrate potential applications as multimodal and bioactive scaffold materials in tissue engineering and regenerative medicine. It is understood that electrostatic interactions play a prominent role in NACC assembly and stability between the collagen and DNA molecules. Thus, ion type and concentration were altered during NACC formation to evaluate the impact on the resulting NACC fiber's formation and stability. As observed through ssDNA binding assays and microscopy, the addition of most ionic salts supported maximal NACC formation in the salt concentration range of 0.05 mM to 5 mM. Salts containing chloride anions stabilized NACC compounds the most effectively, whereas salts containing potassium ions showed mostly destabilization overall. Finally, understanding ion conditions that optimize NACC formation allows for their effective development for potential gene delivery applications and as bioactive scaffolds for tissue engineering.

Presenter(s): Leonardo Guerra

Authors: Leonardo Guerra, Christelle Lteif, Larissa Cavallari, Julio Duarte

Faculty: Dr. Julio Duarte

Heart Failure Progression Associated with RYR1: A Translational Investigation

Background: Heart failure (HF) is a highly prevalent disease affecting roughly 6 million Americans. Our previous transcriptome-wide analysis showed that RYR1 was upregulated in HF patients with severe pulmonary hypertension (PH). Therefore, we aimed to further characterize the role of RYR1 in HF progression and mortality.

Methods: Ryr1 gene expression in lung and heart tissue were compared between HF mice and control mice. A survival analysis in HF patients was performed with the previously implicated polymorphism rs2960321 in RYR1. Finally, a fine-mapping analysis was completed and correlated with expressed quantitative loci (eQTLs).

Results:We found increased cardiac expression of Ryr1 in HF mice compared with control mice (Fold Change = 1.90, P = 0.01). In 327 HF patients, we found the addition of each variant allele of rs2960321 was associated with decreased risk of death (HR = 0.66; 95% CI: 0.44–0.97; P = 0.033). This SNP appears to be an eQTL for RYR1, associated with decreased expression in arterial tissues and blood. For our fine-mapping analysis, we observed an additional SNP (rs12974674) associated with a decreased risk of death with each addition of the variant allele (HR: 0.59,95% CI: 0.40 – 0.87; FDR = 0.042). Additionally, rs12974674 was in high linkage-disequilibrium (r2 > 0.9) with our discovery SNP (rs2960321) and an eQTL for RYR1 in arterial and lung tissues.

Conclusions: Ryr1 had higher expression in hearts of HF mice, and a putatively functional polymorphism in RYR1 was associated with decreased mortality in HF patients.

Presenter(s): Sarah Gurevitch

Authors: Sarah Gurevitch, Vandana Baweja

Faculty: Professor Vandana Baweja

Florida Domestic Architecture in the 1940s: Economy House

The 1940s proposals for the Economy House comprised two main strategies in their designs: reduction of the cost through mass-production and an increase in flexibility of homes for future expansion. The Second World War transformed Florida residential architecture in the 1940s through the development of new technologies like prefabrication, material innovations, increased industrial production, innovations in lighting, and improvement in thermal comfort design. These technological advancements combined with budget constraints and cultural shifts called for a national dialogue for the ideal postwar home. In planning a house within limited budgets, designers faced tension between the mass-production and individualization of houses. Thus the planning of the 1940s Economy House addressed the competing requirements of standardization and customization. Florida architects in the 1940s tried to create livability at a lower cost. Due to high building costs in the postwar years, architects approached design with economic and civic responsibility, which resulted in maximum and efficient use of space. Architects proposed cutting costs through—outdoor living, modular planning, prefabrication, use of prefinished materials, and the use of new materials. Socio-cultural shifts after the war increased leisure time, which transformed the living room to serve multiple recreational functions that ranged from informal family living to formal hosting of guests. The use of new materials, advanced acoustics and lighting, and better articulation of space made it possible to design multipurpose living rooms. Higher levels of efficiency through mechanization were achieved in the economy house and with that, the house was standardized and mass-produced as one single unit.

Presenter(s): Alara Guvenli

Authors: Alara A. Güvenli, Sabrina Zequeira, Emely A. Gazarov, Sanjana Ravi, Argyle V Bumanglag, Jennifer L. Bizon, Barry Setlow

Faculty: Barry Setlow, PhD

Effects Of Chronic Oral THC Consumption On Working Memory In Aged Rats

Cannabis is the most widely used illicit drug in the US, and individuals over the age of 65 are the fastest growing group of users. Cannabis (and cannabinoids such as delta-9-tetrahydrocannabinol (THC), the major psychoactive component of cannabis) generally impair cognitive performance, but studies of cannabis/cannabinoids are generally conducted in young adults. Given that aging itself is frequently accompanied by cognitive impairments, it is important to determine how cannabis/cannabinoids affects cognition in aging. We conducted an initial study in rats to evaluate the effects of chronic oral administration of THC on performance in a working memory task. Young adult (5 months) and aged (23 months) rats of both sexes were trained on a delayed response working memory task in operant chambers, in which rats remember the left/right position of a response lever over short delays (0-24 s) to earn food rewards. Upon reaching stable performance, rats were given 6 weeks of daily 1-hour access to either plain gelatin or gelatin containing 1 mg/kg THC in their home cage in the afternoons, while continuing behavioral testing in the mornings. As expected, among rats that consumed plain (control) gelatin, aged rats performed worse than young. In the young group, rats that consumed THC gelatin performed worse than rats that consumed plain gelatin. In the aged group, however, rats that consumed THC gelatin performed better than rats that consumed plain gelatin. These findings suggest that under some conditions (poor baseline performance and/or advanced age), cannabis may provide cognitive benefits, even when consumed chronically.

Presenter(s): Anna-Sophia Hadley

Authors: Anna-Sophia Hadley, Brendan O'Donnell, Chris Orozco, Leah Buch, Martin Vivas-Gonzalez, Michele Manuel, David Christianson

Faculty: Dr. Michele Manuel

Breast Expander Redesign

Breast expanders are a medical device that allow for breast tissue expansion, following a mastectomy due to breast cancer diagnosis. Tissue expansion is required for subsequent breast implant and is accomplished by increasing saline injections. The current expander designs contain a stainless-steel port and Neodymium magnet, which allow the surgeon to locate the port for saline injection. These components interfere with proton radiation therapy and imaging techniques such as Computed Tomography (CT) or Magnetic Resonance Imaging (MRI). The purpose of the redesign is to create an expander that reduces the interference with proton radiation therapy and imaging. Materials were narrowed to non-ferromagnetic metallic options to ensure patients can undergo MRI and CT scans. The Nd-based magnet was removed and replaced with an ultrasonic probe for port location identification. CT images and stopping power calculations were performed to determine potential X-ray and proton interaction with candidate materials. Aluminum and Magnesium were predicted to drastically reduce proton interaction while maintaining functionality for doctors and patients. Further research is required to identify the optimal alloy composition.

Presenter(s): Marion Hagstrom

Authors: Marion Hagstrom, Parker Kotlarz, Dr. Marcelo Febo, Dr. Juan Nino

Faculty: Dr. Juan Nino

<u>Translatable Biomarker Identification in Alzheimer's Disease</u>

Alzheimer’s disease (AD) is a neurodegenerative disorder affecting a growing worldwide elderly population. The identification of biomarkers for brain functionality is expected to highlight preclinical stages of impairment, aid the development of therapeutic intervention, and deter disease progression. Connectomic analysis, a graph theory-based approach used in analyzing brain connectivity matrices, was used along with percolation theory targeted attack models to investigate network effects of neurodegeneration in AD. This work analyzes matrices derived from resting-state functional magnetic resonance imaging (fMRI) collected on mice with extracellular amyloidosis (TgCRND8 mice, n=17) and control littermates (n=17). Global, nodal, spatial, and percolation-based analysis was performed comparing AD and control mice. Our results indicate a short-term compensatory response to neurodegeneration in the AD brain via a strongly connected core network with highly vulnerable hubs. Targeted attacks demonstrated a greater vulnerability of AD brains to all types of attacks. Targeted attacks also identified progression models to mimic AD neurodegeneration using betweenness centrality and collective influence metrics. Furthermore, both spatial analysis and percolation theory identified a key anterior-to-posterior disconnect in AD mice. Current research is focusing on human brain networks for possible replication of these patterns using cognitively normal and mild cognitive impairment patients from the Alzheimer’s Disease Neuroimage Initiative (ADNI) dataset. Additionally, machine learning segmentation of fMRI brain scans will be used to cross-validate our connectomic findings. This research pursues our long-term goal of identifying clinical biomarkers in the brain to screen patients who may have a predisposition for AD.

Presenter(s): Kendra Hall

Authors: Kendra Hall, Yang Feng, Daniil Shabashvili, Cassandra Berntsen, and Olga Guryanova

Faculty: Dr. Olga Guryanova

Dnmt3a+/--driven clonal hematopoiesis promotes more severe tumor histopathology, proliferation and angiogenesis in a colitis-associated colon cancer model

Clonal Hematopoiesis (CH), detected by presence of somatic mutations such as in the DNMT3A gene, is a clonal expansion of hematopoietic stem cells (HSC) without overt hematologic abnormalities (Jaiswal & Ebert, 2019; Genovese et al. 2014). CH is present in colorectal cancer (CRC) patients at higher frequency than in age-matched normal population and is associated with an adverse outcome (Coombs et al., 2017). We hypothesized that DNMT3A-driven CH leads to a more aggressive CRC phenotype. To this end, we combined a bone marrow transplantation (BMT) based mouse model of CH with a chemically induced colitis-associated colon cancer (CAC) model. We observed increased tumorigenesis in colons of Dnmt3a+/--CH mice compared to DNMT3AWT-transplanted control animals. Colon swiss-roll stained with H&E showed heightened histopathology, including increased adenocarcinoma formation, higher tumor immune infiltration, extensive erosion and hyperplasia of colonic epithelium in Dnmt3a+/--CH mice. To assess proliferation of epithelium, we performed Ki67 immunohistochemistry (IHC) and found a higher proportion of marker-positive cells in crypts from Dnmt3a+/--CH animals than in controls. This result indicates that Dnmt3a loss in bone marrow promotes colon epithelial cell proliferation. Further, we stained colon frozen sections for endothelial marker-CD31, which showed increased vascularization in tumors of Dnmt3a+/--CH animals. Taken together, these data indicate that CH driven by heterozygous loss of Dnmt3a results in a more aggressive colon cancer phenotype, consistent with clinical observations. These findings provide a deeper understanding of the interplay between mutations in the hematopoietic system and solid tumors. Further studies are needed to investigate underlying molecular mechanisms and to test potential therapeutic approaches targeting these altered pathways.

Presenter(s): Kaori Hall

Authors: Kaori Hall, Ben Lemmond, Matthew E. Smith

Faculty: Dr. Matthew Smith

Documenting the distribution and diversity of edible chanterelles (Cantharellus spp.) in Florida

Cantharellus (chanterelles) is a popular genus of edible plant-symbiotic ectomycorrhizal fungi that can be found in soil in the summer. Their distinctive, funnel-shaped mushrooms are often bright colors of yellow, orange, pink, or cream. Many species of Cantharellus have similar morphologies, making them indistinguishable without using molecular techniques. For example, almost all Cantharellus with reddish coloration have been called C. cinnabarinus. Molecular data, however, has shown that many specimens with this name are different species that have the same general morphology. Not much research has been done to find out the distribution of Cantharellus species in Florida, and we hypothesized that there may be unnamed species in the state. Using molecular phylogenetics, we are examining the diversity and distribution of Cantharellus in Florida. So far, we have observed evidence of 21 species, with 7 being unnamed species.

Presenter(s): Emma L. Hammer, Harleen K. Kahlon, Kaitlyn B. Taylor

Authors: Emma L. Hammer, Kaitlyn B. Taylor, Ila Bagheri, Harleen K. Kahlon, Renata Volonterio, R. Mitchell Faloona, Alexandra Kalo, Jhada Sims

Faculty: Dr. Peggy R. Borum

Single Long-term Research Project Integrates In-depth Knowledge and Skill Development Leading to Scholarship Excellence

Healthcare undergraduates pursuing career and education goals face a highly competitive admission process to graduate and professional schools. Applicants are urged to develop and demonstrate a multitude of health professional competencies obtained from a variety of experiences and communicate them in an integrated manner. The Difference Makers in the University of Florida, Food Science and Human Nutrition Borum Lab surveyed lab members to identify key health professional competencies needed to be a top applicant for their future professions and graduate programs. The Difference Makers then supplemented the data with an internet search for current requirements/competencies for healthcare professions and graduate programs. A focus group made up of the Difference Makers deliberated over the survey results and narrowed the competencies to eight:

- Hands-on Patient/Client Interaction
- Soft Skills
- Collaboration Skills
- Critical Thinking and Problem Solving
- Professional Development
- Sustainability/Commitment
- Effective Oral/Written Communication Skills with Diverse Audiences
- Technical Skills for Data Collection, Management, and Analysis

Completing a multitude of research activities as an undergraduate student to cover all the skills is time demanding, not conducive to in-depth learning, and makes it difficult to integrate the demonstration of competences during an interview. The Difference Makers identified examples of activities developing the eight health professional competencies while working in the Borum Lab. This research highlights the feasibility of obtaining health profession and clinical translational research competencies by overlapping the experiences with skill development when excelling in an extended single extracurricular research program.

Presenter(s): Austin Hammerli

Authors: Austin Hammerli

Faculty: Dr. Michael Binford

Kelp Forest Dynamics near Cape Alava from 1996 –2021 Using Landsat Imagery

Kelp forests are underwater groves of kelp that grow in the ocean's cold and temperate coastal areas. Found along the coasts of every continent except Antarctica, kelp forests are of great importance to the ocean, for they provide habitats, food, shelter, and protection for a diverse range of species of marine life, as well as coastal communities. Mapping kelp forests has historically been a difficult, tedious undertaking since they are found mostly underwater, but recent advances in satellite and airborne remote sensing have been successfully deployed to map kelp forests remotely. This development has revolutionized how kelp forests are studied, for it enables them to be frequently mapped and thereby monitored over time. Accordingly, the objective of this study is to determine whether kelp forests near Cape Alava, located on the Pacific coast of Washington state, have been growing, declining, or remaining stable over the time interval from 1996-2021. Landsat imagery for each of the years being studied was obtained from the United States Geological Survey, and have been analyzed by calculating NDVI values from the imagery. NDVI values associated with vegetation and specifically kelp forests have been used to identify areas of likely kelp forest extent, and a comparison has been performed to identify trends in kelp forest extent from 1996-2021. The results suggest a possible decline in kelp forest extent, but given how dynamic kelp forest extent was from year to year, a longer time interval may need to be studied to make this conclusion.

Presenter(s): JiHo Han

Authors: JiHo (Julie) Han, Saeyeong Jeon, Ziqi Jia, Sunghyun Hwang, Suk-il Choi, and Yong-Kyu 'YK' Yoon

Faculty: Dr. Yong-Kyu 'YK' Yoon

Smart Electropalatography for Linguistic and Medicine Applications (SELMA)

Patients with neurological disabilities, diseases or injuries, such as Parkinson's disease, suffer from speech impairment, which could impact communication and socialization skills often leading to psychological distress. This disability could be improved by assigning quantified diagnoses and interventions. Electropalatography (EPG) is a device that enables doctors to visualize the placement of patients' tongues during speech. With multiple channels of sensors embedded, EPG consists of an upper mouthpiece which fits against a patient's mouth palate. When the tongue comes in contact with a sensor, the position of the sensor gets notified on a screen. Therefore, EPG enables real-time monitoring of the timing and location of the tongue against the palate.

NSF sponsored Smart Electropalatography for Linguistic and Medicine Applications (SELMA) project aims to implement an advanced EPG system. The project targets building the thinnest, wireless and fast-scanning sensor. Unlike the existing EPG, the SELMA system will enable the visualization of the magnitudes of the pressure on the sensors. The limitation in the existing EPG is that the device is thick and contains wires connected to hardware outside of the mouth which hampers the performance of patients' speech during monitoring. Providing a thinner and wireless device will enhance the accuracy of speech monitoring, user comfort, and reliability. The visualization of the location, timing, and pressure caused by tongue contact during speech will contribute to producing more quantified data for doctors and linguists. The SELMA system will allow delivering a better diagnosis and will be used for the foundation of timely intervention.

Presenter(s): Hannah Henry

Authors: Hannah A. Henry, Kathryn E. Sieving

Faculty: Dr. Kathryn E. Sieving

Understanding the complex vocal system of the chick-a-dee call in 2 Floridian species

Birds in the Paridae family share one of the most structurally complex vocalization systems other than humans: the chick-a-dee call. The chick-a-dee call is composed of 2 sections: 1) frequency modulated elements (FME) and 2) D notes. Research indicates the FME section incites vigilance behavior in birds, while the D note triggers conspecifics to approach – both of which communicate alarm. Although the chick-a-dee call is utilized by over 50 different species, it is not well understood whether the structural elements, the FME and D notes, follow a characteristic order among all species. To investigate this phenomenon, the response of wild Carolina chickadees (Poecile carolinensis) and tufted titmice (Baeolophus bicolor) to intraspecific mobbing calls were recorded. The vocal recordings were processed using trained AI models to characterize the calls by the number of FME and D sections. The occurrence of FME-D associations in mobbing calls was quantified by calculating the ratio of FME/total notes and D/total notes, and how results differed between the species. 434 samples were ultimately quantified and statically analyzed with a mixed-effects logistic regression. Results indicated that the Carolina chickadee used a significantly higher proportion of FME notes in comparison to the tufted titmouse. This study provides evidence of quantitative differences in the structure and syntax of the chick-a-dee call information system in different species. Further research is needed to fully characterize how common the FME-D syntax is, and whether the propensity to call with such syntax is similar between all species using the chick-a-dee call.

Presenter(s): Daniela Hernandez-Gil

Authors: Daniela Hernandez-Gil

Faculty: Dr. Richard Kernaghan

Perspectives on Kinship in the Juvenile Justice System and its Legal Outcomes

The Department of Juvenile Justice (DJJ) tries to effectively prevent, treat, and reduce delinquency in Florida, and has several juvenile courts designed to determine the adequate resources for each arrested individual. While the system is incredibly paternalistic and focuses on rehabilitation and community reintegration, it reflects the mainstream anglo-American culture and its assumptions. The legal outcome for each case can be influenced by many things, including the type of crime, personality of the defendant, family circumstance and history, race, sex, etc. and in Alachua county, juvenile Courts can use what could be cultural distinctions to punish and discourage what they deem potentially threatening behavior, from reprimanding parenting styles to openly challenging methods of communication and language. The Court system's inability to adopt culturally informed practices results in Juveniles and their families struggling to reintegrate into the community, which then affects rates of delinquency and ultimately commitment into a detention center. I observed over 170 hours of juvenile court hearings for this research project and noted family presence and adjudication rates. Additionally, I informally interviewed court actors and their opinions on the effect of kinship systems on legal outcome. This project is still in progress, but it has found that children that had non-traditional kinship systems were more likely to be adjudicated and committed to intensive programs, which reflects assumptions on what "good families" are. The 8th circuit's diversity initiatives have not addressed these disparities, and these assumptions can have several long-term effects on the lives of thousands of children in Alachua county.

Presenter(s): Taylor Hilton

Authors: Taylor Hilton, Kalyn Kearney, Jennifer Nichols

Faculty: Dr. Jennifer A. Nichols

Comparing Two Motion Capture Marker Sets for Measuring Thumb Kinematics

Motion capture, which records human movement by measuring the position of passive reflective markers, is widely used to study hand biomechanics. A standardized marker set has not yet emerged for the thumb due to the challenging nature of measuring kinematics small bones with complex motions. In this study, we examine differences in joint angles measured using two common thumb marker sets.

Six healthy subjects (3 male, 3 female) participated in this IRB-approved study. Additionally, for validation, joint angles were recorded using motion capture and a goniometer from an articulated hand model. During testing in both the human subjects and synthetic model, 12 reflective markers were secured to the thumb. These markers defined the "complex" marker set. Movement through two range of motion and two functional tasks were recorded. A 5-marker "simple" marker set was isolated during post-processing to evaluate to what extent differences in joint angles are attributed to the number of and position of the markers present. Joint angle values versus time were calculated using inverse kinematic simulations in OpenSim. Joint angles were compared by calculating average percent error and maximum difference across each task.

Results for this study that include all subjects, ground truth joint angle values measured from the physical anatomical model are still being established. Preliminary analyses indicate that regardless of task, the joint angles measured across the joints of the thumb are substantially different when using the complex versus simple marker sets. This study highlights the importance of marker set selection when analyzing thumb kinematics.

Presenter(s): Ryan Hossain

Authors: Ryan Hossain,*, Amlan Bhattacharjee, Abdias Noel, Kathryn L. Roy, William R. Dolbier, Jr. and Simon E. Lopez

Faculty: Dr. Simon Enrique Lopez D'Sola

Synthesis of Difluoromethyl Substituted α-Oxoketenedithioacetals using Photoredox-Catalyzed Reactions

α-Oxoketene S,S-acetals are 1,3-bielectrophilic synthons widely employed in the preparation of a diverse variety of substituted and fused aromatic and heterocyclic bioactive systems.1-3 Due to the high impact of organofluorine chemistry in the development of new drugs, agrochemicals and materials, the incorporation of fluorine itself or polyfluorinated groups into organic molecules is an increasing demand. Inspired in our previous work on the photoredox difluoroalkylation of olefins and indoles, we visualized α-oxoketene S,S-acetals as possible acceptors for the attack of a $\cdot CF_2H$ radical.4 The S-alkyl groups of the dithioketal can play a crucial role on the stabilization on both the generated radical intermediate and its corresponding derived carbocation, after a singlet electron transfer process (SET) occurs. Our lab has recently explored reaction conditions for the incorporation of a $\cdot CF_2R$ radical into an α-oxoketene S,S-acetals and here we present some of our results.

Presenter(s): Shannon Hurley

Authors: Shannon Hurley, Ellen Leslie Brown, Nicole Ruggiano, Marc E. Agronin, C. Victoria Framil Suarez, Lisa Roberts, Chrystine Kopcsik

Faculty: Dr. Ellen Brown

The Impact of Dementia Caregiving Duration on Caregiver Burden, Self-Efficacy, and Knowledge of Disease

Caregivers of people with dementia may experience a negative impact on their own wellbeing as a result of their caregiving role. The purpose of the current study was to examine the association between the length of time an individual has provided care for a loved one with dementia and factors including caregiver self-efficacy, burden, and knowledge of dementia. Eighteen participants completed a baseline interview using video teleconferencing software as part of an ARHQ (R21 HS026571) funded pilot study of CareHeroes, a new mobile application for caregivers. Participants completed the Patient Health Questionnaire -4 items (PHQ-4), Zarit Burden Interview (ZBI), Caregiver Self-Efficacy Scales, and the Alzheimer's Disease Knowledge Scale (ADKS). Participants were categorized by the duration of time they had served as caregivers (0-4 years, 5-9 years, and 10+ years). PHQ-4 scores and self-efficacy in controlling upsetting thoughts were positively correlated with the length of time a participant had provided care. ZBI scores were highest for the 5-9 year cohort and lowest for the 0-4 year cohort. ADKS scores and Self-Efficacy in Responding to Disruptive Patient Behaviors were highest for the 10+ year cohort and lowest for the 5-9 year cohort. Self-efficacy in obtaining respite was highest for the 5-9 year cohort and lowest for the 10+ year cohort. These results indicate caregivers in the middle of their caregiving journey experience unique struggles associated with low self-efficacy, a deficit of dementia knowledge, and high burden that should be targeted with interventions to promote caregiver education and wellbeing.

Presenter(s): Chidinma Iheanyi-Okeahialam

Authors: Chidinma Iheanyi-Okeahialam, Dr. Catherine Striley, PhD, MSW, MSE, Alyssa Falise M.S.P.H

Faculty: Dr. Catherine Striley

Testing the Association Between Social Support and Adverse Health Outcomes Among Older African American Adults

Introduction High social support can improve some health outcomes, including reducing hospital readmissions (Valtorta et al., 2018). To understand the association between social support and health among older African American adults, this analysis tests the association between perceived social support and chronic disease status.

Methods

UF HealthStreet community health workers recruited a sample of African American older adults, age 50 to 79, from North and Central Florida since 2011. Chi-square tests and multivariate logistic regression models tested whether social support (high or low) predicted chronic diseases status (cancer, diabetes, heart disease, COPD, and depression) among African American adults, given covariates.

Results

The sample included 1,079 African American older adults, 68.3% with a chronic disease and 31.7% without. Compared with African Americans over the age of 70, those 50-59 and 60-69 years old had lower odds of having a chronic disease (OR = 0.5, 95% CI = 0.3–0.8, p < 0.05) and (OR = 0.7, 95% CI = 0.4–1.1, p < 0.05), respectively. Individuals who had a chronic disease were less likely to indicate that they agreed or strongly agreed they have someone they can talk to about things that are important to them (OR = 0.6, 95% CI = 0.4–0.9, p < 0.05), when compared to those without a chronic disease. However, when food insecurity and having health insurance were added, this association was no longer significant.

Conclusion

Lower social support predicted chronic disease alone but not after controlling for lower economic resources among African American older adults. Given this social support may not be sufficient alone, as adversity may be overcoming the buffering effect of social support.

Presenter(s): Mark Itkin

Authors: Mark Itkin

Faculty: Dr. John K. Schueller

<u>Optimization of Structural Design for a Cube Satellite</u>

Thermal coatings are vital to space applications to ensure proper integrity and operation of components during takeoff and while in the vacuum of space. Advances in coatings are always being explored, including a newly developed coating from NASA. In order to test this new surface cover, a small satellite called PATCOOL was designed to send a small experiment into orbit to compare thermal coatings. To ensure the safety of the experiment on board, a satellite structure was necessary for the mission. This structure was created through multiple iterative cycles to meet requirements for takeoff, deployment, and assembly. In addition, structural FEA was performed to furthermore confirm the strength of the structural components. The satellite structure was then able to pass necessary vibration testing and survive both SpaceX Falcon 9 takeoff and deployment from the International Space Station.

Presenter(s): Nishka Jakkidi

Authors: Nishka R. Jakkidi, Joshua Gomes, Ravindra K. Sharma, Shiyu Li, Michelle L. Gumz, Rajesh Mohandas

Faculty: Dr. Rajesh Mohandas

<u>The Role of PER-1, ET-1 Axis in Regulating Endothelial Cell Function</u>

Objective: Results from major epidemiological studies give evidence to the essential role that dietary salt plays in the development of hypertension. When mice with global knockout (KO) of the circadian protein period 1 (PER1) are exposed to a high salt diet, they demonstrate increased endothelin-1 (ET-1) levels, impaired natriuresis, and hypertension. However, the cumulative sodium balance of PER1 KO mice is not different from control mice. Thus, we hypothesize that PER1 might mediate endothelial cell dysfunction and susceptibility to salt sensitive hypertension.

Materials and Methods: Human Umbilical Vein Endothelial Cells (HUVEC) were transfected with siRNA targeting PER1 or non-targeting siRNA controls. Endothelial cell function was assessed by measurement of nitric oxide bioavailability, proliferation, and migration. Nitric Oxide (NO) was quantified by DAF fluorescence, proliferation by EZQuant, and migration by measuring velocity and distance travelled by single cells using time lapse imaging.

Results: Nitric oxide bioavailability was increased with PER1 knockdown (Mean fluorescence 14433 ± 1344 *vs*. 7423 ± 472, $p<0.005$). Migration velocity and distance were decreased with PER1 siRNA compared to non-target controls, though not statistically significant (Mean distance 118.9 uM ± 11.39 *vs*. 138 uM ± 10.88, $p=0.2$) and (Mean velocity 42.3 uM/sec ± 3.98 *vs*. 46 uM/sec ± 3.6, $p=0.14$).

There were no differences in proliferation at 24, 48, or 72 hours (Fold change in cell numbers of PER1 siRNA treated cells compared to non-target controls were 0.87 ± .05 at 24 hours, 0.87 ± .09 at 48 hours, 0.90 ± .06 at 72 hours, p=NS).

Conclusions: Our results suggest that knock down of PER1 increases NO bioavailability and decreases migration of endothelial cells. Experiments are ongoing to delineate the role of ET- 1/ETA and ET-B in mediating the effect of PER1 on endothelial cell function.

Presenter(s): Veema Jhagru,

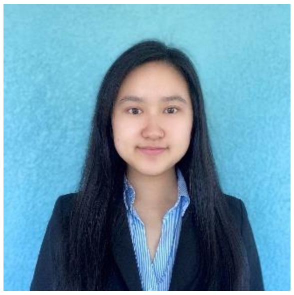
Authors: Veema Jhagru

Faculty: Dr. Christopher Smith

No future? How Japanese Women Authors Resist Reproductive Pressures through Literature

Japan's birth rate has been declining since the 70s, which has prompted critical responses from the Japanese government, particularly focusing on the economic reasons that lead couples to not have children. Since these policies have had no significant impact on the falling birth rate, social stigma has followed rhetoric from the government that blames women who do not want to reproduce as selfish.

This paper looks at four novels written by Japanese women which have been translated and published in English to demonstrate their written resistance to the general discourse of Japan's birth rate. By analyzing Aoka Matsuda's Where the Wild Ladies Are, I look at the challenges of being a woman in the context of singlehood, marriage, and motherhood. In Hiromi Kawakami's Strange Weather in Tokyo, I delve into a woman's age-gap relationship as a means to evade society's pressure on her to reproduce. I argue that Sayaka Murata's Earthlings is a critique on society's disposal of singles who do not want children. Lastly, I analyze Mieko Kawakami's Breasts and Eggs as a young girl enters puberty and rejects the development of her reproduction capabilities. The second part of Kawakami's novel, I argue, is to directly critique Japan's policies on nontraditional reproduction such as artificial insemination and surrogacy. The culmination of these four novels result in a strong critique of the Japanese government's narrative of the falling birthrate which places blame on women for being too selfish to reproduce.



Presenter(s): Wen Jiang

Authors: Wen Jiang, Jorge Valdés Kroff

Faculty: Dr. Jorge Valdés Kroff

Examining Language Interactivity through Classifier Masked Primes in Chinese-English Bilinguals

One universal characteristic of human languages is grammatical agreement dependencies. In Mandarin Chinese, classifiers, or measure words, are an obligatory grammatical class used to characterize a quantified noun. The classifier is inserted in between the numeral and the noun (i.e., 一张票 yī zhāng piào, one ticket). English lacks classifiers, so their use in Chinese may lead to cross-language influence for bilinguals and second language learners. Previous research has investigated language interactivity in bilinguals, commonly through the masked priming lexical decision task (LDT), a psycholinguistic task where participants decide if a sequence of characters form a real word or not. This study investigated Chinese-English bilinguals at the University of Florida (n= 24). The experimental group consisted of Chinese-dominant bilinguals who have been in an immersive English environment for at least one semester. The control group included monolingual or dominant English bilingual speakers with another language other than Chinese. Participants completed two LDTs in a within–subjects design. Part 1 featured Chinese (L1) classifier masked primes in an overt English (L2) LDT. Part 2 featured L1 translated masked primes sharing a common classifier with target words in the overt L2 LDT. The results indicated no interaction effect between group and congruency conditions in either part ($p = 0.334$; $p = 0.889$). These findings reveal no effect of classifier primes in Chinese-English bilinguals, suggesting minimal, or the absence of cross-language influence in this context.

Presenter(s): Zeyuan Jin, Charles Liang

Authors: Zeyuan Jin, Chenyu Liang, Miao Huang, Sydney Yu, Justin Zhang, Shu Wang, Dietmar Siemann, Xin Tang

Faculty: Dr. Xin Tang

Unique dimension-dependent propagation of biochemical signals in cancer spheroids

Calcium signals have critical roles at different stages of human tumor progression, including tumorigenesis, tumor growth, angiogenesis, invasion, and metastasis. A better understanding of calcium code in tumor cells and its pathophysiological consequences on tumor progression and metastasis can provide important insights for next-generation anti-cancer therapies. Here we leverage genetically encoded calcium indicator (GECI) to visualize the inner working of calcium dynamics in human cancer cells. We demonstrate that both human colon and prostate cancer cells generate more spontaneous intracellular calcium transients (CTs) and intercellular calcium waves (CWs) compared to normal epithelial cells. Efforts are underway to investigate whether the propagation of calcium waves shows different characteristics as a function different microenvironmental conditions, including substrate stiffness, 2D/3D environments, and geometric patterns. Home-built MATLAB codes are developed to automatically recognize and systematically analyze the propagation of CWs to quantify the spatial-temporal characteristics, which provides unprecedented insights in dissecting the underlying molecular mechanisms. In vivo experiments are undergoing to understand how these unique calcium activities influence human cancer progression. Together, this research helps understand the cause and consequence of calcium signaling in tumors of colon and prostate cancer patients, potentially contributing to the development of novel anti-cancer therapy.

Presenter(s): Sarah Joe

Authors: Sarah Joe, Dominick Padilla, Bala Rathinasabapathi

Faculty: Dr. Bala Rathinasabapathi

Characterization of Chlorophyll Mutations in Pepper

Mutations affecting chlorophyll levels of immature fruit are known in Pepper (Capsicum sp.). Thus pepper fruit with differing shades of green color are available in the market. Understanding the nature of and inheritance of traits related to immature fruit coloration is critical since this trait could affect both consumer acceptance of the vegetable and postharvest keeping quality. In this study, we tested whether green color of the leaf is correlated to green color of the immature fruit. Color of fully expanded leaves of a variety of peppers grown under greenhouse conditions and their corresponding immature fruit were measured using a handheld Kodak color meter. The -a* value, indicative of green spectrum, measured from leaves and immature fruit were correlated using linear regression. This poster will describe the degree of concordance between the leaf green color and fruit green color and the advantages of using color meter readings for screening pepper germplasm for immature fruit color.

Presenter(s): Sofia John

Authors: Sofia John, Dr. Matthew Wheeler, Dr. Luis Sordo Vieira

Faculty: Dr. Luis Sordo Vieira

Healing and Fibrosis: an Agent-based Model

While healing and repair are part of the body's normal processes, pulmonary fibrosis, or scarring of lung tissue, manifests when these processes get dysregulated after a pulmonary injury. Persistent remodeling and scarring of the lung change its architecture and consequently reduce its function. Patients diagnosed with idiopathic pulmonary fibrosis generally have a poor prognosis after identifying their condition. There has been a multitude of phenomenological events linked to the development of pulmonary fibrosis from viral infections to smoking habits to cancer therapies, however, the exact mechanisms which are disrupted remain unknown.

Agent-based modeling provides a unique opportunity to identify these initiating mechanisms by replicating the behaviors of cell types in biology in a computational platform. In order to better understand pulmonary fibrosis, we are developing an agent-based model that considers the interplay of macrophages, fibroblasts, and alveolar epithelial cells in the development of fibrotic disease after sterile injury. By studying the interactions of these cell types and their production of pro-inflammatory cytokines, anti-inflammatory cytokines, reactive oxygen species, and collagen we can better which dysregulated mechanisms leads to fibrosis. The validity of the model will be further verified by comparing the emergent behavior of the model to known clinical hallmarks of fibrosis.

Our goal with building the agent-based model is to use it as a virtual laboratory that can yield hypotheses of mechanisms driving pulmonary fibrosis and yield hypotheses of therapeutics that can prevent fibrosis.

Presenter(s): Abigail Johnson, Rosie Powell, Kelly Sowers, Marcus Amoranto, Jason Amachree

Authors: Abigail Johnson, Rosie Powell, Marcus Amoranto, Kelly Sowers, Jason Amachree

Faculty: Dr. Jennifer Doty

Family Member Incarceration and its Effect on ACEs

Adverse childhood experiences, such as experiencing the incarceration of a family member, have an immense negative impact on an individual's future health and wellbeing. In fact, the incarceration of a family member can be explained through ambiguous loss theory, which applies to losses that are particularly stressful and traumatic due to lack of closure (Brown, 2020). However, there is a lack of research on the impact of family member incarceration on Alachua County students with regards to increased risk of additional ACEs. We conducted a quantitative analysis of the survey results of Alachua County students (n= 600, 50.4% female, grades 9-12, 41.7% White and 23.7% African American), of which 161 students had an incarcerated family member. There are small positive correlations between having an incarcerated family member and each ACE, but there is a relatively large positive correlation of 0.57 between family member incarceration and the total number of ACEs, suggesting those with incarcerated family members are more likely to have multiple ACEs. Understanding the additional risk factors and challenges that students experiencing family member incarceration in Alachua County face can help inform supports and interventions to better serve students in our local community.

Presenter(s): Mia Johnson

Authors: Mia Johnson, Jacqueline A. Hobbs

Faculty: Dr. Jacqueline A. Hobbs

Predicting the future of mental health: how will in utero COVID-19 infection influence psychiatric illness in future generations?

Objectives: There is limited research on the potential psychiatric effects of in utero COVID-19 infection. There is evidence that COVID-19 infection can lead to obstetric complications and adverse neonatal outcomes. Obstetric complications and neurodevelopmental insults such as viral infections have been implicated in the development of some mental disorders including schizophrenia. We aimed to address the possible mechanisms and influences related to in utero infection that could increase the risk of future mental illness development.

Methods: Searches were conducted in the databases PubMed, Embase, and PsycINFO for studies involving COVID-19 infection and pregnancy, obstetric complications, and psychiatric complications. Any external information outside of these search terms was sourced from these databases.

Results: Several studies found evidence of significantly higher incidences of preterm delivery and cesarean section associated with maternal COVID-19 infection. Other noted adverse birth outcomes included fetal distress, stillbirth, low birth weight, neonatal asphyxia, and pre-eclampsia. These birth outcomes tend to occur in the third trimester, a crucial period for neurodevelopment. Additionally, there have been occurrences of vertical transmission of COVID-19.

Conclusion: It is plausible that in utero COVID-19 infection could increase the risk of mental illness development in the offspring. The observed implications of COVID-19 along with known neurodevelopmental complications of in utero infection provide multiple processes that could impact the future mental health of the offspring. This increased risk could arise from neonatal outcomes associated with COVID-19 infection, the consequences of maternal infection on the fetus, or direct viral infection of the fetus and fetal brain.

Presenter(s): Kamini Kabilan

Authors: Kamini Kabilan, Carlos Kose Jr., Dayane Oliveira, , Jean-François Roulet, Patricia Pereira, Mateus Garcia Rocha

Faculty: Dr. Mateus Rocha

Development of an algorithm to predict the final color of leucite-reinforced ceramic veneer restorations

Objectives: The aim of this study was to develop an algorithm to predict the final color of leucite-reinforced glass CAD/CAM ceramic veneer restorations based on the substrate shade, ceramic shade, thickness, and translucency. Methods: leucite-reinforced glass-ceramics in 4 different shades were sectioned in thicknesses of 0.3, 0.5, 0.7 and 1.2 mm. The CIELab coordinates of each specimen were obtained over four different backgrounds (black, white, A1 and A3) interposed with an experimental resin cement using a calibrated spectrophotometer. The color change (CIEDE2000) values, as well as all the CIELab values for each one of the experimental groups, were submitted to a multivariate linear regression. The regression model was adjusted according to the weights of each dependent variable to achieve the model best-fitting. All functions were programmed into an excel spreadsheet for the execution of the algorithm automation to predicted final shade of the ceramic restoration. Results: Different substrates, ceramic shades, and thicknesses influenced the L*, a* and b* of the final restoration. From all variables, the substrate influences the final ceramic shade more, followed by the ceramic thickness and the L*, a* and b* of the ceramic. The mathematical models were able to generate functions to predict the shade of the ceramic restoration according to the substrate shade, ceramic shade and thickness. Significance: The algorithm developed in the study can predict the final colors of the ceramic restorations made with leucite-reinforced glass CAD/CAM ceramic HT and LT, based on the color of the substrate and different thicknesses.

Presenter(s): Armaan Kalkat

Authors: Armaan Kalkat, Eleonora Rossi

Faculty: Dr. Eleonora Rossi

The Effect of Language Context on Decision Making

Our decisions can be shaped by the language in which we process information. Previous research found that bilingual speakers making decisions in their second language (L2) as opposed to a native language show more utilitarian thinking and less risk aversion. For example, when participants see the "Trolley Problem" in their L2, they are more willing to sacrifice one life to save five. Prominent theories in the field propose that this is because processing in an L2 is less emotional or less likely to trigger norms that prohibit antisocial behavior. To test these hypotheses, we surveyed 122 dominant native English speakers (with differing knowledge of other languages) using a series of 10 moral dilemmas of varying intensity. Participants rated how morally acceptable specific actions are, reported their emotional reactions to each situation, and completed a verbal fluency task, risk-taking measure, and a language background questionnaire. Preliminary results show that the scenarios elicited a wide range of acceptability judgments which were not always correlated to emotional reactions, although some data has yet to be analyzed. While data collection is ongoing for participants who will complete the task in their L2, the current results suggest that social and moral norms may be more influential for these decisions than purely emotional responses. However, the relative weight of these factors likely differs between scenarios. Further analyses will compare the native English group and L2 groups and aim to understand if language experience within the native English speakers explains part of the observed variability in judgments.

Presenter(s): Bhargav Kansara

Authors: Bhargav Kansara, Yuzhi Wang, Nicholas Hiers, Lu Li, Tianqi Li, Peike Sheng, Jessi Effinger-Morris, Mingyi Xie

Faculty: Dr. Mingyi Xie

Visualization of m6A-modified non-coding RNA levels in cancer cells

N^6-Methyladenosine (m6A), or the methylation of adenosine at base position 6, is a prevalent and well-studied modification of genetic material. This modification plays a myriad of roles in RNA, including but not limited to localization, stability, translation, splicing, and determining higher-order structure. More importantly, it has also been implicated in tumor cell proliferation. But while there is extensive research on m6A modifications in messenger RNA, relatively little is known about its role in non-coding RNAs. Previous research from others has shown that 7SK, an abundant snRNA, has high levels of m6A in lung cancer cells. This raises questions about the abundance of m6A modifications on different non-coding RNAs and whether there is any difference in m6A levels on non-coding RNAs between different cancer cell lines. To investigate these questions, we visualized m6A levels on non-coding RNAs smaller than 300 nts through m6A western blots. Here, we found that although there are abundant levels of m6A modifications in all our cell lines, there is no significant variance in abundance. In addition, when overlaying signal from northern and western blotting, we failed to observe any m6A modification in 7SK or microRNAs. These data conflict with previous reports from other groups indicating high m6A abundance in these RNAs. Further investigation into the presence and role of m6A in non-coding RNAs is still needed to understand its place in cancer proliferation.

Presenter(s): Jenna Kasten

Authors: Jenna Kasten, Bailey Oliver B.S., & Sterling W. Sheffield Au.D., Ph.D

Faculty: Dr. Sterling Sheffield

Speech Perception with Interleaved Frequencies Across Ears in Cochlear Implants

Objectives: Cochlear-implant (CI) users have a difficult time understanding speech in noisy environments, partly because of CI users' poor spectral (frequency) resolution. Interleaved processing in CI users may improve spectral resolution and speech perception but may impair spatial hearing. The current study examined the interaction of spectral and spatial-hearing benefits in multi-talker environments.

Design: Forty-two normal-hearing adults participated in the study. Participants completed three experiments: spectral-temporally modulated ripple test (SMRT), sound localization, and speech recognition. Each participant was tested using five processing strategies, an unprocessed (No CI), and 4 CI simulated conditions. The four CI simulated conditions used were traditional CI, interleaved electrodes, interleaved acoustic filters, and interleaved narrow channels.

Results: For localization, there was little to no difference in performance for the CI simulated conditions. Participants had the best spectral resolution in the narrow interleaved conditions and there was a generally better performance with two ears than one ear. Results showed some 2-ear benefit in the interleaved conditions for speech recognition. All interleaving decreased spatial benefits for speech recognition.

Conclusions: Interleaving narrow filters or frequency regions can improve spectral resolution, but might not improve speech recognition. Interleaving had minimal effects on localization, but reduced spatial benefits for speech recognition, indicating spatial effects of interleaving are better revealed in complex environments. Participants were able to integrate interleaved signals across ears for some benefit in speech recognition. Interleaving narrow filters can increase the number of effective channels and spectral resolution can be integrated across ears for some benefit, in bilateral CIs.

Presenter(s): Simon Kato

Authors: Simon Kato, Sara Pollock

Faculty: Dr. Sara Pollock

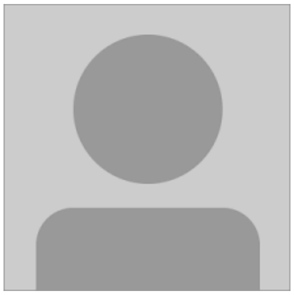
Extrapolated Restarted Arnoldi for Solving the PageRank Problem

This project investigates how extrapolation of the Arnoldi algorithm can accelerate the computation of the dominant eigenvector of the PageRank algorithm.

The PageRank algorithm has famously been used by Google to rank web pages by assigning a reputation which is based on the quantity and quality of links to said web page. The underlying process in ranking the web pages is solving an eigenvalue problem with a Markov matrix, the scale of which only allows for matrix-vector products.

The focus will be on tuning the extrapolation parameter for an extrapolated version of the Restarted Arnoldi algorithm. The PageRank problem provides knowledge of the two dominant eigenvalues and much is known about the behavior of the PageRank convergence. The knowledge will be used to find an extrapolation parameter which works well in practice.

The paper concerned itself with finding an theoretically sound value of the extrapolation parameter for the Restarted Arnoldi algorithm which will work well in practice for web matrices which is a subset of the stochastic class of matrices.



Presenter(s): Selin Kavak

Authors: Sara Agnelli, Selin Kavak, Morgan Collins, Aimee Vance, Sofia Concepcion, Shelbee Mitton, Jordan Hacker, Cheyla Llorens, Rhiannon O'Donnell, Samantha Diaz, Lissette Martinez, Mason Bui, Bailey Busher, Stefany Marjani, Bianca Mateo, Tej Patel, Johanna Rizo

Faculty: Dr. Sara Agnelli

How Are the Arts and Humanities Used in Medical Education at UF College of Medicine?

The “Circular Health Humanities Lab” has been working on progressing medical and pre-medical education at the University of Florida.

We believe that the arts and the humanities can play a unique and unrealized role in preparing physicians for 21st-century health challenges. Our overarching goal is to understand what opportunities and obstacles remain to support the integration of these disciplines along the medical education continuum.

The purpose of our study is (1) to describe what “Health Humanities” is and (2) how/if it is integrated in the medical curriculum at UF. The immediate goal of this study will be to describe - through a survey/questionnaire - if students who are already enrolled in the University of Florida College of Medicine, have been exposed to “Health Humanities” and how.

Our impression is that UF medical students seem interested in learning more about Health Humanities, but they lack the time to do it. What if we consider the pre-med/pre health track? In this regard, we believe that such a study will help advocate for a Health Humanities minor at UF. Therefore, the research aims also to provide ideas and suggestions to the UF undergraduate pre-health curriculum based on information collected from the UF College of Medicine.

This research is being conducted through an IRB and is being completed through interviews and surveys of medical students and medical professionals with insight from various faculty members involved in both undergraduate and medical education at UF.

Presenter(s): Alex Keiser

Authors: Alex Keiser

Faculty: Dr. Jonathan Edelmann

Nagarjuna's Refutation of the Person

This paper examines two arguments from the Personalist (Pudgalavadin) school of Indian Buddhist philosophy that attempts to establish the existence of the person, or pudgala. I then offer two responses from the Madhyamaka philosopher Nagarjuna that refute each of their claims. The first argument of the Personalists is that the existence of a person must be asserted to explain what suffers in samsara, the cycle of birth and death, and what is reborn and enjoys or suffers the fruit of karma. According to them, the existence of the person can be found by examining its supports, which are the five psychophysical constituents of a being. Secondly, the Pudgalavadins also believe that the person can be found by analyzing the transmigration between life and death. They posit that the person is a necessary entity to explain transmigration occurs and how karmic fruit follows between lives. Nagarjuna, however, in response to the first Personalist argument, asserts that there is no person behind the support, and that karmic activity and transmigration occurs without the need for one. Furthermore, in response to the second point, he believes that in reality there is no suffering because of the nonexistence of the person.

Presenter(s): Joshua Kempfert

Authors: Joshua Kempfert, Douglas E. Spearot

Faculty: Dr. Douglas Spearot

Dislocation Mobility in Symmetric Tilt Aluminum Grain Boundaries

Interactions between dislocations and grain boundaries (GBs) greatly influence the strength of metallic materials. One observed interaction is the absorption of a dislocation into a GB, which changes the dislocation core structure and the hypothesis is that this will also change its glide mobility. Thus, the objective of this work is to obtain stress-velocity relationships for select GB dislocations using molecular dynamics simulations. Symmetric tilt GBs are prepared within a fully periodic simulation cell using a gamma surface construction procedure. Lattice screw dislocations are constructed by displacing atoms with a modified Volterra displacement field. Dislocation cores are positioned at the GBs, causing them to absorb and sometimes dissociate through energy minimization. In each simulation, a constant shear stress in the Burgers vector direction for the lattice screw dislocation is applied, and the resulting glide velocity is measured. The stress-velocity curves for the simulated GB dislocations are distinct from each other and that of a lattice screw dislocation, both in their critical glide stresses, phonon drag and nonlinear stress-velocity regimes. This suggests that absorbed dislocation mobility is influenced by GB structure. Ultimately, this work contributes to our understanding of mobility laws for GB dislocations, which might see use in higher-scale dislocation dynamics simulations.

Presenter(s): Saba Khan

Authors: Saba Khan, Kiana Saadatmand, Quaratulain Hassan, Raymond Hautamaki, Rani Ashouri, Josh Lua, Sylvain Doré

Faculty: Dr. Sylvain Dore

Benefits of vitamin D supplementation to attenuate TBI secondary injury

Vitamin D supplementation has been shown to improve outcomes for patients suffering from various illnesses such as stroke and cancer. On the other hand, vitamin D deficiencies have been associated with longer hospital stays, greater severity of symptoms, and death in some complex cases. Due to vitamin D's burgeoning role in improving patient outcomes, a new sector of research is focusing on the lesser-known implications of vitamin D on health. Traumatic brain injury (TBI) affects approximately 69 million people worldwide per year. Here, we summarize the current scientific understanding of vitamin D dynamics with TBI to elucidate a potential way to lessen the cascade of secondary damage after an initial insult, intending to improve overall patient outcomes. Because vitamin D supplementation has been correlated with better clinical outcomes in other pathologies involving immune and inflammatory molecules, it is important to study the implications of vitamin D deficiency (VDD) and supplementation on TBI outcomes. Research on vitamin D supplementation in TBI remains in the preliminary stages. There is still much to learn about vitamin D deficiency, dosage, variants of supplementary forms, mechanisms, and its role in TBI.

Depts of Anesthesiology, Neurology, Psychiatry, Pharmaceutics, and Neuroscience, Center for Translational Research in Neurodegenerative Disease, McKnight Brain Institute, UF-COM, Gainesville, FL. sdore@ufl.edu

Funding: This work was partially supported by grants from the NIH, the DOD, and the UF-COM-Anesthesiology.

Presenter(s): Kaiana Kibler

Authors: Kaiana Kibler, Haolan Zheng, Wayne Giang

Faculty: Dr. Wayne Giang

<ins>Training and age Effects on Visual Attention during Partially Automated Driving</ins>

Introduction: Techniques for evaluating training outcomes are usually knowledge or behavior based, but where participants look while driving can provide insight on their understanding of the system after training.

Objectives: The objective is to analyze what participants look at during an Adaptive Cruise Control (ACC) simulation study to examine how our ACC training program influences gaze allocation for individuals of different ages while driving.

Methods: Visual allocation data was gathered for older (n=19; aged 65+) and younger (n=20; aged 18-25) participants. Participants were randomly assigned to one of two training groups: basic (n=20; similar to owner's manual) or comprehensive (n=19; basic + driver's role and responsibilities + levels of automation). Eye tracking data was collected, and visual attention data (glances toward speed signs) was coded manually by research assistants. Data was analyzed using descriptive statistics and visualizations.

Results: In the ACC on condition, participants had a higher mean number of glances per sign but ignored more of the speed signs compared to the manual condition. For older drivers, the comprehensive training increased the mean number of glances, as well as the number of signs glanced at throughout the drives. For the younger group, the comprehensive training lowered these measures.

Conclusion: Engaging the ACC system influences the way users allocate their visual attention while driving. The comprehensive training did not have the same effect on the two age groups. Further work should be done to verify that eye tracking is an appropriate measure for training outcomes and understanding.

Presenter(s): Josie Kilburn

Authors: Josie L. Kilburn (1), James H. Thorpe (1), John F. Stanton (1), David Feller (2), P. Bryan Changala (3), David H. Bross (4), Branko Ruscic (4)

Faculty: Dr. John Stanton

Applications in Super High Accuracy Thermochemistry Using KS-HEAT

Composite coupled cluster methods are popular computational methods used in the prediction of molecular enthalpies of formation, total atomization energies, bond energies, and other thermochemical properties. HEAT, or high-accuracy extrapolated ab. initio thermochemistry, is one of several prevalent methods (among others such as Wn, FPA, and FPD). As the need and capability to achieve high accuracy computed thermochemical values has increased throughout time, the standards for accuracy in the field have tightened. In the early 2000s, the target accuracy changed from "chemical accuracy" of 4 kJ/mol (~350 cm-1) to "sub-chemical accuracy" of 1 kJ/mol (~80 cm-1), which is regularly achieved or exceeded using the aforementioned methods. Given today's advances in theory and computer hardware, an extension of HEAT, called KS-HEAT, was developed with the intent of pushing the bounds of accuracy for small molecules, targeting the "semi-spectroscopic" range of 20 cm-1, a four-fold reduction in error.

In a recently published work, KS-HEAT was reported to reproduce ATcT (TN v. 1.124) 0K enthalpies of formation of HF, CO, N2, and H2O to within 13 cm-1. In this work, KS-HEAT's performance on a few problems of historical interest is reported. The ammonia inversion barrier, methylene singlet-triplet state energy gap, water dimerization energy, and bifluoride bond energy are investigated.

Presenter(s): Emily Kim

Authors: Emily H. Kim, Jessie A. Pelosi, W. Brad Barbazuk, Emily B. Sessa

Faculty: Dr. Emily Sessa

Gene expression patterns between gametophyte and sporophyte life phases and the genetic forces that drive sex determination in ferns

There are two distinct life stages of ferns: the reduced, ephemeral gametophyte and the large, leafy sporophyte. Ferns are unique among land plants in that these life phases are nutritionally independent. However, the mechanism for how the fern genome produces vastly different life stages is unknown. Furthermore, much is unknown regarding the genetic regulation of sex determination, which occurs in the gametophyte life phase, because ferns, unlike other plants and humans, do not have sex chromosomes. Despite the two life phases being morphologically and functionally different, recent studies in ferns have found that the genes expressed in each life phase are similar. To start unraveling the genetic underpinnings that drive differences in life phases and sexual determination in ferns between gametophyte and sporophyte life stages, we will explore differential gene expression (DGE) and alternative splicing (AS) using Dryopteris ludoviciana as our study system. We will also explore DGE and AS between male and female gametophytes to see if gene expression or AS may be responsible for their functional differences. RNA will be extracted from lab-grown sporophytes and gametophytes to sequence nine RNA libraries (three sporophyte, three male gametophyte, and three female gametophyte) to a depth of 20-25 million paired-end reads. A reference transcriptome will be generated using these libraries and reads will be mapped to the reference to analyze gene expression and alternative splicing. Using this methodology, we will explore the genetics behind the differences between gametophytic and sporophytic life phases and the sex determination in ferns.

Presenter(s): Hannah Kim

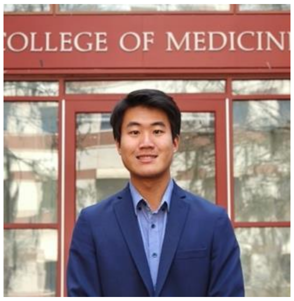
Authors: Hannah Kim

Faculty: Dr. Rae Yan

Depicting Black and Asian-American Race Relations in Film

The division between the Black and Asian American communities is a contentious topic in the analysis of critical race studies. The question of how Asian Americans have aggravated the gap in the American racial division has been widely debated, with Asian-American scholars such as Wesley Yang, Frank Wu, Ellen Wu, and Cathy Park Hong arguing whether complicity with anti-Blackness is to blame.

In my paper, I will analyze five films and a television series by Black and Asian American creators that speak to the subject of complicity to racist behavior: Jordan Peele's Get Out (2017), Spike Lee's Do the Right Thing (1989) and Da 5 Bloods (2020), Justin Chon's Gook (2017), Eddie Huang's Boogie (2021), and Netflix series The Chair (2021). These films examine race relations within interconnected Black and Asian communities, the social and interpersonal impacts of harmful racial stereotypes, and the shared experiences of POC during historical moments of crisis including the fallout of the Vietnam War, the Rodney King murder, and the rise of Black Lives Matter. I argue that these films bring forward shared terms and concepts about the fantasies and realities of racial relations in modern-day America. Through this project, I assess why Black and Asian American groups are depicted as unable to overcome differences despite the ways they are similarly defined and discriminated against and explore how filmmakers engage in difficult candid discussions about what unification requires.



Presenter(s): Hans Kim

Authors: Taylor McElroy, Hans Kim, Sung Min Han

Faculty: Dr. Sung Min Han

No Nonsense: Investigating the role of nonsense-mediated mRNA decay in aging and mobility using a Caenorhabditis elegans model system

Aging is characterized by the progressive decline of physiological processes and diminished function. Mobility decline is a hallmark of aging that negatively impacts quality of life. RNA homeostasis also declines in various tissues during aging, including the neuromuscular system, suggesting a potential role in age-related mobility decline. The nonsense-mediated mRNA decay (NMD) pathway is a conserved RNA surveillance system that could be decreased with age. NMD prevents the expression of aberrant mRNAs containing premature termination codons (PTCs). NMD also degrades transcripts containing long 3' untranslated regions (UTR), upstream open reading frames (uORF), and retained introns. We do not know how the NMD pathway affects mobility decline and neuromuscular system integrity during aging. Our hypothesis is that decreased NMD activity in motor neurons and muscle leads to loss of mobility. In Caenorhabditis elegans (C. elegans), aging decreases NMD activity in various tissues, including the muscles. We employed C. elegans to investigate the consequences of nonfunctional NMD pathway on mobility during aging. Worm strains with loss-of-function mutations in key components of NMD were used: Upf1/smg-2 and smg-5. Lifespan, mobility, and paralysis assays were conducted. Smg-2 and smg-5 mutants both had decreased lifespans. The mutants also had significantly lower average speed on Day 1 of adulthood. On Days 1, 5, and 9 of adulthood both smg-2 and smg-5 mutants had significantly lower thrashing rates in liquid. Smg-2 exhibited a strong resistance to aldicarb paralysis while smg-5 showed little to mild resistance. These results indicate that the NMD pathway is involved in aging and mobility. Thus, clarifying the role of NMD in gene expression with associated functional changes may provide a new understanding of age-related mobility decline and new therapeutic strategies.

Presenter(s): Aecha Kimball

Authors: Aecha Kimball, Edward Braun, Rebecca Kimball

Faculty: Dr. Rebecca Kimball

Do mitochondrial genomes in galliform birds show evidence of adaptation to high altitude?

The energy provided by the Mitochondria is essential for nearly all our biological processes, by taking glucose and oxygen to make energy in the form of ATP. Given low oxygen levels at high altitudes, changes in mitochondria might be expected when looking at adaptations to high altitudes for Galliform Birds. These species of birds are distributed from sea level to above 4500 meters. Utilizing the complete mitogenomes for our 114 species, we looked for positive selection with models that look for changes along specific branches, which we chose as those associated with shifts to high altitude, and site models, that look overall, without respect to altitude. Our branch models found no positive selection, only in our site models could we see some sites for positive selection. Studies have found support for changes in mitochondria that are associated with shifts to high altitude, including in galliform birds. However, they had less than one-fifth of the sample that we now have. This smaller subset of Galliforms perhaps led to differing results, as the larger number of species studied aided us in having an improved data set regarding Galliform variety. They consist of a wide variety of species, from birds such as the common quail to more unique species like the Capercaillie. This explains how they differ in such a number of ways, from inhabited altitude, body size, and metabolism. There are a multitude of other traits that may have changed with the shift to high altitude.

Presenter(s): Alec Kissoondyal

Authors: Alec Kissoondyal

Faculty: Dr. Jonathan Edelmann

Poetic Reflections of Reality: Soma in the Rigveda

Soma, the mysterious substance mentioned in the Vedas, was a key part of early Hindu rituals. Soma was known for evoking intense feelings of bliss and exhilaration in those who consumed it. Its stimulating effects were potent enough to keep priests awake for extended periods of time while simultaneously keeping them lucid enough to recite complex poetic verses for hours on end. The identity of soma has been lost to history, but the importance of the substance is well established in the poetic hymns of the Vedas. In the Vedas, soma is revered as a deity as well as a substance and is associated with symbols that represent divinity and power, such as eagles and mountain peaks.

Over the course of my CLAS project research, spanning from Fall 2021 to Spring 2022, I have conducted extensive research into the poetic descriptions of soma in the Rigveda and other Hindu texts. I have also researched numerous secondary sources written by experts in Indian religion such as Michael Witzel and Frits Staal to develop a better understanding of the historical, cultural, and poetic significance of soma.

In my Spring Symposium presentation, I will argue that the poetic hymns dedicated to soma in the Rigveda are poetic reconfigurations of historical processes surrounding the procurement, preparation, and consumption of soma. With this project, I hope to contribute to the discussion surrounding soma and its importance in the evolution of Hindu rituals and philosophy.

Presenter(s): Rohan Kommireddy, Nabil Chowdhury

Authors: Dr. Jose Cardenas, Charlene Pringle, Rohan Kommireddy, Nabil Chowdhury

Faculty: Dr. Charlene Pringle

Assessing the clinical changes of bronchiolitis after easing COVID-19 precautions

The Covid-19 pandemic was officially declared on March 11, 2020. In response, many countries including the United States implemented lockdowns, social distancing, mandatory mask usage, other precautions around late March of 2020. In the US, many lockdown restrictions started to be slowly lifted from late April to early 2020, with a varying degree of other precautions remaining in place depending on the State. In Florida, restrictions were slowly eased throughout the summer with all capacity restrictions eventually being lifted by September 25, 2020. The change in the implemented precautions to a historically unusual and unexpected change in the incidence of respiratory infections.

Bronchiolitis, which is most commonly caused by Respiratory Syncytial Virus (RSV), is the most common lower respiratory infection in children younger than 2 years. Typically, bronchiolitis presents with seasonal outbreaks in the fall-winter months in the Northern Hemisphere including the US. However, there was an unusual upsurge is RSV cases from March through June, 2021 that was reported in the US.

This study is aimed to determine if this upsurge of RSV cases from March through June, 2021 did, in fact, have increased severity of illness and support requirements compared with the typical seasonal spike of bronchiolitis from December 2019 through February 2020 at the UF Shands Pediatric Intensive Care Unit. Specifically, the study is assessing whether these subjects are having an increased length of stay in the PICU, increased hospital stay, increased viral co-infections, and/or more pronounced severity of illness compared to a similar pre-pandemic time frame.

Presenter(s): Nisha Kotta

Authors: Nisha Kotta, Julie Jameson, Joshua Peeples, Henry Lutz, Alina Zare, and Whitney Stoppel

Faculty: Dr. Whitney Stoppel

Examining Properties of Silk Fibroin Sponges in vivo and in vitro

One of the greatest challenges when designing biomaterials for tissue engineering is achieving a balance between cellular infiltration and scaffold degradation. In this work, we discuss in vivo and in vitro projects done to examine and characterize silk fibroin sponges created from Bombyx mori silkworm cocoons. Firstly, following an in vivo study, we created ground truth labels and used them to train a machine learning model to identify regions of interest (such as adipose tissue) in sections of explanted silk fibroin scaffolds. This allowed us to determine how different fabrication components (for example, collagen I or vascular endothelial growth factor) affect cellular infiltration into the scaffold, as well as how these components (or combinations of them) can influence cell type. Secondly, we created a variety of silk fibroin sponges and determined their degradation rates in protease XIV enzyme solution. There are several parameters we can change when creating these sponges; some examples include degumming time, silk concentration, freezing temperature, and water annealing time. Modifying these creation parameters impacts the rate at which these sponges degrade in vitro. These results allow us to gain a better understanding of how the protease XIV enzyme interacts with the silk fibroin protein under different fabrication conditions, and ultimately provides insight into how these sponges may degrade within the body. Together, these projects speak to the potential of using silk fibroin sponges as a biomaterial for regenerative medicine purposes.

Presenter(s): Kendall Kristjanson, Luiza Cunha

Authors: Kendall Kristjanson, Luiza Cunha, Apollonia Lysandrou, Scott Teitelbaum, Ben Lewis

Faculty: Dr. Ben Lewis

<u>Social Support Impacts Pain-Related Outcomes Among Individuals in Treatment for Substance Use Disorders</u>

Background: An emerging literature highlights chronic pain as both an important antecedent and consequence of substance use disorders (SUDs). Although interventions directed to reducing pain may improve treatment outcomes, few investigations of potential intervention targets have been conducted in SUD treatment settings. The current project examines the relationship between pain and social support during early abstinence. Consistent with studies in community samples, we hypothesized an inverse relationship. However, lacking extant literature, we examined this potential difference as an empirical question. To capture potential changes in these relationships across time, we conducted longitudinal analyses.

Methods: The sample consisted of 533 partially hospitalized patients in treatment for SUD at Florida Recovery Center (FRC). Assessments of social support (Multidimensional Scale of Perceived Social Support; MSPSS) and pain intensity (from NIH PROMIS measure) were conducted at treatment initiation, 30 days, and treatment discharge.

Results: Longitudinal models revealed that total social support remained a significant predictor of pain intensity (p=.005) across treatment. Social support from friends appeared particularly predictive of pain intensity (p<0.001), whereas social support from family failed to account for unique variance. When included in a larger covariate model, friends social support remained a significant predictor of pain intensity (p=0.026).

Conclusion: Consistent with our hypotheses and extant data from community samples, results suggest an inverse relationship between social support and pain. Interestingly, friends' social support appeared particularly predictive. However, although these models reveal potentially important relationships, pain remained difficult to predict, with the full covariate model accounting for only 15% of its variance.

Presenter(s): Ekaterina Knudsen

Authors: Ekaterina Knudsen, Jenee Duncan

Faculty: Dr. Jenee Duncan

The examination of father involvement in the presence of intimate partner violence and the prevalence of child behavioral problems in children ages 3-9.

In 2021, the Centers for Disease Control and Prevention (CDC; 2021) reported that approximately 25% of women and 10% of men in the U.S. had experienced some form of intimate partner violence (IPV). The negative impact of IPV goes beyond the couple subsystem to also impact child well-being (Shortt et al., 2018) and the parent-child relationship (Stover & Morgos, 2013). As most research has focused on mother-child relationships, the current study aims to examine the process through which fathers' IPV perpetration affects later child behavior. Specifically, this study aims to examine the association between fathers' IPV perpetration in early childhood (age 3) and fathers' involvement and prevalence of children's internalizing and externalizing behaviors in later childhood (age 9). The data examined in this study are from the Fragile Families and Child Wellbeing Study (FFCWS), a longitudinal study examining approximately 5,000 children and their families. For this study, we examine data collected during Waves 3 (Time 1) and Wave 9 (Time 2), which included established measures of physical violence, father involvement, and child externalizing and internalizing behaviors. Preliminary bivariate correlations indicated that IPV in early childhood was significantly associated with later internalizing and externalizing behaviors. Father involvement was significantly associated with child externalizing behaviors and IPV, but not internalizing behaviors. Main analyses will include direct path analysis to examine the direct association between IPV and child internalizing/externalizing behaviors. Additionally, I will employ a mediation analysis to examine the role of father involvement.

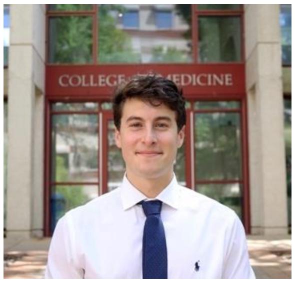
Presenter(s): Ekaterina Krysova

Authors: Ekaterina Krysova

Faculty: Dr. Michelle Phillips

The Effect of Government Spending on Economic Stimuli During COVID Lockdowns on Change in Unemployment Rate.

During the past two years, due to the COVID pandemic, our planet faced one of the biggest economic crises in its modern history. In this research paper, we investigated the correlation between government spending on economic stimuli in European countries and the effects on the unemployment rate increase caused by COVID-related restrictions and closures. The results of the study can be useful to see which economic policies worked efficiently in reducing the unemployment rate and which did not during COVID lockdowns. Moreover, this study helps to assess the effectiveness of these measures. The sample of this paper includes data from 23 European OECD member countries about the length of COVID-19 lockdowns, unemployment rates, excess deaths, and government spending on economic stimuli from January 2020 until September 2021, monthly. Our findings indicate that the government spending on debt contract relief for households during COVID lockdowns has a significant positive impact on the unemployment rate. Contrary to what was expected, the variables in the study that did not affect the unemployment rate are excess deaths, GDP per capita, fiscal measures, and income support. Providing economical support for other countries turned out to have a negative effect on the unemployment rate. Moreover, lockdown duration turned out to have a strong correlation with the unemployment rate.



Presenter(s): Liam Kugler

Authors: Liam Kugler, Manahil Wajid, Jessica Frey MD, Heather Simpson OTD OTR/L, Irene Malaty MD

Faculty: Dr. Jessica Frey

Defining Frequency of Different OCD Subtypes in Adolescent Tourette Syndrome

Objective

To identify associations between subtype of obsessive-compulsive disorder (OCD) and severity of tic symptoms in adolescent Tourette's Syndrome (TS).

Background

There is limited data on the prevalence of OCD subtypes in patients with TS. Current studies fail to break down correlation by subtype. It is important to characterize the most common OCD subtypes that coexist with TS, and identify correlation between OCD subtype and tic severity.

Design/Methods

Adolescent patients between the ages of 13-21 years old with a comorbid diagnosis of TS and OCD completed the following measures: the Yale Global Tic Severity Scale (YGTSS), Children's Yale-Brown Obsessive-Compulsive Scale (CY-BOCS), Gilles de la Tourette Syndrome – Quality of Life scale (GTS-QOL), and the Dimensional Obsessive-Compulsive Scale (DOCS).

Results

There was no significant difference in CY-BOCS scores when comparing between groups based on tic severity scores (mild: 18.5, moderate: 20, p = 0.418), impairment scores (moderate: 22, marked 16.33, p = 0.129), or global severity scores (moderate 18.67, marked: 20.25, p = 0.383). There was no significant difference in DOCS scores between groups based on tic severity (mild: 20, moderate: 21.8, p = 0.469), impairment scores (moderate: 25.5, marked: 15.6, p = 0.178), or global severity scores (moderate: 16.6, marked: 24.75, p = 0.275). Interestingly, severe impairment scores were associated with lower obsessional-compulsive scores.

Conclusions

Given the high comorbidity of TS and OCD, characterization of the OCD subtypes in adolescents with TS can help provide valuable information about this patient population. Further patient enrollment is needed to provide statistically significant results.

Presenter(s): Nicolas Laffineuse

Authors: Nicolas Laffineuse, Sanjeev J. Koppal

Faculty: Dr. Sanjeev J. Koppal

Design and Calibration of a Multispectral Root Imaging System

Multispectral imaging, the collection of images within specific ranges of the electromagnetic spectrum, can be used to capture significant information about a plant's health, activity, and longevity. Specifically, we aim to image a plant's roots and the surrounding soil using minirhizotron tubes, transparent tubes planted in the ground designed for a root imaging system. To date, we have constructed a compact multispectral imaging system that fits into the pre-existing minirhizotron tubes. The system flashes different LEDs of specific wavelengths and takes pictures with a camera. The images are then processed via a MATLAB script which finds the average reflectance on the image at key points and determines the peaks in the electromagnetic spectrum. In the coming months, we aim to finalize the system and start building a database of plant images that can be used for further calibration. Also, we will upgrade the camera and LED assembly to run off of a Raspberry Pi Zero 2 W MCU which can wirelessly trigger the collection and transmission of data while giving us much more control over the camera settings.

Presenter(s): Christina Lagas

Authors: Christina Lagas, Carol Mathews M.D.

Faculty: Dr. Carol Mathews

Understanding Auditory Categorization Functioning in People with Hoarding Disorder

Hoarding Disorder (HD) is a psychiatric condition that is characterized by excessive material possession caused by an inability to rid of items and/or a presence of considerable distress when discarding them. Through the use of neuropsychological tests, researchers can analyze how individuals with HD function cognitively in comparison to controls. A previous research study found that relative to national norms, HD participants demonstrated significant cognitive impairment in visual categorization, tested using the Delis-Kaplan Executive Function System (D-KEFS) Card Sorting Test (Mackin et al., 2010). Our current study is aimed at seeing if these impairments extend to auditory categorization, the ability to categorize items on a verbal-based task, through the use of the Controlled Oral Word Association Test (COWAT). The COWAT prompts participants to name as many words as they can think of within a certain category as fast as they can within a sixty-second time period. By comparing performance in the COWAT between HD participants and age-matched controls, we can hypothesize that the people with HD will perform significantly lower on the test than the controls. The COWAT is currently being administered to participants within a larger neuropsychological battery through a video communication program called Zoom. Assessing cognitive abilities can aid in future diagnoses and treatment for HD. For example, specific cognitive impairment can indicate brain areas that may be responsible for discrepancies and skill remediation may be incorporated into primary therapy.

Presenter(s): Tram Lai

Authors: Tram Lai, Anaïs Ortiz, & Erin C. Westgate

Faculty: Dr. Erin Westgate

Do People Avoid "The Classics"?

Why don't people read classic novels? We argue one reason is inaccurate affective forecasting: people expect reading, especially classic literature, to be boring due to prior bad experiences. We examined people's preferences for contemporary versus classic literature, and whether these feelings predicted their choice of reading material, among 465 UF college students. We presented each participant with ten matched pairs of novels, and asked them to choose which novel (classic vs contemporary) from each pair they would prefer to read. Afterwards, they rated how boring, interesting, enjoyable, meaningful, psychologically rich, and effortful they expected each novel would be, before being randomly assigned to read an excerpt from one of their choices. We found students were significantly more likely to choose contemporary (79%) vs classic (21%) novels, in part because they expected classic novels to be significantly more boring and effortful. Overall, effort and boredom statistically mediated the relationship between type of literature and reading selections, suggesting that one reason people may avoid classic literature is that they expect it to be boring and too hard to read. In follow-up work, we plan to investigate whether these beliefs are true, or whether unfounded fears may lead people to mistakenly avoid effortful activities that they might actually enjoy.

Presenter(s): Austin Lam

Authors: Zachary W Windom, Austin Lam, Ajith Perera, and Rodney J Bartlett

Faculty: Dr. Ajith Perera

An Assessment of Frozen Natural Orbitals and Band Gaps using Equation of Motion Coupled Cluster Theory

Interest in the electronic properties of novel pi-conjugated polymers has surged recently, owing to their use in technological applications and relevance in biological systems. Methods devoted to the study of these materials should be both cheap and highly accurate. A coupled cluster theory of reduced dimensionality would be optimally suitable for this task. In this regard, dimensional reduction is made possible by truncating a significant portion of the virtual space via Frozen Natural Orbitals (FNOs). In this work, we employ the use of the IP/EA Equation of Motion Coupled Cluster Theory (IP/EA-EOM-CC) in conjunction with the Frozen Natural Orbital (FNO) approximation - which is shown to significantly reduce the calculation expense - to target the fundamental gap (aka band gap) of 1-D trans-polyacetylene and polyacene: two prototypical conjugated polymers. We benchmark the accuracy of such a technique against full IP/EA-EOM-CC calculations from prior work and tabulate associated errors and FNO-based, extrapolated band gaps. We show agreement of 0.2 eV in extrapolated band gaps is possible, even after truncating over 40% of the virtual space.

Presenter(s): Molly Lantinberg

Authors: Dorian Rose, Lou DeMark, Gina Brunetti, Joana DeLacy, David Clark,

Faculty: Dr. Dorian Rose

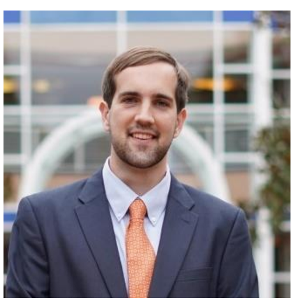
The Impact of Early and Late Backward Walking on Fall Incidence Post-stroke

Background and purpose: Strokes are the most prevalent disabling neurological condition in adults. Falls are one of the main health risks post-stroke. Backward walking has been investigated as a possible tool to help decrease fall incidence. This study intends to determine whether a backward walking training intervention implemented early (2-4 months) versus late (one-year) post-stroke decreases fall incidence in the first year.

Methods: Ambulatory stroke survivors were enrolled 2 to 4 months post-stroke. They were then randomized into the early group, which received backward walking training 2-4 months post-stroke, or the late group, which received backward walking training 1 year post-stroke. Fall incidence and injuries were documented for up to 14 months post-stroke.

Results: Fifty-nine participants completed the study. 32% were classified as non-fallers, 32% as single non-injurious fallers, 49% as multiple non-injurious fallers, and 2% as single injurious fallers. There were no statistical differences found in fall incidence between the early and late groups.

Conclusions: This study did not demonstrate that BWT delivered early post-stroke decreased fall incidence in the first year. Therefore, rehabilitation professionals must continue to educate patients post-stroke regarding fall risk and explore other potential interventions that may address the multi-factorial nature of falls in individuals post-stroke.



Presenter(s): Collin Larke

Authors: Collin Larke, Xheni Bare, Dr. Scott Banks, Andrew Jensen

Faculty: Dr. Scott Banks

Markerless Motion Capture for Large Animal Medical Imaging

The intention of this project is to apply key point detection to perform low-latency markerless motion capture for large animal medical imaging. Current machines cannot get adequate images due to the x-ray scatter. Key point detection uses neural networks to find an object's important points in the image. Motion capture is the ability to calculate the 3D position of an object with the use of 2 or more cameras. The goal of markerless motion capture is to use key point detection to replace the markers that would otherwise be put on the object. The DeepLabCut Python library will be used to perform key point detection. This library was chosen because it already contained support to export trained models. Current literature found that inference speeds for single camera pose estimation could range from 142 frames per second to 1 frame per second depending on the size of the image and hardware used. The exported models will be used to find the key points of an animal from two or more cameras, the points within each view will make up the estimated 2D pose of the animal, the points will be triangulated from the multiple views, and the 3D pose of the animal will be estimated. Results have not yet been achieved but are forthcoming. Review of current literature suggests that it will be a viable method of estimating the 3D pose of animals.

Presenter(s): Karina LaRubbio, Jeremiah Wright

Authors: Karina LaRubbio, Jeremiah Wright, Brendan David-John, Andreas Enqvist, Eakta Jain

Faculty: Dr. Eakta Jain

Who do you look like? - Gaze-based authentication for workers in VR

Behavior-based authentication methods are actively being developed for XR. In particular, gaze-based methods promise continuous authentication of remote users. However, gaze behavior depends on the task being performed. Identification rate is typically highest when comparing data from the same task. In this study, we compared authentication performance using VR gaze data during random dot viewing, 360-degree image viewing, and a nuclear training simulation. We found that within-task authentication performed best for image viewing (72%). The implication for practitioners is to integrate image viewing into a VR workflow to collect gaze data that is viable for authentication.

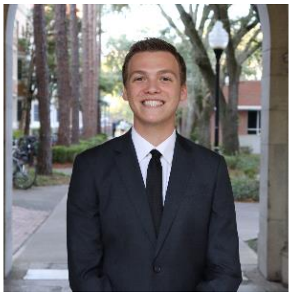
Presenter(s): Ethan Lawrence

Authors: Ethan Lawrence, Joshua Benjamin, Dr. Amanda Subalusky

Faculty: Dr. Amanda Subalusky

Longitudinal Changes in Carbon and Nutrients along the Mara River

The Mara River is the perennial water source for more than 1 million individuals and sustains the Serengeti Mara Ecosystem. Nutrients play an essential role in sustaining the river's aquatic food web. Managing nutrient inputs is essential to preventing eutrophication and diversity loss. We collected water samples from nine sites along the Mara River for ammonium, phosphate, nitrate, and dissolved organic carbon (DOC) analyses. Sites 1-3 are in the forest without wildlife or human inputs. Sites 4-5 are influenced by large-scale agriculture. Sites 6-9 are conservation areas, which include inputs of hippopotamus excretion and wildebeest carcasses during river crossings. Our results show that the forest sites had an average ammonium level of 9.22 µg/L, phosphate level of 7.35 µg/L, nitrate level of 1000.81 µg/L, and DOC level of 1.92 mg/L. The agricultural sites had an average ammonium level of 133. 22 µg/L, phosphate level of 9.32 µg/L, nitrate level of 1197.34 µg/L, and DOC level of 5.06 mg/L. The conservation areas had an average ammonium level of 205.81 µg/L, phosphate level of 15.45 µg/L, nitrate level of 1153.02 µg/L, and DOC level of 5.88 mg/L. Our data suggest that agriculture and associated erosion may be driving increased nitrogen and carbon concentrations in the river. Wildlife inputs also contribute to carbon and nutrient concentrations in the river, particularly for phosphorus. Overall our results show that nutrient inputs from large wildlife are a natural part of the system, but these concentrations may become problematic when compounded by anthropogenic inputs from upstream.



Presenter(s): Jake LeClaire, Madison Mulcahy

Authors: Jake LeClaire, Madison Mulcahy, Andrew Moore, Ben Lewis, Sara Jo Nixon

Faculty: Dr. Sara Jo Nixon

<u>Negative Affect and Substance Use Patterns in Treatment Seeking Adults</u>

Background: Previous research suggests that women tend to express higher levels of negative affect (NA) compared to men. Additionally, work has shown that experiencing affective dysfunction can influence the progression of substance use disorder (SUD). Building on this research, we investigated whether variability in types of drug use affected NA in men and women seeking treatment for SUD. We hypothesize that we will see higher levels of NA in women compared to men. An exploratory analysis will investigate the interaction of sex and substance use patterns.

Methods: Individuals seeking treatment for SUD (n = 283) were assessed on their recent substance use history (6-months prior to entering treatment) and depressive symptomatology using the Beck Depression Inventory (BDI). Three substance use pattern groups were defined as: alcohol use only (Alc), alcohol and stimulant use (Stim), and alcohol, stimulant, and opioid use (Poly).

Results: A 2x3 ANOVA revealed a main effect of group (F = 5.14, p < 0.05) but no main effect of sex nor their interaction (p’s > 0.05). Post hoc analyses of the three groups revealed the Poly group had significantly higher BDI scores than the Stim group (t = -3.24, p < 0.05).

Conclusion: Despite a lack of sex differences, we did find group differences between the Stim and Poly substance use groups. When probing this effect, we found those who used a larger number of substances reported higher BDI scores. While intuitive, the rationale for this relationship demands further study.

Presenter(s): Elizabeth Lee

Authors: Ashley Villanueva, Alaina Massaro, Samantha Jean, Elizabeth Lee

Faculty: Dr. Sterling Sheffield and Dr. Sharon Difino

A study on Spanish Heritage Speakers' use of the Spanish and English Languages

This study presents data collected by using questionnaires on the demographics of Spanish Heritage Speakers and their use of the Spanish and English languages. For purposes of this research, a "Spanish Heritage Speaker" is defined as an individual born to at least one Spanish speaking caregiver and educated primarily in English. Spanish Heritage speakers can be born in the United States (US) in Spanish-speaking homes or come to the US from a location that uses Spanish as the dominant language. The Hispanic population has grown rapidly over the past decade to 34.8 million people in the US that speak Spanish at home, and the number of Spanish Heritage speakers reflects this. The main goal of the questionnaire was to gain more information on how the Spanish Heritage speakers used English and Spanish in their everyday life. The questionnaire consisted of 26 questions, with some having multiple parts. It included age, when and why they learned each language, how much they use each language in different daily environments, and what they use the language to do, such as read and write. The results found that most speakers in their academic, current household, and social settings spoke more English than Spanish. There was a large variability in the Spanish Heritage speakers' backgrounds and use of Spanish and English in most measures. For example, the use of Spanish in their permanent homes ranged from 0%-100%. Overall, this variability shows how diverse the Spanish Heritage Speakers were in background and language use.

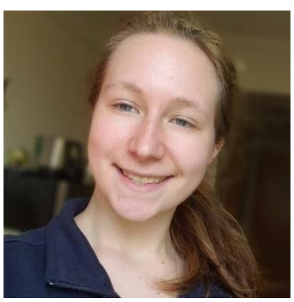
Presenter(s): Dylan Lee

Authors: Dylan P. Lee, Thomas H. Mareci

Faculty: Dr. Thomas H. Mareci

Measurement of neuroinflammation with diffusion-weighted MR

Neuroinflammation is caused by pathology that initiates a glial cell response resulting in cell swelling. This inflammatory process may cause an increase in the rate of water translational diffusion in the brain at the site of inflammation, which may be observed with diffusion-weighted magnetic resonance imaging (DW MRI). However, the DW MRI measurement is a complex response from all local tissues in the brain, so the measurement of a subtle increase in diffusion rate resulting from inflammation requires the development of advanced measurement methods and data fitting procedures. To visualize neuroinflammation with DW MRI, we have developed a data acquisition protocol optimized for discriminating between 1) the more freely diffusing water associated with inflammation, and 2) the restricted diffusing water associated with the tissue microstructure. This method uses a wide range of MRI diffusion weightings with an appropriate sampling of diffusion directions at each diffusion weighting. To analyze this data, we are developing processing routines to allow separation of these two forms of diffusion based on differences in their rates and anisotropy. At low diffusion weighting, the high rate of free water diffusion predominates, while at high diffusion weighting, the low rate of tissue microstructure diffusion predominates. This allows separation of the measured data into high (free water) and low (restricted water) rates of diffusion by the iterative fitting of each domain of diffusion rate until suitable separation is achieved. These methods will be used to relate neuroinflammation to cognitive decline in surgery patients.



Presenter(s): Polina Leger

Authors: Thomas Weingartner, Mark E. Law, Keith Green, Andrew Thomas, Henry Johnson, and Polina Leger

Faculty: Dr. Mark Law

TCAD Comprehensive Silicon Strain Model Using Finite Element Quasi-Fermi Discretization

Abstract—In this work we present a finite element quasi-Fermiimplementation of a generalized first principles strain model for silicon. Strain effects in silicon are often modeled with separate mobility, bandgap, density of states, piezo-Hall, temperature, and doping models. The current work encompasses these effects by utilizing first principles and the finite element quasi-Fermi method to write a conductivity tensor with the appropriate carrier relationships.

Presenter(s): Sophia Leon, Peighton Stypinski, Wallyah Pierre, Simran Punwani

Authors: Liva LaMontagne, Jennifer Doty, David Diehl, Tyler Nesbit, Sophia Leon, Peighton Stypinski, Wallyah Pierre, Simran Punwani

Faculty: Ms. Liva LaMontagne

<u>The Effects of Mindfulness Mobile Apps on Stress Among College Students: Preliminary Results From A Systematic Review and Meta-Analysis</u>

Depression and generalized anxiety levels among college students are at an all-time high (Center for Collegiate Mental Health, 2021). This daunting statistic is alarming for many reasons, particularly because depression and anxiety are linked to a wide range of adverse mental and physical health outcomes such as infectious illnesses, use of alcohol, smoking, self-injury, suicidal thoughts, and suicidal attempts (Oswalt et al. 2020). Mindfulness training applications are self-guided, preventative resources that promote well-being and have been found to reduce stress among U.S. college students in randomized controlled trials (Huberty et al., 2019; Levin et al., 2020). Despite the promising future of mindfulness training apps in improving college students' mental health, there were no currently existing meta-analysis of effect sizes for self-guided mindfulness training apps in student populations. Therefore, we aim to address this gap in preventative research on mindfulness training apps with a systematic review and meta-analysis of the current literature. Our first goal is to dissect the existing literature using exhaustive search terms, databases, and inclusion and exclusion criteria to find patterns in the types of research designs, outcomes, and sample characteristics used. Our narrative review includes a total of 33 studies that use an online mindfulness training program, a sample of college students, and the measurement of one or more mental health outcomes. Our quantitative meta-analysis involved 12 of these randomized controlled trials that we used to calculate the mean effect sizes as well as whether effect sizes were moderated by a variety of relevant factors.

Presenter(s): Jakob Levin

Authors: Jakob E. Levin

Faculty: Dr. Norman J.W. Goda

Romanticizing the Zionist Narrative (1904-1923): Myth and Memory in Degania

This case study analyzes the ideational foundation and aims behind the Zionist project, how those who experienced the years of pre-statehood romanticized their memory of Jews in Palestine while employing it to construct an imagined narrative of the founding purpose. Assessing whether this imagined past aligns with the historical ledger, perhaps most crucially, this article will question whether there even was a grand Zionist project in the first place. While Theodor Herzl, whom the State of Israel's Declaration of Independence refers to as "the spiritual father," "proclaimed the right of the Jewish people to national rebirth," many in the waves of aliyot surrounding the turn of the 19th/20th Centuries simply made the journey to Palestine because it offered greater opportunity for success than the deteriorating societies they called home in Eastern Europe (Declaration of Establishment of State of Israel, 1948). Through research conducted at the Central Zionist Archives in Jerusalem, Israel, and at the Degania kibbutz compound, a sharper picture of the pre-state Zionist reality and intentions will come into focus.

Presenter(s): Grace Li, Kaitlyn King

Authors: Kaitlyn M. King, Grace J. Li, Ambar Velazquez-Albino, Carlos M. Rinaldi-Ramos

Faculty: Dr. Carlos Rinaldi-Ramos

Development of High Throughput Platform for Synthesis of Iron Oxide Nanoparticles for MPI

Magnetic particle imaging (MPI) is an emerging imaging modality that has numerous potential biomedical applications, including blood pool imaging, tumor imaging, and cell therapy tracking. Compared to other imaging techniques, MPI is non-invasive, has no ionizing radiation, and has negligible tissue attenuation and background, making it ideal for certain applications. MPI performance is heavily dependent on the magnetic properties of the superparamagnetic iron oxide nanoparticles (SPION) tracers used for imaging, and therefore the purpose of this research is to synthesize iron oxide nanoparticles optimized for MPI. Our target is to synthesize monodispersed particles of pure magnetite phase, the most magnetic phase of iron oxide, larger than 25 nm. Current synthesis setups are only able to test one condition at a time and use a high volume of reactants, making data collection time consuming and can be wasteful when optimizing conditions. To expedite data collection and reduce chemical waste, we are developing a high-throughput (HT) synthesis platform that can test multiple reaction conditions at once. The designed HT setup allows for 38 simultaneous syntheses, but was limited in that the setup did not have gas flow or mixing capabilities. The gas flow limitation was eliminated by the introduction of a 3D printed 38-port gas manifold and 3D printed caps, providing a constant and uniform gas flow to each reaction vessel. Current efforts revolve around the validation of the HT platform's ability to produce uniform particles, and the necessity of introducing motorized mixing to each reaction vessel.

Presenter(s): Daniel Lichlyter

Authors: Daniel Lichlyter, Zachary Krumm, Todd Golde, Sylvain Dore

Faculty: Dr. Sylvain Dore

Role of CRF and the hypothalamic-pituitary-adrenal axis in stroke: Revisiting temporal considerations and targeting a new generation of therapeutics

Ischemic neurovascular stroke represents a leading cause of death in the developed world. Preclinical and human epidemiological evidence implicates the corticotropin-releasing factor (CRF) family of neuropeptides as mediators of acute neurovascular injury pathology. Preclinical investigations of CRF, CRF receptors, and CRF-dependent activation of the hypothalamic-pituitary-adrenal (HPA) axis have pointed toward a tissue-specific and temporal relationship between activation of these pathways and physiological outcomes. Based on the literature, the major phases of ischemic stroke etiology may be separated into an acute phase in which CRF and anti-inflammatory stress signaling are beneficial and a chronic phase that contributes to neural degeneration, toxicity, and apoptotic signaling. Significant gaps in knowledge remain regarding the pathway, temporality, and systemic impact of CRF signaling and stress biology in neurovascular injury progression. Furthermore, heterogeneity among experimental designs poses a challenge to defining the apparent reciprocal relationship between neurological injury and stress metabolism. Despite these challenges, it is our opinion that the elucidated temporality may be best matched with an antibody against CRF with a half-life of days to weeks as opposed to minutes to hours as with small-molecule CRF receptor antagonists. This state-of-the-art review will take a multipronged approach to explore the expected potential benefit of a CRF antibody by modulating CRF and corticotropin-releasing factor receptor 1 signaling, glucocorticoids, and autonomic nervous system activity. Additionally, this paper compares the modulation of CRF and HPA axis activity in neuropsychiatric diseases and their counterpart outcomes post-stroke. It also assesses lessons learned from antibody therapies in neurodegenerative diseases.

Presenter(s): Jason Liu

Authors: Jason Liu

Faculty: Dr. Yenisel Cruz-Almeida

Age-Related Differences in Pain Sensitivity and Cerebellum Activity from Mechanical Stimuli

Introduction and Background: It has been shown that Quantitative Sensory Testing responses to pain vary with age. In this study, we extend the previous findings by Cole and colleagues with the goal to examine age differences in fMRI activation to a different type of painful stimulation, monofilament stimulation to the knee in patients with symptomatic osteoarthritis.

Methodology: fMRI was acquired from 202 participants with age ranging from 43 to 94 years. Brain images were acquired at the UF's McKnight Brain Institute and at the University of Alabama with a 3T scanner, with 36 3.5-mm slices, TR/TR=2000/30s and 3.5×3.5mm in-plane resolution. Whole-brain 1-mm resolution 3D T1 anatomical images were also acquired with TR/TE=7.1/3.2. Images were preprocessed using standard SPM and CONN algorithms, i.e., slice timing, motion correction, normalization to MNI space and denoising of fMRIs, as well as segmentation of gray matter, white matter, and cerebrospinal fluid masks.

Results: Activations/deactivations for both simulations were located in somatosensory, salience, and default mode network (DMN) areas. The pain-specific activations were mainly located in insular and opercular areas, and pain-specific deactivations were mainly located in the posterior DMN areas. Two clusters were found in the DMN, located in the left caudal posterior Superior Temporal Sulcus and the right caudal/rostroventral Brodmann.

Discussion: We found that DMN deactivation is reduced with age, possibly due to more engagement of negative-task related mechanisms in older adults.

Presenter(s): Jose Lopez

Authors: Jose Lopez, Thiago Matheus de Andrade Bezerra, Dalton James Cravens, Jeremiah Blanchard

Faculty: Dr. Jeremiah Blanchard

SimCoast: Promoting Awareness of Coastal Recession via Gaming

Humans have congregated near coastlines since the emergence of early civilizations. This trend increased during the industrial revolution to facilitate access to oceans for travel and commerce. Though this trend of coastal development continues into the present day, the coast's ability to sustain human activity remains a challenge. Rising sea levels, increasing storm power and coastal development activities have led to recession of coastlines, resulting in loss of land, property damage, and habitat loss; This trend is expected to continue and accelerate. Thus, researchers have recognized the importance of educating the general public about current coastal erosion trends and environmentally sustainable policies. We address this educational aim by developing a city-building video game, "SimCoast", to help community members learn about the impacts of coastline recession and related environmental issues. Our game presents players with a map that mimics South Florida coastline conditions. In SimCoast, the player, acting as a city administrator, enacts policies and regulations that shape the city's public and private-sector developments. Coastal simulations will be driven by data sets collected from real-world coastlines and how they have developed throughout the 20th and 21st centuries, incorporating coastal erosion models from scientific literature and satellite imagery. Our work will also include surveys to measure the impact on perception and learning among participants. In addition to helping community members and policymakers make informed decisions, our work will provide context and guidance to researchers in engineering and education.

Presenter(s): Rendell Rod Lucena

Authors: Rendell Rod L. Lucena, Christopher Lopez, Pratiksha Awale, Tanja Taivassalo, Krista Vandenborne, Glenn A. Walter, Sean C. Forbes

Faculty: Dr. Sean Forbes

Magnetic Resonance Phosphocreatine Recovery Rates and Functional Test Performance in Boys with Duchenne Muscular Dystrophy

Duchenne muscular dystrophy (DMD) is a rare genetic disorder that results in the absence of a functional protein named dystrophin, which is responsible for the protection and strengthening of cardiac and skeletal muscle fibers. DMD is associated with the weakening and progressive degeneration of muscle tissue. To date, little attention has been given to lower leg muscle metabolite recovery rates in boys with DMD and how this marker is associated with disease progression. The objective of this study is to analyze dorsiflexion and plantar flexion phosphocreatine (PCr) recovery rates and individual functional test performances using in vivo non-invasive phosphorus magnetic resonance spectroscopy (31P-MRS). The cross-sectional study is comprised of boys with DMD (n=19, mean: 8.7 ± 1.9 years; range: 6-12 years) and unaffected age-matched controls (n=18, mean: 8.4 ± 2.5 years; range: 6-12 years). Energetic markers such as inorganic phosphate to phosphocreatine ratio (Pi/PCr), PCr/ATP, and pH are assessed to track disease progression. Functional performance was examined by evaluating 6-minute walk test, 4-stair climb, supine to stand, and 10-meter walk/run results. 31P-MRS biomarkers were acquired using a 3.0-Tesla whole body scanner. 31P-MRS time series were analyzed using jMRUI. Findings show that the control group, on average, exhibited faster PCrτ compared to the DMD group, and there was no significant correlation between PCrτ and functional test performance in pre-adolescent boys. The results point to 31P-MRS as a promising supplement for the evaluation of disease progression and clinical treatments involving DMD.

Presenter(s): Ashlyn Ludovici, Callaway Wells, Gabriela Hamerlinck

Authors: Ashlyn Ludovici, Callaway Wells, Gabriela Hamerlinck

Faculty: Dr. Gabriela Hamerlinck

<u>Targeted Prevention and control methods for MSM and IDU populations can reduce stigma and global burden of HIV</u>

HIV/AIDS is one of the deadliest epidemics in history, however the global disease burden is not equally distributed. Intravenous drug users (IDU) and men who have sex with men (MSM) are among the most at risk populations for developing HIV/AIDs. These populations have historically experienced disproportionate HIV associated stigma, such as criminalization and social ostracization, which has created additional barriers to HIV prevention and treatment. Reducing and eliminating stigma faced by these two groups will reduce the transmission of HIV, thus lowering the number of new annual HIV cases. Surveillance, prevention, and treatment methods specifically targeted towards these two populations will help decrease the overall burden of disease. Within the MSM population, HIV prevention and control methods are focused on frequent testing for sexually transmitted infections, consistent and correct condom use and pre- and post-exposure prophylactic medications. Within the IDU population, preventative measures such as decriminalizing drug use, a process that ends viewing drug use as a criminal offense, implementing needle and syringe exchange programs, and increasing access to care will lower the prevalence of HIV. We provide an analysis of multiple HIV prevention and treatment methods and their impact on incidence and prevalence of the disease globally. A single approach to controlling the HIV/AIDS epidemic will not be sufficient alone. Rather, the combination of proactive prevention strategies and reactive treatment options can collectively reduce HIV associated stigma and the global HIV burden.

Presenter(s): Alisa Luthra

Authors: Alisa Luthra, Lazaro Vinola Lopez

Faculty: Dr. Jonathan Bloch

Population Variation Among Extinct Species of Rodents Informs About Exploitation of Resources on the Island of Hispaniola

How humans have impacted rodent biodiversity in the Greater Antilles is still being studied within Pre-Columbian Caribbean archaeology. Rodents were an important component of diet and culture for the people of this region, and continue to be a crucial economic resource into the present day. The island of Hispaniola is the center of the speciation of rodents within the Caribbean; however, most species became extinct within the last two thousand years. Studies on the only extant species of rodents from Hispaniola have shown the existence of morphometric and body size differences from distinct biogeographical regions within the island. Nonetheless, it remains unknown if extinct species follow a similar pattern or not. As a part of the 2021 iDigBio-Summer Internship Program, graduate and undergraduate researchers used cranial and mandibular morphometric data of six extinct Hispaniola rodent species, sourced from collections at the Florida Museum of Natural History, to test this hypothesis. We found significant differences among populations of the same species from distinct biogeographical regions in Hispaniola. These results allow us to create a baseline from the paleontological record and compare it with archaeological specimens, to determine whether humans were translocating species across the island or using local resources.

Presenter(s): Nicolette Lyons

Authors: Dr. Daniel Johnson, Nicolette Lyons

Faculty: Dr. Daniel Johnson

Quantifying Tree Dispersal in Longleaf Pine Forests

Intro

Questions have arisen about how longleaf pine forests change over time. Research shows that, counter to intuition, longleaf pine seedlings do not occur close to adult trees but are most successful if they get several meters away. No mathematical seed dispersal function exists in literature which is needed to model the dispersal process.

Background

Longleaf pine forests once covered much of the southeastern United States but have since been reduced to about 3-5% of their original range. Longleaf pine forests are the focus of restoration efforts in the southeastern US.

Methodology

We partnered with the National Ecological Observatory Network (NEON) to reanalyze seeds collected from litter traps in forest plots located at Ordway Swisher Biological Station (OSBS). NEON protocols only record total seed mass and lack species-specific values. We separated seeds into species-specific pools and weighed. The seed data will be regressed against the tree abundance data to create a function called a dispersal kernel.

Results

The dispersal kernel will be usable by foresters and land managers in conservation efforts, to estimate seed input in longleaf pine forests. The seed dispersal model will be used to understand forest dynamics of longleaf pine trees in a 23-hectare mapped forest dynamics plot at OSBS. The model will aid forest managers in predictions of where to find seedlings and seeds in longleaf pine forests.

Conclusion

The on-going project has provided an excellent opportunity for deeper learning and application of applied quantitative methods beyond what would normally be available in an undergraduate class.

Presenter(s): Ciara Magee

Authors: Ciara Magee, Jaime Jimenez, Ruchir Mishra, Bryony Bonning

Faculty: Dr. Bryony Bonning

Screening of a phage display library to identify peptides that bind the gut of the green peach aphid, Myzus persicae

The green peach aphid (Myzus persicae: Hemiptera) is a major pest of agricultural crops. This insect causes damage both by feeding on plant sap (phloem) resulting in reduced yield, and also by transmitting plant viruses. As the green peach aphid has developed resistance to commonly used chemical insecticides, alternative approaches for control of this insect and the plant viruses that it transmits are needed. The goal of this project is to identify peptides that bind to the surface of the M. persicae gut. Such peptides can potentially be used to block association of plant viruses with their aphid gut receptors. They can also be used as artificial anchors for pesticidal proteins that bind the aphid gut to increase toxicity. To identify aphid gut binding peptides, we fed aphids on a phage display library , dissected the guts and eluted bound phage followed by a second round of enrichment for phage displaying peptides that bound to the gut. Following isolation and sequencing of ssDNA from phages eluted from rounds 1 and 2, a bioinformatics pipeline was used to eliminate poorly enriched and false-positive peptides, and to identify peptides predicted to be stable and hydrophilic. The resulting candidate gut binding peptides can potentially be used for novel bio-based management of M. persicae and to reduce plant virus transmission by this insect.

Presenter(s): Ashley Malcolm

Authors: Rishi Kondapaneni, Ashley Malcolm, Brian Vazquez, Eric Zeng, Tse-Yu Chen,Kyle Kosinki, Ana Romero-Weaver, Bryan Giordano, Benjamin Allen, Michael Riles, Daniel Killingsworth, Lindsay Campbell, Eric Caragata, Yoosook Lee

Faculty: Dr. Yoosook Lee

Mosquito Control Priorities in Florida—Survey Results from Florida Mosquito Control Districts

Florida lies within a subtropical region where the climate allows diverse mosquito species including invasive species to thrive year-round. As of 2021, there are currently 66 state-approved Florida Mosquito Control Districts, which are major stakeholders for Florida public universities engaged in mosquito research. Florida is one of the few states with extensive organized mosquito control programs. The Florida State Government and Florida Mosquito Control Districts have long histories of collaboration with research institutions. During fall 2020, we carried out a survey to collect baseline data on the current control priorities from Florida Mosquito Control Districts relating to (1) priority control species, (2) common adult and larval control methods, and (3) major research questions to address that will improve their control and surveillance programs. The survey data showed that a total of 17 distinct mosquito species were considered to be priority control targets, with many of these species being understudied. The most common control approaches included truck-mounted ultra-low-volume adulticiding and biopesticide-based larviciding. The districts held interest in diverse research questions, with many prioritizing studies on basic science questions to help develop evidence-based control strategies. Our data highlight the fact that mosquito control approaches and priorities differ greatly between districts and provide an important point of comparison for other regions investing in mosquito control, particularly those with similar ecological settings, and great diversity of potential mosquito vectors, such as in Florida. Our findings highlight a need for greater alignment of research priorities between mosquito control and mosquito research. In particular, we note a need to prioritize filling knowledge gaps relating to understudied mosquito species that have been implicated in arbovirus transmission.

Presenter(s): Ria Malhotra

Authors: Dr. Jose Eduardo Santos, Bruna Souza Long,

Faculty: Dr. Jose Eduardo Santos

Rumen Protected Arginine

Arginine is typically considered a nonessential amino acid for metabolic processes' proper function. However, in the proposed experiment, researchers explore the effects of its supplementation into the diet of dairy cattle. Arginine plays a major role in many critical procedures in the body. In order to see if increasing its levels in the body will improve these processes, multiparous and nulliparous cows are receiving the experimental treatment by a supplementation of a lipid encased "rumen protected" version of the amino acid. This application will occur for 21 days prepartum and 21 days postpartum. Those in the control group receive a supplement also containing a lipid and a rumen protected amino acid source for the same duration of time. By applying Arginine to their diets, it is believed that this amino acid would cause increases in milk production, overall immunity, development of oocytes, and the growth of the subject's calves. To test these theories, researchers collect a variety of data in a variety of ways such as monitoring their daily feed intake, monitoring their body conditions and weights, collecting blood for plasma and serum, milk samples and colostrum, and performing liver biopsies. By studying these results we will be able to see if an overall increase to Arginine concentrations in the body can improve its health and function.

Presenter(s): Julie Mallinger

Authors: Julie Mallinger, Jia Tian, Matthew Sarkisian

Faculty: Dr. Matthew Sarkisian

Alisertib Enhances TTFields Efficacy on Glioblastoma Cells by Disrupting Ciliogenesis

Tumor Treating Fields (TTFields), consisting of low-intensity (1-3 V/cm), intermediate frequency (100-300kHz) alternating electric fields, are a recent breakthrough in glioblastoma (GBM) therapy. TTFields is the first treatment proven to extend patient survival since combination or irradiation and temozolomide (TMZ) chemotherapy had become the standard in 2005. How TTFields works is unclear, but studies suggest that they exert antimitotic effects on cells, causing apoptosis of affected cancer cells and inhibition of tumor growth. Many signaling pathways affected by TTFields are linked to primary cilia, microtubule-based organelles that detect extracellular cues. Cilia can relay signals that promote cancer growth and TMZ chemoresistance. Recent studies suggest cilia play a role in the recurrence of GBM after TTFields, suggesting targeting cilia may enhance TTFields efficacy. Here we examined whether targeting Aurora Kinase A, a mediator of ciliary disassembly could enhance TTFields. Inhibitors of Aurora Kinase A (e.g. Alisertib) not only disrupt cilia on non-GBM cells, but cross the blood brain barrier. I found that high and low-grade glioma cells treated with Alisertib at physiologic concentrations display significant loss of immunolabeled cilia. We then performed a series of experiments where we treated GBM cells before, during or after TTFields with 1μM Alisertib. I counted cells immediately after or 7 days later. Despite treatment sequence, adding Alisertib to TTFields significantly reduced the recurrence of GBM cells in vitro, compared to either treatment alone. These findings suggest Alisertib in combination with TTFields warrant in vivo studies to assess the treatment of GBM.

Presenter(s): Stefany Marjani

Authors: Stefany Marjani, Dr. Jill Sonke, Dr. Sara Agnelli

Faculty: Dr. Jill Sonke

Analyzing pre-health students' views on Health Humanities and an applied virtual experience during the COVID-19 pandemic.

Health Humanities is a growing field that uses the humanities, arts, and social sciences to develop observational, analytical, empathetic, and reflective skills necessary in healthcare practice. Although current research explores health humanities for pre-health students enrolled in related programs, there is no data of their motivations, perceptions, and associations in universities without established programs, such as in the University of Florida (UF). This study seeks to assess this information gap at UF and serve as valuable support for future curricula. Furthermore, the study analyzes whether the COVID-19 pandemic affected those perceptions. The study counts with pre- and post-surveys, as well as a virtual health humanities workshop. A total of 123 students completed the pre-survey, and 8 out of those students attended the workshop and completed the post-survey. Quantitative and qualitative data were analyzed using descriptive and thematic analysis. Results include that (1) most students perceived health humanities to be beneficial for them and others, (2) the pandemic taught students the importance of humane care, (3) students would enroll in a health humanities program at UF, and would like the university to develop such a program. Most narrative responses acknowledged health humanities' necessity through five major themes: experience and knowledge, patient-centered care, community-centered care, enhancement of the health professions, and cultural and social awareness. This study will inform the first Health Humanities course and program at UF, advice other universities' health humanities approach to their pre-health students, and support longitudinal health humanities studies before, during, and after attending professional schools.

Presenter(s): Kierra Marquis

Authors: Kierra Marquis, Hannah Levine, Sanaz Motamedi

Faculty: Dr. Sanaz Motamedi

Understanding eLearning Acceptance of Generation Z Students: An Extension of the Technology Acceptance Model (TAM)

The COVID-19 pandemic disrupted instructional practices at educational institutions. Countermeasures included transitioning from primarily in-class learning to primarily eLearning. This shift has been met with varied levels of resistance and acceptance, while one study showed that 85% of higher education students prefer in-class learning. Models developed years ago don't account for the dynamic nature of the education world and the students within it. As a result, there is demand for an understanding of the unique set of needs presented by Generation Z, the population born between 1997 and 2015, during their college years.

The purpose of this study is to explore factors influencing Generation Z students' eLearning acceptance by considering students' backgrounds such as behavioral and personality traits, level of academic success, and course of study. In this study we conducted focus group discussions to explore all factors influencing eLearning acceptance of Generation Z. These focus groups were conducted with three groups of eLearning users who have participated in a fully virtual curriculum within the Department of Industrial and Systems Engineering (ISE) at a large public university. As a result, a model which had the Technology Acceptance Model (TAM) as its core was developed. This research shows that the most relevant factors for Generation Z user acceptance are compatibility, perceived cognitive absorption, perceived usefulness, service quality, system quality, information quality, accessibility, and privacy/security. Based on the findings from focus group discussions, theoretical foundations, and empirical evidence, we hypothesized an innovative and integrated technology acceptance model for eLearning.

Presenter(s): Macey Martin

Authors: Macey Martin, David Ostrov, L. Shannon Holliday

Faculty: Dr. L. Shannon Holliday

Novel Small Molecule Inhibitor of Osteoclast Differentiation

Osteoporosis results in over a million bone fractures each year despite current therapeutics. The need for better anti-osteoporotic therapeutics is clear. The central regulatory pathway in bone remodeling consists of RANKL, a transmembrane protein on osteoblasts and osteocytes, which stimulates RANK, a transmembrane protein on osteoclasts. This stimulation is required for osteoclast formation and bone resorption. Recently, extracellular vesicles (EVs) containing RANK that are released by osteoclasts and serve as novel regulators of bone remodeling were identified. EVs are 30-150 nm in diameter vesicles that are released by all cells, but to date RANK has only been detected on EVs released by osteoclasts. These RANK-containing EVs stimulate a RANKL reverse signaling pathway in osteoblasts that promotes bone formation and are therefore crucial factors in coupling bone resorption with bone formation. We sought small molecules that could bind RANKL and have the same activity as RANK-containing EVs. 3-Nitro-4-phosphobenzoic acid (NPA) was identified and tested on calcitriol-stimulated mouse marrow. NPA (50 µM) reduced osteoclast formation by 88%, while increasing alkaline phosphatase positive osteoblast numbers. NPA also reduced differentiation of RAW 264.7 cells into osteoclast-like cells with an IC50 of about 40 µM. We conclude that NPA is a new inhibitor of osteoclast differentiation and may also simultaneously stimulate RANKL osteoblast formation

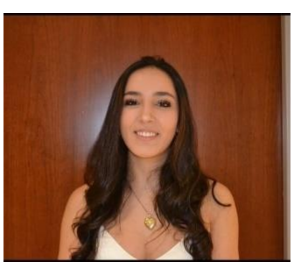
Presenter(s): Victoria Maskas

Authors: Nathan Fisher, Victoria Maskas, Grey Johnson, Addison Sans, Brian Odegaard

Faculty: Dr. Brian Odegaard

Exploring Relationships Between Perceptual and Cognitive Racial Biases

What is the relationship between cognition and perception? Some claim cognition cannot influence perception (Firestone and Scholl, 2015), and that these two domains are mutually exclusive. While this debate spans many phenomena, one aspect involves racial biases in perception and cognition. Despite extensive literature on both of these topics, to the best of our knowledge, no study has explored the relationship between perceptual and cognitive racial biases in the same individuals in a within-subjects design. In this experiment, we explored this relationship in 28 University of Florida students using three tasks. First, participants completed a two-interval forced-choice procedure where they were shown pairs of grayscale faces (some with European features, some with African features) and asked to judge whether the second face was darker or lighter than the first. Second, individuals completed the Implicit Association Test (IAT) to measure their associations between race (white people, black people) and positive/negative adjectives (good, bad, etc.). Finally, subjects answered questions to measure explicit attitudes about different racial groups. To analyze our data, we first computed a slope metric to assess perceptual bias in the Race-Lightness Task (RLT), measuring the degree in which morphology influences lightness judgments. Next, to assess bias from the IAT, we employed a diffusion model (Ratcliff et al, 2016; Kvam, 2019). The correlation between RLT performance and a model parameter reflecting racial bias was not statistically significant, $r(26) = .18$, $p = .347$. Overall, our exploratory analyses provide preliminary support for the independence of perception and cognition for racially-based tasks.



Presenter(s): Lauren Massais, Anthony Hockman, Kiara Mackenney, Juan Ricardo, Mariana Rivas

Authors: Anthony Hockman, Kiara Mackenney, Lauren Massais, Juan Ricardo, Mariana Rivas

Faculty: Dr. Jennifer Doty

Analyzing Predictors of Depression in College-Aged Individuals

Due to an increasing prevalence of depression in college-aged students, this research analyzed the potential interplay between amount of sleep, frequency of alcohol consumption, and ability to turn to a friend as potential antecedents, as these are substantial external factors during this period of life. Though a variety of studies have examined these factors individually, there has not been extensive research analyzing all of them together in relation to depression. Utilizing the second generation data from the YDS Data Archive (N=673), a linear regression was conducted to determine the statistical correlation and significance of these factors in relation to college-aged individuals reporting they were "feeling depressed" (Mean Age: 18.157; 21.8% Male, 33.9% Female, 0.3% Other; 45.6% White, 7.1% Black/African American, 6.2% Hispanic/Latino, 5.5% Asian, 2.2%, American Indian/Alaska Native, 0.1% Pacific Islander, 2.2% other, and 1.8% Mixed). There is a statistically significant negative correlation between social support and feelings of depression (B= -.224, SE= -.091, p=.001;). However, the correlation between alcohol and depression was not significant (B= -.039, SE=.05, p=.57), nor was the correlation between levels of sleep and depression (B=-.026, SE=.054, p=.705). In analyzing these results, the presence of stable friendships in individuals ages 18-24 may be vital in mediating the rise of depression, thus acting as a protective factor. Prevention programs centered around this issue should focus on building friendships and encouraging social connections for successful outcomes.

Presenter(s): Rohan Master

Authors: Rohan Master, Lei Wang, Yufeng Xiao, Yuewan Luo, Daohong Zhou, Guangrong Zheng, Weizhou Zhang

Faculty: Dr. Weizhou Zhang

Developing a PROTAC-based NR4A1 Degrader for Melanoma Cancer Therapy

Melanoma is one of the most common skin cancers in the United States and accounts for nearly 100,000 new diagnoses every year. Recent studies have highlighted the role and importance of the transcription factor nuclear receptor subfamily 4 group A member 1 (NR4A1) in melanoma for cancer survival, invasion, and metastasis. NR4A1 overexpression in melanoma cell lines has been linked to poor prognosis. Using a proteolysis-targeting chimeras (PROTACs) drug strategy, we have developed an NR4A1 degrader. Our PROTACs contain two active domains and a linker. One domain is specific to NR4A1, and the other domain recruits an E3 ligase which works to ubiquitinate NR4A1 and degrade the protein via the ubiquitin-proteasome pathway. The PROTAC drug design offers the benefits of equilibrium occupancy, longer-acting activity, reduced toxicity, and specificity to the target protein. Our PROTACs can degrade NR4A1 and induce apoptosis in melanoma cell lines. This treatment can efficiently induce cell death in vitro and reduce tumor size in the murine B16 melanoma model. Our NR4A1 PROTACs are a promising future direction for patients with melanoma.

Presenter(s): Anthony Matos

Authors: Anthony Matos

Faculty: Dr. Lei Zhang

Symmetry of minimizers of the Sobolev energy and a Morse-Sard theorem for monotone Lipschitz maps

In this paper we prove that extremizers of the Gagliardo-Nirenberg Sobolev inequality are radial functions depending only the distance to the origin. We first sketch Talenti's proof using the Coarea formula and the isoperimetric inequality, then demonstrate how to prove radiality by using the method of moving planes applied to the corresponding Euler-Lagrange equation. Finally, we prove a version of the Morse-Sard theorem for functions which are monotone and Lipschitz but not necessarily continuously differentiable.

Presenter(s): Alex Matys

Authors: Alex Matys, Carrie Adams

Faculty: Dr. Carrie Adams

Long term monitoring of actions and outcomes: Improving and streamlining learning from longleaf pine restorations at Morningside Nature Center

The restoration of natural ecosystems relies on the feedback received from monitoring programs which take long-term data on the health of an ecosystem. In this study, the monitoring program of a longleaf pine ecosystem in north central Florida is reviewed and revised. This revision was based on contact with park managers and the analysis of existing data with the goal of improving the restoration program's effectiveness. Analysis of existing data revealed the present inability to draw conclusions due to the temporal limitations of the data set. Our findings illustrate the importance of maintaining and continuing monitoring programs due to the value of long-term data for assessing changes in an ecosystem over time. In addition, future data collections will yield more useful feedback as a result of improvements made to the protocol. The design of a monitoring program must be closely linked to the specifics of the restoration program intended to be studied. This study provides an account of this process to be referenced during the revision of similar monitoring programs.

Presenter(s): Melanie McCleary

Authors: Melanie L. McCleary, Taylor Combs Judkins, MS, and Bobbi Langkamp-Henken, Ph.D., R.D.

Faculty: Dr. Bobbi Langkamp-Henken

Food Cravings and Menstrual Symptoms during menstruation are weakly associated but do not differ by oral contraceptive type

Despite efforts to explain how the menstrual cycle and associated hormones influence food cravings, little is known as to how menstrual symptoms themselves in addition to the consumption of diverse oral contraceptive (OC) types influence the desire to eat certain foods during menses. This study determined whether there was an association between frequency of menstrual symptoms and food cravings during menstruation in women on OC as measured by the Menstrual Symptom Questionnaire (MSQ) and Food-Craving Inventory (FCI). This study also examined whether there was a difference in food cravings and menstrual symptoms between women taking a monophasic versus triphasic OC. Healthy women between 18-35 years of age (n=153) who took an OC were recruited for an interventional study from which secondary analyses of baseline data were conducted. The MSQ and FCI were completed during the same menstrual cycle. Increasing frequency of menstrual symptoms was associated with frequency of food cravings ($r=.27$; $p=.0007$). The frequency of total menstrual symptoms of women consuming a monophasic OC (mean ± SEM, 68.3 ± 1.14) was not significantly different than those consuming a triphasic OC (68.1 ± 2.91) ($p=.894$). The frequency of food cravings of women consuming a monophasic OC (1.87 ± 0.04) was not significantly different than those consuming a triphasic OC (1.81 ± 0.09) ($p=.762$). These data suggest that food cravings and menstrual symptoms during menstruation are weakly correlated but do not differ by OC type.

Presenter(s): Shannon McCloskey

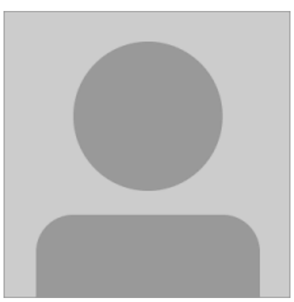
Authors: Shannon McCloskey, Eric Loken, David Jahn, Christopher Karstens, Bryan Smith

Faculty: Stephen Mullens

Determining When and How a Random Forest Adds Value to Day 1 SPC Hail Forecasts

This study investigates when a random forest (RF) algorithm's day 1 severe hail probabilities differ from corresponding Storm Prediction Center (SPC) human-generated probabilities by at least one SPC outlook category. The goal of this study is to determine when an RF is most and least likely to add value to day 1 SPC human hail forecasts. RF forecasts are trained on forecast variables from the High-Resolution Ensemble Forecast System, version 2.1 (HREFv2.1) and observed SPC hail reports, using 627 days of data from May 2018 through April 2020. RF forecasts are compared against a continuous version of human-generated day 1 SPC hail forecasts, produced daily at 06z.

Analysis shows that the RF is especially skillful in reducing false alarm by forecasting one outlook category lower than that of the SPC. Additionally, when the RF forecasts at least one outlook category higher (lower) than the SPC, ensemble mean storm attribute variables including maximum 2-5 km updraft helicity, maximum upward vertical velocity, and maximum downward vertical velocity tend to have higher (lower) absolute values. Meanwhile, the distribution of these variables does not change much when the SPC forecasts at least one outlook category higher or lower than the RF. These findings suggest that RFs add value to the SPC by calibrating their probabilities based on the strength of simulated storms, while SPC forecasters add value to the RF by analyzing other (meteorological and non-meteorological) variables.



Presenter(s): Megan McGourley

Authors: Megan McGourley

Faculty: Professor John Maze

Designing for the Human Experience: A Study of Phenomenological Spaces

Sensory environments exist throughout the built world. Design foundations emphasize the visual quality of space and neglect the remaining observational senses that inform the experiences people use to understand their surroundings. Architects are able to shape the experiences of inhabitants who occupy a space through a phenomenological approach to human-centric design. The development of a phenomenological lens in architecture assists in designing nuanced, informative, and experiential spaces through which the psyche assigns memory. Place, memory, and understanding of the senses create a framework that clarifies the difference in cognitive responses to architecture among humans.

This research explores sensory sites in an urban and semi-urban environment to catalog changes in sensory stimulation in varied environments. It analyzes a body of theoretical thinking and philosophy of phenomenology to understand spaces as they are and as they appear. Using site evaluations, written observations, collaged studies of spaces, and photography, this work probes the built world to act as a vehicle for memory and deeper human connection.

Presenter(s): Kiersten Meigs

Authors: Kiersten Meigs, Zachary Slepian

Faculty: Dr. Zachary Slepian

On a General Method for Resolving Integrals of Multiple Spherical Bessel Functions Against Power Laws into Distributions

We here present a method of performing integrals of products of spherical Bessel functions (SBFs) weighted by a power-law. Our method, which begins with double SBF integrals, exploits a differential operator ˆDdefined via Bessel's differential equation. Application of this operator raises the power-law in steps of two. We also here display a suitable base integral expression to which this operator can be applied for both even and odd cases. We test our method by showing that it reproduces previously-known solutions. Importantly, it also goes beyond them, offering solutions in terms of singular distributions, Heaviside functions, and Gauss's hypergeometric, 2F1 for all double-SBF integrals with positive semi-definite integer power-law weight. We then show how our method for double-SBF integrals enables evaluating arbitrary triple-SBF overlap integrals, going beyond the cases currently in the literature. This in turn enables reduction of arbitrary quadruple, quintuple, and sextuple-SBF integrals and beyond into tractable forms.

Presenter(s): Qirong "Sherry" Meng,

Authors: Qirong Meng

Faculty: Dr. Dennis DiPasquale

Chinese international student's utilization of campus career resources at 4-year public university in the southeastern United States

Colleges have been dedicated to helping students better prepare for their careers post-graduation. Research on how university students utilize colleges to better their careers, in particular using university career resources, is not in short supply. However, this research is focused on American students. Research on international students, in particular students from China, is limited. As Chinese students comprise the largest group of international students, this is a gap in the research that needs to be explored. As this trend doesn't appear to be slowing down, this is an important area to ensure the school meets its educational objectives for international students as well as American students.

This research will use a survey to understand international students' awareness, use, and satisfaction of their school's existing career resources.

This research expects to find or expects to answer the question: how do international students, in particular, Chinese students currently use collegiate career services? Are they satisfied with the resources the school offers right now? Is there any specific difficulty international students face without knowing? Can the school improve their career service to meet their needs for educational purposes?

Presenter(s): Sarada Menon

Authors: Sarada Menon, Michelle Cardel, Young-Rock Hong

Faculty: Dr. Michelle Cardel

Impact of COVID-19 on Mental Health Outcomes of Behavioral Research Participants

The goal of this study is to examine the impact of COVID-19 on mental health outcomes of behavioral research participants and their ability to adhere to intervention recommendations. This is a follow-up assessment to a previously conducted cross-sectional study. We conducted a qualitative/quantitative longitudinal assessment to analyze participants enrolled in health-related interventions (n=135; 83% women; >50% currently enrolled in behavioral interventions). The survey instrument was modified from an Ebola survey that characterized the disease and its effects on mental health. Additional questions assessing specific behavioral intervention recommendations such as dietary changes, physical activity, alcohol consumption, smoking, sleep were also added and included qualitative free-form response questions. Female participants showed a significant decrease in PTSD symptomatology compared to baseline scores (p<0.001). Participants across all age groups showed a significant decrease in PTSD symptomatology and an increase in Anxiety/Depression compared to previously reported baselines scores. The 18-35 age group showed the most significant reduction in PTSD symptomatology (23.9%) while the 55+ age group showed the most significant increase in Anxiety/Depression scores (24.2%). These findings suggest that behavioral research participants no longer experience PTSD symptomatology related to COVID-19, however, many deal with anxiety/depression-related mental health issues caused by the pandemic.

Presenter(s): Axianax Merone, An P. Q. Nguyen, Jonathan Valentin, Nisha M. Kotta, Viviana Pinzon, Ashley Landry, Henry M. Lutz, Julie F Jameson, Whitney L Stoppel

Authors: Axianax Merone, An P. Q. Nguyen, Jonathan Valentin, Nisha M. Kotta, Viviana Pinzon, Ashley Landry, Henry M. Lutz, Julie F Jameson, Whitney L Stoppel

Faculty: Dr. Whitney Stoppel

Studying the effect of different degradable parameters have on silk sponges for biomedical applications

Natural silk has a unique set of qualities as a biomaterial, including outstanding mechanical properties, biocompatibility, and biodegradability. Silk sponges have the potential to serve as the platform for tissue regrowth to replace damaged tissue, and their customizability offers the capability to deliver more personalized treatments to patients. Silk fibroin, derived from Bombyx mori silkworm cocoons, can be used to create sponge-like materials with a wide range of adjustable properties. The sponge can enzymatically degrade in the body, and it is possible to produce scaffolds with extracellular matrix (ECM) components that encourage cell proliferation, migration, and infiltration. The objective of our study is to analyze the relationship between silk degradation rate and the parameters that can be modified during the scaffold formulation process. Manipulation of the silk format and enzyme type impacts degradation rates, and we are currently exploring these results further by adjusting additional parameters that are hypothesized to affect degradation rates including annealing time, degumming time, freezing temperature, and polymer concentration. We were able to show in our research that these parameters have an impact on enzymatic breakdown in vitro. While several of the enzymes used in the experiment are not found naturally in the body, our enzymes serve as a starting point to understand our methods and mathematical model.

Presenter(s): Sabahattin Mert, Davis Rash

Authors: Davis B. Rash, Sabahattin M. Daloglu, Christopher A. Cravey, Rebika Makaju, Sadhvikas J. Addamane, Dominique Laroche

Faculty: Dr. Dominique Laroche

Study of Quantum Phenomena in 1D and 2D GaAs Structures

In our lab, we design and fabricate novel nanodevices in the cleanroom at the Nanoscale Research Facility and study the fascinating quantum effects arising when they couple to other materials and nanostructures. Our current research centers around observing the low-temperature magnetotransport characteristics in GaAs/AlGaAs heterostructures. We perform these measurements at millikelvin temperatures by using a dilution refrigerator equipped with a vector magnet capable of reaching magnetic fields of 6 T. The low-disorder heterostructures produce two-dimensional electron gases. By studying the scattering mechanisms in these two-dimensional systems, we can minimize disorder in the starting material for quantum wire fabrication. This increases the mean-free path in ballistic nanowires and so enables observation of quantized conductance and quantum transport in longer devices. In successful devices, we perform Coulomb drag experiments, which enables us to probe the strength of electron-electron interactions. Because current accepted theories of interacting fermions fail in one-dimension, we try to observe experimental evidence for the alternative Luttinger liquid theory through our observations of the Coulomb drag signal. Its temperature dependence in particular is of great importance for understanding both the microscopic origin of the drag signal and the strength of electron–electron interactions. We have observed stronger drag signals with decreasing temperature until approximately 500 mK; at lower temperatures, we have observed a fluctuating drag signal. These results point toward the importance of charge fluctuations as a mechanism for inducing Coulomb drag.

Presenter(s): Jordan Milano

Authors: Jordan Milano, Adriana Sandino, Jessivca Bove, Russell Bauer

Faculty: Dr. Russel Bauer

<u>Demographic Trends in Patient Fear-Avoidance Following Traumatic Brain Injury: Normative Development of the BIRDS Scale</u>

Many patients report persisting symptoms past the normal recovery period for mild traumatic brain injuries (TBIs). To minimize the lifestyle impacts of these lingering symptoms, some patients utilize maladaptive coping mechanisms such as “fear-avoidance” or “endurance” behaviors. Few assessment tools to measure these behaviors and their implications on TBI recovery have been created. The Brain Injury Recovery Dispositions (BIRDS) scale is being developed to assess these behaviors in patients suffering from prolonged TBI symptoms. The scale places patients on a spectrum from “dove” (exhibiting more fear-avoidance behaviors) to “hawk” (exhibiting more endurance behaviors) using an 18-item questionnaire. Patient age, sex, years of education, and time between injury and questionnaire completion were investigated for impacts on patient scoring on the BIRDS scale. The scores of 69 BIRDS scale patient questionnaires were analyzed for potential relationships with the variables of interest using the Pearson correlation coefficient. Patient age, sex, and years of education were not significantly correlated with scores produced by the BIRDS scale questionnaire. Time elapsed was significantly correlated with both the hawk subscore (r = .34, p < .05) and specific placement on the BIRDS spectrum (r = .24, p < .05). Insignificant correlations between patient demographics and scores produced by the questionnaire supports the use of this clinical assessment tool for a variety of patient populations. The significant correlations between time elapsed, hawk subscore, and BIRDS spectrum placement indicates that patients are still experiencing symptoms for extended periods after injury and are exhibiting increased endurance behavior over time.

Presenter(s): Caroline Millwater

Authors: Caroline Millwater, Dimuthu Kodituwakku, Coray Colina

Faculty: Dr. Coray Colina

Effects of Glycosylation of Glucose Oxidase Dynamics Utilizing Molecular Dynamics Simulations

Glucose oxidase (GOx) is a dimeric enzyme possessing 587 residues on each of its two monomers, which catalyzes the oxidation of β-D-glucose to produce D-glucono-1,5-lactone and hydrogen peroxide. This reaction has importance in the food, medical, and biotechnology industries as a means of removing oxygen and glucose from a system. Previous works on GOx have characterized differences in enzyme activity due to glycosylation, which is defined as the attachment of carbohydrate moieties to the enzyme. This work utilizes atomistic molecular dynamics simulations to model the enzyme as a dimer with (glycosylated) and without (deglycosylated) its carbohydrate moieties in solution up to 2 microseconds. The molecular dynamics simulations were run in four separate replicas per model with eight runs in total performed via the HiPerGator 3.0 supercomputer. Root mean squared deviation and radius of gyration calculations were used to compare the simulated enzyme to the crystal structure of GOx obtained from the Protein Data Bank with the identification code 1GPE. The results suggest larger fluctuations (6-10 angstroms) in the conformation of the deglycosylated enzyme when compared to the glycosylated enzyme, which indicates lower structural stability. These results show important insight into the conformation of this enzyme in solution, and lead to further inquiry about the attachment of synthetic polymers to GOx for the advancement of drug research.

Presenter(s): Rebecca Molina

Authors: Rebecca Molina, Eduardo Calixto, Philip G Hahn

Faculty: Dr. Phil Hahn

Influence of Abiotic and Biotic Stressors on the Sensitivity Defenses of Mimosa strigillosa

In plants, both physical and chemical traits are involved in the defense against environmental stress and herbivory. In the case of Mimosa plants, touch-sensitive responses through leaf-closure provide a unique form of mechanical defense. While past research has shown that the impacts of stressors such as competition or short-term drought may cause the chemical defenses in plants to increase or decrease, it is unknown how the interaction of these stressors may influence the efficiency of touch-sensitive responses. In this study, we hypothesized that the touch-sensitive responses of Mimosa strigillosa would strongly differ from regularly watered individuals when subjected to short-term drought. Additionally, we hypothesized that competition would hinder the touch-sensitive response, particularly from competitors in closely related taxa. To test these hypotheses, an experimental design was performed with three competition groups of Mimosa: competition within itself, competition with another member of its family, and competition with a member outside its family. Within each competition group, one half of plants were regularly watered, while one half did not receive water for three days. Plants were then subjected to a tactile stimulus in a greenhouse environment, with the degree of leaf closure being measured as an estimate of recovery. Drought was a significant factor of leaf closure, with drought-affected plants having greater leaf closure than regularly watered plants. Competition showed some marginal significance as a stress factor in the re-opening success of the leaf. These results suggest that abiotic factors may be more influential drivers of plant defense traits than competition.

Presenter(s): Victor Moncada

Authors: Moncada, V. M.; Kumar, A.; Henderson, W. H.; Castellano, R. K.

Faculty: Dr. Ronald K. Castellano

Design and Synthesis of Novel Self-Assembling [3.3]Paracyclophane Monomers

[n.n]Paracyclophanes ([n.n]pCp) exhibit transannular π-π interactions through their closely situated aromatic rings. Because of their unique stereochemistry and optical properties [n.n]paracyclophanes function as molecular scaffolds for a variety of applications, ranging from chiral ligands to conjugated polymers. In the supramolecular field, the Castellano group in 2016 reported the first [2.2]paracyclophane based monomer – [2.2]paracyclophane tetracarboxamide ([2.2]pCpTA) that was capable to self-assemble and form homochiral one-dimensional supramolecular polymers through double-helical hydrogen bonding among anti- aligned amide hydrogen bonding units. Extending the bridge length from [2.2]pCpTA to [3.3]paracyclophane tetracarboxamide ([3.3]pCpTA) again forms a self-complementary 1-D supramolecular polymer. However, it suffers from poor assembly strength due to an increase in monomer conformational freedom. To further tune the self-assembling properties of [3.3]paracyclophane derivatives, the installation of various H-bonding units is essential. Synthetically, the first step is the macrocyclization of 1,4-bis(bromomethyl)benzene with a TosMIC adduct under dilute conditions to afford the [3.3]paracyclophane-diketone. The next step is the Wolff-Kishner reduction to afford the [3.3]paracyclophane scaffold ready for various H-bonding group installation through a coupling reaction and acylation with different electrophiles. The crude product from each step must be purified via column chromatography and analyzed by NMR before proceeding to the next step.

Presenter(s): Anna Montelongo, Denna Bakhtiar

Authors: Anna Montelongo, Denna Bakhtiar, Samantha M. Smith, Elena L. Garcia, Caroline Davidson, Sarah Lovett, Arman Mahmood, Sara N. Burke

Faculty: Dr. Sara N. Burke

Immediate Early Gene Validation of Muscimol Inactivation in Paired-Associates Learning

Age-related cognitive decline is a complex phenomenon that results from functional decline of a variety of systems in the brain and negatively impacts quality of life. Research has shown that the hippocampus and dorsal striatum play essential roles in supporting spatial memory, which is known to decline with age. The hippocampus-mediated system is linked to allocentric spatial behavior (object-to-object), while the dorsal striatal system is linked to egocentric spatial behavior (object-to-self). Although both systems support memory guided behaviors, it is hypothesized that they may compete with one another. The relationship between these structures in visuospatial associative memory, another cognitive faculty known to decline with age, is currently unknown. This study tested young (n=8) and aged (n=8) male rats on a touchscreen-based platform to measure hippocampal-dependent visuospatial paired associative learning and on a striatal-dependent T-maze control task after undergoing bilateral cannulation and inactivation of the dorsal striatum. Results showed that inactivation did not alter performance on the PAL task (young: $T(7)=1.258$, $p = 0.249$; aged: $T(6) = 0.098$, $p = 0.925$), but it did affect T-maze performance (young: $F(59,184) = 11.67$, $p < 0.0001$) leading to the conclusion that the dorsal striatum may play a minimal role in PAL task performance as measured by percent correct across a 90-trial session. Furthermore, we are quantifying the expression of cFOS protein in the dorsal striatum as an indicator of cellular activity using cell counting software to validate the behavioral aspects of this study at a cellular level.

Presenter(s): Isabella Montoya-Bedoya

Authors: Isabella Montoya

Faculty: Dr. Amanda Phalin

Root Causes and Mitigation of Algorithmic Bias in Machine Learning

Algorithmic bias can arise from several factors, including programming errors, data accessibility, and programmer bias. Machine learning systems must go through a continuous learning and training cycle to understand and interpret large sets of data. Once the machine can make connections between data points, it relays information back to the user based on the assumptions it gathered over a designated period of time. As new developments are made in artificial intelligence, it is the responsibility of companies to monitor and adjust any systems that are biased against stakeholders. While this type of artificial intelligence has the ability to reduce human error, it also requires constant modification and training. Lack of updated data or training can lead systems to unintentionally discriminate against certain groups of people. Models also have the possibility of operating on data produced from biased intentions and inequities. This article examines the root causes and mitigation of bias algorithms while analyzing the effects that bias decisions have on real-world decisions. Ultimately, it is concluded that although machine learning is inevitably prone to output data errors, the root cause of algorithmic bias stems from human bias and data input errors in artificial intelligence systems.

Presenter(s): Claudia Morales

Authors: Claudia Morales, Dr. Nichole Scaglione, Dr. Liana Hone

Faculty: Dr. Nichole Scaglione

How do sorority members and non-sorority members compare in sexual assault experiences, alcohol-related sexual consequences, and number of protective behavior use?

Studies have shown that there is a strong correlation between Greek Life membership and increased sexual assault risk (Canan, 2018). Many college campuses emphasize the importance of both alcohol and sexual assault protective behaviors in order to prevent sexual violence, especially while drinking. This study examines the relationship between sorority membership and sexual assault experiences, alcohol use, alcohol-related consequences, and protective behavior use. Female drinkers (n= 138) completed a web-based survey after their first semester of college. Participants reported whether they were a member of a sorority, the number of unwanted sexual experiences, alcohol-related sexual consequences they experienced, and the number of alcohol and sexual assault protective behaviors they used over the course of the semester. A series of independent-sample t tests showed that sorority members experienced significantly more sexual assault and sexual consequences, drank more, and used more alcohol and sexual assault protective behaviors than non-sorority members. The results of this study suggest that the various protective strategies that members of sororities practice may not be as effective when sexual assault is still more prevalent, perhaps due to increased drinking or the context where their drinking occurs. Future research could potentially examine whether increased drinking among sorority women could explain why there is a high risk for sexual assault despite the increased protective behavior use. Future research could also examine how fraternity members use sexual assault protective strategies relative to sorority members, and how that might relate to the increased sexual assault risk in Greek Life.

Presenter(s): Kendall Moran

Authors: Kendall B. Moran Jr., Jennifer A. Nichols

Faculty: Dr. Jennifer A. Nichols

Can Musculoskeletal Simulations Effectively Capture the Relationship between Upper Limb Posture and Thumb-Tip Force?

Postural changes at the wrist and forearm affect how individual muscles must be activated to generate pinch forces at the thumb-tip. However, experimentally measuring and modulating individual muscle activations is difficult. Previous experimental work has evaluated maximum pinch force at various postures, but to our knowledge, no computer simulations have replicated these findings. Given that computer simulations can be a useful tool to study the musculoskeletal system, the objective of this study was to investigate a musculoskeletal model's ability to simulate lateral pinch at various upper limb postures.

Lateral pinch force data and electromyography (EMG) data that defines muscle activations were recorded at nine postures from four subjects in this IRB-approved study. Pinch force simulations at the same nine postures were conducted using a musculoskeletal model. Simulations were run with and without using collected EMG to guide muscle activations. Forces generated in both sets of simulations were compared to literature and experimental data.

Simulations performed without experimental guidance resulted in forces that were drastically different from that reported in the literature. Experimentally-guided simulations using mean EMG as maximum muscle activation were only able to be collected at various forearm postures with a neutral wrist posture. These simulations resulted in force trends across forearm postures that followed data collected experimentally and that in the literature.

Experimentally-guided simulations using our model seem to generate physiologically-reasonable forces across forearm postures. Future work is needed to improve the ability of the model to simulate tasks outside of a neutral wrist posture.

Presenter(s): Nicole Morgan

Authors: Nicole Morgan

Faculty: Dr. Jill Sonke

Graphic Medicine and Clinical Empathy Formation: Evaluation of a Pilot Program for Pre-Health Students

Graphic medicine is a burgeoning subfield of comics studies. Central to the graphic medicine subfield are graphic memoirs of illness and disability, long form texts referred to in the literature as graphic pathographies. While graphic medicine interventions have been employed in graduate learning environments in the health professions with demonstrated success, there is little research on their impact when used as an intervention for pre-health undergraduate students. This capstone project aims to assess the outcomes of a virtual graphic medicine book club for pre-health students, and to determine the extent to which graphic pathographies can support the education of future clinicians by cultivating an awareness of the patient experience and clinical empathy during their baccalaureate years. In conjunction with book club activities, participants were invited to complete surveys assessing their self-reported knowledge and perceptions about comics, graphic medicine, healthcare, and patient experiences. Changes in empathy were also assessed using a modified Kiersma-Chen Empathy Scale, an instrument designed to assess empathy in health professions students.

Presenter(s): Catalina Morrison

Authors: Catalina Morrison

Faculty: Dr. David Arnold

Magnetic Nanoparticles and Symbiosis – Moore Foundation Project

Euprymna scolopes, also known as the Hawaiian bobtail squid, have a symbiotic relationship with V. fischeri, a bioluminescent bacterium. These bacteria and the hemocytes of the squid have markers that allow them to be isolated from other cells. Magnetic fluorescent nanoparticles (MFN) can bind to specific cell receptors or embed themselves onto the cell membrane. This allows for the manipulation of the cells with a magnetic field. This magnetic field is created by using a coil system placed on the microscope stand around the slide containing the cells. The extracted hemocyte cells from Bobtail Squid already contain a symbiont receptor ligand on its cells, removing the need for genetic manipulation when collected and labeled with the functionalized MFN. My role in this project involved creating this coil system. The coil system I created uses two coils with 350 turns in a Helmholtz configuration with a DC current tested at 2 amps, to create a field sufficiently strong enough to manipulate the cells. When creating the coil system, it is important that the coils do not interfere with the microscope or harm the cells by producing an excess amount of heat. The cells are placed a few millimeters below the coil axis as the coils sit directly on the microscope platform. After running various finite-element simulations using COMSOL Multiphysics, collecting data using a transverse probe, and calculating the gradient of the magnetic field, cell manipulation is possible with a strong enough force created by the coils.

Presenter(s): Ahmad Moussa, Shawn Khan

Authors: Liam F. Fitzgerald, Jacob Lackey, Zachary R. Salyers, Ahmad Moussa, Shawn Khan, Terence E. Ryan,

Faculty: Dr. Terence Ryan

Impact of chronic aryl hydrocarbon receptor activation on skeletal muscle health and function

Objective: Chronic tobacco smoking is associated with skeletal muscle weakness, atrophy, and exercise intolerance, however, there is an incomplete understanding of the molecular mechanisms. Tobacco smoke contains numerous chemicals, including dioxins and polycyclic hydrocarbons, that can bind to an activate the aryl hydrocarbon receptor (AHR). The AHR is a ligand activated transcription factor best known for upregulation of xenobiotic metabolism, however chronic activation is toxic in many cell types. The objective of this study was to examine if chronic activation of the AHR, alone, adversely effects skeletal muscles.

Methods: Four-month-old male and female C57BL/6J mice were treated with adeno-associated viruses (AAV9) encoding either a GFP control (AAV9-HSA-GFP), wildtype AHR (AAV9-HSA-AHR), or a constitutively active AHR (AAV9-HSA-CAAHR) generated by deletion of the ligand binding domain, all driven by a muscle-specific human skeletal actin promoter (n=8/group/sex). Five months following treatment, mice were euthanized and measures of muscle mass, myofiber cross sectional area (CSA), muscle force production/fatigue, and mitochondrial oxidative phosphorylation were performed.

Results: Treatment with AAV9-HSA-AHR or AAV9-HSA-CAAHR did not significantly alter muscle mass (all P>0.05). Maximal force production of the extensor digitorum longus muscle was also not statistically different across treatments (group effect P=0.0759). Mitochondrial oxidative phosphorylation was impaired in mice treated with AAV9-HSA-CAAHR (P=0.0007), however this impairment was only observed in conditions mimicking high energy demand (i.e. exercise).

Conclusion: Myofiber-specific expression of a CAAHR was found to negatively impact mitochondrial oxidative phosphorylation. Interestingly, these changes occurred in the absence of significant muscle atrophy or weakness.

Presenter(s): Bryce Murillo

Authors: Bryce Murillo, Alisa Johnson, Yenisel Cruz-Almeida

Faculty: Dr. Yenisel Cruz-Almeida

Investigating Exercise's Role on Muscle Physiology in Older Adults with Chronic Pain

Knee osteoarthritis (OA) roughly affects 32.5 million adults in the U.S., yet little is known about its effect on muscle physiology, specifically in the quadriceps. Exercise is used as a treatment for knee OA as it has been known to decrease inflammation, increase mobility, and decrease overall pain levels, however little is known on how it alters muscle physiology in this clinical population. We aim to investigate the acute effects of exercise on muscle physiology in those with knee osteoarthritis when compared to age-matched healthy controls. The participants will also undergo quantitative sensory testing to gauge their sensitivity to several types of stimuli and we will have them perform a series of strength training exercise tasks to quantify their knee range of motion and quadricep strength in both legs. We will take muscle physiological measures (e.g., natural oscillation frequency, dynamic stiffness, mechanical stress relaxation time) before and after the participants perform the exercise task to gauge the acute effects. The measurements will be taken immediately after completing all the exercise tasks to see the most immediate effects of the strength training. We hypothesize that there will be a decrease in muscle stiffness (muscle mobility and range of motion) and increase in muscle tone (muscle tension at rest) post-exercise. Understanding how exercise affects muscle physiology in knee OA individuals will be a key step in determining how to better utilize its role as a treatment.

Presenter(s): Eaden Murphy

Authors: Eaden Murphy

Faculty: Dr. Hal Knowles III

Systemic Impacts of Vehicular Fleet Electrification: A Sustainability Analysis

Electric vehicles are being adopted at record rates by the consumer market, but have yet to be adopted by commercial fleets on a wide scale. There are opportunities and constraints associated with this transition, and this research explores them with an applied sustainability analysis. Since the benefits of EV adoption span a wide range, this research attempts to compile information across the four pillars of sustainability and format them in an approachable manner. There is a significant up-front cost associated with EV adoption, but when considering the environmental, social and cultural benefits there is emphatic evidence to support the switch.

The paper is broken down into four main sections assessing the economic, environmental, social and cultural aspects of EV fleet transitions. Existing literature on the topic is explored broadly, establishing significant evidence to support the research model. Based on the findings, a decision support tool is introduced that can process fleet data and establish an estimate of holistic cost/benefit across the 4 established categories. Then, this model is applied to several units within the University of Florida fleet to demonstrate the tool in action.

When considering the raw price of upgrading an entire fleet of vehicles, the EV transition can be intimidating. The environmental benefits associated with eliminating emissions entirely, economic strengths of EVs, and social and cultural benefits from improved safety and institutional culture can all combine to incentivize fleet managers to establish sustainability initiatives and adopt EVs ahead of the consumer curve.

Presenter(s): Aubrey Mys

Authors: Aubrey M. Mys & Dr. Catherine W. Striley

Faculty: Dr. Catherine W. Striley

State regulations for kratom (Mitragyna speciosa) use in the United States.

Over the past six years, regulations and policies regarding Kratom and Kratom-based products have received widespread, global attention, especially in the United States. Thus, I reviewed policies and regulations related to Kratom consumption and distribution in the United States.

In February 2022, the website, American Kratom Association, was analyzed to note the current legal policies. Google searches then confirmed the American Kratom Association's data on Kratom policies. The laws surrounding Kratom usage were recorded and then cross-analyzed to compare with the laws the American Kratom Association reported in each state's senate. The data was collected using the platform Microsoft Excel. The items used were the states listing if the substance Kratom was legal, had pending legislation, or was illegal. All fifty states have legal proceedings surrounding Kratom, so they were included in the study. Findings showed that forty-four U.S. states do not have policies that regulate Kratom use and that six states (Vermont, Rhode Island, Indiana, Wisconsin, Arkansas, and Alabama) currently ban Kratom. Some states passed bills, such as the Kratom Consumer Protection Act, which allows the consumption of this substance for adults. Other states, including New Hampshire, New Jersey, Michigan, Louisiana, and Hawaii, have pending legislation about the regulation of Kratom. Limitations to this research included data collection in February 2022 and pending legislation restricting complete data collection. Future research is needed to examine pending Kratom legislation in some states. Research in subsequent years could examine changing legislation surrounding Kratom.

Presenter(s): Emma Nabbie

Authors: Emma Nabbie

Faculty: Dr. Elizabeth Lada

Investigating the Relationship Between the Properties of Circumstellar Disks and Their Parent Stars

Circumstellar disks are structures composed of gas and dust that surround young stars as they accrete mass, and they are known sites of planet formation. It is imperative that we accurately characterize the properties of circumstellar disks to investigate how these traits influence the formation of planets. Archival Spitzer Space Telescope photometry spanning 3µm-8µm was used to construct broadband spectral energy distributions (SEDs) for a sample of young stars in the young clusters NGC2068 and NGC2071 in Orion, and NGC1333 and IC348 in Perseus. The sample was chosen to include sources that emitted light at millimeter wavelengths, allowing the calculation of the disk mass. The young stellar objects (YSOs) were classified based on the evolutionary state of their inner disks, which is determined by comparing their infrared photometry to stellar models. Disk masses were calculated using 1.3mm fluxes from the IRAM Telescope. Analysis of the SEDs suggest that only the coolest YSOs (with temperatures less than 5000 Kelvin) still retained their disks. This could imply a relationship between the evolutionary state of a disk and the temperature of its progenitor star. Of the original sample, NGC2068 and NGC1333 contained mainly Class I and II YSOs, indicating the presence of disks. The subsets of NGC2071 and IC348 are dominated by diskless Class III and Anemic YSOs, with few Class II stars. There is no observed correlation between disk mass and temperature, or between a disk's evolutionary state and its mass.

Presenter(s): Pia Nair

Authors: Pia Nair, Mingxin Yang, Arashdeep Singh, Joanna Peris, Guillaume de Lartigue

Faculty: Dr. Guillaume de Lartigue

Elucidating the role of ethanol-responsive vagal neurons in ethanol consumption and reward

Alcohol use disorder (AUD) is the leading cause of preventable death worldwide but lacks efficacious treatment options. The vagus nerve is a vital part of the gut-brain axis, conveying sensory information involved in reward. Vagotomy, or surgical resection of vagal fibers, significantly reduces alcohol consumption, implying a potential role of the vagus nerve in AUDs. However, vagatomy lacks specificity by impairing sensory and motor signaling between the brain and peripheral organs.

Here, we leverage unique strengths of the recently-developed Targeted Recombination in Activated Populations (TRAP2) mouse model, to provide unbiased cell type-specific genetic access to neuronal populations based on their activation by defined and time-constrained stimuli. We found a subpopulation of vagal cells activated in response to ethanol infusions. We validated a protocol for selective ablation of alcohol-responsive vagal neurons using viral mediated caspase in TRAP2 mice. Alcohol-ablated mice significantly reduced alcohol consumption compared to control littermates. We assessed the role of these neurons through a flavor-nutrient conditioning paradigm. Preference for a flavor paired with IG ethanol infusions increased similarly between groups, suggesting that ethanol sensing vagal neurons are not necessary for ethanol reinforcement. However, circulating blood alcohol levels were significantly lower after IG infusions, but not IP injections, indicating a role for ethanol sensing vagal neurons in alcohol absorption.

Overall, these results demonstrate that alcohol-responsive vagal neurons are necessary in regulating alcohol consumption, acting at least in part by increasing circulating alcohol levels. Inhibition of these neurons could be an effective strategy for treating AUD.

Presenter(s): Emily Najduch Najduch

Authors: Emily Najduch, Rebecca Zambrano, Jayden Yarborough, BS, Kerri-Ann Chambers, BS, Isabella Ramirez, BS, Alaina Mitchell, BS, Lisa A. House, PhD, Anne Matthews, PhD, RDN, Karla P. Shelnutt, PhD, RD

Faculty: Dr. Karla Shlenutt

The Impact of Healthy Meal Kits on Child Meal Preparation and Enjoyment

Background: Involving children in meal preparation has been shown to increase their interest in healthy foods and willingness to try new foods.1 In addition, children who prepare meals are more likely to enjoy these healthier meals and incorporate more nutritious foods in their diet.1 Finding creative ways to interest children in meal preparation may be an important approach to improving dietary quality and overall health.

Objective: To determine the impact of a healthy meal kit program on child meal preparation and enjoyment in a rural and suburban community.

Methods: Participants (adult main preparers of food from rural and suburban households with at least one child and low income) were given weekly meal kits each containing three healthy recipes with ingredients to feed four people. Demographic data were collected at baseline and analyzed using descriptive statistics. Child mealtime behavior data were collected post-intervention and analyzed using a frequency analysis.

Results: Participants (N=63; rural=40; suburban=23) were mostly non-Hispanic (98.4%) and female (75.7%). Most participants (rural=69.3%, suburban=54.2%) indicated that their children were often/always involved in the meal kit preparation. Of the rural and suburban participants who indicated that their child was often/always involved in the meal kit preparation, 69.3% and 61.5%, respectively, also agreed or strongly agreed that their child enjoyed the meals included.

Conclusion: Data suggest that a meal kit program is a creative and effective method of increasing child meal preparation in a rural and suburban community. In addition, children who participate in meal kit meal preparation are more likely to enjoy the prepared meal.

Presenter(s): Lucia Navia

Authors: Lucia Navia[1], Pierre Ghobrial[1], Clebson S. Tavares[1], Ruchir Mishra[1], Bryony C. Bonning[1]

Faculty: Dr. Bryony Bonning

Assessing the toxicity of bacterial pesticidal proteins Xpp37Aa and Tpp78Aa1 to the Asian citrus psyllid, Diaphorina citri

The Asian citrus psyllid (ACP), Diaphorina citri Kuwayama, is a hemipteran insect that vectors the bacterial causative agent of citrus greening disease, Candidatus Liberibacter asiaticus (CLas). Citrus greening has severely impacted the citrus economy in Florida decreasing its production by approximately 74%. Use of chemical insecticides to suppress ACP populations is a primary strategy for management of this disease, but extensive use has selected for insecticide resistance. Insecticidal proteins from Bacillus thuringiensis (Bt) can provide a safe and environmentally benign alternative for ACP management. Here, we report the toxicity of two Bt derived proteins, Xpp37Aa1 and Tpp78Aa1, against ACP adults. Proteins were expressed in BL21 E. coli cells grown in Luria-Bertani broth medium containing Ampicillin, solubilized and affinity purified. Two different conditions of induction were performed for both proteins. His-tag purification was carried out by a Takara kit protocol, with a few modifications. A Bradford assay was performed to determine the protein concentration. Protein integrity was assessed by running an SDS PAGE gel. A membrane feeding bioassay with three biological replicates was set-up using 4-day old ACP adults. Significant mortality between the treatment and buffer control was measured by Student t test using p-value of 0.05. Tpp78Aa1 and Xpp78Aa1 at concentrations of 48.2 and 68.4 ppm resulted in ACP mortality of 58.36% and 45.17% respectively at day 7. These results show that these two proteins are toxic to ACP and may provide a more sustainable approach for management of ACP and citrus greening disease than use of chemical insecticides.

Presenter(s): Marisa Nelson, Nick Cocoves

Authors: Henry Tingle, Andrew Ortega, Tony Diaz, Marisa Nelson, Nick Cocoves, Dr. Peter Ifju

Faculty: Dr. Peter Ifju

The "Sipper" Drone-based Water Sampling System

The "Sipper" was developed by the University of Florida as a method of water collection by means of a drone in response to the iCOAST initiative to collect and test water samples for water quality impairment detections. The method of water collection utilizes a drone that carries a vessel which contains sterile storage containers that can gather water samples upon command. In the original system, a boat-shaped vessel was utilized, and a winch system was attached to the drone to move the vessel. In the current version, the vessel was redesigned to be a pod shape, with the winch installed in the vessel to become a self-contained system. For further development, the GNSS utilized in the Sipper must be tested for accuracy in the horizontal field. The testing can enhance the self-correction properties in the system to ensure that the Sipper is traveling to accurate locations for water collection. In addition, the Sipper required development to allow for an autonomous water collection process. Typically, the system requires manual control with the drone to travel to the correct testing location as well as to lower the vessel to the water and gather a water sample, and an autonomous system would improve the efficiency of this process. A computer program was tested with an Arduino device to facilitate an autonomous sampling process. These attributes were developed to further improve the efficiency and versatility of the system. The following presentation will detail the development, testing, and improvement of the Sipper system.

Presenter(s): Quyen Nguyen

Authors: Quyen Nguyen, Amy Peiper, Stephanie Karst

Faculty: Dr. Stephanie Karst

Development of a Reporter MNV to Study Virus-Host Intestinal Epithelium Interactions

Norovirus is the leading cause of severe childhood diarrhea around the world and a major cause of acute gastroenteritis in all age groups. There are no currently approved vaccines or targeted therapeutics for norovirus infection and very little is known about the pathogenic mechanisms underlying gastroenteritis symptoms. To gain further understanding of this important virus, murine norovirus (MNV) has been used as a model system for many years and has led to significant advances in understanding norovirus biology. However, the absence of symptoms in immunocompetent adult mice infected with MNV limits the applicability of this model to delineation of viral mechanisms of disease. Using a novel symptomatic neonatal mouse model developed in the Karst lab, it has been shown that virulent strains of MNV infect intestinal immune cells at the peak of disease whereas attenuated strains do not. The mechanisms by which MNV transcytoses the epithelial barrier to reach its immune cell targets during symptomatic infection is unknown, and this interaction is undoubtedly key to disease pathogenesis. To study this interaction, I will work to generate a first-in-the-field reporter MNV by utilizing click chemistry and quantum dot technology. This reporter virus will then be used to test the hypothesis that MNV uses well-established routes for macromolecular transport across the intestinal epithelium.

Presenter(s): Charlene Nguyen

Authors: Peng Jiang, Charlene Nguyen

Faculty: Dr. Peng Jiang

Hot-Programming of Shape Memory Polymers

Shape memory polymers (SMPs) are a type of smart material that can recover from its deformed, temporary shape back to its original, permanent shape. This occurs due to an applied external stress, such as heat and pH. The deformation history can be manipulated through external forces, including hot-programming. Hot-programming has advantages in characterizing shape memory polymers. They can easily be deformed into its temporary shape with minimal stress. In this paper, the characteristics of shape memory polymers will be tested through hot-programming. Samples will be deformed at optimal temperatures and recovered by heating them above their glass transition temperature.

Presenter(s): Tanner Noronha-Weeks

Authors: Tanner Noronha-Weeks, Liana Hone

Faculty: Dr. Liana Hone

For Whom (Followers of Abrahamic Religions), and for What Reason (Intrapersonal Religious Commitment), is Sociosexuality More Closely Related to Religiosity?

Sociosexuality–attitudes/behaviors related to casual sex–is negatively related to religiosity. This may be especially true for followers of Abrahamic religions because these religions emphasize abstaining from extramarital sex. Moreover, interpersonal religious commitment may be more strongly related to sociosexuality than intrapersonal commitment. In this study, we aim to replicate the correlation between sociosexuality and religiosity, assess whether the relationship is stronger among Abrahamic followers, and deduce whether the relationship is driven more by inter- or intra-religious commitment.

Participants were N=817 college students (n=441 women; n=377 men) aged 17-48 (M=19.14, SD=2.18). Measures included demographics (age, sex, religion), the Sociosexual Orientation Inventory (SOI), and the Religious Commitment Inventory (RCI). Students were 554 Abrahamic followers and 250 non-Abrihamic followers. SOI scores ranged from 0-263 (M=53.42, SD=37.30) and RCI scores ranged from 0-4 (M=1.16; SD=1.01).

Replicating prior findings, SOI and RCI were negatively correlated–students with unrestricted sociosexual orientations were less religiously committed–r=-.26, p<.001. In line with predictions, SOI and RCI were negatively correlated among Abrahamic followers, r=-.30, p<.001, but not non-Abrahamic followers, r=-.12, p=.066. Contrary to predictions, sociosexuality was more strongly related to intrapersonal commitment (r=-.25, p<.001) than to interpersonal (r=-.22, p<.001) commitment.

This study clarifies the relationship between sociosexuality and religiosity–it is driven by Abrahamic followers, perhaps due to Abrahamic emphasis on abstinence. Moreover, it is driven by intra- rather than interpersonal commitment, perhaps because internal commitment more accurately predicts sociosexual attitudes/behaviors than outward displays of commitment, which may be performative.

Presenter(s): Melissa Ogasawara Tozaki

Authors: Melissa Ogasawara Tozaki, Jeanne-Marie R. Stacciarini, RN, PhD, FAAN

Faculty: Jeanne-Marie R. Stacciarini, RN, PhD, FAAN

Effective Advising: Enhancing Academic Success for Black Students in Health Sciences

Black students in the United States present a higher rate of changing majors or dropping out of college than their white counterparts. The negative racial experiences and challenges Black students at UF face may prevent them from achieving their educational goals. There is a relationship between students' academic success and effective academic advising. The purpose of the study was to identify the challenges and facilitators for Black minority students and academic advisors concerning the practices of academic advising. This study was a secondary data analysis. Focus groups data gathered from students and academic advisors about facilitators and challenges Black students face to pursue health education majors in a primarily White institution (PWI) in the South. Thematic analysis was performed to analyze the transcriptions of three focus groups. The themes identified from the students' focus group were: “Structure of the institution” and “personal”. A theme solely from the advisors' focus groups was “career mentorship”. And the themes that were common in both the students' and advisors' focus groups were “connection” and “communication”. The findings of this study suggest that Black students face significant barriers to successfully navigating the health professions pipeline.

Presenter(s): Ashley Ohall

Authors: Ashley Ohall, Bryndan Durham

Faculty: Dr. Bryndan Durham

"Determining Preferential Nitrogen Conditions for Phytoplankton Photosynthetic Cycles"

Phytoplankton, or single-cell algae, use light energy to transform carbon dioxide and other inorganic nutrients (e.g., nitrate, phosphate, sulfate) into organic matter that fuels the marine food web. As differential nutrient availability alters phytoplankton metabolism, metabolic changes that we do not yet understand may take place through the food chain. The ways in which environmental conditions alter primary production and metabolic outputs of photosynthesis must be further studied to understand ocean productivity in our future, changing ocean.

Here, I examined photosynthetic and metabolic features of Thalassiosira pseudonana, a diatom species that is widespread in the ocean with distribution in brackish, coastal, and open-ocean waters, under varying nitrogen conditions. I studied T. pseudonana growth and metabolism using nitrate versus ammonium versus urea to determine if the diatom has optimal resource condition(s) based on nitrogen source. Measurements included growth rates, fluorometry-based photosynthetic chemistry, and cellular carbon and nitrogen content. I then conducted similar measurements on natural phytoplankton populations in the Gulf of Mexico to compare with laboratory culture results.

Under saturating light, T. pseudonana uses nitrate and ammonium preferentially compared to urea, based on growth rate. Under low light, data suggests that there was less preference between the three nitrogen conditions, with urea performing similarly to nitrate and ammonium conditions. These data will lead to future research aimed at analyzing what effects the use of different nitrogen sources have on metabolic outputs of phytoplankton and how this may alter microbial food webs.

Presenter(s): Grace Oldham

Authors: Grace Oldham, Yuting Zhai, Dr. KC Jeong

Faculty: Dr. KC Jeong

Comparative Whole-Genome Analysis of Methicillin-resistant Staphylococcus aureus to Understand Genetic Features Associated with Host Adaptation and Dissemination in both Humans and Food Animals

Methicillin-resistant Staphylococcus aureus (MRSA) is a typical human and animal pathogen, causing various diseases that pose great concerns to public health. We aim to understand genetic features that enable MRSA for successful colonization in humans and animals. We conducted whole-genome sequencing of 50 MRSA strains isolated from hospitalized patients (HMRSA), as well as the genome sequences of 50 food animal MRSA (FAMRSA) from the NCBI database and identified their sequence types. Then, we constructed a core-genome based maximum-likelihood phylogenetic tree for FAMRSA and HMRSA. Strains isolated from the same host species have closer phylogenetic relatedness. Only two strains isolated from humans were clustered with four other strains from food animals. We further conducted comparative genome analysis to identify the antibiotic resistance and virulence profiles of these strains, with an emphasis on the differences between human and animal hosts. Multiple antibiotic resistant mechanisms were identified in the MRSA strains. Regardless of the host types, methicillin resistance and efflux pump encoding genes were shown in all the strains. There was no specific host-related resistance gene identified. Various virulence factors were also identified in the MRSA strains. Interestingly, strains isolated from the same host species have more similarity in their virulence profiles. In a future study, we are going to investigate the mobile genetic elements of these MRSA strains to further understand the dissemination and specificity of MRSA in different hosts.

Presenter(s): Ariana Orr

Authors: Ariana Orr

Faculty: Dr. Hania Al-Shamat

The Ambivalence of Egyptian Refugee Policy and its Impact on the Livelihood of Sudanese Refugees (1952-2020)

In Middle East and North Africa mixed migration studies, Egypt receives most attention for its popularity as a transit country; however, Egypt's capability as a host country deserves analysis because of the degree to which it has historically committed to refugee intake while simultaneously placing restrictions on refugee livelihood. This paper uses a historical comparative approach to study Egypt's refugee policies since independence until nowadays. It analyzes these policies considering the recently coined concept of ambivalence, which is the inaction of host country and the intention behind policies that are either liberal or exclusionary depending on current circumstances. It also studies the impact of these policies on the Sudanese refugees, whose country of origin has had a "special relationship" with Egypt pre-independence. The study shows that economic and foreign policy challenges, and the importance of adhering to international norms and standards of refugee intake have shaped Egypt's historical and present-day ambivalent refugee policy. Sudanese nationals overall enjoyed special privileges of residency and work due to the legacy of the Anglo-Egyptian Condominium and the special terms of the 1974 Wadi El Nil Agreement. However, the ascension by Egypt to the 1951 Geneva Convention with special provisions regarding the right to work and residency complicated things for the post 1983 Sudanese refugees. Amidst multiple bilateral agreements with Sudan, Egypt has been exclusionary in its domestic policy given its economic conditions and liberal in its foreign policy in order to appear to adhere to international norms.

Presenter(s): Cristina Ortiz

Authors: Cristina V. Ortiz-Carro, Jonathan R. Cowart, Danielle M. Collins, Iskande V. Larkin

Faculty: Iskande V. Larkin, PhD and Jonathan Cowart, PhD

Preliminary Assessment of the Effects of Liquid Storage on Sperm Head Morphometry in a West Indian Manatee (Trichechus manatus)

While the conservation status of the West Indian manatee (Trichechus manatus) has been downgraded from ‘endangered’ to ‘threatened’, the population still remains quite vulnerable. In addition to both natural and anthropogenic threats that result in high numbers of injuries and mortality on an annual basis, the West Indian manatee faces potential challenges to reproduction related to moderate level of inbreeding occurring within the population. The use of assisted reproductive techniques (ART), such as liquid storage and cryopreservation of spermatozoa, are potential mitigation strategies that have been successfully used for the conservation and maintenance of genetic heterozygosity in many species. Unfortunately, no ART have been established for the genetic and reproductive management of West Indian manatees. Therefore, this study aimed to investigate the morphometric changes associated with liquid storage on the spermatozoa of West Indian manatees in an effort to optimize liquid storage techniques in this species. Specific objectives were to: 1) compare the influence of different semen extenders on the morphometric parameters of West Indian manatee spermatozoa, and 2) compare the influence of storage time on the morphometric parameters of West Indian manatee spermatozoa. Semen samples were collected by manual stimulation and diluted using four semen extenders. Samples were then aliquoted for each semen extender and storage time (0, 6, 12, and 24 hr) and maintained at room temperature. Sperm morphometry was assessed using a modified SpermBlue® staining protocol. 200 sperm per extender and storage parameter were analyzed for the eight standard head morphometric parameters. Data collection remains on-going.

Presenter(s): Katelyn Palmer

Authors: Katelyn Palmer, Shion Newsom, Alanna Allion, Richard C. Hulbert Jr.

Faculty: Dr. Richard Hulbert

<u>Quantitative analyses of carapacial bones of fossil and modern samples of the turtle Trachemys (Reptilia: Testudines: Emydidae)</u>

Trachemys is a genus of freshwater turtle with a 7-million-year fossil record in Florida. Thousands of fossils of Trachemys have been collected at Montbrook, a new late Miocene locality in Levy County. This large sample allows statistical comparisons of individual bones of the shell with other samples of fossil and modern Trachemys. Thirteen measurements were taken with digital calipers on the nuchal bone. Using t-tests, Montbrook Trachemys adults are significantly smaller from those from an early Pliocene sample of Trachemys inflata from Polk County for 11 of 13 measurements (p values < 0.01). But, testing for differences in nuchal shape using Mann-Whitney U-tests for equal medians and Kolmogorov-Smirnov tests for equal distributions reveals no significant differences between 11 ratios of nuchal measurements from Trachemys inflata and Montbrook Trachemys. Significant differences in nuchal shape were present between Montbrook Trachemys and Trachemys scripta (both fossil and modern samples). This supports the assignment of the Montbrook sample to the extinct species Trachemys inflata. No significant differences were found in either nuchal size or shape between samples taken from different stratigraphic levels at the Montbrook site. The sixth and seventh neural bones of Trachemys are similar in both size and shape, and therefore difficult to distinguish solely by visual inspection. Linear discriminant analysis using eight measurements was able to correctly identify these bones from Montbrook with 94% accuracy. These results indicate that quantitative comparisons using standard univariate and multivariate statistics can be successfully applied to turtle shell bones if large samples (n>30) are available.

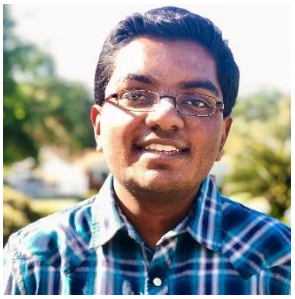
Presenter(s): Matthew Pancorbo

Authors: Matthew Pancorbo

Faculty: Dr. Anna Peterson

Exploring Recent Increasing Trends in Veganism and Vegetarianism

Veganism and vegetarianism are lifestyles that are considered a commitment to many, and people take on that front for a variety of reasons. For most, it is to spare the lives of animals, to better the environment, for health reasons, to teach them to respect all life, or a combination of those. Research has been previously done on the benefits of taking on a vegan or vegetarian diet, and the results have been open to the public for many years. However, there has recently been a positive trend in people starting that lifestyle or at least opening themselves up to the possibility of changing what they eat on a daily basis. That trend was explored through a process of surveying and interviewing students who attend the University of Florida in order to isolate any influencing factors in the recent growth of veganism and vegetarianism and understand why they might be significant. Two factors that were especially prominent from the results were difficulty and preference in taste, and there was some correlation found between decreasing difficulty of living as a vegetarian or vegan in terms of expense and convenience and increasing likelihood of trying such a lifestyle. This was further explored psychologically to better understand why this correlation was found.



Presenter(s): Arjun Panicker

Authors: Arjun Panicker, Jessica Aldrich, Shreedevi Kumar, Blanka Sharma

Faculty: Dr. Blanka Sharma

Mechanisms of Manganese Dioxide Nanoparticle Uptake and Retention for Chondroprotection

Introduction: Osteoarthritis (OA) is a degenerative disease that affect millions of people, with most treatments focused on pain management rather than reducing or alleviating the degenerated cartilage. Numerous therapies have been tested as potential articular treatments of OA but had limitations of low bioavailability and rapid clearance from the joint space. We addressed these limitations by using a Manganese Dioxide nanoparticle (MnO2 NP) drug carrier that can target cartilage through electrostatic interactions, which would improve bioavailability and retention. We found that these NPs can penetrate the cartilage and localize with chondrocytes. The purpose of this project was to continue the study of these particles by investigating the mechanism for uptake and retention of the particles in chondrocytes using various inhibitors of cell endocytosis methods.

Methods: MnO2 NPs were fabricated via previously reported methods and had a size of 11.6 nm. To visualize short-term uptake, fluorescently tagged particles were imaged via confocal microscopy. To analyze uptake mechanisms, inhibitors of Clathrin-mediated endocytosis, caveolin-mediated endocytosis, and macropinocytosis were added to chondrocytes treated with fluorescently tagged particles for 1 hour, and then analyzed with flow cytometry.

Results: Through fluorescent microscopy, the imaging study showed that MnO2 NP uptake by the chondrocytes occurs. The studies on uptake mechanisms indicated that nanoparticle uptake by the chondrocytes could be through macropinocytosis. Macropinocytosis involves an extension of the plasma membrane that non-specifically brings extracellular molecules into the cell; therefore, this study's finding supports the observed uptake from microscopy and the effective internalization of the particles by chondrocytes.

Presenter(s): Julianna Panton

Authors: Julianna Panton

Faculty: Dr. Martin Heesacker

Impact of COVID-19 and Racism on African Americans Attending Predominantly White or Historically Black Universities

In recent years, racism has become increasingly visible and COVID-19 has ravaged many communities, but especially African American communities. The purpose of this study is to catalog the subjective experiences of African American college students during this time of stress, both with their own voices and using standardized assessments, as well as to explore whether coping resources and attending an Historically Black College or University (HBCU) compared to a Predominately White Institution (PWI) are associated with lower levels of distress. This study participants will be approximately 100 students who identify as African American and 100 other participants, all over the age of 18. Approximately half must be enrolled in a HBCU and half enrolled in a PWI in order to participate. Data will be collected using surveys that are disseminated through social media, class instructors, and recommendations. A potential outcome for this study is African American college students attending HBCUs will score higher than those attending PWIs regarding their level of race-related stress, COVID-related stress, and depressive affect. The results of this study may offer insight into the nuanced experiences of African American college students. This knowledge can also encourage the implementation of targeted interventions for these students.

Presenter(s): Grace Parker

Authors: Grace Parker, Rebecca Henderson, Danielle Cooke, Seth Downing, Lauren Appleby, Aqueena Fernandez, Alexis Garcia, Alyssa Nielson, Carol Matthews

Faculty: Dr. Carol Mathews

The Spontaneous Identification of HD in Others by Individuals who Meet Criteria for Hoarding Disorder

Hoarding Disorder (HD), once considered a subtype of OCD, shares similarities to OCD with regards to its robust familiality (Iervolino et al., 2009). Children of individuals with HD may learn similar conventions about the value of possessions, which could, in part, explain the increased prevalence of HD in families. (Brakoulias et al., 2016) The present study involves the identification of suspected HD in others by individuals meeting diagnostic criteria for HD, during which participants named both familial and non-familial relations. The study aimed to investigate how recognition of HD in others (and in particular, family members) may impact recognition of HD in oneself. The most common reaction to naming another individual with HD can be summarized as follows: the individual first identifies another individual with HD symptoms, then relates their own condition to that of the identified individual (usually in terms of severity). The majority of participants posited that their own symptoms were less severe compared to those of the named individual. Those who named parents were more likely to discuss the impact that growing up around saving behavior had on their condition. Although individuals with HD historically demonstrate low levels of insight (Tolin et al., 2008), participants spontaneously assessed the severity of suspected HD in others.

Presenter(s): Bianca Parra

Authors: Carly N. Logan, Katelyn N. Lubke, Sara N. Burke

Faculty: Dr. Carly Logan

Expression of the Immediate Early Genes Arc and Narp During Cognitive Multitasking is Attenuated in Aged Rats

To examine the deficits in the perirhinal cortex (PER), the working memory task (WM/BAT) has been used. The rats are expected to perform a spatial alternation task and an object discrimination task simultaneously. The correct choice updates as the rat's position changes around the maze finding that with aged rats immediate-early gene (IEG) Arc changes expression in the PER. The PER acts as an inhibitory wall between the entorhinal cortex and the hippocampus, due to the PER interneuron projections to layer II of entorhinal cells which synapse in the hippocampus (Pinto et al., 2006). In the PER, aged rats have reduced monosynaptic coupling between excitatory principal cells and PER interneurons (Maurer, Burke, et al., 2017). Reduced afferent drive onto PER interneurons manifests as increased activation in the lateral entorhinal cortical neurons projecting to the hippocampus resulting in hyperactivity in CA3 (Maurer, Johnson, et al., 2017). There is an imbalance between inhibitory and excitatory signals in the PER across the medial temporal lobe circuit. Neuronal activity-regulated pentraxin (Narp) and the upregulation of Narp following behavior encodes an effector protein that clusters on AMPA receptors on parvalbumin-positive interneurons (Chang et al., 2010). The current work used the WM/BAT task and a control alternation task and quantified the expression of Arc and Narp in young and aged rats. In aged rats, there was a decreased proportion of cells with Narp mRNA and co-expression of both. Dysregulation of inhibition and excitation in the PER disrupts cognitive multitasking due to the interruption of feedforward inhibition.

Presenter(s): Shruti Patel

Authors: Shruti Patel, Hannah Pamplin, Alexandra Mazur, Madison Fangman, Rani Ashouri, Sylvain Dore

Faculty: Dr. Sylvain Dore

Should carbon monoxide donors be considered a therapy for NeuroICU patients?

Acute brain injuries are a leading cause of medical-related deaths and often result in complex outcomes that are difficult to treat. This work outlines the use of carbon monoxide (CO) as a possible therapy for various acute brain injuries. Although CO is commonly thought to be toxic, existing literature forms a consensus that CO is in fact a neuroprotective agent against acute brain injury. CO has a vasodilatory effect as it binds to heme and an anti-inflammatory effect at low doses, upregulating the Nrf2 pathway by increasing Nrf2 translocation, thus increasing expression of other anti-inflammatory proteins such as heme oxygenase-1, glutathione reductase, and NADPH quinone dehydrogenase-1. Administered after the onset of stroke symptoms, CO can act against cell death and thrombosis while increasing cerebral angiogenesis. Ischemic stroke outcomes improve after low-dose administration of CO-releasing molecule (CORM)-3 due to its anti-inflammatory nature, and mitochondrial biogenesis also improves with the administration of CORM-2. CO plays a neuroprotective role in neonatal hypoxic-ischemic encephalopathy by regulating cell death. CO also protects against the effects of subarachnoid hemorrhage by reducing vasospasm and neuronal death and regulating microglial erythrophagocytosis via CD36 expression, which aids in the clearance of red blood cells. In traumatic brain injury (TBI), low doses of CO lower cell death and improve blood flow in the amygdala and facilitate neurogenesis, improving neurological and behavioral consequences after TBI. CO delivery via CORM is a promising therapy against the poor outcomes of brain damage, neuronal death, and neurological deficits after brain injury.

Presenter(s): Alisha Patel

Authors: Alisha M. Patel, Amin Sobh, Jonathan D. Licht

Faculty: Dr. Jonathan Licht

YTHDF2 Loss Drives Dexamethasone Resistance in Multiple Myeloma

The glucocorticoid dexamethasone is one of the frontline therapeutic agents used to treat Multiple Myeloma (MM). While dexamethasone is typically used in low doses to mitigate its adverse effects, MM cells often acquire resistance to dexamethasone through poorly understood mechanisms. Using a CRISPR-based genetic screen, we identified multiple cellular mechanisms that can alter sensitivity of MM cells to dexamethasone. We focused on the YTH N6-Methyladenosine (m6A) RNA Binding Protein 2 (YTHDF2), a reader of m6A on mRNAs that triggers their degradation. YTHDF2 was identified as a candidate gene whose disruption increases MM cell tolerance to dexamethasone. To confirm the effect of YTHDF2 loss on modulating dexamethasone sensitivity, we used the CRISPR-Cas9 lentiviral system to disrupt YTHDF2 in KMS11 MM cells. The Cas9-guide RNA vector that was used also co-expressed GFP to enable monitoring of wildtype and YTHDF2-deficient cell growth with time in control and dexamethasone-treated cultures by flow cytometry. A vector targeting Rosa 26, a non-essential genetic locus was used to generate negative control pools. Results revealed that while disruption of YTHDF2 has no effect on MM cell proliferation under normal growth conditions, it conferred resistance to dexamethasone. Cell viability and apoptosis assays revealed YTHDF2-deficient cells display enhanced viability as well as decreased apoptosis in the presence of dexamethasone compared to control cells. Additional work is in progress to determine the mechanism by which YTHDF2 loss drives dexamethasone resistance in MM. Findings from this work could reveal novel targets to mitigate dexamethasone resistance in MM cells and improve patient survival.

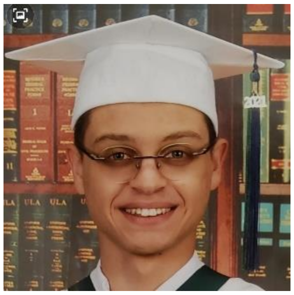
Presenter(s): Natalie Patten

Authors: Natalie Patten, Michelle Gaynor, Douglas Soltis, Pamela Soltis

Faculty: Dr. Pamela Soltis

Geographic and Taxonomic Occurrence R-Based Scrubbing (gatoRs): An R Package and Reproducible Workflow for Processing Biodiversity Data

There is ongoing debate concerning best practices in obtaining and processing biodiversity data for use in research applications; i.e. which repositories to use, how to identify and deal with duplicate specimens, and the appropriate downstream processing steps. Thus, I created gatoRs: an R package to help researchers navigate through these critical data processing steps. I produced a step-by-step workflow with graphics to help researchers employ this new package. This workflow includes functions that streamline downloading records from Global Biodiversity Information Facility (GBIF) and Integrated Digitized Biocollections (iDigBio). I also developed a function that will graphically display potentially problematic, flagged, data points and allow these points to be manually reviewed and removed from the dataset. Additionally, I developed functions to identify records that need geographic coordinates inferred. Functions related to cleaning specimen records were also developed, including those to remove duplicate data points, check locality precision, and retain only one occurrence point per pixel. All of these functions are packaged in our own R package, gatoRs. To demonstrate the application of this workflow, I will obtain and process data for 25 endangered plant species from Florida. Specifically, I will use herbarium records and available environmental data to generate ecological niche models for these species. Overall, my research will enable the scientific community to process biodiversity data for analysis, thus contributing to our overall knowledge of plants, their current distributions, and possible future response to climate change.




Presenter(s): Sebastian Paulis, Richard Huang, Paige Anderson, Keith Lim

Authors: Sebastian Paulis, Richard Huang, Paige Anderson, Keith Lim

Faculty: Dr. Raymond Issa

Development of a Safe and Anthropomorphic Aerial Robot to Improve Human-Drone Interaction in Construction

Drones are quickly being incorporated into regular daily jobsite activities, with applications ranging from the pre-construction (e.g., site planning) to construction (e.g., progress monitoring) and post-construction (e.g., facility maintenance) project phases. The incorporation of drones stems from their abilities to accomplish tasks in less time and cost compared to traditional tasks. Despite their advantages, drones pose additional safety hazards that have not been yet explored in the literature, particularly when interacting with human workers. Previous work has investigated equipping drones with anthropomorphic (i.e., human-friendly) and safety characteristics to make drones easier to work with; however, the combination of these principles has yet to be explored and analyzed within the context of a construction jobsite. Therefore, this project presents the development of a safe and anthropomorphic drone, to improve the interaction between humans and drones in construction. More specifically, the Human-Drone Interaction, Human-Robot Interaction, and construction literature were reviewed to identify: (1) current and future drone applications in construction together with sensors used to perform data collection; (2) the safety-related challenges that drones could encounter on jobsites (e.g., hazardous situations); and (3) anthropomorphic features that have been used previously to design these aerial platforms and make them more human-friendly. Based on the identified information, a drone design was conceptualized, 3D-modeled, and then programmed in a VR-based game engine to introduce dynamic effects and bring it to life. By developing the social drone, the interaction between humans and drones on jobsites could ultimately lead to more user-friendly, safe, and comfortable drone deployments.

Presenter(s): Trevi Perez

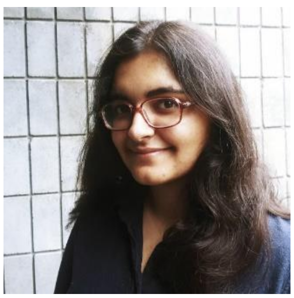
Authors: Trevi Perez, Olivia Edwards, Josh Lua, Diana J. Wilkie, Sylvain Doré

Faculty: Dr Sylvain Dore

<u>Investigation on the relevance of soluble CD163, CD36, and LRP1 receptors in the clinical assessment and treatment of sickle cell disease</u>

Sickle cell disease (SCD) is a genetic hemolytic anemia disorder that is a natural precursor to a wide array of life-threatening symptoms, such as stroke and chronic vaso-occlusive crises (VOC). It is hypothesized that the occurrence of these clinical outcomes may be dependent on or indicated by the presence of several receptor proteins, whose roles are implicated in inflammatory and oxidative pathways via the mediation of free acellular hemoglobin (Hb). This team effort sought to investigate the correlation between levels of soluble forms of CD163, CD36, and LRP1 within the bloodstream and the severity of symptoms of SCD. An emphasis on these receptors' soluble forms allows one to investigate their binding ability to ligands and their physiological role alongside cleaving enzymes responding to inflammation. Focused research also explores the ability of studies to generate recombinant decoy proteins with the potential for ligand-specific inhibition or clearance. Clinical and preclinical studies concerning the use of these three receptors as biomarkers were gathered using the following search engines: PubMed, Dimensions, Google Scholar, and Primo. Research into this subject revealed a correlation between levels of the soluble form and the most severe clinical manifestations of SCD symptoms and associated clinical outcomes. The mechanisms by which these soluble receptors are generated, their physiological function, and their capacity to predict clinical outcomes are all subjects that remain to be elucidated by further research and independent validation.

Funding: This work was partially supported by grants from the NIH, the DOD, and the UF-COM-Anesthesiology.



Presenter(s): Priyanka Perisetla, Ofelia Alvarez, Persis Desai

Authors: Priyanka Perisetla, Persis Desai, Ofelia Alvarez

Faculty: Dr. Nicole E Jones

The Effectiveness of Organizational Health Literacy Interventions: A Systematic Review

As awareness of health literacy disparities has grown over the past decades, it has become evident that healthcare organizations urgently need to make changes to increase quality of care and reduce inequities in access and delivery. Organizational Health Literacy (OHL) initiatives aim to make it easier for patients to navigate the healthcare system, understand health information, and manage their health effectively. This review aims to summarize and examine recent OHL intervention methods and their effectiveness in overcoming health literacy disparities.

We performed searches in PubMed and supplemented with Google Scholar and grey literature, focusing on OHL interventions using terms like "health care interventions" and "organizational." Two reviewers independently screened titles, abstracts, and full-texts for inclusion based on specified criteria. Data was extracted and methodological quality was evaluated using Joanna Briggs Institute Critical Appraisal tools. The 16 studies included in the analysis were further categorized by OHL domains: communication, patient engagement, and ease of navigation.

Multiple effective strategies included the implementation of low-literacy accessible, multilingual tools and communication aids, as well as holding educational interventions that equipped healthcare workers with knowledge and skills for providing accessible care. These OHL strategies were found to improve patient-provider communication, patient engagement and self-efficacy, and health outcomes including medication adherence and rate of medical errors. This strengthens the proposition that healthcare organizations should continue to make OHL a priority to improve quality of care and reduce inequities due to low health literacy.

Presenter(s): Nicole Petit

Authors: Nicole Petit, Linchun Jin, Jianping Huang

Faculty: Dr. Linchun Jin

Delineating the Expression of SPDYE3 in Malignant Gliomas

Malignant gliomas are highly invasive brain tumors associated with a poor prognosis and rapid disease progression. Prognostic markers aid in deciding treatment strategy and assessing the risk of disease progression. In this study, we identified that SPDYE3, a gene with overexpression in malignancies, is a negative prognostic marker and is involved in promoting tumor progression.

Methodology: Analysis of SPDYE3 expression in gliomas was conducted using the GTExPortal and TCGA RNAseq v2 datasets. A correlation between the SPDYE3 gene expression and patients' survival was performed. Immunohistochemistry was performed on normal human tissue and glioblastoma samples. Immunocytochemistry for SPDYE3 protein expression was performed on murine cell lines, including 4T1, B16, GL-261, and KR158, and on human cell lines, including U87, A375, U251, and GBM lines transduced with lentiviral SPDYE3. Western blotting was also conducted on U87, A375, and SPDYE3-overexpressing cells, with antibodies targeting the N-terminal and C-terminal of the protein.

Results: Testis express SPDYE3 at a higher level than normal tissues and that SPDYE3 expression is negatively associated with glioma patient survival (p<0.05). Immunocytochemistry showed a cytoplasmic positivity, demonstrating that SPDYE3 is expressed in 4T1, GL-261, KR158, U87, A375, and U251. Glioblastoma samples were found to express SPDYE3 at higher levels than normal brain samples. Western blot analysis confirmed that SPDYE3 is endogenously expressed in U87 and A375 tumor lines.

Future Directions: We will determine the influence of SPDYE3 on glioma proliferation, by performing a proliferation assay on SPDYE3-overexpressing tumor cells, and its role in tumor progression.

Presenter(s): Robrielle Pierce

Authors: Robrielle Pierce, Eva Garcia Ferres, Matthew Baldwin

Faculty: Dr. Matthew Baldwin

Examining Justifications of Unfair Systems

System justification theory posits that people are motivated to see the society they live in as fair and just. However, the research on system justification has often conflated evaluations of the system with motives to support it. The present study explores the concept of tacit system justification – the tendency to justify systems even when these are evaluated poorly. Compared to bolstering legitimations which applaud the status quo, we believe tacit system justification captures the passivity of people who acknowledge that the system is imperfect, but still lack the motive to try to change the system. We examine the relationship between these different forms of system justification and apathy variables in an online correlational study (N = 160). In addition, combining this study with a similar one (N = 320) allowed us to test whether ethnic minority groups – who are more subject to adversity within the existing socio-political systems – are more likely to report tacit than bolstering forms of system justification. The results of the study counter our hypothesis. First, the three apathy measures do not significantly predict tacit system justification as hypothesized. Additionally, ethnic minority participants did not report more tacit system justification than their white counterparts. However, we do find that White Americans report significantly more bolstering system justification scores than do non-white participants. These results suggest that everyday apathetic feelings are unrelated to ways of thinking and feeling about the system, and highlight White Americans' positive relations to the system compared to those of minority groups.

Presenter(s): Gabriela Pinero-Crespo

Authors: Gabriela Pinero-Crespo, Heather Brockway, PhD.

Faculty: Heather Brockway, PhD.

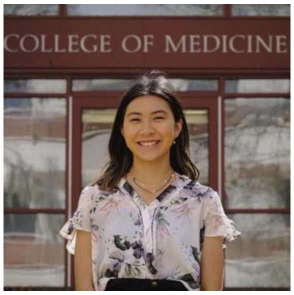
<u>The characterization of the Pregnancy Specific Glycoprotein (PSG) gene locus in trophoblast cell line HTR8/SVneo.</u>

Objectives: Proper placental development is essential for a healthy, complication-free pregnancy. The PSG gene locus has 11 members and is located on Chr19q. Studies have shown these genes are highly expressed in the placental trophoblast cells and implicated in essential pregnancy processes. Aberrant PSG expression (PSG3/5/11) has been observed in pre-eclampsia, an adverse pregnancy outcome associated with poor trophoblast invasion into the maternal uterine tissues. We hypothesized that PSGs have a role in trophoblast invasion and used the HTR8/SVneo cell line as model for this process.

Methods: Gene expression for entire PSG gene locus was examined in silico for HTR8/SVneo using publicly available data. We obtained and cultured HTR8/SVneo cell line using standard conditions. Gene expression was assessed by quantitative PCR (QPCR). Fluorescent immunocytochemistry (IF) was conducted using PSG specific antibodies to determine localization and relative protein quantification.

Results: In silico analyses of microarray data of HTR8/SVneo cell line indicated, although the PSG gene locus was expressed, no significant differences were observed between genes. Initial QPCR data suggests PSG1, PSG3, and PSG11 are not well expressed while PSG5 and PSG9 are moderately expressed. IF staining indicated that the HTR8/SVneo cells are mesenchymal in nature. IF for PSG1 and PSG11 reflected the expression data with low protein abundance. PSG9 protein was significantly abundant and appears localized to the cytoplasm.

Conclusions: Validation of PSG expression and protein levels do not reconcile with the publicly available array data and previously published data. Further characterization of the PSG locus in HTR8/SVneo is required.



Presenter(s): Aeja Pinto

Authors: Aeja M. Pinto, Parker L. Kotlarz, Juan C. Nino, Marcelo Febo, The Alzheimer's Disease NeuroImaging Initiative (ADNI)

Faculty: Dr. Marcelo Febo

Brain cortical differences in functional connectome strength in subjects with subjective memory complaints, mild cognitive impairment, and Alzheimer's disease

The early behavioral signs of Alzheimer's disease (AD) begin years-to-decades before the clinical symptoms manifest. The objective of the present preliminary study was to determine how functional connectivity (FC) between nodes located in distributed brain regions is modified at distinct stages of cognitive decline/AD. Using subset of data available from ADNI, we investigated functional connectivity between 300 nodes embedded within 17 distinct networks in control elderly participants (n=51), and participants classified as either having subjective memory complaints (SMC, n = 18), early mild cognitive impaired (EMCI, n=34), MCI (n=11), late MCI (LMCI, n=13), and AD (n=7). Subjects were part of the ADNI study (ages: 61-96; n=134, 50% female) and the data were from their initial visit (AD subjects were either in their 1st or 2nd year visit). We also analyzed available clinical dementia rating scores (CDR, sum of boxes) and geriatric depression scale (GDS) assessments for this study cohort.Graph theory-based calculations were applied to weighted undirected matrices constructed from 44,550 pairwise correlations between fMRI signals from 300 regions (Yeo parcellation). We identified a cluster of nodes in the somatomotor and dorsal attention networks of the Yeo parcellation that showed a gradual decline in node strength from controls to MCI and AD. A separate cluster of nodes located in default/dorsal attention network showed a transient increase in node strength. Pairwise permutation tests between each group vs controls indicated that differences in node strength varied rostral-caudally across the cortex from SMC to MCI and AD. In AD, significant differences in node strength were observed in occipital, temporal lobe, and superior parietal areas. Although the link to underlying synaptic function is unclear, the results suggest that the strength of communication across the cortex could vary over the course of progression of cognitive decline.

Presenter(s): Matthew Po

Authors: Matthew A. Po, Zifan Liu, Sitong Liu, Carlos M. Rinaldi-Ramos

Faculty: Dr. Carlos M. Rinaldi-Ramos

Formulation of Iron Oxide Nanocomposite Tracers for Magnetic Particle Imaging

Thermal decomposition synthesis of superparamagnetic iron oxide nanoparticle (SPION) tracers has been optimized in recent years to produce high performance tracers for magnetic particle imaging (MPI). However, this synthesis method produces particles coated with an organic layer that renders them hydrophobic and thus unsuitable for biomedical applications. To be introduced into the body, the particles must be prepared using a method that transfers the particles to aqueous media while maintaining their stability. Here, we investigate flash nanoprecipitation (FNP) as a method of encapsulating SPIONs into polymeric nanocomposites that are stable in water. In this work, FNP is applied to create nanocomposites composed of a stabilizing shell of amphiphilic poly(D,L-lactic acid)-block-poly(ethylene glycol) (PLA-b-PEG) and a hydrophobic core of SPIONs and poly(D,L-lactic acid) (PLA). The volume fraction of PLA in the nanocomposites was varied to investigate its effect on nanocomposite size and MPI performance. Preliminary results suggest that nanocomposite size remains constant for low volume fractions of PLA but begins to increase linearly after the volume fraction reaches about 22.6% PLA. Additionally, results suggest that MPI performance, which is indicated by tracer signal intensity and resolution, has a non-monotonic dependence on volume of PLA.

Presenter(s): Kiana Polanin

Authors: Kiana Polanin

Faculty: Dr. Max Deardorff

Breaking Barriers: How Women's Social Mobility Transformed Under Nahua and Spanish Influence from the 16th to the 18th Century in Colonial Mexico

Did European gender values undermine the autonomy of Indigenous women in colonial Mexico? This article will answer the aforementioned question by examining womens' lives in Mexico during the colonial period from approximately 1500 to 1800. Close analysis of last wills and testaments left behind by women in Culhuacan during the sixteenth century demonstrate that they surprisingly enjoyed greater avenues of social mobility than did women in Toluca during the seventeenth and eighteenth centuries. This analysis will inform readers of the evidence drawn from these cultures and the significant conclusions it generates. An examination of two separate corpuses of last wills and testaments left behind by indigenous Mexican women exposes variances in womens' avenues of social mobility under Nahua and Spanish influence in Culhuacan and Toluca during the sixteenth and eighteenth centuries, respectively. Prior to Spanish invasion, Nahua culture gave the women of Culhuacan economic and social autonomy. Certain pre-Hispanic privileges such as holding public offices were still conserved at the end of the 16th century. However, a gradual replacement with Spanish values and structures that was nearly complete by the 18th century diminished women's autonomy. But no matter how much their independence decreased, women still did all they could with what they had.

Presenter(s): Eli Prescott

Authors: E.J. Prescott, A.J. Williams, K. L. Craft, J.R. Skok

Faculty: Amy Williams

<u>Detection of Organics in Icelandic Hot Spring Deposits with Implications for Organics Preservation in Relict Martian Hot Spring Environments</u>

Unique microbial ecosystems inhabit hydrothermal spring environments. These environments have the capacity to preserve biosignatures left by microbial cells within siliceous sinter layers deposited by the springs. The discovery of hydrothermal deposits on Mars has recategorized terrestrial hot springs as Mars-analog environments, driving forward the study of biosignature preservation in these settings to help prepare future missions to Mars. This study quantifies the organics detectable by SAM-instrument like (Curiosity rover) pyrolysis gas chromatography mass spectrometry (py-GC-MS) without derivatization in three Icelandic hot-spring deposits ranging from modern and active, modern and altered, and relict. Preliminary results indicate a complex mixture of alkanes and methyl esters (C9 to C15), and several aromatic molecules with variable methyl functional groups. By exploring the preservation of organic matter from extremophile microbes in terrestrial siliceous sinter, it is possible to extrapolate the degree of organic preservation possible for hydrothermal siliceous sinter samples on Mars.

Presenter(s): Neel Reddy

Authors: Whitney Woodmansee, Neel Reddy

Faculty: Dr. Whitney Woodmansee

<u>Assessment of the 2016 American Thyroid Association Hyperthyroidism Clinical Guidelines on Treatment of Subclinical Hyperthyroidism among Clinicians</u>

The purpose of this project is to repeat the prior clinical survey of ATA members to determine if the 2016 guidelines impacted clinical practice and to assess the practice patterns in general medicine providers. A study was undertaken in 2003 to understand management strategies at the time in the absence of clinical guidelines. In 2016, the ATA released guidelines for the diagnosis and management of subclinical hyperthyroidism. These guidelines presented additional treatment requirements and management options for patients with hyperthyroidism. A confidential case-based and voluntary survey will be emailed to American Thyroid Association (ATA) thyroid specialists across the United States as well as to general practitioners in the University of Florida's Internal Medicine and Family Practice Departments. The survey will present several hypothetical cases regarding patients of different ages and genders who suffer from subclinical hyperthyroidism and will ask the respondent for their preferred treatment plan. The results are currently unavailable and data collection is ongoing. A full statistical analysis and comparison will be provided when the data is collected.

Presenter(s): Brittany Rein

Authors: Brittany Rein, John Nemenyi, Katherine Thompson-Witrick

Faculty: Dr. Katherine Thompson-Witrick

Analyzing the Impact of Yeast Population Dynamics on Beer Flavor with Third-Generation Quantitative Genomics

Saccharomyces cerevisiae var. diastaticus are typically viewed as spoilage microorganisms in the brewing industry because of their ability to ferment dextrins that are ordinarily nonfermentable. If this secondary fermentation occurs in a packaged bottle, carbon dioxide and ethanol buildup can cause excessive pressure great enough to induce gushing or exploding of the bottle.

Over the last decade, the craft brewing industry has begun looking at nontraditional strains of yeast like Diastaticus for their unique flavor profiles. Diastatic activity occurs within a genetically diverse group of S. cerevisiae strains. A key difference between traditional brewers' yeast and Diastaticus is the presence of the STA1 gene. STA1 influences a range of behaviors—notably production of extracellular glucoamylases and unusually high attenuation—largely driven by whether or not the STA1 promoter is intact. This project examines the impact of mixed culture fermentation on the final products' flavor profile while comparing changes in yeast population to the initial pitch rate. Standardized methods were used for propagating and counting the yeast prior to pitching. The 3rd-generation sequencing platform MinION by Oxford Nanopore Technologies was used with EPI2ME and WIMP pipelines to correlate changes in the percentage of two diastatic Saccharomyces cerevisiae strains provided by Omega Labs. US-05 (SafALE™), a non-diastatic strain, served as the control. Shifts in population dynamics were correlated back to the detected STA1+ genetic markers based on their original percentage pitch rates. This work demonstrates potential industry applications of MinION sequencing for assessing spoilage risks and making predictions on product quality.

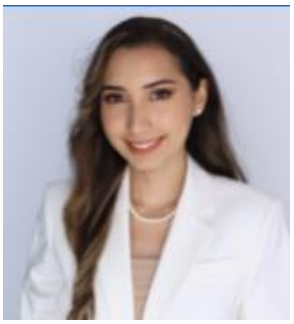
Presenter(s): Benjamin Rheault

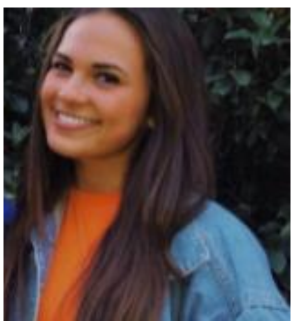
Authors: Benjamin Rheault, Alexis Dougherty, Jeremiah Blanchard

Faculty: Dr. Jeremiah Blanchard

Pseudocode vs Compile-and-Run Prompts: Comparing Measures of Student Programming Ability in CS1 and CS2

In college-level introductory computer science courses, the programming ability of students is often evaluated using pseudocode responses to prompts. However, this does not necessarily reflect modern programming practice in industry and academia, where developers have access to compilers to test snippets of code on-the-fly. As a result, use of pseudocode prompts may not capture the full gamut of student capabilities due to lack of support tools usually available when writing programs. An assessment environment where students could write, compile, and run code could provide a more comfortable and familiar experience for students that more accurately captures their abilities. Prior work has found improvement in student performance when digital assessments are used instead of paperbased assessments for pseudocode prompts, but there is limited work focusing on the difference between pseudocode and compile-and-run assessment prompts. To investigate the impact of the assessment approach on student experience and performance, we conducted a study at a public university across two introductory programming classes (N=226). We found that students preferred and performed better on typical programming assessment questions when they utilized a compile-and-run environment compared to a pseudocode environment. Our work suggests that compile-and-run assessments capture more nuanced evaluation of student ability by more closely reflecting the environments of programming practice and supports further work to explore administration of programming assessments.





Presenter(s): Micayla Richardson, Talia Skollar, Marlen Barajas Espinosa, Caroline Casola

Authors: Kimberly Wiley, Chelsea Demasters, Micayla Richardson, Marlen Barajas Espinosa, Talia Skollar, Caroline Casola

Faculty: Professor Kimberly Wiley

The Roles of Nonprofits in the Food Supply Chain

Recently, demand from nonprofit organizations with mission areas addressing hunger have experienced demand far beyond their food resource capacity. To investigate the symbiotic relationships between Florida's food and agriculture nonprofits, government, and for-profit organizations, we built a point-in-time dataset of all nonprofit organizations currently involved in the food supply chain in Florida using U.S. IRS 990 forms. A research team coded a dataset of approximately 1,300 Florida nonprofit organizations to assess their alignment with the food supply chain; categorizing each organization into pre-production, production, distribution, and consumption. In total, 930 nonprofits aligned with the food supply chain. This allowed us to examine the intermediary roles NPOs play in food distribution chains and map NPOs engaged in food system maintenance. Next, the team coded the 930 existing organizations according to IFAS Extension's 7 Strategic Initiatives and 22 Workgroups to identify possible Extension-nonprofit collaborations. This analysis allowed us to assess the value of nonprofit organizations in maintaining Florida's food supply. Preliminary findings indicate that 54% of food and agriculture nonprofits in Florida are associated with the pre-production stage of the food supply chain, primarily including professional and educational associations for farmers. This finding indicates that farmers associations have a mutualistic relationship with production. However, the pandemic has caused a breakdown in distribution from 2020-2022. The role of nonprofits should evolve to be more symbiotic, with individual entities working together within the sector. Potential collaborations with Extension such as training on sustainability, educational services, or other supports could fill this gap.

Presenter(s): Justin Rietberg

Authors: Justin Rietberg, Hitomi Yamaguchi

Faculty: Dr. Hitomi Yamaguchi

Internal Polishing of Workpieces Using Oscillatory Magnetic Field-Assisted Finishing

Magnetic field-assisted finishing (MAF) is capable of polishing the interior surface of tubes to improve their surface finish, such as in cases where surface roughness must be controlled to produce desired flow conditions. In MAF, internal polishing on tubular workpieces is typically performed by rotating either the workpiece or magnets arranged around the workpiece at high speeds to generate relative motion between the target surface and abrasive slurry pressed against the surface by magnetic tools that have been introduced to the workpiece interior. For workpieces with complex geometry (e.g., a part with multiple internal passages), however, this method is not applicable. In these cases, the relative motion between the workpiece and the abrasive must instead be produced by oscillating the workpiece and/or magnets. To obtain a desired relative oscillating motion between the tool and target surface, a new processing principle must be developed, and the tool geometry, material, and magnetic field at the polishing area (which influences the magnetic force acting on the tool) must be properly designed. This presentation first explains the new processing principle and presents the polishing machine developed to realize that principle. Polishing experiments using stainless steel tubes demonstrate the effects of tool material and geometry on the tool motion and polishing characteristics of the tube interior. The findings and an application of the developed process—polishing internal passages of additively manufactured parts—are also discussed in this presentation.

Presenter(s): Janelle Roach

Authors: J. Roach1, A.J. Williams1,2, J. Eigenbrode2, M. Millan2,3, R.H. Williams2,4, A. Buch5, S. Teinturier2,6, D.P. Glavin2, C. Freissinet7, C. Szopa7, O. McIntosh7, S.S. Johnson3, C. Knudson2,4, J.M.T. Lewis2,8,9, A. McAdam2, R. Navarro-González10, V. Fox11, A

Faculty: Dr. Amy Williams

Organic Molecules on Mars: Results from the First In Situ TMAH Thermochemolysis Experiment at Gale Crater, Mars

The SAM instrument on the Curiosity rover can perform wet chemistry experiments in conjunction with pyrolysis gas chromatography mass spectrometry analysis of surface samples. Two cups in SAM contain reagents for thermochemolysis with tetramethylammonium hydroxide [TMAH] in 25% in methanol. These experiments transform polar organic molecules into volatile derivatives that are more amenable to GC-MS analysis, and free bound components of larger macromolecules otherwise undetectable with GC-MS. This work reports on the results from the first in situ TMAH experiment conducted by SAM on Mars. This experiment was performed in September 2020 at the Mary Anning drill site in the Glen Torridon region. Ongoing analyses indicate that the TMAH experiment was successful, and that a variety of aromatic molecules were detected.

The data may indicate that large, complex molecules were present. Some of the molecules that were identified in both the EGA and GC-MS data (e.g. tri- and tetra-methylbenzene, methylnaphthalene) may be indigenous to the sample. Molecules detected only with GC-MS (e.g. benzoic acid methyl ester, di-, tri-, and tetra-methylbenzenamine) may also be indigenous to the sample or be formed from SAM-internal reactions. Several known SAM-internal molecules were also identified in the EGA and GC data.

Meteoritic input or indigenous abiotic refractory organic material are possible sources of organics at the martian surface. Several organics identified with the TMAH experiment are also liberated from the Murchison meteorite with SAM-like TMAH thermochemolysis experiments.

Presenter(s): Rachel Robbins

Authors: Caroline M. Hill, Rachel Robbins, Philipp Furler, Simon Ackermann, Dr. Jonathan R. Scheffe

Faculty: Dr. Jonathan Scheffe

Solar-Driven Chemical-Looping Reforming of Methane over Catalytically Enhanced Ceria

Two-step solar thermochemical (STCH) redox cycles are a promising method for converting and storing solar energy in the form of chemical fuels. This process consists of an endothermic reduction step, driven by concentrated solar thermal energy, and an exothermic oxidation step where H2O or CO2 are split to produce H2 or CO, precursors to liquid solar fuels. Oxygen transfer occurs via a redox cycle utilizing a metal oxide. One difficulty related to STCH cycles is the high temperature (e.g 1400 °C) required to drive the endothermic reaction. Solar-driven chemical-looping reforming (CLR) of methane helps decrease the reduction temperature by utilizing methane in the endothermic reduction step, and is the focus of this work. Ceria (CeO2) is the state-of-the-art metal oxide candidate used in STCH and CLR cycles, but thermodynamic and kinetic limitations motivate the addition of catalysts to obtain more favorable reaction rates. In this study, candidate catalysts were evaluated for their effects on CLR of methane over ceria. The ceria-catalyst samples were isothermally cycled in a thermogravimetric analyzer (TGA) to determine reaction rates and reaction extents via measured mass changes. Following the characterization of the samples, a packed bed reactor was used to experimentally measure the conversion and selectivity of the highest performing ceria-catalyst combinations. The addition of the catalysts generally increased reaction rates and conversion.

Presenter(s): Kendall Robinson

Authors: Kendall Robinson, Seth Downing, Andrea Guastello

Faculty: Dr. Andrea Guastello

Impacts of the COVID-19 Pandemic on Mental Health of Undergraduate Students

Previous studies conducted in the United States during the COVID-19 pandemic have found that undergraduate students experienced considerable levels of anxiety, depression, stress, difficulties transitioning to online learning, worries about academic performance, and difficulties concentrating (Hathaway et al., 2021; Lee et al., 2021; Son et al., 2020; X. Wang et al., 2020; Fruehwirth et al., 2021). However, these studies were primarily conducted during the first wave of the pandemic. To assess ongoing impacts of the COVID-19 pandemic on undergraduate students, students at a state university in the southeastern United States were surveyed to examine associations between mental health symptoms (anxiety, depression, and stress) and class modality (classes online versus at least one in-person class), along with various demographic and academic variables (perceived distractibility and perceived decrease in quality of coursework). The results showed that class modality was not a significant predictor of anxiety, depression, and stress. Perceived distractibility and perceived decrease in quality of coursework were significant predictors of all three outcomes and female gender was a positive predictor of anxiety and stress. Students within this study reported clinically significant levels of anxiety, depression, and stress, indicating the need for further research on the availability of mental health services for students.

Presenter(s): Amelia Rooks

Authors: Amelia Rooks, AJ Reisinger

Faculty: Dr. AJ Reisinger

Effects of Residential Lawn Management Practices on Surface Water Nutrient Runoff

Urban runoff has become an increasing concern in recent years due to an increase in cultural eutrophication and urbanization. Urbanization leads to increases impervious surfaces which greatly facilitate the export of limiting nutrients, such as nitrogen and phosphorus, into local aquatic ecosystems. These nutrients can cause cultural eutrophication resulting in the formation of toxic and nontoxic algal blooms. Our study aims to provide recommendations of alternative lawn management strategies to reduce the concentration of nitrogen and phosphorus exported from urban environments. We compared the concentrations of surface water runoff from local Gainesville lawns with four different management strategies including traditional inorganic fertilizer, compost topdressing, biosolids-based fertilizer, and control lawns with no added fertilizer. We found that traditional fertilizer applications result in the highest concentration of both phosphorus and nitrogen in surface water runoff. The lawn management type shown to produce the highest mean concentration of nitrogen in surface water runoff is traditional synthetic fertilizer followed by biosolid, control, and compost with the lowest concentration. The management type shown to produce the highest concentration of phosphorus in surface water runoff is also traditional synthetic fertilizer followed by control, compost, and biosolid with the lowest concentration. With these results, we suggest that compost may be an environmentally responsible alternative soil fertility approach for residential lands. Lawn owners looking to reduce nutrient export while maintaining a fertile landscape may consider compost topdressing in place of traditional fertilizer to decrease the export of nitrogen and phosphorus from lawns via surface water runoff.

Presenter(s): Jose Rosa

Authors: J. G. Rosa, D. T. Nguyen, N Diodati, D. I. Pedro, J. M. Urueña, W. G. Sawyer

Faculty: W. Gregory Sawyer

Study of Epithelial Cell Mucin Networks on Polyacrylamide Extracellular Matrices During Shear

The mechanics of mucin network dynamics, as well as their role in epithelial cell friction and shear, are investigated. Experiments were performed using Hemi-spherical polyacrylamide(pAAM) probes with a 2 mm radius of curvature and a shell thickness of 250 μm, a constant contact pressures of ~ 500 Pa was maintained across the cell interface. The formation of polyacrylamide extracellular matrix of collagen type I (0.2 mg/ml) was done using 1mM Sulfo-SANPAH. This photoactivatable reagent becomes available for binding to the pAAM via UV photoactivation. The other end is an ester group, which at pH 8.5 reacts with amine groups that are present in collagen type I. These proteins provide binding sites for cells on the hydrogel surface, and therefore, allow cell adhesion. Confluent layers of human Corneal Epithelial Cells (hTCEpi) were cultured for ~ 4 days on both the probes and the culture dishes. In situ biotribology studies were performed at a normal load of 300 μN between the two surfaces, friction force measurements were recorded on a custom fabricated biotribometer. The addition of MUC2 maintained shear stress values (~40Pa) for over 300 cycles. Surfaces with only membrane mucins showed increasing shear stresses to >100 Pa within 100 cycles. Results demonstrated that mucin network reduced shear stress, friction, and cell damage.

Presenter(s): Chelsea Rosen

Authors: Chelsea Rosen, Tolulope Ajayi, Sitong Liu, Carlos Rinaldi-Ramos, PhD, Blanka Sharma, PhD

Faculty: Dr. Blanka Sharma

Characterization of Polymer-Based Magnetic Nanoparticle System for in Vivo Joint Tracking

Osteoarthritis (OA) is a prevalent, degenerative disease resulting in cartilage destruction, joint pain, and inflammation. OA has limited treatment options due to cartilage environment complexity. Intra-articular drug delivery systems, like nanoparticles (NPs), are becoming increasingly relevant due to their ability to target and localize to diseased cartilage. To understand how NP targeting impacts therapeutic outcomes, the ability to track NPs in vivo is important. Conventional fluorescent NP tracking methods using imaging modalities like in vivo imaging systems (IVIS), have limitations like photobleaching and signal attenuation. Utilizing superparamagnetic iron oxide nanoparticles (SPIONs) with an emerging imaging modality, Magnetic Particle Imaging (MPI), overcomes these limitations. The objective of this study was to establish a dual functioning NP system for tracking using fluorescence and MPI imaging. NPs were synthesized by incorporating SPIONs into poly(lactic-co-glycolic acid) (PLGA) NPs and fluorophore conjugation. NPs were characterized for their physiochemical properties, iron content, fluorescence, MPI signal intensity, and MPI and IVIS tracking efficiency after incubation with bovine cartilage. Data indicated successful modification of PLGA NPs to have magnetic and fluorescent properties while maintaining similar characteristics, but with 50% iron content loss. This study demonstrated successful synthesis and application of a dual functioning NP system with IVIS and MPI tracking capabilities, which can further our understanding of NP behavior in vivo.

Presenter(s): Javier Rosero

Authors: Javier Rosero, Caleb Kramer, Peter Kima

Faculty: Dr. Peter Kima

Evaluation of the mechanism(s) by which Leishmania donovani derived Vasohibin (LdVash) is loaded into host cell exosomes

Leishmania donovani (Ld) is a species in the Kinetoplastid family that is known to cause visceral leishmaniasis in vertabrate hosts. It is fatal without treatment. Ld is known to be phagocytosed by macrophages of the host, wherein they undergo a morphological change that ensures their survival within host cells. Analysis of the composition of exosomes produced by infected macrophages by mass spectrometry revealed a Ld derived vasohibin homologue (LdVash) of mammalian vasohibins. Vasohibins are of particular interest due to their potential role in tissue vascularization. The tetraspanins CD63, CD9 and CD81 are known markers of exosomes that are incorporated at different steps of exosome biogenesis. This research project is focused on elucidating the association between the tetraspanins and LdVash in order to learn more about the packaging of LdVash into exosomes. In these studies, RAW264.7 macrophages were infected with Ld metacyclic parasites and fixed at different timepoints with paraformaldehyde. Immunofluorescence assays were performed to visualize the potential association between LdVash and the tetraspanins. In addition, organic compounds that block the ESCRT-dependent or ESCRT-independent pathways of exosome biogenesis were added to Ld infected macrophages to determine the biogenesis scheme utilized for LdVash loading of extra cellular vesicles. Ongoing data analysis should clarify a possible relationship between LdVash and the exosomal tetraspanins.

Presenter(s): Taylor Ross

Authors: Taylor Ross

Faculty: Dr. Jennifer Doty

Mediating Effect of Social Self-Efficacy and Attributional Blame on the Relationship Between Parent-Child Trust and Youth Mental Health

Mental health problems are a growing concern that affects almost half of the adolescent population; yet less is known about general mental well-being compared to diagnosable mental illness. Guided by social cognitive theory and past empirical findings, the study's conceptual model posited that parent-child trust promotes positive youth mental health through the pathways of social self-efficacy and attributional blame. Using data from 127 parent-child dyads (children aged 10-14) who participated in at least 2 of the 3 waves, this study extends current knowledge by examining potential mediators of the relationship between parent-child trust and youth mental health. Significant indirect pathways indicated that when combined, social self-efficacy and attributional blame fully mediated the association between parent-child trust and youth mental health. Results of the study aligned with the social cognitive theory perspective that youth outcomes can be influenced by the acquisition of skills through observational learning of healthy models, such as parents. Findings suggest that a tiered intervention model that utilizes the two evidence-based approaches of social emotional learning and parent-based prevention could be a powerful strategy to improve adolescent mental health.

Presenter(s): Sophia Roth

Authors: Sophia Roth, Surabhi Mishra, Ivan Ishkov, L. Jeannine Brady

Faculty: Dr. L. Jeannine Brady

Characterization of Streptococcus mutans Elongation factor-P (EF-P)

Objectives: Streptococcus mutans is a major etiological agent of dental caries that relies on membrane proteins for virulence. Elongation factor-P (EF-P) facilitates the translation of proteins with consecutive prolines in S. mutans. Thus, this study investigated whether EF-P elimination impedes translation of these proteins. The findings were intended to help construct an essential tool for isolating ribosomes with ribosome nascent chains from S. mutans for in vitro transcription/translation/translocation assay development.

Methods: Wild type (WT) and Δefp mutant growth was qualitatively observed under non-stress, acid stress, and salt stress conditions. To identify relevant genes with polyproline sequences, analysis of genomic S. mutans strain UA159 data was conducted. In addition, growth curve analysis of WT, Δefp, and ΔspaP strains under non-stress and acid, salt, and zinc stresses were performed using Bioscreen C technology. The dot blot technique was applied to the three strains to detect protein presence.

Results: The Δefp strain displayed arrested growth under only acidic conditions. Genomic analysis showed 266 genes with polyproline stalling sequences that were further categorized for possessing weak, strong, or multiple polyproline stalling motifs. The spaP stalling sequence contains eight motifs, therefore the ΔspaP mutant strain was selected as positive control for the following experiments. Growth curve and dot blot results will be presented.

Conclusion: While further investigation is necessary, our current findings indicate that EF-P elimination in S. mutans can hinder translation of proteins with consecutive prolines.

Presenter(s): Daniella Rudolph

Authors: Daniella Rudolph

Faculty: Professor Lillian Orenduff

Our Fate in Fashion

Our fate is fashion is a research project centered around raising awareness on the fate of the environment, economy and society through the lens of the fashion industry. It is no secret that the production and consumption of the fast fashion industry has become an ever increasing phenomenon, however, and it is beginning to show the negative side effects it has on the earth as a whole. It is extremely crucial to educate individuals not only on these negative effects, but ways that they can make a difference through everyday decisions to assist in lessening and reversing these taxing side effects. This research project aims to both inspire and educate to spark change amongst the general population, however especially to the generation that is going to be presenting at this conference as they are key players in being the catalyst for change. It is crucial to equip these emerging leaders with a wide scope of knowledge and understanding on a complexly interlinking fast fashion industry, so they may be inspired and educated on their future endeavors in creating creative and innovative solutions for change. Research methods include the analysis of fast fashion brands and production methods and materials, as well as comparing and contrasting the disproportionate consumption, production and waste statistics of various countries including the United States. This will shine light on how these factors contribute too and interlink with the topic of climate change, socio-economic and health crises.

Presenter(s): David Ruiz Menjivar, Michaela Tizazu

Authors: David Ruiz Menjivar, Michaela Tizazu, Steven Brandt

Faculty: Dr. Steven A Brandt

Morphometric and Technological Analyses of Late Pleistocene and Early Holocene Lithic Assemblages and Further Testing of the Economic Defendability Model from Guli Waabayo Rock-shelter in southern Somalia.

For decades archaeological research in Somalia remained stagnant due to political instability. However, refined dating methods and renewed studies of curated archaeological assemblages from excavated open-air and rockshelter sites in southern Somalia have pushed back human occupation from <10 ka to ~30 ka. This has allowed archaeologists to re-consider how hunter-gatherer populations coped with paleo-ecological changes that characterized the shift from the arid conditions of Marine Isotope Stage (MIS) 2 (~29-14.5 ka) tp the African Humid Period of early MIS 1 (~14.5 – 5 ka). Here we focus upon recent technological and 3D morphometric analyses of lithic assemblages from the Late Pleistocene/Early Holocene deposits of Guli Wabaayo (GW) rockshelter, Buur Heybe, southern Somalia to help test a long-standing ecological model that predicts changes in lithic technology and morphology as proxies for changes in the mobility and subsistence strategies of hunter-gatherers responding to fluctuations in the availability of key resources. As predicted, MIS 2 assemblages reflect a more mobile foraging system characterized by planimetric flake/blade core reduction strategies and distinctive pressure-flaked, unifacial/bifacial/trifacial pointed tools made on thermally altered exotic stone tools, compared to MIS 1 assemblages that suggest more sedentary strategies such as opportunistic reduction strategies, local stone tool use, earliest grindstone and the absence of highly stylistic exotic stone tools.

Presenter(s): Yveline Saint Louis

Authors: Yveline Saint Louis

Faculty: Dr. Adrienne Strong

Identifying Barriers to Malaria Prevention and Treatment in Colonial Tanzania

Malaria is one of the oldest and deadliest mosquito-borne diseases in human history. 200-300 million people contract malaria each year and over a million people die; a majority being children in sub-Saharan Africa. Currently, Tanzania accounts for 3% of global malaria cases, 5% of global deaths, and 95% of the country's population is at risk of infection. The history of malaria in Tanzania is complicated; despite the remarkable improvements in malaria therapeutics and preventative tools, the disease continues to be a leading cause of child mortality. For this study, I will examine official archival documents from Tanzania's colonial period including malaria reports, surveys, and communications between health officials to identify early obstacles to malaria eradication in the Tanganyika Territory. Identifying early challenges not only leads to a deeper understanding of the disease itself, but it also helps today's health officials to determine what needs to be changed in order to better address this pressing health issue. By thoroughly examining the history of malaria and noting what works and does not work in control programs, public health officials in Tanzania can develop newer, more appropriate interventions that help alleviate the massive health burden of humankind's most complicated disease.

Presenter(s): Varun Sama, Sophia Eberhard

Authors: Varun Sama, Sophia Eberhard, Torrey Baines, Charlene Pringle

Faculty: Dr. Torrey Baines

Genomic Analysis of Pediatric Systemic Inflammatory Response Syndrome (SIRS)

Systemic Inflammatory Response Syndrome (SIRS) is a condition of body-wide inflammation caused by the immune system due to a non-infectious or an infectious insult. In the latter case, SIRS and sepsis are synonymous terms. This systemic response is an elevated metabolic state broadly characterized by fever, increased heart rate, and increased respiratory rate. This state can progress to multiorgan dysfunction syndrome (MODS), which affects organ systems such as the lungs, heart, and kidneys. MODS is believed to be a manifestation of a dysregulated immune response to the insult. The means of progression of SIRS/sepsis to MODS and potential death is not well understood in the context of variation in clinical patient outcomes. We hypothesize that in children with SIRS, the progression to septic shock, MODS, and/or death is, in large part, dependent on the variable expression patterns of multiple gene products. In this ongoing study, we have enrolled 31 patients at the UFHealth Shands PICU site. Blood will be acquired from the patient on the day of enrollment and on the third day following enrollment. Gene products in the blood are being investigated using novel microarray technology that allows for determination of the expression pattern of >10,000 genes. This ongoing study aims to build a database of these gene expression patterns in critically ill pediatric patients to identify significant genetic markers that predispose children to the progression of SIRS/sepsis into MODS and/or mortality.

Presenter(s): Ritika Samanta

Authors: Ritika Samanta 1,3, Mojdeh Faraji 1,3, Barry Setlow 2,3, Jennifer L. Bizon 1,3

Faculty: Barry Setlow, PhD

<u>Effects of optogenetic inactivation of prefrontal cortex during intertemporal choice in young and aged rats</u>

The process of decision making requires multiple regions of the brain to work in cohesion. Making a decision to choose a large, delayed reward over a small immediate reward differentiates aged rats from young rats. In these experiments the prefrontal cortex (PrLC) is tested among the young and aged rats regarding their intertemporal decision making. Ion channels are used to optogenetically inhibit dopamine neurons and inactivate the prefrontal cortex among these rats at different phases of their decision-making process –delayed and deliberation. Young and aged rats choose between two levers, a small, immediate vs. a large, delayed food reward. PrLC inactivation during deliberation of a decision, or prior to, led to more impulsive choices in both young and aged rats. Also, PrLC inactivation during the delay, or after, a decision attenuates an increase in small, immediate rewards among both rats. In contrast, inactivation during the delivery of the large reward showed no difference in young rats but a slight increase in aged rats. PrLC inactivation has no significant changes during the intertrial delay and large reward, small reward, and intertrial interval at either age. Given the data, the prefrontal cortex significantly contributes to intertemporal choice and varying choice behavior as aging occurs.

Presenter(s): Paula Sanchez Garzon

Authors: Paula Sanchez Garzon, Mary Lusk, Amanda Muni-Morgan

Faculty: Dr. Mary Lusk

The Study of Atmospheric Nitrogen Transformations in Wimauma, Florida and its Implications in Red Tide Mitigation

The study of nitrogen (N) transformation in urban ecosystems is crucial in the protection of coastal water bodies in Florida because N fuels harmful algae blooms in Florida, including Karenia brevis (red tide). While we know that K. brevis may use inorganic and organic N in point and nonpoint sources of pollution, little is known about the magnitude of bioavailable organic N in watershed components such as atmospheric deposition and throughfall. The purpose of this investigation was to study and identify the forms and concentrations of N in rainfall, throughfall, and stormwater runoff for 4 storm events, and evaluate the availability of dissolved organic N (DON) in the sample for K.brevis. We analyzed all samples types from each storm for inorganic N forms (nitrate and ammonium) and DON, and incubated triplicate subsamples from the first storm with K. brevis. Ammonium and nitrate were highest in throughfall in the first storm event, likely due to the first flush phenomenon. DON concentrations were consistently higher in the throughfall for all storm events, and K. brevis cell growth was highest in the throughfall samples, demonstrating that DON availability increased as the rainfall was converted to throughfall by interaction with the urban tree canopy. This work confirms that rainfall is enriched in N as it passes through the urban tree canopy and that the N also becomes more bioavailable as it passes through the canopy, which implies that preserving vegetated areas under trees to capture and process throughfall nutrients may have water quality benefits.

Presenter(s): Adriana Sandino

Authors: Jessica Bove, Adriana Sandino, Jordan Milano

Faculty: Dr. Russell Bauer

<u>Influence of Improved Lifetime TBI History Ascertainment on Clinical Outcomes</u>

Background

Having a positive history of TBI may have many implications for long-term clinical outcomes and recovery from injury, but current TBI reporting strategies are insufficient. The objective of this study was to determine if sex plays a role in TBI self-report differences among individuals with a positive life-time history of TBI and to determine how number of previous TBIs impacts mood.

Method

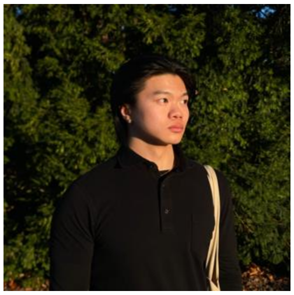
Participants were 12 individuals (5 M, 7 F) with a known history of TBI. Questionnaires. Group comparisons were performed on the total number of reported TBIs before and after hearing a definition for TBI. Secondary analysis examined correlation between total number of TBIs and anxiety.

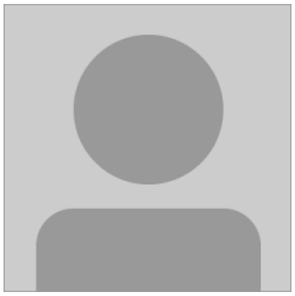
Results

Participants reported an average of 3.1 more concussions after hearing the definition of a mTBI. This result was driven by men, with males reported significantly more mTBIs than females ($p = 0.05$). Further, there was a positive, strong correlation between total number of lifetime concussions and anxiety severity.

Conclusion

These preliminary results suggest that males may benefit from being read a definition of TBI prior to reporting on TBI history. Additionally, accurate reporting on the number of TBIs may have clinical implications for later-life symptomatology, specifically with mood. Further research with greater sample sizes are needed to fully understand differences in mTBI reporting and its intersectionality with clinical outcomes.





Presenter(s): Luke Samuel Sandoval, Katelyn Meister

Authors: Luke Samuel Sandoval, Katelyn Meister

Faculty: Dr. Piyush Jain

Project Title: Reverse Transcription-Free RNA Detection with CRISPR/Cas12a Using Split Activators

CRISPR/Cas12a RNA-guided complexes are widely utilized for diagnostic purposes through nucleic acid detection; however, the recognition and cleavage of RNA substrates requires reverse transcription of RNA to DNA. Without prior reverse transcription, Cas12a can only detect DNA and not RNA. In this report we demonstrate that the simultaneous addition of two truncated activators mimicking a full-length target can efficiently activate the trans-cleavage activity of Cas12a. From this discovery, we have found that the PAM-proximal "seed" region of the crRNA exclusively recognizes DNA for trans-cleavage, and the PAM-distal region of the crRNA can tolerate RNA and DNA substrates for Lb, As, and Er Cas12a effector proteins. AsCas12a acts as an exception in which it has the ability to tolerate RNA substrates at both the PAM-proximal and PAM-distal ends of the crRNA. We have developed a "split activator" method named 'Split Activators for Highly Accessible RNA Analysis' (SAHARA) in which we are able to detect RNA sequences at the PAM-distal region of the crRNA by merely supplying a short ssDNA or a PAM containing dsDNA to the seed region. SAHARA allows reverse transcription free detection of RNA using Cas12a. The mechanism has been proven to detect picomolar concentrations of synthetic RNA resembling a polypeptide precursor gene in the Hepatitis C Virus (HCV). Our research provides valuable insights into the nucleic acid requirements and configurations for the activation of trans-cleavage activity in CRISPR/Cas12a, as well as simultaneous detection of both DNA and RNA substrates.

Presenter(s): Karina Sarandrea

Authors: Karina Sarandrea

Faculty: Dr. Ido Oren

The European Energy Union-A Case For Strategic Constructivism?

The purpose of this study is to explore how the development and behaviors of the European Energy Union (EEU) can be explained through the lens of Nicolas Jabko's strategic constructivism. It builds on existing research that has applied tenets of strategic constructivism to the larger auspice of the European Union (EU) and other constructivist approaches as they have been applied to the EEU while providing new scholarship on how the EEU specifically is a case study for strategic constructivist theories. State of the energy union reports, EEU policy proposals, and other primary sources were used to investigate how the EEU has demonstrated tenets of the theory, such as Martha Finnemore and Kathryn Sikkinke's norm entrepreneurship. The analysis confirms that the EEU is a successful case study for strategic constructivism on part of its leaders and their emphasis on norms, long-term vision making, and other theoretical aspects with the aim of addressing security challenges created by EU dependency on Russian energy. By highlighting the political utility of the EEU as it relates to EU energy policy, this study contributes to understanding of the Union's response to Russia through a constructivist theoretical framework, which also works to improve broader conceptions on how the creation of norms may solve important international security problems, especially in the realm of energy scarcity.

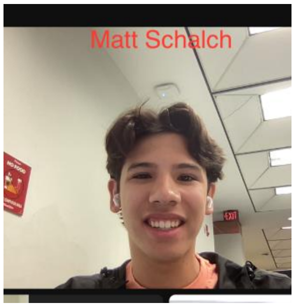
Presenter(s): Isabella Satizabal

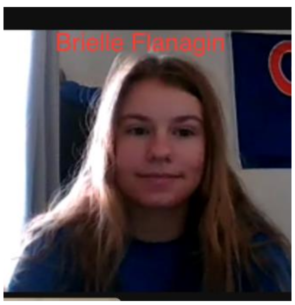
Authors: Isabella Satizabal

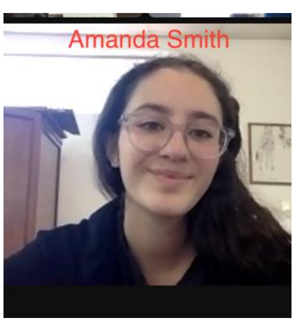
Faculty: Dr. Meryl Alappattu

What barriers are experienced prior to receiving Gender Affirmation Surgery (GAS)?

In this analysis, the aim is to delineate barriers transgender and non-binary patients experience before receiving Gender Affirming Surgery (GAS). Types of GAS include facial reconstruction, chest "Top" surgery, and genital "Bottom" surgery. The hypothesis is that patients will report more barriers relating to insurance coverage and monetary expenses as opposed to familial or emotional barriers. This IRB-approved study employs the use of focus group interviews on ZOOM to gather first-hand experiences relating to GAS and barriers they experienced. Participants were recruited through a convenience sampling involving posted flyers at several locations of the University of Florida campus, social media, and contacting local healthcare networks that support non-binary and transgender communities. The study also used snowball sampling to enable participants that have participated in the study to refer their peers. After the interviews are transcribed, the initial analysis will focus on thematically grouping barriers mentioned by patients during the focus group. There were a total of 8 gender-affirmed individuals that participated in the focus interview session. Using the transcripts from the medical transcriber and field notes, five notable themes relating to barriers were determined. They include financial barriers, educational barriers, barriers related to pre-surgical requirements, familial barriers, and emotional barriers.







Presenter(s): Matt Schalch, Mara Climau, Brielle Flanagin, Gabbie Goldberg, Amanda Smith

Authors: Mara Cilmau, Matt Schalch, Brielle Flanagin, Gabbie Goldberg, Amanda Smith

Faculty: Dr. Jennifer Doty

The Effects of Volunteering in Research v. Television

In today's world, observing volunteering on television can serve as a medium for the general population to learn about the benefits of public service, influencing how they perceive the act of volunteering. Many research articles have shown that volunteering has a generally positive impact on the overall well-being of people who participate in it, no matter what their original motives for engaging in voluntary actions were. However, an analysis of how the benefits of volunteering are depicted on television has not been widely conducted. Our first research question asks how television portrayals of volunteering benefit volunteers in comparison to existing volunteering research. Our second question asks what the potential effects of those messages are. To answer these questions, we utilized textual analysis in Google Sheets to code 88 television storylines in which volunteers were shown to have a positive experience. We examined the motivations of the volunteers, the benefits they gained from their individual experiences, the level of importance of volunteering to the volunteers, and whether their mental health improved from their involvement. When examining the existing research on the benefits of volunteering, we observed that many of the studies found a positive relationship between the act of volunteering and mental health benefits. In our data, however, we found that only some of the storylines depicting volunteering showed any mental health benefits, as the majority of the data portrayed other types of benefits to the volunteer.

Presenter(s): Shayna Schulman

Authors: Shayna Schulman

Faculty: Ph.D., Angela McCarthy

Perspectives on the First Amendment: The Impact of Age on Free Speech Freedoms

To what extent does the American public support the prohibition of hate speech given the constitutional protection of free speech under the First Amendment? The First Amendment states that "congress shall make no law… abridging the freedom of speech." This project analyzes published data from the Cato Institute Free Speech and Tolerance Survey (2017) to determine the role that Americans' age plays in their support of a hate speech ban. Individuals of various generations differ in their experiences with world events, politics and social norms. These differences can impact views on free speech. Preliminary analysis shows that younger generations are more likely to support the prohibition of hate speech than older generations. Current scholarship lacks a depth of research in this area. As such, this project establishes relationships concerning views on hate speech that are a novel contribution to this field of study.

Presenter(s): Elizabeth Sebastian

Authors: Elizabeth Sebastian, Alberto Perez

Faculty: Dr. Alberto Perez

Molecular Dynamics Analysis of ET Domain Interactions in BET Family Proteins with Peptides (BRG1, CHD4, JMJ6, LANA, TP, NSD3)

BRD3 and BRD4 are proteins involved in gene expression within mammalian DNA (LeRoy et al., 2008). It contains an extraterminal domain (ET) that binds other regulatory proteins and has also been hijacked by viruses to locate near the transcription start site. These protein-protein interfaces are mediated by peptides (BRG1, CHD4, JMJ6, LANA, NSD3, TP) that adopt unique conformations, altering the conformation of BRD3 through its beta pleat orientation (Aiyer et al., 2021). Inhibiting these viral interactions and manipulating BRD3 and BRD4 for gene therapy approaches are two promising directions for drug discovery. Development efforts require a deeper understanding of the protein interaction with peptides to understand its effects on the overall stability of the complex, and how these effects can be manipulated. Molecular dynamics allows for the understanding of the change in stability with conformation. Additionally, Principal Component Analysis allows for a more robust study of conformational spaces as it observes the differences in the microstates of the complex, which have an outsized role in biological processes (Hess, 2000). RMSF data suggests that all peptides stabilize the complexes in comparison to the unbound protein. PCA results indicate that unbound BRD3 complexes contain multiple structures, in contrast to BRD4 complexes which show one structure. Upon binding, some BRD3 complexes have multiple energy states, but all complexes contain one energy state in common. These results indicate that the similarity of BRD3 and BRD4 in their function may be due to similarities in structure after binding.

Presenter(s): Kailey Seiler

Authors: Kailey Seiler, Dr. Elizabeth Wood

Faculty: Dr. Elizebeth Wood

Exploring infant mortality drivers in Alachua County Florida: A qualitative study

Infant mortality continues to be one of the most pressing yet preventable public health issues in the United States and around the word. Currently, Alachua county, Florida carries an infant mortality rate over a third greater than the Florida state average rate, with the African American infant mortality rate being over double the Florida State average rate. Little is known about the implications that have led Alachua county to hold such unseemly rates, especially given the number of health care resources present within the county. This study explores expert attitudes and opinions of those working in the field of maternal/infant health and related fields through in-depth interviews conducted via zoom/by phone. By methods of quantitative content analysis, major themes and sub-themes were identified by researchers regarding the drivers of infant mortality, solutions/barriers to solutions, and racial inequalities. Themes were then compared among different types of participants (physicians, educators, and community workers) to identify similar/dissimilar perceptions based on occupation. Major findings indicate the following themes of racial disparities, preterm birth, healthcare access, insurance coverage/income inequality, and lifestyle factors regarding the drivers of infant mortality. Other major themes were identified for solutions/barriers to solutions and racial inequalities as well. Our findings indicate both issues pertaining to Alachua county itself , such as healthcare access in relation to transportation and geographical divide, along with further societal issues such as in our healthcare system in general and social inequities experienced by minority groups.

Presenter(s): Dhairya Shah

Authors: Dhairya Shah, Emily Helm, Stephanie M. Karst

Faculty: Dr. Stephanie Karst

Identification and purification of norovirus virulence factors

Human noroviruses are the leading cause of severe childhood diarrhea and acute gastroenteritis outbreaks worldwide. Despite its widespread impact, there is limited knowledge about the pathogenic mechanisms underlying norovirus-induced disease. Murine noroviruses (MNV) provide a tractable small animal model to investigate the pathogenic mechanisms and virulence of norovirus in vivo. Previously, our lab has shown that genetically wild-type neonatal mice develop acute, self-resolving diarrhea following MNV1 infection, a disease course that mirrors human norovirus pathogenesis. Furthermore, genetically similar strains of MNV show differences in virulence as MNV-CR6 is attenuated compared to MNV1. This difference in virulence allows us to determine which viral proteins (VP) are important in conferring virulence in vivo by producing chimeric viruses where genes encoding for individual viral proteins are swapped between MNV1 and CR6 strains. Using this system, our results have shown that the VP1 protein is sufficient for virulence since CR6VP1.MNV1 caused increased diarrhea and colon content inconsistency compared to parental CR6. CR6VP1.MNV1 was as virulent as parental MNV1, showing that it is responsible for the virulence difference between these two parental strains. In this work, we will determine the mechanism by which VP1 contributes to diarrhea by first purifying the MNV1 VP1 protein. Using the purified protein, we will test hypotheses regarding the mechanisms of VP1 where it i) alters intestinal permeability ii) alters chloride secretion and iii) alters calcium signaling utilizing our in vivo neonatal mouse model as well as a polarized epithelial monolayer.

Presenter(s): Alex Shamoun

Authors: Alex Shamoun, Ravi Kumar, Leonardo Ferreira

Faculty: Dr. Leonardo Ferreira

Viral Expression of Mitochondrial-Targeted Catalase Delays the Onset of Isotonic Peripheral Fatigue in Mouse Diaphragm

Peripheral fatigue refers to the acute reduction in the contractile capacity of skeletal muscle following repetitive activation. Understanding the mechanisms of fatigue can be helpful for improving sports performance for athletes as well as clinical outcomes for patients who suffer from accelerated fatigue, a phenomenon commonly observed in several diseases. In this study, we evaluated the contribution of excessive production of mitochondrial-derived reactive oxygen species (ROS) to the development of isotonic fatigue in vitro. Using an adeno-associated virus, we overexpressed mitochondrial-targeted catalase (mCAT), an enzyme involved in the decomposition of ROS, in the diaphragm of male mice ($n = 11$). Control animals received an empty viral vector ($n = 8$).

Diaphragm bundles were isolated and subjected to a 5-minute in vitro isotonic fatigue protocol in which the decline in mechanical power was monitored over time. Time to 50% of baseline power output ($p = 0.044$) and power at 300 s ($p = 0.005$) increased with expression of mCAT compared to controls, indicating that overexpression of mCAT delays the onset of fatigue. These findings suggest that mitochondrial-derived ROS contribute to the development of peripheral fatigue.

Presenter(s): Jake Shannin

Authors: Jake Shannin, Babette A. Brumback

Faculty: Babette A. Brumback, Ph.D.

Disagreement Concerning Effect-Measure Modification

Stratifying factors, like age and gender, can modify the effect of treatments and exposures on risk of a studied outcome. Several effect measures, including the relative risk, hazard ratio, odds ratio, and risk difference, can be used to measure this modification. It is known that choice of effect measure may determine the presence and direction of effect-measure modification. We show that considering the opposite outcome -- for example, recovery instead of death -- may similarly influence effect-measure modification. In fact, if the relative risk for the studied outcome and the relative risk for the opposite outcome agree about the direction of effect-measure modification, then so will the two cumulative hazard ratios, the risk difference, and the odds ratio. When risks are randomly sampled from the uniform (0,1) distribution, the probability of this happening is 5/6. Disagreement is probable enough that researchers considering one relative risk should also consider the other and further discussion if they disagree. (If possible, researchers should also report estimated risks.) We highlight an example on COVID-19 in Mexico and Italy.

Presenter(s): Julia Shapiro

Authors: Julia Shapiro

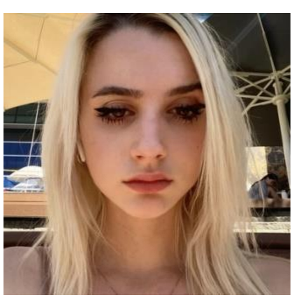
Faculty: Dr. Seth Bernstein

Nazi Conspirator, Russian Patriot: Judging General Andrei Vlasov

Lieutenant General A.A. Vlasov was an infamous, high-ranking Soviet defector during the Second World War. After his capture by German soldiers in 1942, Vlasov featured heavily in anti-Soviet German propaganda and organized anti-Soviet resistance in German-occupied territories. He was recaptured by Soviet forces in May 1945 and executed as a traitor in August 1946.

Vlasov's story challenged crucial Soviet narratives about the war, and posed a threat to Soviet solidarity and stability in its aftermath. His case was rarely acknowledged among Soviet historians, only resurfacing after its collapse in a wave of nationalistic works that sympathized with Vlasov as a patriot and martyr of Stalinist repression. In the West, numerous political and practical factors since the 1950s have left scholars split on the truth of Vlasov's intentions, beliefs, and historical impact. His story remains controversial in Russian academia; attempts to rehabilitate Vlasov have been suppressed by the Putin regime.

This paper utilizes German and Soviet primary sources from recently declassified Russian state archives, as well as Western, Soviet, and Russian historiographic works from the 1950s to today. This paper demonstrates that Vlasov was intensely preoccupied with how he would be perceived by history; in this pursuit, he actively curated a vague, inconclusive record of his wartime experience. It also assesses why Vlasov's case presents a unique challenge to historians, and remains highly controversial in academic and political discourse under the Putin regime.



Presenter(s): Jaclyn Shaw, Valerie Dunn, Shubham Patil, Valeria Westring, Rosey Angina

Authors: Rosey Angina, Valerie Dunn, Shubham Patil, Jaclyn Shaw, Valeria Westring

Faculty: Dr. Jennifer Doty

Discrepancies in Colorectal Cancer Risk Perception

Background: Colorectal cancer (CRC) is easily treatable when diagnosed early. Therefore, adults at average risk should start screening at age 45. However, there is a lack of consistent screening among persons at risk, causing CRC to be one of the deadliest cancers. Health information technologies can be tailored to persuade adults to get screened for CRC.

Objective: This cross-sectional, quantitative analysis explores if socioeconomic factors are associated with perceived risk for CRC. This paper explores how race and education may be associated with increased CRC risk perception after experiencing virtual medical appointments.

Methods: A secondary analysis of data from the research study funded by the National Cancer Institute was conducted to analyze the correlation between socioeconomic factors and perceived risk of CRC. An independent sample T-test was used to determine if perceptions of risk, measured on a 7-point Likert scale, vary based on dichotomized variables for race and education.

Results: 48 adults completed the questionnaire. There were no significant differences in risk perceptions by race (Black vs. White). There were significant differences in risk perceptions by education, where risk perceptions were higher among those with lower education ($M=2.68$ $SD=1.46$).

Conclusion: No correlation between race and perceived risk of CRC was observed, but there was a relationship between education and risk perception. Supplying tailored information on CRC to populations of lower education could increase awareness of CRC risk perception. Long-term, this study aims to determine if health information technologies can augment awareness of potential risk for CRC.

Presenter(s): Tushar Shenoy

Authors: Tushar Shenoy, Maddalena Parafati, Jorge Mojica-Santiago, Paul Coen, Christine Schmidt, LeGrand Malany, Siobhan Malany

Faculty: Dr. Siobhan Malany

<u>Drug Efficacy Testing in Skeletal Muscle Microphysiological System</u>

Sarcopenia is the process of gradual muscle loss associated with age. Currently, treatment for sarcopenia consists of resistance exercise, but potential pharmacological treatments are still being evaluated. For long-term spaceflight missions, drug countermeasures will be necessary to prevent muscle wasting in astronauts. Microgravity research onboard the International Space Station will enable greater understanding of these conditions due to accelerated atrophy and thus, ground-based control studies evaluating drug efficacy are crucial for future planned ISS research. To characterize mechanisms of muscle atrophy, young (20-40 years) and old (60-80 years) human myoblasts, derived from muscle biopsies from AdventHealth were used as the cell source. The young and old human muscle cells were cultured and enriched for CD56+ cell populations, and subsequently seeded into PDMS based microfluidic tissue chips. Tissue chips containing live 3D human muscle bundles were subject to an electrical stimulation regime. A twice per day regime of 3V, 2 Hz, 2 ms for 30 min was applied to approximately two-week differentiated muscle bundles for seven days. Tomatidine, a natural small molecule derived from tomato plants, was utilized in tandem with electrical stimulation to evaluate myotube contractile response and gene expression compared to non-treated bundles. Tomatidine (5 μM) treated muscle bundles demonstrated a distinct contractile behavior evidenced by displacement magnitude determinations. Ongoing dose-response and gene expression profiling from RNA isolated from the myotube bundles will provide further insight into additional differences due to drug treatment. Ultimately, this will serve as a verification study for the SpaceX CRS-25 mission to the ISS.

Presenter(s): Grace Shoemaker, Emma Vesco

Authors: Santosh Rananaware, Emma Vesco, Grace Shoemaker, Nicolas Macaluso, Brianna Pizzano, Swapnil Anekar, Marco Downing, Piyush Jain

Faculty: Dr. Piyush Jain

Amplification-Free Nucleic Acid Detection at Room Temperature using CRISPR Chain Reaction

Rapid and sensitive detection of nucleic acids is critical for a wide variety of biotechnological and pharmaceutical engineering applications. The SARS-CoV-2 outbreak has highlighted the need for robust diagnostic tests that can accurately identify pathogen nucleic acids in different types of human biological samples. Traditional nucleic acid detection assays based on reverse transcriptase polymerase chain reaction (RT-qPCR) are widely used but are limited by their dependency on expensive reagents, sophisticated equipment, and trained personnel. Recently, a large number of CRISPR/Cas based diagnostic platforms such as SHERLOCK and DETECTR have been established, which take advantage of type V and type VI Cas effectors to exhibit non-specific collateral cleavage. While CRISPR-based methods are rapid, cost-effective, and can be deployed at point-of-care, they lack in detection sensitivity without pre-amplification steps. Here, we have developed an amplification-free CRISPR/Cas12 based diagnostic method called CRISPR Chain Reaction (CCR) by combining a primary, on-target CRISPR/Cas system with a 'locked' secondary CRISPR/Cas system that consists of excessive secondary DNA activators and a modified crRNA that is locked. If the primary CRISPR system finds a target nucleic acid, it initiates collateral cleavage and unlocks the secondary system, producing an enhanced signal. By combining CCR platform with reverse transcriptase, we were able to detect attomolar concentration of a wide variety of DNA and RNA targets including HIV-1 and SARS-CoV-2 at room temperature without target pre-amplification. CCR also offers the ability to combine Cas12 and Cas13 effectors in a single assay, enabling amplification-free detection of both DNA or RNA targets.

Presenter(s): Melos Shtaloja, Jovana Grdinic

Authors: Melos Shtaloja, Jovana Grdinic

Faculty: Professor Jason Alread

Public Health, Designed: Observing and Creating Safe Public Spaces in Times of COVID-19

In the early days of the COVID-19 pandemic, public spaces were made less accessible, less inviting, and less collaborative. Following the framework of The One Health Center of Excellence, the paper explores the impact of spatial planning on the public health of Gainesville, Florida. This paper argues that the inclusion of spatial planning in the holistic health discourse is in the best interest of advancing future health outcomes and sustaining public wellbeing.

A literature review had been conducted to understand the scope of changes that the COVID-19 pandemic has made nationally, focusing on some college towns and the changes to their local built environment. Moreover, the paper introduces recent successes of health-oriented public spaces, displaying them as imperative to the design process in times of crisis.

Following the goals of the Downtown Gainesville Strategic Plan, the authors suggest the reduction of parking spaces in downtown Gainesville and provide example proposals for two community-oriented projects. Designing with the intent of sustaining public health and wellbeing requires planning an equitable distribution of housing and public space. Healthy public spaces are central to developing social infrastructure, which is integral to community wellbeing during a crisis.

Presenter(s): Jessica Shubin

Authors: Jessica A. Shubin 1,2, Daniel H. Ryu 1,3, Duc Duong 4, Qi Guo 4, Nicholas Seyfried 4, Todd E. Golde 1,3 and Karen N. McFarland 1,4

Faculty: Dr. Karen McFarland

Unbiased multi-omics screen to uncover neuronal adaptation during Tau-mediated neuropathology

Accumulation of Tau protein into neuronal tangles is a pathological hallmark of Alzheimer's disease and related dementias. Mutations in the MAPT gene—which encodes the Tau protein—causes "tauopathies", a group of disorders with the common pathological features of neurofibrillary tangles and neurodegeneration. Past studies from our lab demonstrate that a mutant form of Tau harboring two familial mutations (P301L/S320F) rapidly forms insoluble tangles in vivo and ex vivo. Moreover, neuronal Tau tangles undergo a surprisingly rapid turn-over.

The aims of our current study are two-fold: 1) How does Tau protein turn-over in neurons? 2) How do neurons adapt to Tau tangles? Using a simplistic model system of primary mouse neuronal-glial cultures, we overexpressed wild-type or mutant Tau using AAV. Cells were collected at two timepoints—prior to and after Tau tangle formation—and submitted for genome-wide transcriptomic and proteomic analyses.

Transcriptomic analyses demonstrate that the expression of mutant forms of Tau blunt gene expression changes suggesting a loss-of-function mechanism when Tau forms tangles in a neuron. Gene ontology analysis suggests the involvement of ribosomal genes, oligodendrocyte biology and apoptotic factors while WGCNA identifies protein degradation mechanisms (ubiquitination and lysosomal degradation) as hub genes with significant gene expression modules. Proteomic results highlight the involvement of members of the ubiquitin proteosomal pathway including Trim44, Pja1 and Pja2. Here, we describe initial studies aimed at understanding the role of these proteins on Tau tangle formation.

Presenter(s): Craig Singiser

Authors: Craig Singiser, Zach Karpinski, Jason Livesay, Ranga Narayanan

Faculty: Dr. Ranga Narayanan

Gravitational Effects of the Faraday Instability

Faraday instability is a signature of resonance and interfacial motion when a bilayer fluid system is oscillated in a direction perpendicular to the interface. In this study, theoretical predictions are compared to experiments in a mechanically oscillated two-fluid system. The system studied was of rectangular geometry to allow for direct comparison of future results to be obtained in microgravity. The dynamics of a two-fluid system can be used to measure surface tension and viscosity to high degrees of accuracy with the theory studied. These thermodynamic properties of fluids have broader impacts on fields such as additive manufacturing. A two fluid system containing Fluorinert and Silicon Oil was mechanically forced at a selected amplitude and frequency. Iterative amplitude sweeps at selected frequencies allowed for determination of the onset of instability. Preliminary studies found good agreement between predicted waveforms and experimental behavior of the system at the onset of instability. However, experimental points of instability were at consistently higher amplitudes. This observation was anticipated and is believed to be a result of side wall dampening from the small geometry containers used. The results of this study confirm the ability of theory to qualitatively predict the onset of instability in two-fluid systems. Furthermore, that behavior obtained from ground experiments will translate to future microgravity experiments aboard the International Space Station (ISS).

Presenter(s): Helena Small

Authors: Helena Small

Faculty: Dr. Anna Peterson

An environmental and sociopolitical investigation on humans' moral obligation to solve problems they created.

In December of 2021, a small Indian village witnessed warfare between a pack of monkeys and local canines. The pack of monkeys was seeking revenge for the murder of one of their own, by a local dog, and thus a detrimental battle broke out between them. This fight began to involve local residents in the village, therefore raising the question of what role humans should play in a conflict between animals because human action is the reason they are there in the first place. There is also a discrepancy between values humans hold for different animals, as monkeys are akin to humans genetically, and dogs are companion animals. Though there is this disparity between values of animals interpersonally, there is a larger trend of humans valuing animals as less than human, and excluding them from other considerations. It has been alleged by numerous environmentalists and philosophers that this valuation directly correlates to how people treat other humans, insofar as they are treated as less than human too. This relationship between values, how much merit other humans and animals are given, and human practices of this value, displays how interconnected and integral values and practices are in creating and upholding oppressive structures. Because these systems were built by humans, the question remains of if humans have a moral obligation to solve these problems that they created, both in the instance of the dog and monkey case study and in abolishing oppressive structures as a whole.

Presenter(s): Mackenzie Smith

Authors: Mackenzie Smith

Faculty: Dr. Ara Jo

Factors of Emergency Department Visits Among Children with Asthma: Medical Expenditure Panel Survey, 2019

Asthma is a common disease in children and a common reason to present to the emergency department (ED). This study investigated different factors, such as socioeconomic status, patient-provider relationship, and compliance to medicine, in relation to ED visits among children with asthma in the United States. Data was obtained from the 2019 Medical Expenditure Panel Survey (MEPS), completed via the Agency for Healthcare Research and Quality and the Centers for Disease Control and Prevention. The primary outcome was ED visits, defined as one or more visits in the past year. Using SAS software, results showed that socioeconomic status was not a significant factor in a child presenting to the ED. Additionally, patient-provider relationship was not significantly different in children with no ED visits versus children with one or more ED visits. Due to limited research about pediatric utilization behavior, it is crucial for further research to be conducted in the pediatric population.

Presenter(s): Aidan Smith

Authors: Aidan Smith, Adithya Gopinath, Stephen Franks, Phillip Mackie, Habibeh Khoshbouei PhD-PharmD.

Faculty: Dr. Habibeh Khoshbouei

In human macrophages dopamine transporter trafficking represents a potential immunosuppressive mechanism

Monocytes are blood immune cells that can differentiate into monocyte derived macrophages (MDMs), exhibiting tissue specific phenotypes. Dopamine regulates the peripheral immune system, albeit with a less understood mechanism. Human macrophages express dopamine machinery including tyrosine hydroxylase (TH), vesicular monoamine transporter 2 (VMAT2), dopamine receptors, and dopamine transporter (DAT). Though DAT is a master regulator of dopamine signaling, functional consequences of DAT activity on macrophages is unknown. Using qPCR, cell-surface membrane biotinylation, and Western blot, we confirmed that blood-derived human macrophages express DAT at the surface membrane of macrophages. Notably, MDMs harbored intracellular pools of DAT with unknown function (Mackie et al., 2022). In this study, we investigated whether macrophage DAT exhibits its canonical activity. We found that similar to DAT expressing cells, macrophage DAT uptakes dopamine, releases dopamine via reverse transport mechanisms, and undergoes trafficking. Endotoxin-induced immunostimulation and DAT blockade increased the release of pro-inflammatory cytokines TNFα, IL-6, and CCL2 and decreased phagocytic capacity of MDMs, suggesting, in MDMs, DAT activity attenuates inflammatory responses. Consistent with this hypothesis, we found immunosuppressive cytokines TGFβ and IL10 increase forward DAT trafficking, which increases DAT levels at the MDMs' membrane, potentially enhancing the ability of macrophages to mitigate inflammation. Ongoing studies will elucidate immunological consequences of macrophage membrane DAT in disease states with underlying inflammation such as Parkinson's disease.

Presenter(s): Kierstin Smith

Authors: Kierstin Smith, Minh-Chau Le, Dongjiang Chen, David Tran, Z. Hugh Fan

Faculty: Dr. Hugh Fan

Fabrication of Microfluidic Devices for Capture and Release of Triple-Negative Breast Cancer Cells

Triple-negative breast cancer (TNBC) is an aggressive cancer with common relapses and metastases likely due to the migration of tumor cells to bone marrow (BM), where they become disseminated tumor cells (DTCs), which can lay dormant before metastasizing. Due to the rarity of DTCs being a few per 10^6 nucleated BM cells, this project investigates the use of microfluidic devices in efficient capture and release of TNBC cells. Geometrically enhanced mixing (GEM) device featuring surface-based herringbone micromixers were created by casting polydimethylsiloxane (PDMS) in a mold and bonding to glass slides. For immunoaffinity-base capture, devices were coated with anti-epithelial cell adhesion molecule (anti-EpCAM) or anti-epidermal growth factor receptor (anti-EGFR) antibodies. TNBC cells spiked in buffer were run through the devices at a flow rate of 1 µL/s. Release was performed using trypsinization, tapping, or a combination. Trypsinization involved running 0.25% Trypsin-EDTA into the device and incubating it for 5 minutes at 37°C before running media at 5 µL/s through the outlet of the device. Tapping was performed by running cell media at 5 µL/s through the device while periodically tapping on the top. The combination procedure was the trypsinization procedure with tapping during the media wash. The GEM device produced a 78% capture efficiency for TNBC cells when coated with anti-EGFR, and the tapping and combination release procedures resulted in ~67% and ~71% release efficiency, respectively. This work establishes the use of immunoaffinity capture in microfluidic GEM devices and the ability to efficiently release TNBC cells for subsequent genomic analysis.

Presenter(s): Jackie Snytte

Authors: Jackie Snytte, Christian Cordon-Cano, Will Rose, Andrew Moore, Ben Lewis, Sara Jo Nixon

Faculty: Dr. Sara Jo Nixon

Investigating the effect of pain on the relationship between depressive symptomatology and drinking habits

Background: Prior research has shown an association between depressive symptomatology and alcohol use disorder. Additionally, depression has been associated with chronic pain and alcohol is often used to cope. We seek to investigate the association between depressive symptoms, hazardous drinking patterns, and chronic pain within those seeking treatment for substance use disorder (SUD). We hypothesize that the relationship between depressive symptomatology and drinking patterns will be stronger in those who report chronic pain compared to those who do not.

Methods: Individuals seeking treatment for SUD (n = 248) were assessed on their recent drinking history (past 6-months) measured in average standard drinks per day, depressive symptomatology using the Beck Depression Inventory (BDI), and endorsement of chronic pain. Individuals were separated into No Pain and Pain groups.

Results: There was no statistical difference between the drinking levels of the No Pain and Pain groups (t = 0.78, p > 0.05). The Pain group reported significantly higher depressive symptomatology (t = 4.86, p < 0.001). The relationship between drinking patterns and BDI scores was assessed within groups using a Pearson correlation. A Fisher r-to-z transformation did not show that correlations were different between the two groups.

Conclusions: Contrary to community outcomes, these data obtained in SUD treatment settings failed to show a differential relationship between depressive symptomatology and drinking in the two groups. The typical high levels of drinking among those seeking treatment may prohibits its observation. Future research including community members with varying drinking levels is needed to resolve this question.

Presenter(s): Manjula Somanchi

Authors: Dan Jin, Bayli DiVita Dean, Laura Falceto Font, Manjula Somanchi, Mathew Sebastian, Connor Francis, Alexandra Reid, Catherine Flores

Faculty: Dr. Catherine Flores

<u>The role of interferon gamma in shaping hematopoietic stem cell derived myeloid population repertoire</u>

Glioblastoma (GBM) is a common and primary aggressive brain tumor found in adults. The median prognosis of survival for GBM patients is extremely poor at only 15 months. Immunotherapy is currently being explored as a treatment option for GBM. Our previous studies show that a combination of hematopoietic stem and progenitor cells (HPSC) and adoptive cell therapy (ACT) can significantly increase treatment efficacy in the mouse GBM model. The efficacy of the combination is dependent on the specific dendritic cell (DC) differentiation from transplanted HPSCs. However, it is unclear how the specific DC differentiation occurs. Previous research has indicated that interferon gamma plays a role in the HSPC differentiation and our study is focusing on understanding the underlying mechanisms of differentiation by interferon gamma. We can use an in vitro system to differentiate HPSCs in tumor conditioned media which mimics the in vivo HPSC differentiation in the tumor environment. Our results show that HPSCs mainly differentiated into myeloid derived suppressor cells (MDSCs) in tumor conditioned media and the addition of interferon gamma resulted in more DC differentiation and more MDSC suppression. Interferon gamma in tumor conditioned media increases DC populations and suppresses MSDC and macrophage populations. We also found that Interferon-gamma receptors are expressed on the myeloid progenitor cells which is consistent with the role of interferon gamma in driving myeloid cell differentiation. Studying the role of Interferon gamma can further clarify the immunotherapy mechanism of the HSPC-ACT platform and help to find specific therapeutic candidates to modulate HPSCs.

Presenter(s): Kristin Soulliere

Authors: Kristin Soulliere

Faculty: Dr. Gayle Zachmann

Activating Jewish Women's Bodies with Eugénie Foa (1796-1852) and Hélène Cixous (1937-)

In a comparative study across genre and nearly two centuries of historical and political ferment, the writings of Eugénie Foa (1796-1852) and Hélène Cixous (1937-), two female French-Jewish writer activists, present through their fictional and autobiographical works, respectively, nuanced criticisms of what for each in their times constituted a control of Jewish women's bodies from the inside out. In the context of Foa's engagement, crafting tales in alignment with popular national narratives, specifically those featuring disenfranchised Jewish female characters, her work takes on the task of reassessing the ancient and modern systems of marriage and divorce that contribute to the systematic oppression of women. Her stories call into question the sinister ways religious and national systems of patriarchal control place Jewish women at the mercy of choices made concerning their bodies. Cixous, with several decades of ardent feminist engagement in her arsenal, turns this lens inward in her remembering and reimagining of her upbringing in a Jewish family in French-Algeria, one punctuated by war, racism, widespread anti-Semitism, and competing nationalisms. She offers a series of stories that illustrate pivotal moments in her understanding, through her own experience and those of whom she was close to, of the ways in which historically contested groups, in this case, the figures of the woman and the Jew, mutate and take on different forms in reaction to moments of periodic political and dialectical change. When analyzed together, their works reveal fascinating parallels between the issues that each considered worthy of deeper investigation.

Presenter(s): Austin Spicola, Matthew Gibbons

Authors: Matthew Gibbons, Austin Spicola (Co-presenter), Niko Linzer, Fang Yu, Stephen Jones, Eliot Gunn, Mir Hossain, Eugene Oltz, and Jörg Bungert

Faculty: Dr. Jorg Bungert

Modulation of Tal1 expression in T-cell acute lymphoblastic leukemia (T-ALL) using synthetic DNA-binding proteins

T-cell acute lymphoblastic leukemia (T-ALL) is an aggressive blood cancer that makes up to 15% of ALL cases in children and up to 25 % of ALL cases in adults. A subset of T-ALL, about 5%, is characterized by high level expression of the transcription factor Tal1. TAL1 is involved in the specification of myeloid cells and positively regulates the differentiation of red blood cells. Aberrantly high-level expression of TAL1 in T-ALL is mediated by a mutation of a cis-regulatory DNA element that creates one or multiple binding sites for the transcription factor Myb. The presence of the Myb binding sites creates a super-enhancer (SE) that drives high-level expression of TAL1. We generated a zinc finger (ZF) DNA-binding domain 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 binding site with high affinity. Delivery of the ZF protein to JURKAT cells either via virus mediated delivery of the 8ZF-Myb expressing gene or via direct protein transduction reduced expression of Tal1 and cell proliferation of JURKAT cells. We generated additional 8 ZF-Myb expression constructs in which Myb is fused to a peptide facilitating delivery or to a repression domain (KRAB) expected to confer long-term silencing of the Tal1 gene.

Presenter(s): Danielle Springer

Authors: Springer D, Lysandrou EA, Sutton J, Hunt J, Teitelbaum S, Lewis B

Faculty: Dr. Ben Lewis

The Impact of Cognitive Behavioral Therapy on Pain and Abstinence Self-Efficacy Among Individuals in Treatment for Substance Use Disorders

Background: Cognitive Behavioral Therapy (CBT) is a common psychotherapeutic intervention used in the treatment of both Substance Use Disorders (SUDs) and chronic pain. Despite substantive literatures examining CBT-associated outcomes in these conditions, its application in contexts of pain/SUD comorbidity remains uninvestigated. The import of such investigation is highlighted by evidence suggesting that chronic pain is characterized as both cause and consequence of substance use and is considered a risk factor for SUD development and relapse. We hypothesized that CBT would be associated with improvements in outcomes related to pain (i.e., pain intensity), substance use (i.e., abstinence self-efficacy), and their intersection (i.e., pain-related abstinence self-efficacy).

Methods: Patients (N=533) were assessed at treatment entry, after 30 days, and at discharge. Longitudinal models were used to examine CBT attendance as a predictor of pain intensity and abstinence self-efficacy. Correlations were conducted to characterize relationships between these outcomes and frequency of CBT sessions.

Results: The group receiving CBT reported greater abstinence self-efficacy in pain-related contexts ($p=0.002$) and lower pain intensity ($p=0.008$) across treatment. Higher frequency of CBT attendance was associated with modest reductions in pain severity ($r=-.17$, $p=0.02$), but was not associated with self-efficacy.

Conclusions: Results supported our hypotheses that CBT attendance would result in greater improvements in pain intensity and pain-related self-efficacy. In contrast, CBT did not appear to differentially impact general abstinence self-efficacy, relative to other treatment modalities. These findings suggest that CBT may be particularly effective for patients with SUDs and chronic pain.

Presenter(s): Ethan Stolen

Authors: Ethan Stolen, Michelle Gaynor, Shengchen Shan, Douglas Soltis, Pamela Soltis

Faculty: Dr. Pamela Soltis and Dr. Douglas Soltis

The Impact of Genome Doubling on Gene Expression Noise in Arabidopsis thaliana

A key question in biophysical investigations is how life arises from, and thrives in, the inherently random interactions of molecules. A consequence of this cellular environment is the stochasticity of gene expression, or noise, which is defined as the difference in the number of copies of a protein produced by genetically identical cells. Since stochastic gene expression affects the flow of information from DNA to the protein structure of an organism, we are especially interested in the effect of genetic (gene copy) redundancy on the noise of gene expression. Whole-genome duplication (WGD), or polyploidy, is one possible source of redundant genetic information, resulting in individuals with duplicated genetic information. To quantify the effect of WGD on gene expression noise, we designed an experimental setup using dual reporter proteins: yellow (YFP) and cyan (CFP) fluorescent proteins. We propose to cultivate Arabidopsis thaliana individuals from a line with these two proteins inserted into the genome. We will then induce synthetic autotetraploidy using colchicine. We will determine the level of gene expression using confocal laser scanning microscopy to measure the fluorescent intensity of the reporter proteins. We hypothesize that the synthetic autopolyploid individuals will be characterized by an overall increase in extrinsic noise, due to increased variation in cellular volume, but a decrease in intrinsic noise due to the redundancy of genetic information buffering gene expression. Experimental setups like this one may make clear the effects of WGD on gene expression noise and contribute to a better understanding of an important evolutionary force.

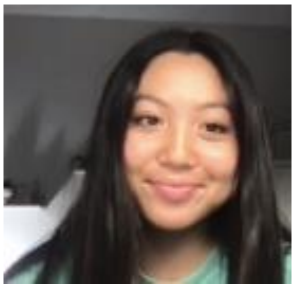
Presenter(s): Piotr Suder

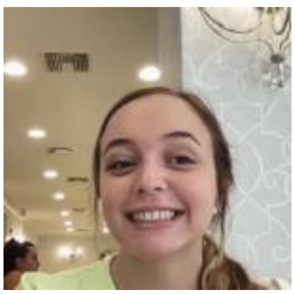
Authors: Piotr Suder, Aaron Molstad

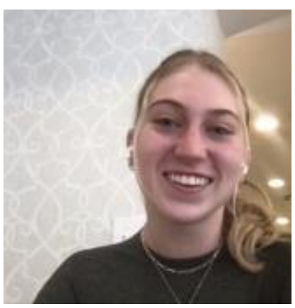
Faculty: Dr. Aaron Molstad

Multipopulation covariance networks estimation for high-dimensional compositional data

Compositional data naturally occurs in many areas of research in the natural sciences. One of the most prominent examples is the study of the human microbiome, where one can measure the relative proportions of many distinct microorganisms from a sample. Often, practitioners are interested in learning how the dependencies between microbes vary across distinct populations. In statistical terms, the goal is to estimate a covariance matrix for the (latent) relative abundances of the microbes in each of the populations. However, the compositional nature of the data prevents us from using standard estimators for these covariance matrices. In this project, we introduce a novel, sparsity-inducing estimator for multiple covariance matrices arising from high-dimensional compositional data which allows for information sharing across distinct populations of samples. We propose a proximal-proximal-gradient algorithm for computing the estimator, and provide a software implementation. Through simulation studies, we demonstrate that our estimator can outperform existing estimators of the covariance matrix for compositional data.







Presenter(s): Eric Sung, Ashlyn Carter, Caitlin Guiang, Hannah Dickinson, Kiley Vanness

Authors: Xiaoqi Ma, Jennifer Doty, Ashlyn Carter, Hannah Dickinson, Caitlin Guiang, Eric Sung, Kiley Vanness

Faculty: Dr. Jennifer Doty

Parental Effects on Cyberbullying Victimization

Cyberbullying victimization is generally defined as the willful and repeated harm inflicted through the use of computers, cell phones, and or other electronic devices. The outbreak of COVID-19 could substantially increase risk factors of cyberbullying victimization, considering the context of increased digital use. This study hypothesized that parental trust and monitoring would predict change in cyberbullying victimization among different genders. A questionnaire survey was conducted among parents and adolescents across three waves of data - pre-coronavirus outbreak, during coronavirus pandemic, and after the peak of the coronavirus pandemic. Parent trust was measured by the Inventory of Parent and Peer Attachment scale, and cyberbullying victimization was measured by a Problem Behavior subscale. Cyberbullying was recorded on a scale of 0 to 1 in order to create a binary logistic regression for future analysis. Through implementing a logistic regression using "SPSS Statistics", we were able to determine that parental trust was more significant than parental monitoring on managing cyberbullying practices. Furthermore, race, gender, and age were not found to be statistically significant in relation to cyberbullying victimization. The results show a significant correlation between the parental trust and the child's experience with cyberbullying. Additionally, we examined whether parental monitoring on the child's technology use had an effect on cyberbullying victimization which was found to not be statistically significant to our results. The lack of significance suggests that any parental interference in their child's online usage may exacerbate the extent of cyberbullying victimization, though further research is required to validate this claim.

Presenter(s): Ellery Susa

Authors: Ellery Susa

Faculty: Dr. Hui Zou

The Narrative Space: John Hejduk's Angelic Architecture

Following Cartesian dualism, modern architecture tends to dissociate mind and body and overlook the spiritual soul, but Hejduk challenged such an understanding of buildings as autonomous objects and put an emphasis on the soul of architecture, which has a direct connection to good humanity. As a great American architect and educator, Hejduk wrote poems, created experimental drawings, and focused on the symbolism of angels to understand the importance of historical meaning in architecture and to define humanity as the subtle threshold between heaven and earth. He explored the design concept of "narrative space" to address the predicament of meaninglessness in the built environment and implemented it to redefine human perceptual and emotional connection to the lost spiritual and cosmic world. His poetry helped to define the interrelationship between reality and imagination in the architectural design process, creating a spiritual link between what is physically present and the meaning behind it. As seen through his mystic drawings and poems, Hejduk moved away from the modernist dogma of "form follows function" towards an expressive and critical design language. His architectural meditation through poetry, drawings, design, and construction draws the multiple threads of memory, history, trauma, and poetical emotion and interweaves them into the production of marvelous space that can tell stories and inspire our passion for the spiritual home.

Presenter(s): Sara Sutton

Authors: Sara Sutton, Andrea Guzman, Jacqueline Watkins, Christopher L. Souders II, Christopher J. Martyniuk

Faculty: Dr. Christopher J. Martyniuk

<u>Investigation into the neurotoxicity of tryptophan metabolites, indole and xanthurenic acid, using the human SH-SY5Y neuroblastoma cell line</u>

Microbial-derived metabolites produced in the gastrointestinal (GI) system can be rapidly absorbed into the blood system. Further metabolism in the liver or brain can produce metabolites that can become more toxic to cells. Tryptophan, the precursor for serotonin, is an amino acid that is primarily metabolized by GI microbiota. Tryptophan can be metabolized into different derivatives including indole and xanthurenic acid. These metabolites can cross the blood brain barrier to affect the central nervous system, however there is little data reporting on their effects in neuronal cells. To address this knowledge gap, we assessed the potential for these metabolites to induce neurotoxicity in human SHSY5Y cells. Over 48 hours, indole was not overly toxic to human neuroblastoma cells based on several cell viability assays, while xanthurenic acid was relatively toxic to SH-SY5Y cells, reducing cell viability after only 4-hour treatment. Casp3 activity was induced by indole after 24 hours which was not observed with xanthurenic acid. Conversely, xanthurenic acid (>100 µM) increased the production of reactive oxygen species in a time and dose dependent fashion, while indole did not generate significant ROS. We did not detect any change in mitochondrial membrane potential for either indole or xanthurenic acid. Taken together, xanthurenic acid exerted higher toxicity to SH-Sy5Y cells compared to indole and toxicity may involve different mechanisms related to each metabolite. This study improves understanding of toxicity of microbial-derived metabolites in the central nervous system.

Presenter(s): Gianna Sweeting

Authors: Gianna Sweeting, Ruogu Fang

Faculty: Dr. Ruogu Fang

African American Representation in Alzheimer's Disease Research

Alzheimer's disease (AD) is a brain disorder that affects both cognition and behavior. While the direct cause is unknown, genetic research has aided in providing several potential causes as well as identifying trends amongst different groups, allowing for a personalized approach to AD treatment for individuals. Researchers in the field are currently exploring the racial differences in AD, and despite being a low percentage of participants within clinical trials, African Americans are said to have a higher age-specific prevalence of AD when compared to their White counterparts. This low representation within clinical trials calls into question the validity of conclusions around African American patients. Thus this paper aims to examine statistics and conclusions based on datasets with low African American participation, as well as the reasons for this low participation and how to potentially increase it. The findings of these papers can aid in increasing African American participation as well as making AD research more representative of the population.

Key - Words: African American, Alzheimer's Disease (AD), Racial Disparities

Presenter(s): Ohee Syed

Authors: Ohee Syed, Adithya Gopinath, Habibeh Khoshbouei

Faculty: Dr. Habibeh Khoshbouei

Characterization of TNF-alpha receptor expression and distribution in Parkinson's disease model mice

Parkinson's Disease (PD) is a progressive neurodegenerative disorder that is characterized by both motor and nonmotor features. PD results from degenerating dopamine neurons in the substantia nigra (SN). Although the pathogenic mechanisms that cause dopamine neuron degeneration in PD are still unknown, the literature suggests that inflammation and pro-inflammatory cytokines such as TNF-alpha play a role in PD progression. TNF-alpha has two ligand subtypes: soluble TNF (solTNF) and transmembrane TNF (tmTNF), and two-receptors, TNFR1 and TNFR2. In vivo and in vitro data suggest increased TNFR1 expression is implicated in degeneration of dopamine neurons. Dopamine neurons, microglia, astrocytes and vascular endothelial are known cell types to be affected by TNF-alpha and express TNF-receptors. To investigate the mechanistic link between TNFR1 expression and PD progression, we aimed to assess the expression and distribution of TNF-receptors in the 6-OHDA mouse model of PD. Via immunohistochemistry (IHC), we first optimized TNF-receptors detection in multiple brain regions in control mouse brain, setting the stage for characterization of TNF-receptors in the 6-OHDA model of PD. Ongoing studies will investigate whether there is a progression-dependent change in the expression and distribution of TNF receptors in the midbrain and dorsal striatum of PD mice. The results will reveal the link between TNF-alpha-mediated inflammation and PD progression.



Presenter(s): Kevin Tandi, Hannah Kempfert, Kaitlyn Burstiner

Authors: Kevin Tandi, Hannah Kempfert, Kaitlyn Burstiner, Joel Harley

Faculty: Dr. Joel Harley

Radial Modal Analysis Using Neuromorphic Event-Based Imaging

This work proposes an algorithm to extract the vibrational modes for radial movement using an event-based dataset. A neuromorphic camera, unlike a typical high-speed digital camera, records data per pixel triggered by a change in intensity at that pixel. Data is organized as a matrix of ascending time stamps per event, the spatial coordinates of the pixel at each respective time stamp triggering an event, and the polarity of the event at each pixel (a binary value for either an increase or decrease in light intensity). Since sampling occurs on a pixel-by-pixel basis and is not subject to a frame rate, neuromorphic cameras can efficiently capture local high-speed motion with a reduced amount of data. In this work, the Davis-430 neuromorphic camera is used to produce an event-based dataset of a wine glass spatially vibrating at its resonant frequency, induced by sound. The vibrational modes of the glass are then extracted by using phase-based motion extraction to compute the local phase at a spatial neighborhood of each active pixel, followed by principal component analysis to identify the most dominant modes present. Previous works have used neuromorphic cameras to extract modal frequencies with algorithms limited to unidirectional motion and simple bodies. This work expands these prior efforts to extract modal frequencies using radial motion and a body that distorts.

Presenter(s): Reece Tappan

Authors: Reece C. Tappan, Lauren A. Laboissonniere, Adamantios Mamais, Matthew J. LaVoie

Faculty: Dr. Matthew LaVoie

Stress-Mediated Nuclear Localization of PINK1 and phosphorylated ubiquitin

Mutations in the PTEN-induced kinase 1 (PINK1) gene have been implicated in Parkinson's disease (PD), where mitochondrial dysfunction as a result of these mutations is observed. Basal activity of PINK1 is relatively low in healthy cells, as it is cleaved in mitochondria after import. Within dysfunctional mitochondria PINK1 fails to be cleaved and autophosphorylates, becoming activated. PINK1 then phosphorylates parkin and ubiquitin at their respective serine 65 residues, recruiting them to the mitochondria, thus initializing selective degradation via mitophagy. The role of PINK1 in mitochondrial maintenance is well characterized; however, we sought to better understand the function of this protein irrespective of mitophagy. Using immunofluorescence and immunoblot analysis, we evaluated PINK1 activation in WT and PINK1-/- HEKs. We observed localization of PINK1 and its substrate pS65-ubiquitin in the nuclei of CCCP-treated cells, suggesting a novel function of this kinase in the nucleus during mitochondrial stress. Using in silico modeling, we identified potential nuclear localization signals within PINK1, lending insight into its ability to enter the nucleus. To continue this research in a more cell-relevant model, we generated human iPSC-induced astrocytes (iAs), which are suggested to be the major source of PINK1-dependent ubiquitin phosphorylation. We performed a screen of adeno-associated viruses (AAVs) in our iAs to identify the most efficient virus for cargo delivery into these cells for use in future studies. This project identifies novel PINK1 localization within the nucleus and will lead to important downstream studies of protein function that may shed light on uncharacterized disease-relevant pathways in PD.

Presenter(s): Sarah Tatum

Authors: Sarah Tatum, Emily Helm, Stephanie Karst

Faculty: Dr. Stephanie Karst

Investigating Extraintestinal Dissemination of Norovirus in the Neonatal Mouse Model

Norovirus is the most common cause of severe childhood diarrhea and a leading cause of acute gastroenteritis worldwide. Murine norovirus (MNV) has been used as a model system to study norovirus infection; however, immunocompetent adult mice infected with MNV do not develop diarrhea as seen in human infection. Thus, our lab developed and utilizes a novel neonatal mouse model with various virulent (MNV1 and WU23) and attenuated (CR6) strains. In this model, genetically immunocompetent neonatal BALB/c mice infected with virulent strains develop self-resolving diarrhea. To explain this difference in virulence between strains, we examined the role of extraintestinal dissemination to the spleen, liver, and pancreas in norovirus infection. We hypothesized that extraintestinal dissemination correlates with virulence in strains MNV1 and WU23 compared to attenuated strain CR6 and found that it does. In previous studies, major capsid protein VP1 correlated with diarrhea and was identified as a possible virulence factor. To determine if VP1 correlates with this phenotype, we created chimeric viruses that swap the gene encoding for VP1 between select virulent and attenuated strains. If VP1 was responsible for dissemination, we expected to see a restoration of extraintestinal viral titers for chimeric strains with a CR6 backbone and the VP1 gene from MNV1 or WU23. Ultimately, we found that VP1 is not sufficient to explain this phenotype. Although we cannot support this mechanism of extraintestinal dissemination, future studies may investigate whether there remains a role for VP1 or dissemination in norovirus infection.

Presenter(s): Aubrey Tews

Authors: Aubrey Tews, Bahar Armaghani

Faculty: Professor Bahar Armaghani

LEEd Certified and Bird-Friendly Window Design: How to Ensure Both are Possible

Green buildings (i.e., LEED certified buildings) emphasize access to daylight and views for occupants' wellbeing, comfort, and productivity. Window glazing allows access to daylight and views but is often detrimental to birds. Annually, up to a billion bird in the United States die due to window collisions. A comprehensive literature review and data analysis of LEED and methods of deterring collisions was conducted to determine solutions to limit bird deaths at LEED certified buildings. Deterrence factors of building design, outdoor surroundings, and occupant behavior were evaluated, due to their collective impact on bird-window collisions. To best prevent collisions and adhere to LEED, window glazing with visual markers and sound deterrents should be used. Certain façades should be avoided and building lights should be turned off during migration season. Additionally, vegetation near buildings is encouraged in LEED certification, but increases the frequency of bird-window collisions. These findings suggest that LEED, particularly the credit "Daylight and Quality Views," is not completely aligned with current bird-safe design practices. While certain window glazing is acceptable for both LEED and bird-safe design, the two are not mutually exclusive. Due to this, it is recommended that window glazing that aligns with LEED and is bird-safe, is made clear within the LEED "Daylighting and Quality Views" credit description. LEED and bird-safe design practices also have contradictory views on vegetation near buildings. There should also be further research into if vegetation near buildings would still increase bird-window collisions if deterrent factors, such as bird-safe windows, were utilized.

Presenter(s): Anna Thodhori, Agustina Salomon, Elizabeth D'Amico

Authors: Anna Thodhori, Agustina Salomon, Elizabeth D'Amico

Faculty: Dr. Feihong Wang, PhD

COVID-19 Impact Perceived by College Students Enrolled in the Coordinated General Psychology Program

COVID-19 has negatively impacted college students' mental health, (Wang et.al, 2020), social interactions (Son et.al, 2020), and academics (Kecojevic et.al, 2020), simultaneously producing positive impacts (Lopez-Castro et.al, 2021). The pandemic has affected college minorities more due to concurrent racial injustice (Reyes-Portillo et.al, 2022), though few studies have examined variations across ethnicities. This study aimed to expand the literature regarding: What are the major COVID-19 impacts perceived by college students? How do the impacts differ across gender, race, and academic level?

We conducted thematic and secondary data analyses on impacts reported by 186 students enrolled in a general psychology course at the University of Florida. Participants consented and responded to an open-ended survey item. A codebook developed by Wang & Shabash (2020) guided data coding, with average inter-coder agreements of 84%.

Data analysis yielded six major impacts: academic, lifestyle changes, health, financial/work, social dynamics, and mental health. Participants reported significantly more negative (M=4.01, SD=1.856) than positive (M=0.22, SD=0.544) impacts (p<0.001). A Friedman test and post-hoc Wilcoxon Signed Ranks tests indicated more social dynamic and academic impacts were reported than health (p<0.001) and more academic were reported than mental health (p<0.001) and social dynamics (p<0.001). Impacts across demographic groups were not significant.

Our findings suggest: collegiates experienced more negative impacts than positive; significant differences exist between the major impact types. Demographic group differences are prevalent, but our sample may have been too small to exhibit this. Higher educational institutions should be aware of the coronavirus' impact on students and provide appropriate support.

Presenter(s): Lyndsey Thomas

Authors: Lyndsey A. Thomas, Carla L. Fisher, Michaela Devyn Mullis, Tithi B. Amin, Carma L. Bylund

Faculty: Dr. Carma Bylund

Understanding Older Adults' Cancer Experiences, Support Needs, and Communication Needs

Introduction: Research has demonstrated that geriatric patients with cancer have distinctive needs that differ from younger cancer patients. Compounded by the fact that blood cancer treatment and recovery tend to be different from what is typical for solid tumors, older blood cancer patients' needs have yet to be fully addressed. Thus, this study explores the experiences of older adults (aged 75 and older) diagnosed with a variety of blood cancers with the goal of understanding their unique support and communication needs.

Methods: We recruited participants in collaboration with The Leukemia & Lymphoma Society (LLS) using multiple methods such as email recruitment and website postings. We screened interested participants via telephone to verify eligibility to participate in the study. One post-doctoral researcher conducted interviews with 35 patients.

Results: These 35 patients (51.4% male) were ages 75 – 89 years old with a type of leukemia and/or lymphoma. Early results indicate that most geriatric patients with leukemia/lymphoma typically identify either a spouse (48.6%) or report no one (34.3%) as a primary caregiver. Though results are not yet finalized, these data suggest a wide range in challenges facing older adults living with leukemia/lymphoma and that they seem to prioritize individual coping approaches.

Conclusion: Given this, it is expected that, even within this narrow population, diverse needs and challenges will be expressed from patient to patient. Moving forward, we will continue to interview participants and collect information concerning their specific needs in terms of support and communication.

Presenter(s): Tyler Thompson

Authors: Tyler Thompson, Ann C. Wilkie

Faculty: Dr. Ann C. Wilkie

Propagating Mint Plants from Stem Cuttings

Mint plants can have a variety of different uses both commercially and residentially. In a commercial setting, mint can be used to produce dental hygiene products such as toothpaste and mouthwash. However, in a residential setting, people use it in foods, teas, baths, and even bug repellents. In light of its various uses, this study attempts to optimize the process of propagating mint plants from stem cuttings to quickly and effectively produce mint leaves. This study compared various treatments of mint cuttings, including the use of a rooting hormone, indole-3-butyric acid. The study was conducted in a greenhouse over the course of a few months. The propagated mint plants were measured by number of roots, length of roots, size of the plants, number of leaves, and the SPAD meter readings on the leaves of the plants. Results of the propagation study will be presented. This study works to improve current practices for mint propagation for commercial and residential use.

Presenter(s): Ailish Tierney

Authors: Ailish Tierney, Katarina Jurczyk, Chaitra Peddireddy, Nikita Soni, Lisa Anthony

Faculty: Dr. Lisa Anthony

Touch Interaction for Data Engagement with Science on Spheres

In addition to flatscreens, multi-touch spherical displays are increasingly being used for educational purposes. In the Touch Interaction for Data Engagement with Science on Spheres project, we understand how to design educational interfaces for spherical touchscreens to help children and adults engage and learn from global data visualizations. We conducted a museum study with 571 users (370 adults and 201 children). We analyzed how users interacted and collaborated with spherical displays by looking at their touch gestures (e.g. drags, swipes, etc.) as well as their physical formation (e.g. standing angle) around the sphere. Our findings showed spherical display's potential to support collaborative learning in museums, specifically for global data visualizations.

Despite the educational benefits of physical spherical displays, the COVID-19 pandemic did not allow us to continue museum deployments. As an alternative option, we designed and developed a virtual spherical display prototype using comparable capabilities and imagery as previously used in the spherical display to help users learn about global data visualizations. We plan to compare how people learn from different mediums (i.e. physical vs virtual) in order to design more intuitive and effective learning experiences for both forms. As such, we will compare the types of interactions individuals have during observational studies. Through this, we hope to collect data that will help determine the effectiveness of learning on virtual vs physical displays. As a USP Scholar, I lead the efforts of developing a virtual spherical display prototype using Unity that could be run on a laptop.

Presenter(s): Isabela Torres Pereira Meriade Duarte

Authors: Isabela Torres, Ali Lateef, Monique Bernier, Viviana Pinzon, Bryce Shirk, and Whitney Stoppel

Faculty: Dr. Whitney Stoppel

Exploring Plodia Interpunctella as a New Source of Silk for Biomaterial Applications

Isabela Torres1, Ali Lateef1, Monique Bernier1, Viviana Pinzon1, Bryce Shirk2 and Whitney Stoppel1,2 (1)Chemical Engineering, University of Florida, Gainesville, FL

(2)J. Crayton Pruitt Family Department of Biomedical Engineering, University of Florida, Gainesville, FL

Due to its strength, elasticity, and toughness, silk has been used for different kind of materials in the biomedical industry. Silk makes a great biomaterial in the biomedical field due to its biocompatibility and biodegradability. However, this field is mostly dominated by the unilateral study of the species Bombyx mori, chosen due to its wide availability and its prevalence in textiles. Although silk fibroins isolated from the cocoons of Bombyx mori can be used to create films, sponges, gels, and other biomaterials, investigators are limited by the mechanical properties of the native silk fiber, limiting the range of materials properties achievable in certain systems, such as in the development of silk-based bioinks for 3D printing. Therefore, studying alternative sources of silk fibroin proteins can add to and expand the applications of silk-based materials in the biomedical field. Our study looks at the silk sheets of a world-wide insect pest called Plodia interpunctella for use in future tissue engineering applications. Silk fibroin produced by Plodia interpunctella has significantly lower fiber diameter and tensile strength compared to Bombyx mori, presents a potential cost-effective method for silk collection, and has well- defined protocols for lab rearing. In hope of including Plodia interpunctella as a viable source of silk fibroin for biomaterials, we are studying the chemical and physical properties of the silk sheets and the biological and evolutionary drive of the sheet laying process.

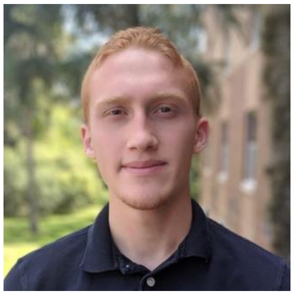
Presenter(s): Elizabeth Tortolini

Authors: Elizabeth Tortolini, Grayson Bishop, Sterling Sheffield

Faculty: Dr. Sterling Sheffield

Vocoder Training in Normal Hearing Listeners for Cochlear Implant Simulations

Bilateral Cochlear Implants (CIs) can be programmed with identical or complementary (interleaved) frequency cues across ears. Research has shown that listeners with CIs might struggle to integrate complementary cues across ears or require training to do so. This study used different CI simulations to address whether normal-hearing listeners can integrate CI simulations with complementary cues across ears for better speech understanding and whether speech perception with training differs for various CI simulations. The effects of interleaving cues and upward frequency shifts were examined with four vocoders: 1) identical without a shift, 2) identical with a shift, 3) complementary without a shift, and 4) complementary with a shift. Participants completed baseline speech testing, 45 minutes of training with auditory vowels and consonants with feedback, and repeated speech testing in one and both ears to measure performance changes and binaural integration. The data from both the vowel and the consonant testing show that participants could integrate CI simulations with complementary cues across ears. Whether the signal was complementary or identical had more of an effect on the performance than whether it was shifted or unshifted, and the condition where participants struggled the most was with both complementary cues and shifts. Our data support our hypothesis that participants would obtain more benefit from training for CI simulations with neural shifts in frequency, however not for CI simulations with complementary cues across ears. The data also support our hypothesis that participants can integrate complementary cues across ears, but they did not require training.



Presenter(s): Noah Towbin

Authors: Noah Towbin

Faculty: Dr. Emily Bald

<u>The Effectiveness of Different Childhood Obesity Interventions in Low-Income American Communities</u>

Background: Childhood obesity is a prevalent disease that increases the risks of asthma, cardiovascular disease, and certain psychological issues among other health problems. As rates increase among low-income and minority populations, gaps in the research exist concerning the relative effectiveness of different types of interventions against this condition.

Design: This review explains the nature and effectiveness of community-, school-, home or parent-based, and integrated interventions involving a combination of these focuses against childhood obesity in low-income, minority populations within the United States. For each of these types of interventions, several examples are analyzed with an emphasis on how they directly affect physical health measurements, drive behavioral changes, impact nutritional literacy, and improve understanding of some preventative measures that can be taken.

Results: Community-based action successfully targets physical measures of health, such as BMI and waist circumference, and more peripheral factors like nutritional literacy. School-based interventions also positively impact BMI and waist circumference, and they disseminate extensive nutritional knowledge, leadership skills, and behavioral strategies. Parent- or home-based efforts improve physical health measures by educating caretakers of affected children about fitness and nutrition. Integrated measures have great potential to mitigate unhealthy lifestyle choices and improve access to nutritional information and community resources.

Conclusions: Low-income, minority communities should consider pursuing integrated interventions against childhood obesity that integrate the statistically significant components of the other categories. Future research should focus on how integrated interventions with elements of child engagement, hands-on learning, and improvements in infrastructure impact physical measures of health in this population.

Presenter(s): Terri Tran, Samantha Enslow

Authors: Terri Tran 1 , Samantha Barker 1 , Samantha Enslow 1 , Lisa E. Emerson1 , Hailey Barker1 , Mark Ou 1 , Carol Hoffman 2 , David W. Pascual 2 , Mariola J. Edelmann 1

Faculty: Mariola Edelmann, PhD

Protective Immune Responses Generated from Antigen-Containing Extracellular Vesicles

Salmonella typhimurium is a gram-negative intracellular bacteria that causes foodborne illness. Salmonella infects a variety of cells, including antigen-presenting cells such as macrophages. Our laboratory has found that Salmonella-infected macrophages secrete extracellular vesicles (EVs) that can have immunomodulatory functions. EVs can package various cargo including proteins, nucleic acids, metabolites, lipids, and Salmonella antigens. We hypothesized that EVs that package Salmonella antigens are sufficient on their own to stimulate immune responses in study animals. Our previous work has characterized antigen contents from Salmonella-infected macrophages; however, the extent to which EVs generate protective antibody response has not been fully explored. IgA is an immunoglobulin produced in response to a specific antigen. The presence of IgA responses may indicate immune protection against an organism, such as Salmonella. The purpose of this project was to determine if EVs made by macrophages during Salmonella infection generate pathogen-specific IgA responses. To study this, we dosed mice with EVs, a live vaccine strain of Salmonella as a positive control, or PBS as a negative control. Mouse stool was collected each week and analyzed for IgA responses. Fecal IgA titers showed similar responses between EV and live vaccine treatment groups, while PBS mice had no measurable IgA tigers. Overall, our results suggest EVs from Salmonella-infected macrophages are able to induce Salmonella-specific fecal IgA responses, which could be protective. Future work will investigate the level of protection provided by the IgA antibodies.

Presenter(s): McKinley Traylor

Authors: McKinley Traylor, Dr. Hongcheng Liu

Faculty: Dr. Hongcheng Liu

Zeroth-order optimization for Monte Carlo-based radiotherapy treatment planning

The goal of radiotherapy treatment planning is to optimize the radiation dose delivered to patients for cancer treatment. An optimal plan optimizes the dose coverage on cancerous tissues while minimizing the dose delivered to healthy tissue. During the radiotherapy treatment planning process, a highly accurate dose calculation is necessary for providing an optimized dose to patients. Monte Carlo (MC) simulation, which involves repeated random numerical sampling, can provide this accuracy but often requires an infeasible amount of time and memory for practical use. This study aims to improve upon previous MC-based dose calculation methods by developing three approaches that maintain high accuracy while reducing the number of iterations needed. Three gradient-free methods are developed and tested in MATLAB for performance using the same objective function. In all three methods, the goal is to calculate the optimal solution to a minimization problem. While the collection of results on the performance of these methods for minimizing the test function is ongoing, promising preliminary results have been achieved for one method's performance in proton therapy treatment planning.

Presenter(s): Natalie Triana

Authors: Natalie Triana

Faculty: Dr. Anna Peterson

The need for corporate sustainability as a requirement in undergraduate business education

As global temperatures rise and our planet faces the ever-growing consequences of climate change, sustainability practices (especially amongst corporations) are more important than ever before. More specifically, proactive strategies and shifts in organizational culture should be at the forefront of corporate environmental strategies. However, scholars have debated on the determinants that motivate corporations to act proactively towards the environment (eco-design, sustainable management, source reduction) rather than reactively (compliance with regulations). Research has shown that environmental values and awareness impact the degree to which business managers or employees implement proactive environmental policies. Additionally, studies have proven that values are formed early-on and during transitional periods of a person's life (such as college), and subsequently become harder to change over time. Therefore, some scholars argue for the implementation of sustainability in business education. Some universities and MBA programs have created competitions, events, and workshops to promote sustainability, but none have fully introduced sustainability or business ethics as a requirement for business students. This paper describes a review of the existing literature that supports an integration of environmental knowledge and values into undergraduate business education. Furthermore, this research contains significant implications for business managers and higher education institutions. Future scholars can provide more concrete evidence supporting this position by conducting experimental research on the effectiveness of the sustainability-focused business programs mentioned in this paper.

Presenter(s): Valerie Truesdell

Authors: Valerie Truesdell, Clayton Swanson, Steven Winesett, Jonathan Miles, Sudeshna Chatterjee, Brigette Cox, Adam Woods, Dorian Rose, Rachael Seidler, David Clark

Faculty: Dr. David Clark

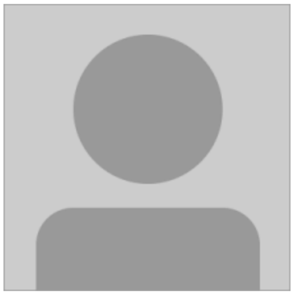
Relationships Between Cognition and Physical Function in Older Adults

Cognitive function and walking performance decline with typical aging. While cognitive function is necessary for navigating one's surroundings, there remains a lack of research assessing associations between specific cognitive domains and gait related spatiotemporal measures. Therefore, the purpose of this project was to determine whether domain specific cognitive function was associated with specific gait measures in a group of older adults.

Cognitive and gait data was collected from 16 participants (age 77.3 ± 6.33 years, 75% male). Cognitive function was assessed through the computer-based Cambridge Brain Sciences Neurocognitive Assessment toolbox. Both mean and variability of gait was quantified during a 2-minute self-selected pace walk using 7 wireless inertial sensors securely attached to the body.

The results indicate that better cognitive function was associated with better walking performance. Specifically, cognition related to attention, response inhibition, and verbal short-term memory was associated with better mean walking performance for nearly all gait measures. Moreover, better attention and verbal short-term memory demonstrated significant associations with gait variability. However, response inhibition demonstrated no significant associations with gait variability.

The associations between cognitive function and walking performance suggest an important role for domain specific cognition and walking performance in older adults. Specifically, we see that both attention and verbal short-term memory were related to mean and variability gait measures, while response inhibition was only associated with mean related gait measures. These results may help clinicians characterize those in need of rehabilitation, and further may foster new rehabilitation approaches designed to enhance mobility through specific cognitive training.



Presenter(s): Stephanie Truta

Authors: Stephanie Truta, Dominick Padilla and Bala Rathinasabapathi

Faculty: Dr. Bala Rathinasabapathi

Toward Orange and Blue Peppers: Descriptions of purple flower color and flower size in segregating lines of pepper Capsicum annuum

Certain varieties of pepper (Capsicum spp.) produce purple coloration of leaves, stems, flower petals and immature fruit due to accumulation of anthocyanin pigments. Such accumulation brings about a novel color with ornamental values especially when present in large flowers and can potentially increase antioxidant activity of the vegetable. Anthocyanin also helps plants adapt to environmental stress (drought, extreme cold, photodamage). We are interested in using the purple color trait in breeding new pepper varieties. Our goals are to determine the segregation pattern for flower size and purple coloration-related traits, and to test whether the flowers' color corresponds to their cotyledon color. In this study, a population of plants, named JRX, segregating for purple and non-purple coloration were observed to document these aspects of genetic segregation.Variations in purple flower color were recorded, categorized, and named and the diameters of fresh flowers were measured. Although previous studies identified anthocyanin coloration of pepper flowers, in this study we identified several new aspects. This included purple coloration of immature ovules and the nearby tissue where seeds develop, and the near lack of purple coloration on the outer part of the flower's ovary where all other parts of the flower had purple coloration. A Chi-Square test revealed that the segregation ratio for purple flower color fit a single-gene model, but the flower size behaved as a multigenic trait. Our findings will be useful for developing novel varieties of pepper that may have both enhanced nutritional and ornamental qualities.

Presenter(s): Kaitlyn Tucker

Authors: Kaitlyn Tucker

Faculty: Dr. Gabriel Maltais-Landry

An incubation study of organic fertilizers and amendments to measure nitrogen release for integrated nutrient management in agriculture

Nitrogen (N) inputs are necessary to maximize yields in agricultural systems but they must be managed adequately to limit negative environmental effects through eutrophication and potential economic losses due to inefficient nutrient use by crops. Managing N sustainably is especially difficult when using organic amendments and fertilizers, as the organic nitrogen they contain must be released through mineralization prior to crop uptake, and the rate of N release must match crop demand to minimize losses and maximize crop nutrient use efficiency. We designed an 8-week incubation experiment to assess N release and carbon dioxide (CO2) emissions of two amendments (compost or biochar from poultry manure) and two fertilizers (10-2-8, 13-0-0) that were applied to soils from Citra and Immokalee (FL) and incubated at 24°C and 30°C. Soil CO2 emissions were measured weekly, while inorganic N concentration was measured every 4 weeks. Cumulative CO2 emissions after 8 weeks were consistently higher for the composted poultry manure than other amendments, with emissions of 1541-1555 mg C-CO2 for the Citra soil and 1702-1869 mg C-CO2 for the Immokalee soil; emissions were also higher with biochar than with fertilizers. Processed fertilizers (10-2-8 and 13-0-0) had the highest N release after 8 weeks, except for the Citra soil incubated at 24°C for which the biochar amendment resulted in the highest N release. Overall, these results indicate that processed protein-based fertilizers such as 10-2-8 and 13-0-0 had the greatest N release while also minimizing CO emissions, emphasizing their value in an integrated nutrient management framework.

Presenter(s): Selin Tukel

Authors: Selin Tukel, Sylvain Doré

Faculty: Dr. Sylvain Dore

Circle of Willis and posterior communicating artery variations and traumatic brain injury

TBI is known to cause injury to the cerebrovasculature essential to normal brain perfusion, resulting in primary injury at the site of impact and, more importantly, following secondary factors. Of these secondary factors, disruption to cerebral blood flow (CBF), cerebrovascular reactivity (CVR), blood-brain-barrier (BBB) disruption, reactive oxygen species, and inflammation are of central importance. Importantly, the Circle of Willis (CoW) is an essential anastomosis providing blood to both brain hemispheres. It is known that the general population exhibits variations, commonly hypoplasia in the CoW and, specifically, the posterior communicating artery (PComA). Of note, in addition to the primary damage and potential internal bleeding, TBI poses a secondary significant risk for ischemic stroke due to insufficient perfusion. After TBI, there are also CBF, CVR, BBB disruptions, ROS, and inflammation. The lab has also demonstrated that small changes in the CoW can also affect the amount of hippocampal neuronal damage after transient global ischemia. The current research investigates variations in the CoW and PComA in modulating the increased risk of ischemic stroke, finding a significant correlation. This comprehensive review summarizes the relationship between TBI secondary factors, ischemic stroke secondary factors, and CoW and pCOMa hypoplasia or variations. There appears to be a relationship connecting TBI and CoW/PComA variations through the link between ischemic stroke and CoW/PComA variations; justifying the need for additional preclinical and clinical research.

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Funding: This work was partially supported by grants from the NIH, the DOD, and the UF-COM-Anesthesiology.

Presenter(s): Dana Tuyn

Authors: Dana Tuyn, Benjamin Kidd, Dr. Maurice Swanson, Dr. Eduardo Candelario-Jalil, Dr. Marcelo Febo, Dr. Justin Varholick, Dr. Sylvain Doré

Faculty: Dr. Maurice Swanson

Investigations of Post-Stroke Outcomes in Acomys cahirinus

Stroke is classified as the second leading cause of death worldwide and can result in chronic disability (Donkor, 2018). Ischemic stroke, the most common type of stroke, results from occlusion of an artery supplying blood to the brain. This blockage results in ischemia, hypoxia, and subsequent necrosis of brain tissue. Tissue loss is not restored in humans or rodent models of stroke, which can lead to long-term functional impairments. We investigated the post-stroke outcomes in the African spiny mouse, Acomys cahirinus, due to their regenerative abilities. Previous studies involving Acomys show regeneration of skin, cartilage, skeletal muscle, spinal cord, and kidney (Maden & Varholick, 2020). Scarless regeneration and functional recovery after complete spinal cord transection have also been reported (Nogueira-Rodrigues et al., 2021). Therefore, we wanted to test if Acomys cahirinus is capable of brain regeneration after ischemic stroke. Post-stroke outcomes are recorded from 0 to 180 days post-injury using MRI and behavioral analysis. The most impacted brain regions include the hippocampus, striatum, thalamus, amygdala, and frontal cortex. Preliminary MRI results suggest no brain regeneration as of 4 months post-injury, but afflicted regions are filled with cerebrospinal fluid (CSF). Despite lack of brain regeneration, spiny mice show robust behavioral recovery and survival. Remarkably, cage behavioral analysis shows regained motor function including eating, drinking, chasing, and climbing as quickly as 2 days post injury. Further studies will prioritize understanding the profound neural plasticity in these animals. Discoveries in how these animals recover behaviorally have the potential to improve post-stroke outcomes in patients.

Presenter(s): Sydney Utzig

Authors: Sydney Utzig, Emily Lindner, Katie Gingerich, Dr. Emily Miller-Cushon

Faculty: Dr. Emily Miller-Cushon

The effect of social contact during the pre-weaning phase on food neophobia in dairy calves following grouping

Dairy cattle exhibit neophobia, which can reduce feed intake when the diet changes. Providing dairy calves with social housing has been shown to reduce avoidance of novel feeds, compared to housing calves individually. Our objective was to evaluate the relationship between access to social companions during the pre-weaning phase and the longer-term response to novel feed after group-housing. Calves were randomly assigned to individual (IH; n = 22) or pair housing (PH; n = 18; 1 focal calf/pen) from birth until group-housing (4-6 calves/group) at 8 weeks of age. Calves were provided two different novel feed tests, where they were provided apples and then carrots on consecutive days, with each test lasting 1 hour. Attention-directed towards the feed trough, and consumption of the novel feed were continuously recorded from video for each test. One pen of calves (4 IH and 1 focal PH) was excluded from analysis of the carrot test due to video failure. During both the novel feed tests, attention-directed towards the feed trough did not differ between treatment (P > 0.23). However, during the novel apple test, previously IH calves spent more time consuming the novel feed (6.9 vs. 3.4 min; IH vs. PH; P = 0.02), but there was no difference in duration of feeding during the novel carrot test (3.9 vs. 4.0 min; IH vs. PH; P = 0.97). These results suggest that previous housing treatment can affect the amount of time dairy calves spend consuming a novel feed, depending on the type of feed.

Presenter(s): Sofia Valencia Osorio

Authors: Sofia Valencia Osorio, Samantha A. Shablin, Carl N. Keiser, Ana V. Longo

Faculty: Professor Dr. Carl Nick Keiser

Differences in immune and stress response in the frog Osteopilus septentrionalis based on infection status with Batrachochytrium dendrobatidis (Bd)

Amphibians have been experiencing worldwide declines at alarming rates. This is partially due to the emergence of Batrachochytrium dendrobatidis (Bd), a novel fungal pathogen that causes the lethal skin disease, chytridiomycosis. One question researchers have been prompted with is addressing the interplay between Bd infection and amphibian physiology, especially the amphibian immune system and stress hormones. To address this question, we examined the immune and stress responses of an amphibian species highly susceptible to Bd infection, the Cuban treefrog (Osteopilus septentrionalis), by comparing white blood cell profiles and glucocorticoid levels in infected and uninfected individuals.

Corticosterone (CORT) is a primary amphibian glucocorticoid influenced by disease. Similar to cortisol in humans, corticosterone closely interacts with immune functioning and acute stress response via the hypothalamic-pituitary-adrenal axis (HPA). Furthermore, lymphocyte levels serve to measure the adaptive immune system's activity as they produce antibodies against foreign pathogens and kill infected cells. Because Bd hinders amphibian immune response by impairing lymphocyte proliferation and inducing apoptosis, we predicted lower levels of lymphocytes in the blood of infected frogs. Although the results indicated no significant difference in the number of lymphocytes between infected and uninfected frogs, the frogs' stress levels did show relationships with leukocyte differentials. Bd infection leads to a stress-induced response which increases CORT levels. High glucocorticoid levels consequently increase neutrophil:lymphocyte ratios. Overall, we see changes in immune function and stress physiology with changes in infection status, potentially having larger consequences on fitness.

Presenter(s): Laura Valletti

Authors: Lauraa Valletti, Ann C. Wilkie

Faculty: Dr. Ann C. Wilkie

Food Waste Audit and Participant Analysis at the Student Compost Cooperative

There is an exorbitant amount of food waste generated worldwide, with over 1.3 billion tons of food waste discarded annually. The Student Compost Cooperative (SCC) at the Bioenergy and Sustainable Technology Laboratory provides a space for students and community members to compost their food waste in Gainesville, Florida. The objective of this study was to quantify the amount of food waste that was brought to the SCC, and thereby diverted from the landfill. Over the course of six months, October 2021 through March 2022, the collected food waste was audited and analyzed. An on-site scale was provided for participants to weigh the mass of food waste contributed to the compost bins. Data was analyzed on an individual participant and on an overall basis. The individuals who deposited their food waste during this time also completed a participant survey to determine what factors influence their likelihood to compost. Some key findings identified in the analysis include the total weight of food waste composted per person, the specific composition of the food waste, and one-time versus repeater participant behavior.

Presenter(s): Brian Van

Authors: Brian Van, Ann C. Wilkie

Faculty: Dr. Ann C. Wilkie

Student Compost Cooperative: Analytics of Education Outreach

The Student Compost Cooperative (SCC), a facility located at the Bioenergy and Sustainable Technology Laboratory, provides members with sustainable opportunities to complement their lifestyles. During the Spring 2021 semester, we studied how many individuals the SCC onboarded and educated across different academic disciplines and backgrounds about food waste composting and other sustainable practices. To accomplish this, attendance data from weekly orientation/education sessions were collected via an online form accessed by QR code and analyzed. The analysis concluded that students from the College of Liberal Arts and Sciences (CLAS) and the College of Agricultural and Life Sciences (CALS) represented the highest proportion of orientees. More so, word-of-mouth was identified as the primary way orientees became aware of the SCC. Approximately a year has passed since the establishment of this data collection strategy and, with the conclusion of this semester, a year will have passed since the initial analysis of the data. As of March 17th, 2022, CLAS and CALS remained as the largest affiliation of students, but word-of-mouth no longer held the majority as an outreach method. The SCC continues to be successful in promoting and encouraging sustainable practices across different colleges at the University of Florida and in the local community. Our analysis shows that the SCC serves as a university and community accessible resource for composting and sustainability education.

Presenter(s): Thabasya Veeramani

Authors: Thabasya Veeramani, Sylvain Doré

Faculty: Dr. Sylvain Dore

Therapeutic potential of iron chelators mitigating oxidative stress and iron homeostasis dysregulation following ischemic stroke

During many forms of brain injury, an imbalance or overload of iron in the brain leads to exacerbated damage and unfavorable outcomes. Iron chelators are being studied as novel treatments for ischemic stroke due to their ability to bind to iron and prevent it from participating in damaging mechanisms such as ferroptosis. However, there have only been a few clinical trials on this topic, so most of the data for this review comes from preclinical trials. The data derived from preclinical trials indicates that iron chelators such as deferoxamine can improve anatomical and functional outcomes after ischemic stroke. However, due to small sample sizes, variations in the method of administration, and a relatively low number of preclinical trials, this data is not fully reliable. More clinical and preclinical trials would need to be conducted to comprehensively study the effects of iron chelators on ischemic stroke patients and determine which dosage and method of administration are the most beneficial.

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Presenter(s): Kevin Vega

Authors: Kevin Vege Gonzalez, Subhash Nerella, Ziyuan Guan, Patrick Tighe, Azra Bihorac, Parisa Rashidi

Faculty: Parisa Rashidi, PhD

<u>Activity Detection from Depth Cameras in the ICU</u>

Patient care in Intensive Care Units (ICU) greatly benefits from monitoring patient activity. However, present methods to monitor patient activity often rely on self-reporting or manual observations by staff which is limited and often inefficient. Cameras and computer vision are promising tools to monitor patients and healthcare worker activities autonomously and granularly and greatly improve the efficiency and reliability of data collection. Vision based activity monitoring has been deployed to measure patient mobility in the ICU, track, and log patient activity, and monitor risky behaviors like falls. However, traditional cameras record identifiable features and raise many privacy concerns. Depth cameras serve to alleviate privacy concerns by merely recording an outline of the patient and obscuring most facial features. We leverage visual data from depth cameras to build a machine learning system to detect patient posture in the ICU. We developed and trained a deep learning classifier on depth images from a simulated ICU environment. The data collected in ICUs are manually labelled by trained annotators for training the deep neural network. We also employed an active learning approach to selectively choose the images to train to make the annotation process efficient and prevent annotation fatigue among the annotators.

Presenter(s): Krishna Vekariya

Authors: Krishna Vekariya, Aravindraja Chairmandurai, Kesavalu Lakshmyya

Faculty: Dr. Kesavalu Lakshmyya

Periodontal Bacteria Dissemination Following Ecological Time-Sequential Polymicrobial Periodontal Infection

Periodontitis (PD) is a chronic inflammatory polymicrobial dysbiotic disease caused by several microbes including bacteria, viruses, and fungi interacting in the host subgingival sulcus. Streptococcus gordonii, Fusobacterioum nucleatum, Porphyromonas gingivalis, Treponema denticola, and Tannerella forsythia are major common co-colonizers of the subgingival sulcus in man and are considered leading opportunistic bacteria. Our primary objective was to determine intravascular dissemination of “partial human mouth microbes” (PAHMM) (S. gordonii+F. nucleatum+P. gingivalis/T. denticola/T. forsythia) in an ecological time-sequential polymicrobial periodontal infection (ETSPPI) mouse model. Ten-week-old male and female C57BL/6J mice (N=10) were used for chronic bacterial infection (Group 1 Male + Infection; Group II; Female + infection) and two groups as sham-infection (Group III Male + control; Group IV Female + control). After 19 weeks of bacterial infection, mice were euthanized and tissues (heart, lungs, brain, kidney, spleen, liver) collected. Genomic DNA from an aliquot of each tissue was extracted, 16S rRNA gene specific PCR was performed for the respective bacteria using specific bacterial primers, and gel electrophoresis was conducted. We identified S. gordonii, F. nucleatum, P. gingivalis, and T. forsythia genomic DNA in both male and female mice in multiple internal organs. Heart, lungs and kidneys are the predominant organs that were positive for genomic DNA. This indicates periodontal bacteria colonized and infected/adhered gingival epithelial tissue, penetrated gingival epithelial cells, and gained access to the systemic circulation to infect the target organs. This study demonstrates the synergistic pathogenicity of periodontal bacteria in the novel ETSPPI mouse model that replicates human pathobiology.

Presenter(s): Angelique Vela

Authors: Angelique Vela, Nora Hlavac, Christine Schmit, Sahba Mobini, Erin Patrick

Faculty: Dr. Erin Patrick

Modeling Electrical Stimulation of Cells

Adipose-derived stem cells (ASCs) show promise in the field of regenerative medicine, especially due to their ability to produce secretome, which is a secretion of trophic paracrine factors. Electrical stimulation (ES) is currently being explored as a means to influence ASC production of secretome, but the relationship between secretome production and ES regime parameters, such as electric field strength and frequency, is unclear. A factor that further obscures this relationship is that a give ES regime can differ drastically from the electric field experienced by a cell as the applied electric field changes within the bioreactor. It is necessary to account for the factors of bioreactor geometry, electrode material, medium conductivity, and faradaic by-products that can alter the applied electrical field when attempting to establish a relationship between secretome production and ES. This work details methods for correctly characterizing the electric field experienced by the cells by taking into account the capacitive nature of the metal-electrolyte interface and then reviews literature on ES of ASCs with corrected electric field calculations.

Presenter(s): Sophia Velasco

Authors: Sophia Velasco, Martin Badov, William Hachmeister, Janelle Azar, Abeer Dagra, Philip Mackie, Fatima Shaerdazeh, Habibeh Khoshbouei

Faculty: Dr. Habibeh Khoshbouei

<u>Changes in axonal complexity, arborization, and networking of neurons harboring Xq27-q28 deletion due to Fragile X Syndrome</u>

Fragile X Syndrome (FXS) is the most common form of inherited intellectual disability and common comorbid condition in people with autism. Patients that suffer from FXS present with severe behavior phenotypes, including hyperactivity, impulsivity, anxiety, poor language development, and seizures. In FXS, the amplification of the trinucleotide CGG repeat element within the 5' of the FMR1 gene on the X chromosome causes a fragile site at the q arm (Xq27-28). The lack of FMRP (FMR1 gene product) in neurons leads to the dysregulation of microtubule formation, negatively affecting the formation of dendritic spines. While animal models of FXS have provided valuable insight into the neurobiology of this condition, recent clinical trials based on animal models have failed to correct disease-related phenotypes in patients with FXS. This project utilized an iPSC-derived neuronal model to investigate neurons from an individual patient affected by FXS. Neuronal progenitor normal cells and cells with Xq27-28 deletion were differentiated and immunolabeled, then neuronal phenotype was validated via immunohistochemistry. Morphometric analyses were conducted via the Simple Neurite Tracer (SNT) Image-J plug-in to analyze the number of terminal branches, cable length, length of primary and terminal branches, and ramification index. Results showed a significant decrease in cable length, length and number of terminal branches, and ramification index for cortical neurons harboring the Xq27-28 deletion. These results support the hypothesis that iPSCs-derived cortical neurons harboring the Xq27-28 deletion exhibit a significant decrease in axonal complexity, dendritic arborization, and networking.

Presenter(s): Bhuvaneshwari Venkataramanan, Priya Larson, Drake Kavanaugh

Authors: Venkataramanan Bhuvaneshwari, Larson Priya, Kavanaugh Drake, DiGennaro Peter

Faculty: Peter DiGennaro, PhD

Parasitic Nematodes Survey of Mosquito Larvae in Alachua County

There is an obvious and considerable interest in developing novel methods to control mosquito-borne diseases due their impacts on mammalian hosts. Biological control practices are sustainable alternatives to chemical control of mosquito populations. Some nematodes are efficient insect parasites and represent a potential source of novel biological control agents. Such beneficial nematodes are potent biological control agents that can remove harmful pests whilst also preserving non-target insect populations. One such nematode, Romanomermis culicivorax, is a parasite of mosquito larvae, inducing paralysis and eventually killing its host. The potential success of a biological control agent can be informed from the current prevalence of native populations. Thus, we conducted a survey of parasitic nematodes in mosquito larvae in Alachua County. Samples were obtained from all around Alachua County, with assistance from the Gainesville Department of Public Works Mosquito Control Section. Subsequent visual inspection and PCR for R. culcivorax were conducted to detect the presence of mosquito and nematode DNA in each sample. Out of the twenty-five mosquito samples tested, only one sample tested positive for the presence of the beneficial nematode. This sample was found in an apartment complex in proximity to Devil's Millhopper Geological State Park. This work demonstrates the presence of mosquito parasitic nematodes in Alachua County, but at very low levels, potentially discouraging the use of such biological control practices. In addition, the proximity of the positive sample to the natural area may indicate the need to preserve such spaces for effective biological control measures.

Presenter(s): Aditi Verma, Julia Spadafino, Alexandra Tabares, Edison Tran, Keandre Monleon, Thu Tuot

Authors: Aditi Verma, Julia Spadafino, Alexandra Tabares, Edison Tran, Keandre Monleon, Thu Tuot, Jennifer Doty PhD

Faculty: Dr. Jennifer Doty

<ins>The Effect of Parental Monitoring on Adolescent Substance Use As a Protective Factor</ins>

Substance Use Disorder (SUD) is a mental diagnosis that typically manifests in late adolescence, indicating impairment in daily life functioning and health—driving while impaired is a growing threat to public safety, as rates of intoxicated adolescent drivers have increased in recent years. Prevention approaches must be utilized to reduce risk factors and reinforce promotive protective factors in individuals and the environment surrounding their growth and development. This study focuses on parental monitoring as a protective factor against the driving impaired youth; parental monitoring is the degree to which parents practice awareness, communication, and tracking adolescent behavior. Survey data was collected from the Florida Youth Substance Abuse Survey (FYSAS), an annual report administered to grades 6-12 across a random selection of middle and high schools in Florida (n=5031, Mage= 15.95, SD=1.25). Samples were used to investigate the independent effect of parental monitoring on the frequency of alcohol and/or cannabis use while driving. Results indicate that higher levels of parental monitoring (OR=-.531) were related to a lower frequency of intoxicated adolescent drivers, and higher levels of parental monitoring (OR= -.447) were related to a lower frequency of drivers under the influence of marijuana. Results extend findings that found that high parental monitoring is linked to less substance use among adolescent students. These results suggest that parents might reduce the risk of substance use by closely monitoring their children by helping them get involved with healthy stimulation activities.

Presenter(s): Ashley Villanueva

Authors: Ashley Villanueva, Alaina Massaro, Samantha Jean, Elizabeth Lee

Faculty: Dr. Sharon Difino & Dr. Sterling Sheffield

<u>The Effects of Time Immersed and Language Proficiency on Spanish and English speech perception in Spanish Heritage Speakers</u>

Although little research is available concerning the prevalence of Spanish Heritage Speakers (SHS) in the United States, it is known that Hispanics/Latinos make up almost 20% of the U.S. population. SHS are born to at least one Spanish speaking caregiver, are bilingual, and educated primarily in English. SHS present a unique case since they typically learn Spanish as their first language (L1), however transition to English as their dominant and second language (L2) when entering primary education. Therefore, comprehending how speech perception differs within SHS, who experience varying degrees of language proficiency due to time immersed, in Spanish and English, is a main objective within this study. AzBio sentences were utilized to test participant's speech perception abilities under the following four conditions: two-talker practice and final, reverse energetic, and 10-talker babble. The SHS underwent the four conditions in English and Spanish, totaling to 8 conditions. Native English (NE) and Spanish (NS) participants were included as controls. The results from the English conditions reveal similar performances between NE and SHS; however, the NE group consistently performed slightly greater than the SHS group. These findings are consistent with the results from the Spanish conditions between NS and SHS groups. Within our study, an analysis between time immersed in each language and speech perception scores reveal that time spent in Spanish correlated positively with Spanish speech-in-noise performance. Additionally, Spanish proficiency is slightly correlated with speech perception scores. Overall, this study serves as a foundation for future research and audiologic clinical implications concerning SHS.

Presenter(s): Manahil Wajid

Authors: Manahil Wajid, Jessica Frey, Liam Kugler, Jon Toledo, John Yu, Tamara Stiep, Janine Lobo Lopes, Irene A. Malaty

Faculty: Dr. Jessica Frey

Botulinum Toxin Outcomes in Patients with Lower Limb Dystonia

Background: One of the most effective treatments for dystonia is botulinum toxin (BoNT) injection to affected muscle groups, but the evidence specifically for lower limb dystonia is limited.

Methods: Patients with leg dystonia (N=17) who regularly receive BoNT were enrolled. Outcome measures were assessed at two time points: baseline BoNT clinic visit (T0) and 3-8 weeks later during peak-dose benefit (T1). At both T0 and T1, patients completed a Clinical Global Impression Scales, and a neurologic exam was video-taped and scored by blinded raters according to the Unified Dystonia Rating Scale (UDRS) and the Fahn-Marsden Dystonia Rating Scale (FMDRS). T-test was used for statistical analysis.

Results: Demographically, 65% were female, and average age was 66. Underlying causes of leg dystonia included Parkinson's disease (N=13), DYT-1 (N=2), and idiopathic causes (N=2). Compared to baseline, patients rated significant improvement in the severity of these symptoms: range of motion (T0: 4.12, T1: 2.33, p=0.011), pain (T0: 3.41, T1: 1.78, p=0.036), abnormal position (T0:4.24, T1: 2.89, p=0.045), sleep (T0:2.94, T1:1.44, p=0.009), and concentration (T0:2.61, T1:1.67, p=0.03). There was non-statistically significant improvement in gait (T0:4.12, T1: 3.13, p=0.132), mobility (T0:3.94, T1:3.0, p=0.085), independence (T0:3.41, T1:2.78, p=0.489), and mood (T0:2.59, T1:1.67, p=0.124). There was also non-statistically significant improvement in dystonia in the leg portions on the UDRS (T0:5.9, T1:4.9, p=0.489) and FMDRS (T0:9.7, T1:8.9, p=0.506).

Conclusion: These preliminary results demonstrate that BoNT for lower limb dystonia leads to significant improvement in many symptoms experienced by patients.

Presenter(s): Kelviyana Walker

Authors: Kelviyana Walker

Faculty: Research Assistant Professor

<ins>The Culture of Recovery: An Efficacy Study on Applied Theatre Intervention in Recovery and Healthcare</ins>

Recovery from substance abuse is a difficult yet rewarding process endured by those who make the choice to change their lives for the better. Upon leaving substance abuse treatment, an overwhelming number of patients report their healthcare ranks top priority for areas of improvement. However, a culturally historical barrier between one's healthcare and their recovery from substance abuse can make tending to that priority difficult. The potential consequences of minimal health advocacy in recovery must be thoroughly investigated as recovering addicts have difficulty transitioning into healthy lifestyles that are unique to them. The Culture of Recovery project works to contribute to the need for further research on the effectiveness of applied theatre in spreading awareness of the message that simply states that recovery is health. The project uses practices such as forum theatre in an online workshop to provide a space for recovering addicts and community members to discover new paths to navigate recovering healthcare experiences. The workshop effectiveness was assessed with a pilot show following a preliminary survey and forgoing a post-interview focusing on the attitude change of the participants. As workshop participants reported the workshop effectiveness in its goal to bridge recovery with healthcare, several people were exposed to and safely reflected on recovery's role in healthcare and healthcare's role in recovery. Both facilitator and participants noted the benefits of applied theatre in recovery as there was a positive trend in attitude changes and the project succeeded in improving participant knowledge of the subject matter.

Presenter(s): Margaret Walker

Authors: Margaret Walker

Faculty: Neil Weijer

From Scholars to Laymen: Observations on the Culture and Practice of Natural History in the Seventeenth Century and Beyond

Early natural history texts offer fascinating looks into the social landscape of scientific communication. Beginning in the seventeenth century, the focus of this paper is on the effort of prominent philosophers to institutionalize natural history work and establish a more communal approach to science. In particular, a central point is the formation of the Royal Society, Britain's most prominent scientific academy, and how its founding fellows reconstructed the dissemination of scientific information vis-á-vis open discourse and greater accessibility to research. The implementation of Baconian methodology — Sir Francis Bacon's revolutionary investigative experimental techniques — is another significant factor, and his work was heavily espoused by the early Royal Society. The combination of these two powerful constituents resulted in a reformation of both the social and technical components of natural history, and the new structure that emerged is clearly reflected in later periods. Influences established at that time are indeed visible even now; modern discourse and methodology follow many of the guidelines established in the early field of natural history. By examining several notable texts and the mindsets of the authors behind them, it is hoped that this project will shed light onto the transformation of the early natural history community and how this reframing period laid the foundation for scientific communication today.

Presenter(s): Rachel Walton

Authors: Rachel Walton, Amanda Bennett, Yo Jackson, Joy Gabrielli

Faculty: Joy Gabrielli, PhD

Foster caregiver characteristics associated with youth revictimization during foster placement

Background: Despite foster placement serving to prevent further maltreatment, some youth still experience victimization from foster caregivers, visits with biological caregivers, foster siblings, and others during out-of-home placements (Jonson-Reid, 2003). Prior research has identified parent characteristics associated with risk of youth revictimization (Ferguson, 2009). However, little research has been done to identify risk factors associated with the recurrence of maltreatment for youth residing in foster care. Therefore, this study will examine foster caregiver characteristics that may be associated with youth revictimization that occurs during placement in foster care.

Methods: Data from 500 youth (8 to 18 years old) residing in foster placements in the Midwest were utilized from the Studying Pathways to Adjustment and Resilience in Kids (SPARK) project. Youth reported on their history of physical (18 items), sexual (12 items), and psychological abuse (25 items) at 3 time points. Youth demographic information, parent demographic information, and youth behavior and emotion information was collected via caregiver report. Youth and caregiver reported on family environment characteristics.

Results: A regression analysis will be performed looking at foster caregiver characteristics and covariates of child age, gender, and race as predictors of youth reported maltreatment experiences within foster care across timepoints.

Conclusion: Certain child demographics (age, race, externalizing problems), parent demographics (age, marital status, socioeconomic status), and family environment characteristics of foster homes (family conflict, placement type) may be associated with youth revictimization within foster placements.

Presenter(s): Xinyue Wang

Authors: Xinyue (Serena) Wang, Jaime Jimenez, Ruchir Mishra, Bryony C. Bonning

Faculty: Dr. Bryony Bonning

Identification of the most abundant proteins in the gut of the whitefly, Bemisia tabaci

The sweet potato whitefly, Bemisia tabaci (Hemiptera: Aleyrodidae), is one of the most destructive global insect pests of open field and protected vegetables, and ornamental crops. Damage resulting from whitefly feeding and associated plant virus transmission results in billions of dollars in crop losses worldwide. Management of whitefly populations and associated plant viral diseases is challenging for many reasons including widespread whitefly resistance to chemical insecticides. Alternative approaches for management of B. tabaci include the use of bacteria-derived pesticidal proteins, viruses and silencing RNAs, all of which typically work via the gut. In this study, we aimed to identify the most abundant proteins in the whitefly gut by performing whitefly gut dissections and preparing brush border membrane vesicles (BBMV). For that purpose, 2,000 guts were dissected from whitefly adults for each of three replicates. Samples were enriched for membrane proteins using differential centrifugation by selective divalent-cation precipitation and prepared using Sample Preparation by Easy Extraction and Digestion (SPEED). The samples were analyzed using Data-Dependent Acquisition and/or Data Independent Acquisition analyses, and expression between/among samples compared. Proteomic analysis of BBMV from B. tabaci adults identified 927 gut proteins. These proteins were further used for subcellular localization. Detailed knowledge of the most abundant proteins on the surface of the gut will be key for optimization of environmentally friendly technologies for management of B. tabaci to the benefit of agricultural productivity.

Presenter(s): Xinlin Wang

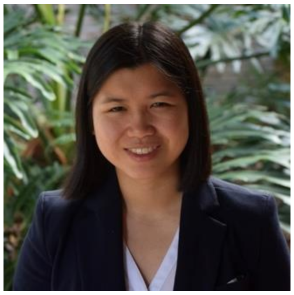
Authors: Xinlin Wang, Yang Lin

Faculty: Dr.Yang Lin

“Soil phosphorus dynamics and retention capacity during the conversion from a natural forest to a tea plantation in subtropical China”

Phosphorus is one of the most essential but limited elements in the terrestrial system associated with primary productivities. Phosphorus ultimately enters the soil through weathering of minerals and decomposition of organic, and once it enters the soil environment, it tends to be absorbed by soil particles and fixed by amorphous metals and clay content. The ability of soil to absorb phosphorus, however, is not indefinitely, and once it is exceeded, the labile P becomes mobile and ultimately moves into aquatic systems through groundwater and precipitations, having an implication for water eutrophication. In recent years, due to the surging global population and food security, lots of natural forests have been transformed into agricultural lands. Synthesis fertilizers containing a high amount of phosphorus are often applied to these agricultural lands due to the high nutrient demand of routine cultivation. Therefore, it is significant to understand the effect of land conversions such as fertilization from the natural ecosystem to the agricultural ecosystem on soil phosphorus, which has an implication for both sustainable agriculture and aquatic eutrophication.

We study the impacts of decades of land conversion from subtropical forests to tea plantations in subtropical China, focusing on the soil phosphorus fractional transformation and sorption capacity. Soil samples are collected from both evergreen forests and tea plantations as pairs in 0 – 20 cm and 20 – 40 cm. Among all fractions, it is observed that NaOH-Pi and Residual-P accumulated largely, and Smax decreased significantly after the land conversion, suggesting a loss of P bioavailability.



Presenter(s): Jieli Wegerif

Authors: Wegerif, J., De Gracia Coquerel, M., McAuley, A., Goss, E., and Ascunce, M.

Faculty: Dr. Erica Goss

<u>Impact of antibiotic application on Candidatus Liberbacter asiaticus titer in Florida's commercial citrus groves</u>

Citrus greening, or Huanglongbing (HLB), is a fatal disease attributed to the bacterium Candidatus Liberibacter asiaticus (CLas) which causes citrus trees to hyperaccumulate carbohydrates in their leaves. Antibiotic applications are a last resort defense against HLB as there are no known cures or resistant citrus varieties. This research analyzed whether antibiotic treated trees show lower CLas titer and reduced counts of culturable bacterial colonies. Leaf samples were taken from 30 citrus trees across three groves receiving different antibiotic treatments. Quantitative PCR (qPCR) was used to evaluate CLas titer in 60 samples taken at two timepoints, spring and summer. Differences between titers were compared between groves and over time. Assessment of bacterial populations were made by culturing samples on agarose plates and counting colony forming units (CFUs). Although CLas cannot be cultured, CFU values were used the assess the impact of antibiotic treatment in sprayed groves on total bacterial community. Ct values were between 18.5 and 36.9 with values below 34 considered positive detections of CLas. Statistical analysis was used to examine correlations between CLas titer and relative abundance of CFUs among groves. This analysis contributes to a broader understanding of the impact of antibiotic application on CLas in commercial groves and the relationships between tree microbial communities, CLas titer, and grove management.

Presenter(s): Hannah West

Authors: Hannah West, Apollonia Lysandrou, Ben Lewis, Scott Teitelbaum, Liana Hone

Faculty: Dr. Liana Hone

<u>Examining the Relationship Between Positive Alcohol-, Opiate-, Cannabis-, and Stimulant Use Disorder Diagnosis and Past Week Experiences of Pain Among Patients Entering a Recovery Center</u>

Many substances that are commonly misused are known for their analgesic properties (Ditre et. al, 2019; Ilgen et. al, 2010; McCurdy et. al, 2005), some substances (e.g., opiates) are known to cause hyperalgesia (Bekhit, 2010), and patients in recovery from substance use disorders often experience uncomfortable withdrawal symptoms (West & Gossop, 1994). However, the different experiences of pain among patients in early recovery from alcohol-, opiate-, cannabis-, and stimulant use disorders is understudied. This study examines the different relationships between a positive diagnosis of alcohol-, cannabis-, opiate-, and stimulant use disorders upon inpatient treatment onset and past week pain. The sample comprised N = 1,013 patients aged 18 - 83 (M = 40.39, SD = 13.79), including 652 men and 360 women with a range of 0 to 120 days sober (M = 18.09, SD = 28.63, Median = 6, Mode = 4) at treatment onset. Participants completed AUD (n = 623 positive), OUD (n = 282 positive), CUD (n = 231 positive), and SUD (n = 115 positive) screeners and pain measures from the NIH PROMIS battery, which were used to develop a composite pain score with a range of 3 to 15 (M = 6.05, SD = 3.26). We hypothesized that a positive diagnosis for any substance use disorder would be positively related to pain composite scores, controlling for covariates including age, gender, and number of days sober prior to entering treatment. OUD diagnosis significantly predicted pain composite scores, b = 0.25, p < 0.001. Neither CUD, b = 0.05, p =0.12, or SUD, b = 0.03, p = 0.34, diagnoses predicted pain composite scores. Contrary to hypotheses, AUD diagnosis, b = -0.07, p = 0.02 negatively predicted pain composite scores. However, in a model regressing all diagnoses on pain composite scores (controlling for covariates), only OUD diagnosis remained a significant predicter of pain composite scores, b = .25, p < 0.001. Understanding the different pain experiences among patients in early recovery has the potential to improve efforts toward providing tailored recovery plans.

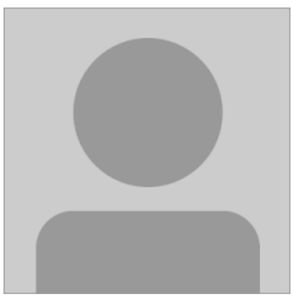
Presenter(s): Jade White

Authors: Jade White, Jessica Aldrich, Blanka Sharma, Ph.D.

Faculty: Dr. Blanka Sharma

Targeted Nanoparticle Delivery for Osteoarthritic Cartilage

Osteoarthritis (OA) is the leading cause of disability in the US. The only treatments currently available include palliative care until a total knee replacement is required. There is a significant need to develop therapeutic systems that can address this growing medical concern. Poly Lactic-co-Glycolic Acid (PLGA) nanoparticles loaded with resveratrol are being studied as a possible therapeutic for cartilage protection. PLGA is biocompatible and biodegradable, while resveratrol has been shown to ease joint pain and inflammation in patients suffering OA. This research focuses on the targeted application of this nanoparticle system for the prevention of OA. The early work consists of characterizing the loaded nanoparticles and determining drug loading efficiency and capacity.



Presenter(s): Sophie White

Authors: Sophie White, John Pfeiffer, Zachary Randall, Larry Page

Faculty: Dr. Larry Page

Two New Species of Pangio (Cobitidae) From Cambodia

Two species of the genus Pangio, previously unrecognized scientifically, are described from Cambodia. The first, which was previously confused as P. oblonga, is distinguished from P. oblonga genetically and by a smaller body size and the number of caudal fin rays. The second, which also is distinguished genetically, is closely related to P. filinaris but differs in having shorter nasal barbels.

Presenter(s): Jaxton Willman

Authors: Jaxton Willman, Shreya Saxena

Faculty: Dr. Shreya Saxena

System Identification and Control of Anatomically Accurate Biomechanical Human Limb Models

Developing neuromusculoskeletal models including neural activation, muscle contraction and skeletal dynamics for targeted sensorimotor control is critical for (a) understanding the control strategies implemented by the brain to drive movements, and (b) improving assistive technologies for motor diseases and disorders, including neurodegenerative diseases that affect movements. This work aims to develop a brain-inspired closed-loop controller for an anatomically and physiologically accurate arm model. We consider a 6-muscle, 2-joint human arm model created in the OpenSim software. We use OpenSim's computed muscle control tool to generate the corresponding muscle activations from the states of the elbow and shoulder joints from a generated set of 5000 unique motion files. With the muscle activations as the input and states of the joints as the output, we estimate a 9th order linear dynamical system to approximate the musculoskeletal dynamics, reaching a high accuracy for the elbow angle across 500 held-out movements for system validation. We design a proportional-integrative-derivative (PID) controller to each muscle input to drive the estimated linear dynamical system towards a reference input. We then model the neuromuscular control of a human arm by placing these tuned controllers directly in closed loop with the OpenSim musculoskeletal model to achieve desired movements. We compare the closed loop results of the OpenSim and linearized models. This framework can be used in the study of assistive neurotechnologies for combatting the effects of neurodegenerative diseases, for example, by designing compensators to reduce the effect of weaker neural signals to the muscles.

Presenter(s): Bailee Wilson

Authors: Bailee Wilson, Elena Kalina, Brianna Rosner, Benjamin Berey, Tessa Frohe, Michael Stellefson, Fred Muench, Stephanie O'Malley, Robert Leeman

Faculty: Dr. Robert Leeman

<u>Factor Structure, Reliability and Validity of a Modified System Usability Scale for Alcohol-Related Technology Among Young Adults Who Drink Heavily</u>

Purpose: Alcohol-related mHealth interventions are valuable due to young adults' frequent technology use. The System Usability Scale (SUS) assesses the usability and acceptability of these technologies. We modified the SUS by altering language and adding items about alcohol-related technology. We evaluated the factor structure, reliability, and validity of the modified SUS using data from a recent study testing mHealth interventions.

Methods: The parent study (N=99, 51% male) involved a smartphone breathalyzer device/app, blood alcohol concentration (BAC) app, and self-texting procedure. Participants were randomly assigned 1 technology during an alcohol self-administration session, then had access to all technologies during a field period. The modified SUS was administered twice. Exploratory and confirmatory factor analyses, evaluation of internal consistency reliability, and correlations with alcohol and technology variables were conducted.

Results: Confirmatory factor analyses yielded a five-item acceptability subscale (α=.90-.95) and a four-item usability subscale (α=.71-.89). Breathalyzer device/app and BAC app usability were positively correlated with a measure of technology use (r=.29, p<.01 for both). Breathalyzer device/app usability was inversely correlated with alcohol-related consequences (r= -.24, p<.05). Usability and acceptability for the BAC app were inversely associated with alcohol-related consequences (r= -.39, p<.01; r= -.26, p< .05, respectively).

Conclusions: Findings suggest the modified SUS is reliable. Acceptability and usability of mHealth technologies were significantly related to technology use during the field period, suggesting the validity of the modified SUS. Acceptability and usability were also significantly related to fewer negative alcohol-related consequences, which supports the value of these technologies.

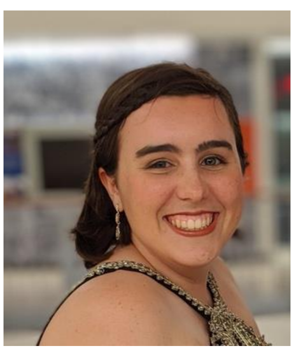
Presenter(s): Caleb Wong

Authors: Caleb Wong, Joseph Antonelli

Faculty: Assistant Professor Joseph Antonelli

Studying the effects of race and place using causal inference methodology and sensitivity analysis

The objective of this study is to study racial bias in policing and the extent to which neighborhood demographics affect this bias. To do this, we investigate a concept called "Race and Place." This theory states that the combination of race and place play a critical role in police-civilian encounters. Often, this means minorities are more likely to be arrested in predominantly white areas than other areas. Unfortunately, most administrative policing data suffer from selection bias, which makes it difficult to learn causal relationships between race and policing outcomes. We first review existing work that addresses this problem and detail important assumptions about data that allow for the estimation of causal effects. Additionally, we derive a new causal metric that is less prone to such selection bias that directly answers the question of whether race and place interact to affect policing outcomes. Using the New York Police Department's "Stop, Question and Frisk" (SQF) dataset from 2003 - 2013, the Current Population Survey (CPS), and Police-Public Contact Survey (PPCS) collected by the U.S. Department of Justice, we estimate this metric and find that race and place does play a pivotal role in police encounters of Black individuals in New York City. We run additional sensitivity analyses and find that our main finding is robust to violations of our modeling assumptions, and discuss future improvements to our work using cell-phone level mobility data.



Presenter(s): Katrin Woods

Authors: Katrin Woods, Dr. Candice Adams-Mitchell

Faculty: Dr. Candice Adams-Mitchell

Music Training and its Effects on Working Memory and Attention in Children With Chronic Medical Conditions

As researchers have discovered new permanent methods of treatment for serious chronic illnesses like Sickle Cell Disease, Diabetes, and cancer, the life expectancy of children with chronic illness has increased, and researchers are now seeing the effects of chronic illness on aspects of daily living. Children with chronic illness often have declines in cognitive function that are often undiagnosed and therefore remain untreated. There is a significant gap in the literature for music training in the population of individuals with chronic illness, particularly children. This study aims to provide research on this topic and determine if music training can benefit children with chronic illness.

In this case study, researchers focused on working memory and attention span in a five-year-old subject with Sickle Cell Disease. The subject was given working memory and attention span tests intermittently while meeting twice a week to learn melodies on the xylophone. Results are pending at this time.

Presenter(s): Erin Wright

Authors: Erin Wright, Brandi Martinez, Hannah Alarian

Faculty: Dr. Hannah Alarian

Gendered Preferences: How Sex and Skill Level Affect Immigration Attitudes

Immigration attitudes are often shaped by labor-market preferences, with immigrants in high-skilled occupations generally preferred to those in perceived lower-skilled positions. This literature, however, has yet to explore whether economic preferences can also be gendered. This article addresses this gap, exploring how the intersection of sex and skill level affects support for immigrant admission to the United States. To do so, we field two original survey experiments in the United States, presenting hypothetical visa applications. We randomize applicant sex and skill level, particularly varying skill level as unskilled, skilled, and professional as defined by current US immigration law. We find that female applicants are preferred compared to male and non-identifying applicants. Although skilled and professional applicants are reviewed more positively than unskilled applicants, we find this effect is moderated by sex. Specifically, women benefited the most from skill level. This study provides a more nuanced understanding of the role of identity, sex, and economics in shaping public support for immigration.

Presenter(s): Shangtao Wu

Authors: Shangtao Wu

Faculty: Daiqing Liao

The Effects of Death Domain Associated (DAXX) Protein on the SREBP Pathway during Lipogenic Gene Expression

Rapidly proliferating cancers cells that outgrow their dynamic extracellular environments require a continuous supply of endogenous lipids to satisfy their metabolic requirements. Rapidly growing cancer cells require these lipids for cell membrane structure, energy storage, and signaling purposes. Cancer cells acquire these lipids through increased uptake of exogenous lipids when they are available or upregulating de novo lipogenesis mechanisms when they are absent. De novo lipogenesis is upregulated through the action of a multitude of transcription factors, such as sterol regulatory element-binding proteins (SREBP1/SREBP2). The ability of SREBP1/2 to exert their effects is largely dependent on SREBP cleavage-activating protein (SCAP), which mediates transport of SREBP from the ER to the Golgi resulting in proteolytic cleavage and nuclear entry. Furthermore, DAXX is a gene expression modulator and has been shown to interact with SREBP1/2 to activate SREBP-mediated transcription in previous research conducted by the Liao lab. We evaluated the effects of cell growth media on the intracellular localization of DAXX, SREBP-2, and SCAP by immunofluorescence assays to further investigate this relationship. We found evidence of DAXX-SREBP2 co-localization to the nucleus when an external lipid supply was present in the cell medium. In addition, we found increased DAXX and SCAP nuclear localization in the absence of an external lipid supply in the cell medium compared to when a lipid supply was present.

Presenter(s): Shuyan Xia

Authors: Yuhao Chen, Shuyan Xia, Boyi Hu

Faculty: Dr. Boyi Hu

The Impact of Autonomous Mobile Robots on Human Co-Workers

As the technology of automation become evolved, the warehouses are seeking optimal solutions for improving the efficiency and minimizing the labor cost. Autonomous mobile robots are broadly utilized in warehouses to transform supply chain operations. Instead of taking over all jobs from human workers, robots are collaborated with human beings to perform tasks. Since humans and robots will share their workspace without fences, it is critical to ensure their safety in collaboration. The study aims to evaluate the implementation of autonomous mobile robots and the effects of the human mental workload and system productivity with robots in smart warehouse. The experiment tested three modes of human-robot interaction: no robot involved, mobile robot with empty payload and mobile robot with full payload. The performance of participants was evaluated via pupillary response, subjective workload, and task performance (completion time and errors). The preliminary results indicated full payload robot slightly increased the workers' mental workload and expanded task completion time. This study is expected to contribute to the feasibility of safe human-robot collaboration in the future of smart warehousing.

Presenter(s): Olivia Yao

Authors: Olivia Yao

Faculty: Professor Creed Greer

Adolescent Medical Autonomy vs Parental Rights: Looking at the Minor Consent for Vaccinations Amendment Act of 2020

On December 23 of 2020, a bill passed in Washington D.C. that would allow minors as young as 11 years old the right to consent to their own vaccinations without parental involvement: B23-0171 - Minor Consent for Vaccinations Amendment Act of 2020. Although not unique- with currently at least nine other states allowing minors some sort of vaccination right - this new bill has been faced with heated backlash with a lawsuit having been filed July 12 of 2021. This paper pulls upon existing sources of research to (1) analyze the complex history that the United States has with medical autonomy in regards to vaccination, the (2) legal balance of power between the legal rights of a parent and the rights of a minor to their own medical autonomy, and (3) the legal concepts brought up when challenging the constitutionality of bills like the Minor Consent for Vaccinations Act. Building upon these and concepts such as the Mature Minor Doctrine, this paper helps to shed insight as to whether or not the B23-0171 bill- and other similar bills granting minors more medical autonomy- hold up in a court of law.

Presenter(s): Jacob York

Authors: Jacob York, Amor Menezes

Faculty: Dr. Amor Menezes

High-Throughput Automated Data Processing to Characterize Synthetic Biology Constructs

Genetic components in synthetic biology constructs (e.g., promoters, repressors, activators, and terminators) behave inconsistently between laboratories due to differing experimental techniques. Each laboratory must recharacterize these components to inform mathematical models that will accurately predict construct behavior. The current approach to characterizing these components uses a plate reader to generate time-series data for properties like optical density, fluorescence, and luminescence. Each plate reader run produces a large dataset that requires extensive data processing across experimental conditions to create an accurate picture of component behavior. This data processing is currently done by hand, which is time consuming, rate limiting in synthetic biology workflows, and repetitive across laboratories. To automate such processing, we developed a novel software tool that uses the Pandas, Numpy, and Matplotlib Python libraries to: compile necessary plate reader data; visualize the data for close experimentalist inspection; and aggregate data for downstream model-fitting and component mathematical characterization. Our tool facilitates multiple analyses in rapid succession, reducing average data processing times from about six hours to approximately two minutes. We anticipate that future integration with customized mathematical modeling software will further accelerate experimental synthetic biology workflows.

Presenter(s): Sydney Yu

Authors: Sydney Yu, Chenyu Liang, Xin Tang

Faculty: Dr. Xin Tang

Elucidating the integrated biochemical and mechanical biology in tumor cells

An increasing number of studies have demonstrated the crucial roles of the interplay between microenvironmental mechanics in tissues and biochemical-genetic activities in resident tumor/stromal cells at different stages of tumor progression. Among all biochemical activities, calcium (Ca^{2+}) signals play an important role in cellular dynamics, controlling and regulating various cellular activities. Hence, learning how these signals affect cell behavior is vital to understanding overall tumor and stromal cell functioning. However, existing techniques encounter challenges to study Ca2+ levels and dynamics in a non-invasive, cell-type specific, high-throughput, and long-term fashion. Genetically encoded calcium indicators (GECIs), used in conjunction with confocal microscopy, are one emerging technology that enables quantitative imaging of Ca2+ signals in live cells and tissues. To utilize these indicators, it is necessary to generate stable cell lines that express them. Here, we report the detailed methods employed to establish both cancer and normal cell lines that express GCaMP5G Ca2+ indicators and QuasAr2 voltage indicators for functional calcium imaging experiments.

Presenter(s): Rebecca Zambrano

Authors: Rebecca Zambrano, Kerri-Ann Chambers, BS, Jayden Yarborough, BS, Isabella Ramirez, BS, Alaina Mitchell, BS, Lisa A. House, PhD, Anne E. Mathews, PhD, RDN, Karla P. Shelnutt, PhD, RD

Faculty: Dr. Karla Shelnutt

Comparing Shopping Habits of Rural and Suburban Participants with Varying Access to the Grocery Store

Background: In urban clusters (suburban) and rural areas, low access is defined as being >1 mile and >10 miles, respectively, from the nearest grocery store.1 Communities with low access to affordable healthy food retailers may depend on food retailers with limited access to healthy produce.2 This reliance can lead to poor diet quality and diet-related diseases.2

Objectives: To determine whether distance traveled to a grocery store influenced where groceries were purchased in suburban and rural communities.

Methods: A cross-sectional analysis of self-reported demographics, distance to a grocery store, and food purchase locations of participants from a rural and suburban county participating in a meal kit intervention. Data were analyzed using descriptive statistics.

Results: Participants (N=98; rural=67; suburban=31) were non-Hispanic (98%) and female (99%) with an annual household income of < $50,000 (97.9%). The majority (73.1%) of participants in the rural community had high grocery store access and while the majority (83.9%) of participants from the suburban community had low grocery store access. At least once per week, most rural participants with high or low access shopped at a supermarket (56.3% vs 58.8%, respectively). Suburban participants with high access or low access also shopped most frequently at the supermarket (46.7% vs 46.2%).

Conclusions: Both rural and suburban participants with low or high grocery store access shopped at least once per week at the supermarket suggesting that participants value options at a supermarket and are willing to travel to find one.

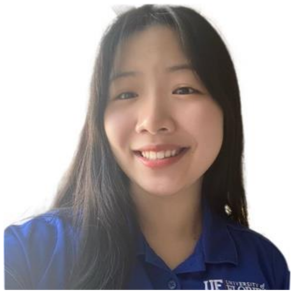
Presenter(s): Samantha Zaw

Authors: Samantha Zaw, Ashley Krause, Joshua D. Perlin, Yijun Lin, Erin C. Westgate, & Matthew Baldwin

Faculty: Dr. Matthew Baldwin

How past self-gratitude affects self-perceptions

A growing body of research in psychology supports the notion that gratitude—the recognition of a positive outcome attributed to an external source—is linked to benefits related to morality, prosociality, and psychological well-being (Emmons & McCullough, 2004). Although gratitude toward others is a widely studied topic, research has yet to explore gratitude toward the self. Thus, we aim to address this gap by exploring past self-gratitude—feelings of gratitude toward one's own past actions—and self-perceptions. In three studies, participants expressed gratitude toward another person or to themselves (vs. a control condition). Compared to the control condition, expressions of gratitude toward others and to the self were redemptive and highlighted one's moral character. Moreover, when compared to a control condition, expressions of past self-gratitude featured elements of self-awareness (such as self-connectedness), whereas gratitude toward others did not. Our findings suggest that expressions of past self-gratitude result in a shift in self-perceptions, which portrays the self as a moral exemplar who improved over time and leads to a sense of clarity and connectedness toward oneself.



Presenter(s): Xinyi Zhang

Authors: Xinyi Zhang, Tara Hashemian, Jason Cory Brunson

Faculty: Dr. Jason Cory Brunson

<u>Machine learning, individualized modeling, and risk factor analysis of clinical diagnoses</u>

Machine learning (ML) has achieved remarkable improvements in predictive accuracy, but advanced ML methods are not as interpretable as generalized regression. Models fit "locally", i.e. to similarity-based cohorts, rather than "globally" to whole data sets, have shown improvements in prediction accuracy and also have the potential for individualized interpretations of identifying key risk factors and estimating their effects. This study has 2 primary objectives: (1) Determine whether individualization yields performance improvements. (2) Determine whether individualized models reveal subpopulation differences in risk factor profiles. We used 3 data sets associated with the tasks of classifying breast cancer, identifying the presence of heart disease, and classifying dermatological presentations. Conventional ML models we use for predictions are logistic regression, random forest, and support vector machine. We used 3-fold cross-validation on each training set to tune model hyperparameters, then classified the testing data using each model. Each prediction problem was best solved by a different set of models, indicating that these data sets collectively provide a diverse testing ground to test an individualized approach to predictive modeling, based on relevance cohorts defined using case–case similarity measures. This approach will introduce two additional hyperparameters that must be optimized: the choice of similarity measure and the size of the similarity-based cohorts. Preliminary tests have shown that for three datasets, the individualized models are likely to improve the global model prediction accuracy or at least to match up. Additional results on variable importance comparison may be reported in the poster.

Presenter(s): Kevin Zhou

Authors: Huanzhou Xu, Xiaofan Li, Tiffany R. Frey, Kevin Zhou, Lauren E. Droske, Michael T. McIntosh, Sumita Bhaduri-McIntosh

Faculty: Sumita Bhaduri-McIntosh, MD, PHD

IFI16 PARTNERS WITH KAP1/TRIM28 TO MAINTAIN EBV LATENCY

Like other herpesviruses, the oncogenic Epstein-Barr virus (EBV) adopts a latent state in host cells in order to establish permanent residence. Host processes silence these viruses upon entry into the cell which inhibits the damaging lytic viral phase and hides the virus from the immune system. While EBV latency is established using both the expression of viral latency genes and host mechanisms, latency can be maintained with little to no viral gene expression required. The host encoded DNA sensor IFI16 has been found to be an important part facilitator of latency in herpesviruses through its association with the heterochromatin mark H3K9me3. This mark is typically used by the constitutive heterochromatin machinery (HCM) to silence various genes. HCM can also play a role in the antiviral silencing of the lytic phase of EBV and other herpesviruses. We investigated the involvement of IFI16 in restricting EBV lytic activation by interacting with HCM. We found that it partners with two core components of the HCM machinery: the TRIM28/KRAB-associated protein 1 (KAP1) and the site-specific DNA binding KRAB-ZFP SZF1. Together, these proteins promote EBV latency by silencing the EBV latent to lytic switch protein ZEBRA, encoded by the BZLF1 gene. We also found that disrupting EBV latency rapidly downregulates IFI16 transcription, further reinforcing the previously unknown link between IFI16 and the core HCM. Importantly, this partnership indicates the role of IFI16 in the establishment and maintenance of EBV latency through antiviral heterochromatic silencing.

Presenter(s): Jillian Zuwala

Authors: Yonghee Oh, Jillian Zuwala, Caitlin Salvagno, Grace Tilbrook

Faculty: Ph.D., Yonghee Oh

The Impact of Pitch and Timbre Cues on Auditory Grouping and Stream Segregation

In multi-talker listening environments, the culmination of different voice streams may lead to the distortion of each source's individual message, causing deficits in comprehension. Voice characteristics, such as pitch and timbre, are major dimensions of auditory perception and play a vital role in grouping and segregating incoming sounds based on their acoustic properties. The current study investigated how pitch and timbre cues (determined by fundamental frequency, notated as F0, and spectral slope, respectively) can affect perceptual integration and segregation of complex-tone sequences within an auditory streaming paradigm. Twenty normal-hearing listeners participated in a traditional auditory streaming experiment using two alternating sequences of harmonic tone complexes A and B with manipulating F0 and spectral slope. Grouping ranges, the F0/spectral slope ranges over which auditory grouping occurs, were measured with various F0/spectral slope differences between tones A and B. Results demonstrated that the grouping ranges were maximized in the absence of the F0/spectral slope differences between tones A and B and decreased by 2 times as their differences increased to ±1-semitone F0 and ±1-dB/octave spectral slope. In other words, increased differences in either F0 or spectral slope allowed listeners to more easily distinguish between harmonic stimuli, and thus group them together less. These findings suggest that pitch/timbre difference cues play an important role in how we perceive harmonic sounds in an auditory stream, representing our ability to group or segregate human voices in a multi-talker listening environment.

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