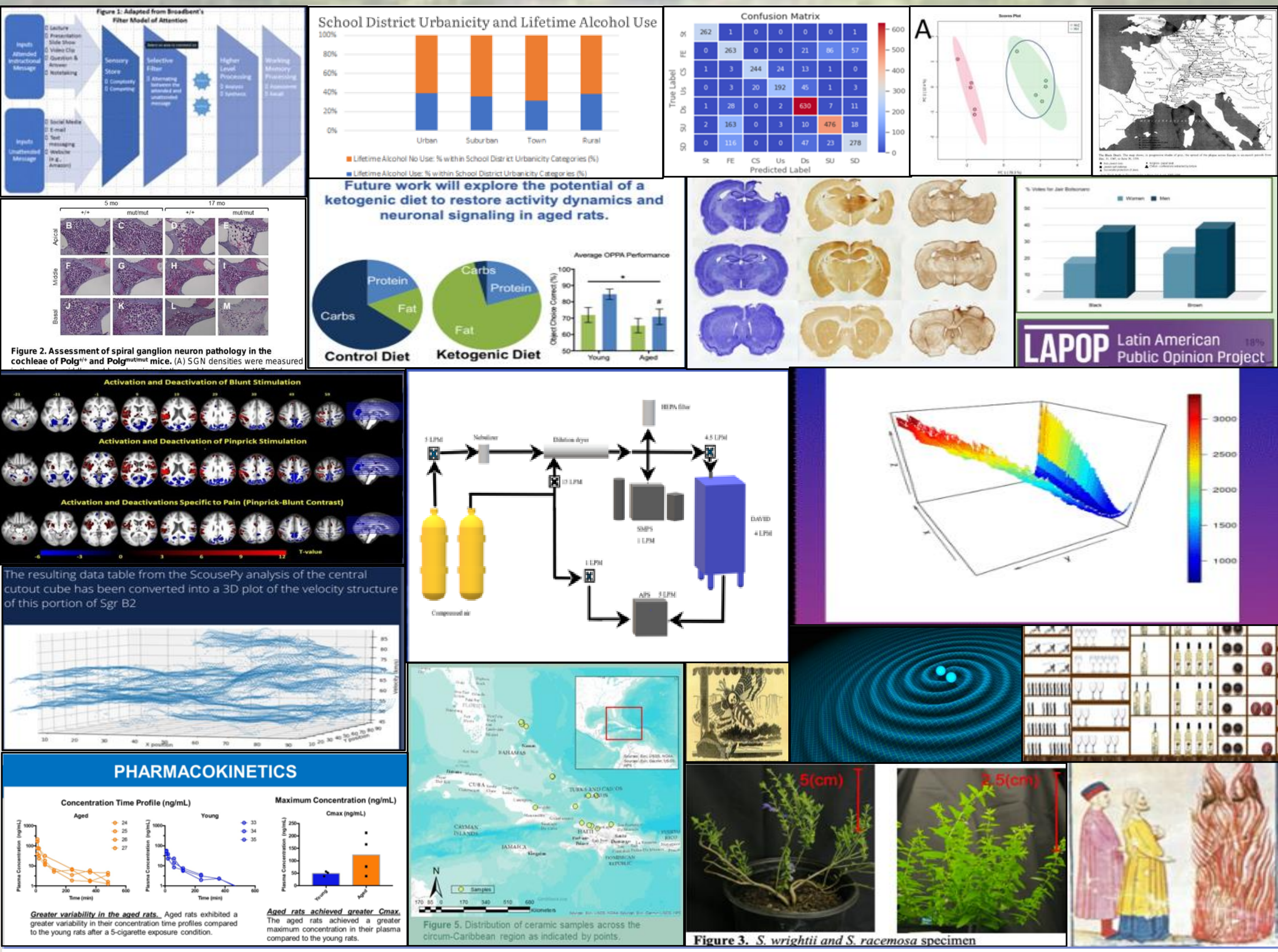
24th ANNUAL SPRING UNDERGRADUATE RESEARCH SYMPOSIUM

APRIL 4, 2023 | 1PM-5PM

Stephen C. O'Connell Center



CENTER FOR UF UNDERGRADUATE RESEARCH

Undergraduate Research for All

GO GATORS | GO RESEARCH

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Welcome

The 24th Annual University of Florida Undergraduate Research Symposium the largest celebration of undergraduate research at UF yet, with a record number of posters (475) and presenters (695). 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.

This large number of presenters is a reflection of the team research conducted by many of our students. Of note are the 67 first-year University Research Scholars who will be presenting the research they have conducted in their Course Based Undergraduate Research Courses, through 38 posters and one oral presentation.

CUR strongly supports students research presentation efforts. This year we sponsored 50 students to attend the Florida Undergraduate Research Conference. We also helped support 30 students from 21 departments to present at Plant Biology 2022, Biomedical Engineering Society, Human Factors Annual Meeting, American Assc. of Pharmaceutical Scientists, SERMACS, American Society for Microbiology, Neuroscience 2022, American Institute of Chemical Engineers, Society for Neuroscience, Society of Neuro Oncology, Society for Personality and Social Psychology, American Mosquito Control Assoc., American Assc. Dental, Oral and Cranial Research, 2023 AADOCR/CADR, American Association for Anatomy Connected 2023, Society of Pediatric Psychology Annual Conference, American Association for Cancer Research Annual Meeting 2023, Association for Research in Vision and Ophthalmology, 2023 ASP Annual Convention, and the 2023 Equine Science Society Symposium.

This year we imitated the Research Excellence Program for Undergraduates to provide them with the opportunity to receive recognition at graduation for their research efforts. Each of these students has benefitted from mentoring provided by exceptional faculty and graduate student researchers. 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

UF Students Presented at the 12th Annual Florida Undergraduate Research Conference February 2023.

UF Center for Undergraduate Research
UNIVERSITY of FLORIDA

24th Annual

Spring Undergraduate Research Symposium

April 4th, 2023

Stephen C. O'Connell Center

Program in Brief

11:00 am – 12:45 pm	**Poster Set Up**
1:00 pm – 1:20 pm	**Welcome Remarks** *Dr. Anne Donnelly, Director, UF Center for Undergraduate Research* Professor *Morgan E. Yacoe, MFA, Research Coordinator II, Center for Arts in Medicine*
1:30 pm – 2:30 pm	**Poster Session A**
2:30 pm – 2:45 pm	**Announcement of Best Paper Contest Winners** *Dr. Neil Weijer, JUR Editor*
2:45 pm – 3:00 pm	**Poster Swap**
3:00 pm - 4:00 pm	**Poster Session B**
4:30 pm	**Poster Take Down**

UNDERGRADUATE BEST PAPER AWARD WINNERS

Social, Behavioral, & Educational Sciences

Saba Khan

FACULTY MENTOR: Michael Moorhouse

College of Public Health and Health Professions

Analyzing Methods of Prevention in Improving Outcomes for Patients with Opioid Use Disorder

Introduction: Each day, approximately 187 Americans die from opioid overdose, resulting in over half a million deaths. Current methods of prevention within the U.S. include cognitive behavioral therapy (CBT), medication-assisted treatment (MAT), and involuntary commitment. This study seeks to analyze these methods of prevention and the degree to which they improve outcomes for patients with an opioid use disorder (OUD). We hypothesized that patients who receive CBT, MAT, and seek treatment voluntarily will report lower cravings, experience lower relapse rates while in treatment, and will experience a lower risk of readmission following discharge.

Method: Data was collected from the Florida Recovery Center (FRC), located at the University of Florida, over the last 5 years from patients who had received inpatient treatment for an OUD. Treatment interventions were analyzed across the following three outcomes: self-reported cravings, use-in-treatment, and readmission to the FRC following discharge.

Results: Reported cravings were less for patients who received more CBT sessions, $p=0.0075$ (95% CI [-0.1093, -0.0171]) and more for patients committed to treatment, $p=0.0004$ (95% CI [0.7033, 2.4445]). Patients involuntarily committed were more likely to use substances while in treatment, $p=0.0011$ (OR 5.1552, 95% CI 1.9348-13.7356). Patients given MAT or committed involuntarily experienced greater odds of being readmitted to the FRC in the future following discharge; however, these findings were not significant (MAT: OR 1.5338, 95% CI 0.8222-2.8613; Marchman: OR 1.7171, 95% CI 0.7967-3.7008).

Discussion: This research supports the use of CBT at reducing patient cravings while in treatment and opposes the use of civil commitment (involuntary treatment) at reducing patient cravings and substance use in treatment.

Sofia L. Goodrich

FACULTY MENTOR: Brent S. Sumerlin
College of Liberal Arts and Sciences

Democratization of Sono-RAFT: utilizing low-frequency sonication to achieve controlled radical polymerization

Sonochemically initiated RAFT polymerization (Sono-RAFT) is achieved by low-frequency ultrasound (US) (40 kHz) in bulk monomer for the first time. Continuous sparging of argon, throughout sonication, generates transient cavitation events in which monomers can undergo pyrolysis to produce exogenous radicals suitable for initiating polymerization. Previous works report Sono-RAFT in organic solvents (DMF and DMAc) as well as aqueous solutions; utilizing high sonication frequencies (490 kHz) to generate solvent radicals for polymer initiation by pyrolysis. Our method allows for the synthesis of controlled polymers without the need for solvent or an exogenous initiator with easily accessible and inexpensive equipment. A variety of acrylate and acrylamide monomers were successfully polymerized and prepared with excellent control. The increase in solvent viscosity throughout bulk polymerization limited the final monomer conversions (15 – 20%) and the upper limit of molecular weight (10 - 20 kDa). MALDI-TOF chain-end analysis elucidated the monomer radical initiating species and confirmed the retention of the chain-transfer agent in the primary polymer populations.

Presenter(s): Nikolai Abraimov, Jessica Malosh, Trevor Yates
Authors: Nikolai D. Abraimov, Jessica A. Malosh, Trevor L. Yates, & Matthew J. Traum
Faculty: Matthew Traum

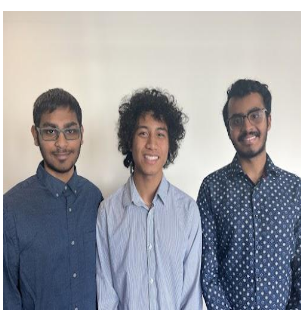
A Benchtop Tensile Tester for Student-Accessible Mechanics of Materials Testing and Instruction

Experiential learning involving tensile property measurements of a variety of materials is an important part of the engineering curriculum. However, this capability is often inaccessible to students because current tensile testing machines are expensive, complex, and immobile. Past attempts at compact tensile testers failed to produce accurate results because they required samples too thin for emergence of material bulk properties and thus gave results inconsistent with tabulated property values. In response, an economical, portable, and accurate alternative was created that allows students to gain hands-on experience collecting and manipulating stress-strain measurements to ascertain material properties important for mechanical engineering design. An iterative "Ship of Theseus" design method was used starting with assembly of a prototype based on pre-existing low-cost tensile testing machines. The prototype will undergo testing ensuring needed measurement thresholds are met. Next, increases in safety, affordability, ease of use, will be realized by swapping in better components. As the device undergoes rigorous testing, design and fabrication improvements will be implemented. Once finalized, this robust tabletop tensile tester will be used as a teaching aid in UF's 2023 Summer Mechanics of Materials course as well as others also required for mechanical engineering students.

Presenter(s): Joseph Alberto, Yash Patel, Davis John
Authors: Joseph Alberto, Davis John, Yash Patel, Kandice Simmons, Michael Hanna, Swapnil Joshi, Dr. Michael E. Harris
Faculty: Michael Harris

Identification and Characterization of Amino Acids and Residues involved in Allosteric Regulation of Human Ribonucleotide Reductase

Allosteric regulation is a fundamental property of most enzymes, including ribonucleotide reductase (RR). RR is a biologically universal enzyme that helps generate nucleic acids necessary for DNA synthesis and is a paradigm of protein allostery. Therefore, several RR inhibitors are utilized as cancer treatment drugs. RR is regulated by a nucleotide effector binding on one of its three regions: the A-site, S-site, and C-site. The binding of specific nucleotides at these sites controls enzyme activity, substrate specificity, and catalysis, respectively. Previous studies focused on the effects of S-site binding on oligomerization and activity. However, how allosteric A-site binding affects RR remains largely unresolved - limiting our understanding of how RR functions in vivo. Solving this problem can facilitate future design of new RR inhibitors or allosteric effectors. The proposed research aims to: 1. identify important amino acid residues involved in RR regulation by using mutagenesis informed by previous studies, simulations, analysis, and modeling; and 2. determine the roles of individual residues on RR activity and oligomerization using multiple assays. The overall goal of this research is to identify amino acids interactions that control RR's activity and provide insight into the long-range communication involved in the allosteric regulation of RR.



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Presenter(s): Dima Alsheikh, Jade Hernandez, Olivia Keable, Kiara Pfister, Divya Somayaji, Ryan Walsh
Authors: Dima Alsheikh, Kaylan Hebert, Jade Hernandez, Olivia Keable, Jennifer Miller, Melissa Moreno, Kiara Pfister, Divya Somayaji, Ryan Walsh, Wendy Dahl
Faculty: Wendy Dahl

Test-Retest Reliability of Phase Angle Assessment

Prader–Willi syndrome (PWS) is a rare genetic syndrome presented with altered body composition, reduced energy expenditure, and hyperphagia, typically leading to obesity. Obesity and altered body composition contribute to low-grade inflammation leading to increased risk of morbidity in those affected by PWS. Low-grade inflammation in adults with PWS may be assessed by phase angle (PhA), an indicator of cell membrane integrity. Bioelectric impedance analysis (BIA), a non-invasive method to measure body composition, is used to assess PhA. The aim of this study is to determine the test-retest reliability of phase angle using BIA in adults with PWS compared to unaffected adults. A cross-sectional study will be conducted. We are recruiting 40 participants (n = 20 adults affected by PWS; n = 20 control adults unaffected by PWS) through distribution of flyers and word of mouth. Repeated through two morning visits, participants will arrive having fasted after midnight before their visit. Measurements of participants' body composition, height, weight, and previous 24-hour beverage intake and physical activity will be taken. If found reliable, a phase angle assessment could reduce the burden of frequent blood analysis experienced by adults with PWS.

Presenter(s): Alejandra Alzamora, Sofia Cabanillas, Katie East, Terry Lu, Benjamin Mellin, Ashley Rubin

Authors: Alejandra Alzamora, Sofia Cabanillas, Katie East, Terry Lu, Benjamin Mellin, Ashley Rubin, Jennifer Drew, and Angelica Ahrens
Faculty: Jennifer Drew

Obesity-Related Genetic Variant rs1121980 is Linked to Regular Nut Consumption

A genetic variant on the fat mass and obesity-associated (FTO) gene, rs1121980, has been demonstrated to have association with the development of obesity. The aim of this study is to analyze to what extent rs1121980 influences certain dietary habits, such as consuming nuts regularly. Student volunteers of the Institutional Review Board-approved 'Great Florida Spitting Contest' research project were asked to electronically fill out the Mediterranean Diet Quality Index (KIDMED), a 16-item validated questionnaire that relates to Mediterranean diet compliance, and to provide a saliva sample. DNA was previously extracted and analyzed using the Thermofisher Precision Medicine Research Array. Associations with the SNP were conducted using a chi-square test of each of the 16 dietary patterns. Significant habit-SNP associations were further quantified with an odds ratio, to determine which genotypes were driving the significant findings. The odds ratio indicated that the presence of the A allele had the most positive impact on the consumption of nuts daily. Together, these results suggest that rs1121980 may be linked to this dietary habit. These findings have important implications for the management of dietary habits, highlighting the importance of studying the FTO gene in future nutrigenetic studies.

Presenter(s): Bernardo Andrade, Kassandra Macchia, Kaylie Martling, Rebekka Perinne
Authors: Bernardo Andrade, Kassandra Macchia, Kaylie Martling, Rebekka Perinne
Faculty: Katherine Deliz

Understanding the Foundational Knowledge of PFAS

PFAS (Per- and Polyfluoroalkyl Substances) are human-made chemicals found throughout the environment due to a multitude of causes including industry emissions, landfills, and runoff. They are used in a variety of industries including aerospace, medical, and consumer products. Since their discovery in the 1930s, PFAS have been used in many products due to their ability to repel oil, heat, and water. Understanding of these chemicals grew and studies in the 90s detected PFAS in human blood. PFAS have gained attention in research due to their presence in drinking water. More recently, the Environmental Protection Agency designated four widely used PFAS as hazardous substances through the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). We have performed a literature review to determine what is currently known about PFAS based on four categories: physical and chemical properties, fate and transport, toxicity, and treatment. This data is organized to present a concise way to understand the history of PFAS and its impacts on humans. By summarizing the general knowledge, we identified the gaps in research that need to be filled and are able to provide foundational knowledge in order to study on how extreme weather affects the fate and transport of PFAS.

Presenter(s): Jeanne Baer, Andrew Brinn, Vriksha Desikan, Maherra Hossain, Hailey Petriccione
Authors: Jeanne Baer, Andrew Brinn, Vriksha Desikan, Maherra Hossain, Hailey Petriccione, Jennifer Drew, Angelica Ahrens
Faculty: Jennifer Drew

Determining Whether LINGO2 Gene Variants Impact Dietary Habits

As more research has been done in the field of genomics and the gut microbiome, scientists have come to question whether there is a link between the gene variants one possesses and how they view diet and what they prefer. With the United States being known for its obesity, scientists are determined to combat this through knowledge. This study investigates whether the presence of a LINGO2 gene variant correlates with certain dietary habits. Six hundred and fourteen students from the University of Florida participated in an IRB-approved research study, the Great Florida Spitting Contest. Participants completed the Mediterranean Diet Quality Index (KIDMED) and provided a saliva sample. DNA was previously extracted and sequenced with the Thermofisher Precision Medicine Research Array. In this project, we compared 16 diet responses with the genetics at a variant in the LINGO2 gene using a. The SNP was associated with daily fruit/fruit juice consumption, weekly consumption of pulses, and consumption of sweets or candy three times or more daily. This demonstrates a potential link of this genetic variant with dietary behaviors.

Presenter(s): Abhiram Bommineni
Authors: Dr. Sharon Lynn Chu, Abhishek Kulkarni, Abhiram Bommineni
Faculty: Sharon Chu

Designing an Intelligent Mobile App to Support Scientifically Meaningful Everyday Observations

Many people find it difficult to apply the knowledge they learn in classrooms to real-life situations. The "Situated Learning" theory suggests we can overcome this challenge by learning in the same context the knowledge is applied. Our research strives to use this theory to improve people's understanding of science, even when they have transitioned out of formal educational settings. To help achieve this goal, we created a mobile application that can detect objects in photos taken by users and provide scientific information about those objects. This situates the learner in a context familiar to them. By running a between-subjects experimental study, we hope to understand how effective this approach is and how it impacts a learner's motivation, self-efficacy, and perceived relevance to learning content.

Presenter(s): Moie Brenner, Joshua DeWese, Tomas Duque, Ana Ferreira, Ahmik Paul, Ethan Yeh
Authors: Moie Brenner, Joshua DeWese, Tomas Duque, Ana Ferreira, Ahmik Paul, Ethan Yeh, Ana Martin-Ryals
Faculty: Ana Martin-Ryals

Evaluating the Feasibility of Anaerobic Digestion for Managing Community Food Waste

Global food waste (FW) is an increasingly serious problem. The USDA estimates 30-40% of food is wasted in the U.S., with most being landfilled. This contributes to climate change due to uncontrolled methane emissions and represents a significant economic loss. Anaerobic digestion (AD) is an alternative to landfilling that could support a sustainable, circular bioeconomy. In AD, anaerobic microorganisms breakdown organic matter into two byproducts: biogas, which can be used for electricity and heat production or upgraded to renewable natural gas, and digestate, which can be used as a nutrient-rich fertilizer. This research aims to evaluate the economic, social, and environmental feasibility of AD for managing community FW. This was done through literature review, experimental biomethane potential (BMP) tests, and expert interviews. The literature review revealed that many factors affect AD performance. Of these, the impact of carbon to nitrogen ratio (C:N) was evaluated via BMP testing using lettuce waste and cellulose. Initial results indicate that 150-350 mL biogas/g VS can be produced with C:N ranging from 9-32. Data from this study is being used to develop an informational brochure to educate the public about AD, and a survey to examine public opinion concerning implementation of a community-scale digester.

Presenter(s): Madeline Browy, Raegan DiRenzo, Balaji Iyer, Amanda Siu
Authors: Madeline Browy and Raegan DiRenzo, Grey Chapin, Balaji Iyer, Amanda Siu, Dr. Corinne Huggins-Manley
Faculty: Corinne Huggins-Manley

Investigating Measurement Fairness in Quantitative Educational Research

Quantitative educational effectiveness research is critical for informing schools, teachers, parents and students about effective practices for promoting learning. Fairness investigations are not standard in educational research, and researchers do not often consider that the measurement process may be compromised by fairness problems, which would compromise results of effectiveness studies. We are working on a systematic literature review project to document the extent to which fairness in measurement was investigated when conducting educational effectiveness research studies. 1,014 effectiveness articles were sampled from the What Works Clearing House (https://ies.ed.gov/ncee/WWC), and of the 1,014, we randomly sampled 250 to be systematically reviewed by a team of five undergraduate students. Before evaluating each article, researchers reviewed a list of fairness terms and concepts that, if mentioned regarding a study's outcome measure, would constitute that study as having addressed measurement fairness. Researchers logged the outcome measures, as being derived from extant data, large-scale standardized tests, and/or developed by researchers, to provide context for the fairness findings. Each article was evaluated by at least three researchers. The supervising professor reviewed the results, and reread and reassessed any articles with discrepancies among the researchers.

Presenter(s): Mia Camacho, Sophia Dadla, Paul Grau, James Hu, Patrick Iteghie, Tristan Pank, Caio Rudloff, Vishal Suresh, Ava Vellozzi, Satvik Vippatoori, Angelos Barmpoutis
Authors: Mia Camacho, Sophia Dadla, Paul Grau, James Hu, Patrick Iteghie, Tristan Pank, Caio Rudloff, Vishal Suresh, Ava Vellozzi, Satvik Vippatoori, Angelos Barmpoutis
Faculty: Angelos Barmpoutis

Developing and User-Testing Educational Games for Literacy

In this project, we developed and tested educational games for literacy based on the UFLI Foundations curriculum developed by the University of Florida Literacy Institute. The project involved digitization of the curriculum (lessons, sections, world lists) and implementation of several engaging games inspired by the prior work of Emily Laidlaw, a teacher in the state of Hawaii, who provided feedback during our project. We faced various design challenges, such as creating an interface suitable for K-2 students and teachers, making it accessible across devices such as tablets, desktops, and laptops, and packaging and disseminating it as a web application that can be easily accessed/installed in the aforementioned types of devices. Finally, we performed small-scale user testing that helped us improve our early prototype and understand how the users navigate throughout our product. Our end product will become available to the existing 30k+ users of the existing apps developed as partnership between the Digital Worlds Institute and the UFLI.

Presenter(s): Steven Cartwright, Marco Garcia, Ainsley Hamilton, Shane Layman, Vedant Patel, Deven Roylance
Authors: Steven Cartwright, Marco Garcia, Ainsley Hamilton, Shane Layman, Vedant Patel, Deven Roylance, Jennifer Drew, and Angelica Ahrens
Faculty: Jennifer Drew

Investigation into the Associations Between a Variation in the ELMO1 Gene and 16 Eating Habits

Researchers have long hypothesized that genetics may be associated with eating habits. In our investigation, we studied the rs6974491 polymorphism within the engulfment and cell motility 1 (ELMO1) gene, a gene that has been linked to Celiac Disease. The data was derived from the IRB-approved research project, “The Great Florida Spitting Contest,” studying 616 students at the University of Florida. Genotypes at the SNP were compared against the participants’ binary answers to a questionnaire asking about their eating habits, the Mediterranean Diet Quality Index (KIDMED). We ran chi-square tests of independence along with odds ratios to determine if there existed a correlation between individual eating habits and their genotypes (GG, AA, AG) at this SNP. The results showed an association with consumption of pasta or rice almost every day, as well as eating sweets and candy several times every day. The other 14 eating habits showed no significant association with genotypes that were tested. The potential impact of this study is to show that certain genotypes within ELMO1 are correlated to unique eating habits, and to use this research to build on nutrigenetics.

Presenter(s): Hana Checketts, Kyle Caliendo, Sebastian Echeverria, Alexis Hartog, Julie Waldrop, Lindsey Zhuang
Authors: Kyle Caliendo, Hana Checketts, Sebastian Echeverria, Alexis Hartog, Julie Waldrop, Lindsey Zhuang, Morgan Yacoe, Angela DeCarlis
Faculty: Morgan Yacoe

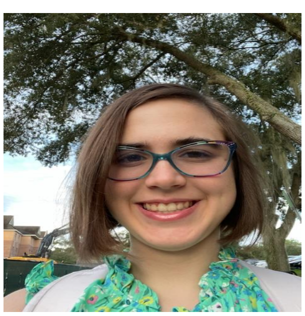
<u>Representation of Historically Excluded Individuals in Studio Art Education</u>

Minority groups have been largely underrepresented in studio art education. The majority of plaster busts used as drawing references depict male Greco-Roman features. The likenesses of people of color are few in number and often have racist undertones. There is currently little literature that explores the effects of drawing minority identities on students’ drawing experiences. This research aims to answer two major questions. One, whether the inclusion of figurative sculptures of underrepresented identities in art studios impacts students’ abilities to represent diverse features through drawing; and two, if drawing from these sculptures impacts students’ general perceptions of bodies. To collect data, this study utilized a mixed method survey followed by a focus group for even more specificity. In the group discussion, a neutral facilitator led a conversation about what the participants felt, thought, and took away from the study. This study is currently still in progress; the next portion of the research will include transcribing and coding the group discussion and survey. The results will then be analyzed and interpreted to determine whether or not drawing from a diverse set of plaster busts shifted students' perceptions or introduced unexpected challenges.

Presenter(s): Ava Clinton, Zachary Morris, Ian Perry, Isabella Santos, Matthew White
Authors: Ava Clinton, Zachary Morris, Ian Perry, Isabella Santos, Matthew White, Jennifer Drew, and Angelica Ahrens
Faculty: Jennifer Drew

The Correlation Between FTO Genotype And Different Dietary Habits

It is known that the fat mass and obesity-associated protein (FTO) gene is a genetic marker for obesity, with studies repeatedly showing carriers of certain variants of the gene being at a higher risk for obesity and related metabolic disease. In an IRB-approved research study, the Great Florida Spitting Contest, 616 students at the University of Florida filled out a dietary questionnaire, the Mediterranean Diet Quality Index (KIDMED), and provided a saliva sample. The subjects' genotypes were previously acquired using the Thermofisher Precision Medicine Research Array (PMRA). A genetic variant in the FTO gene was assessed with their patterns on the 16 diet questions using a chi-square test to determine the significance of our findings. After performing chi-square tests, the only statistically significant result was the correlation between the FTO genotype and daily fruit consumption. This potentially has implications for the use of genetic information in the treatment of obesity and related metabolic disease.



Presenter(s): Evelyn Colon, Hope K. Walter
Authors: Evelyn Colon, Hope K. Walter, An P. Nguyen, Axianax Merone, Henry M. Lutz, and Whitney L. Stoppel
Faculty: Whitney Stoppel

Degradation of Lyophilized Silk Sponges in vitro for Biomedical Applications with Kinetic Modeling

Silk fibroin proteins can be extracted from the cocoons of the Bombyx mori silkworm and regenerated into silk fibroin biopolymer solutions. We use it to create biomaterials. In our research, we are most interested in the properties of scaffolds formed from silk fibroin. Silk fibroin scaffolds have been studied for their use as cardiac patches for congenital heart defects such as Tetralogy of Fallot. Silk scaffolds degrade enzymatically into non-toxic amino acids and the rates of degradation in a controlled environment are tunable by altering fabrication parameters. The degradation rates of silk scaffolds must be understood for successful long-term repair. The objective of this work is to quantitatively relate alterations in fabrication parameters to changing degradation rates with a kinetic model. We hypothesized that lower biopolymer molecular weight and lower polymer concentration would increase the degradation rate. Mass loss over time data, collected through discrete sampling methods, of scaffold degradation for each altered parameter observed increased degradation rates for lower molecular weights and lower polymer concentration, in agreement with the hypotheses. Future work seeks to confirm whether silk scaffold degradation follows the Michaelis-Menten kinetic model and relate the kinetic model to observed in vitro degradation rates.

Presenter(s): Hannah Connell, Valentina Baredes, Matthew Rojas Abohasen
Authors: Valentina Baredes, Hannah Connell, Matthew Rojas Abohasen, Weijie Xu, Rebecca Butcher, David Perez
Faculty: Rebecca Butcher

<u>The allosteric regulation of Caenorhabditis elegans Acyl-CoA oxidase by ATP</u>

The nematode C. elegans secretes ascarosides, a class of pheromones worms use to communicate with each other. The ascarosides consist of an ascarylose core structure and a fatty acid-derived side chain. The side chains of the ascarosides are shortened by peroxisomal β-oxidation cycles. Acyl-CoA oxidase is involved in the rate limiting step of β-oxidation and installs a double bond at the α-β position of the ascaroside-CoA. Previously, the crystal structure of C. elegans Acyl-CoA Oxidase 1.1 (ACOX-1.1) revealed the purified enzyme was bound not only to its FAD cofactor but also to ATP. Prior kinetic studies show that ACOX incubated without ATP or FAD gradually lost its activity. This loss could be blocked by the addition of ATP and FAD, but not FAD alone. We hypothesize that ATP functions as an allosteric regulator and that the binding of the enzyme to ATP alters the enzyme conformation and affects the affinity between the enzyme and its FAD cofactor. We will study the immediate effect of ATP and/or FAD addition on the activity of ACOX-1.1 using an HRP-coupled kinetic assay. To study the key residues involved in the allosteric network, we will utilize mutagenesis and assay the kinetics of the mutant enzyme.

Presenter(s): Kennedy Cook, Abby Prettyman, Caitlyn Annunziato, Avery Branstetter, Jordan Applebaum
Authors: Kennedy Cook, Abby Prettyman, Caitlyn Annunziato, Avery Branstetter, Jordan Applebaum
Faculty: Peggy Borum

Practical Aspects of Using Food as Medicine to Reduce Seizures

One-third of patients with epilepsy do not respond to traditional medical therapies and are diagnosed with refractory epilepsy. Our laboratory has applied a precision medicine approach called Precision Ketogenic Therapy (PKT) which uses foods to reduce seizures. Our Foodomics Database uses Nutrition Facts Label (NFL) images on current products in the Florida market as the source for the nutrient composition of each food consumed by patients. Recently collected data confirms different brands of the same fruit or vegetable have varying nutrient compositions and the values require frequent updating. This semester, we have collected data for 47 products of fruits and vegetables currently used to treat patients. When foods do not have an NFL such as fresh produce, we rely on the Foundation Foods database of the USDA. We found the current Foundation Foods Database had 3 of 6 vegetables and 7 of 9 fruits that were the target of our searches. The Foundation Foods database will provide amino acids, individual carbohydrates, and fatty acid profiles to extend our Foodomics database. These data on specific foods could create a profile template applied to different brands of products to improve the use of food as medicine.

Presenter(s): Rami Darwiche, Maxwell Fletcher, Daniel Sneller, Aleksandra Timofeeva
Authors: Rami Darwiche, Maxwell Fletcher, Aleksandra Timofeeva, Daniel Sneller
Faculty: Raymond Issa

Development of Gesture-Based Human-Drone Interaction Modalties in Construction

The use of drones has become increasingly more common on construction jobsites. This is due in part to the aerial platforms' capabilities of accomplishing tasks in less time and cost while improving jobsite safety by replacing human presence in potentially dangerous tasks.In the future, drones are expected to collaborate with onsite construction individuals to accomplish a variety of tasks (e.g., material handling, aerial construction). This encourages professionals to rely on more intuitive two-way interactions between humans and drones, especially since traditional interaction (i.e., telemetry) restricts both human hands and requires higher levels of pilot training. In order to improve the intuitiveness of human-drone interaction on construction jobsites, this study aims at developing a gesture-based human-drone interaction system for more natural human-drone interactions. The contribution of this study to the body of knowledge is to develop a better understanding of the development stages involved in the design of gesture-controlled drones in construction.

Presenter(s): Caroline Eaton
Authors: Caroline Eaton, James Moran, Liana Hone
Faculty: Liana Hone

The Effect of Sobriety Length, Discrimination, and Dating Anxiety on Drinking Intentions

Abstaining from alcohol can be difficult due to sobriety discrimination (i.e., others' negative appraisals and judgment of sobriety). Sobriety discrimination can occur in the context of many social relationships, and feelings of sobriety stigma may be heightened when a sober person is single and seeking a romantic or sexual partner. We sought to examine how sobriety length, sobriety stigma, and dating anxiety impact a sober person's drinking intentions. Participants were 413 US adults (34.9% women) who identified as single and sober. Participants completed an online survey comprising measures of sobriety length, felt sobriety stigma, others' attitudes regarding abstinence, dating anxiety, fear of being single, and drinking intentions after stressful dating situations. As hypothesized, sobriety length was negatively related to drinking intentions, and sobriety and dating stressors were positively related to intending to drink. The biggest predictor of drinking intentions was felt sobriety stigma, suggesting that stigma may be a useful variable to study in the context of relapse prevention. These results highlight a unique source of stigma that sober individuals face when dating. Given the benefits of social support in recovery, sober dating apps and other support programs may maximize romantic and sexual health and well-being in this population.

Presenter(s): Anne Fang, Nicholas Randazzo, Grace Schlichting
Authors: Anne Fang, Grace Schlichting, Nicholas Randazzo, Thisuri Wanniarachchi, Steven Bruner
Faculty: Thisuri Wanniarachchi

Expanding the Chemical Specificity of Mycosporine-like Amino Acids (MAAs)

Mycosporine-like amino acids (MAAs) are a group of highly photostable and water-soluble compounds synthesized by a wide range of marine organisms. MAAs have been identified as natural sunscreen agents due to their strong UV-absorbing properties, with absorption maxima ranging from 310 to 362 nm. These organisms encode a gene cluster responsible for the biosynthesis of MAAs. Two enzymes of specific interest are the ATP-grasp ligases mycosporine synthase C and D (MysC, MysD). These enzymes catalyze the incooperation of amino acid functionalities to the MAA core, which results in broad range UV-absorbing properties of these small molecules. This project aims to establish the structure-function relationship of MAA biosynthetic enzymes and to engineer the active site of MysD to expand its substrate scope. This would improve the chemical diversity of MAAs, enhancing the photoprotective effects. Furthermore, to gain a more complete understanding of the reaction mechanism, X-Ray crystallography was used as a tool to determine the structure of MysD bound to amino acid substrate. Overall, this project aims elucidate the chemistry of ATP-grasp enzymes involved in MAA biosynthesis to design a set of novel small molecules that can be used in new-generation, broad-spectrum sunscreens.

Presenter(s): Lauren Fritz
Authors: Lauren Fritz
Faculty: Robert Caudle

Partnered Project with Epigen

This project works closely with Epigen Biosciences located in San Diego, California. Epigen Biosciences aims to develop a product that can eliminate the need for systemic analgesics, such as opioids. There is a growing concern regarding opioid usage in America and the research conducted at the University Florida endeavors to achieve a solution by specifically addressing the need for an enhanced healing process for the individuals impacted.

Presenter(s): Isabelle Gerzenshtein, Hannah Bagnis, Cathrine Beshay
Authors: Isabelle Gerzenshtein, Hannah Bagnis, Cathrine Beshay, Jostin Armada, Marisa O. Pacheco, Whitney L. Stoppel
Faculty: Whitney Stoppel

Investigating the Thermostability of Silk Fibroin Micro- and Nanoparticles in Liquid and Lyophilized Formulations

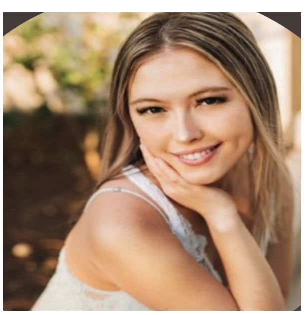
Naturally derived silk fibroin nanoparticles have proven advantageous for drug delivery as they are highly biocompatible. The current standard of preservation for these biomaterials is cold-chain storage, although this costly method limits accessibility to resource-poor countries. Our work investigates storage options for silk fibroin particles derived from the silk cocoons of Bombyx mori. Particles are synthesized from 60-minute degummed silk at 1% weight by volume via probe sonication-based phase separation in a polyvinyl alcohol solution2. To investigate thermal stability, particles were stored at -20°C, 4°C, 23°C, and 37°C. Particles stored at 4°C (standard protocol) maintained hydrodynamic diameter values of 200-1000 nm and PDI values of < 0.5. Over five weeks, weekly measurements of average size and size distribution were obtained using dynamic light scattering (DLS). Scanning electron & light microscopy were also used to visually assess the morphology of particles and confirm DLS measurements. The particles stored in liquid suspension maintained consistent size distributions as shown by the DLS with the exception of -20°C results. These proved unreliable as particles aggregated after freezing for a week. Current work involves replicating the initial experiment to allow for statistical analysis, and exploring lyophilization over time for further particle stabilization.

Presenter(s): Daniela Gomez, Ava Gueck, Wasif Labib, Zachary Lyons, Anish Mandlem, David Shaltakoff

Authors: Daniela Gomez, Ava Gueck, Wasif Labib, Zachary Lyons, Anish Mandlem, David Shaltakoff, Jennifer Drew, and Angelica Ahrens
Faculty: Jennifer Drew

Analysis Finds Significant Relationships between SNP in BACH2 Gene and Three Dietary Habits

BACH2 is a gene in the human genome known for associations with T and B cells and diseases related to the immune system. There may also be associations with BACH2 and diet. Here, data from the IRB-approved research project "The Great Florida Spitting Contest," was analyzed. In this study, 617 students at the University of Florida provided a saliva sample, used to analyze genetic variants with the Thermofisher Precision Medicine Research Array, and filled out the Mediterranean Diet Quality Index (KIDMED), a 16-item survey measuring adherence to a Mediterranean diet. Chi-squared tests of independence were used to find associations between the genotype at a SNP within BACH2 and the responses to 16 different items on the KIDMED along with the KIDMED score. Odds ratios were calculated to find the extent of the differences. Results showed that there was a significant association between the genotype and having a second fruit every day, $\chi 2$ (2, N=617) = 10.24, p = .006. There were also significant associations with consumption of fresh and cooked vegetables more than once a day, as well as commercially baked goods or pastries for breakfast. These results support a role of the genome in dietary habits.



Presenter(s): Peyton Harris
Authors: Peyton Harris
Faculty: Anna Peterson

The Fantasy of Teen Martyrdom Reflecting Jesus Christ: A Case Study on Columbine

In my paper, I will examine modern Christians' fantasy of martyrdom and sacrificial death to reflect Jesus Christ. As an example case study, I will use significant figures in the Columbine school shooting. The idealization of the “sacrificial lamb” and becoming a martyr post-death in honor of Jesus Christ maintains significant cultural relevance and negative implications throughout history. I will examine several Biblically relevant texts, documentaries and diaries of the Columbine victims relevant to this topic.

Presenter(s): Vanessa Hervie
Authors: Vanessa Hervie, Conor Waldt, David Hibbitts
Faculty: David Hibbitts

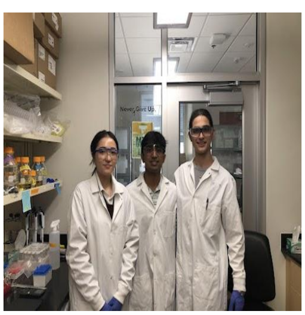
<u>Predicting AuPd Nanoparticle Structures Using Monte Carlo Simulations</u>

Single atom alloy (SAA) catalysts are materials with advantageous capabilities as catalysts; creating ideal turnover rates and selectivity for various reactions. Applications of these materials are curtailed because of the small per-area densities and volumes of active sites, which limits the activity of these catalysts. Hence, smaller nanoparticle catalysts are of interest because they provide a greater surface area to volume ratio, allowing for more potential active sites and increases in product formation. To address this, Monte Carlo simulations informed by density functional theory (DFT) data are used to investigate and predict the structures of the nanoparticles. In this investigation, we study AuPd nanoparticles at various sizes with Au being the “base” metal and Pd being the dopant. We also include an investigation of CO* and O* adsorption. Our initial calculations have revealed that we can predict that Pd will prefer subsurface positions in a bare particle and for Pd atoms to be isolated from each other within a AuPd particle. However, when CO or O are present, the Pd atoms are more likely to occupy surface sites as the stability of the bonds Pd-CO and Pd-O can overcome the energy penalty for Pd atoms to “move” to the surface.

Presenter(s): Edward Kempa, Lauren Dulick, Jennifer Moloney, Emma Herrero, Carolina Aranguiz Dias, Ilise Hyams
Authors: Edward Kempa, Lauren Dulick, Jennifer Moloney, Emma Herrero, Carolina Aranguiz Dias, Ilise Hyams
Faculty: Ashish Aggarwal

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

As developments in the field of artificial intelligence (AI) continue to rapidly advance its possible applications, it becomes increasingly crucial for those developing AI systems to understand how receptive the general public will be to their work. The overarching goal of this research is to understand human decision making (HDM) and its perspective on algorithmic decision making based on varied payoffs and outcomes. For this purpose, we conducted a pair of surveys, with a slight variation in the questions. In total, we collected 284 responses from these surveys administered to engineering students of an introductory programming course from two consecutive semesters in 2022, where the participants were asked about their understanding of AI, as well as their thoughts about the application of AI in the context of an autonomous vehicle placed in an ethically challenging situation. We qualitatively analyzed the data for individual questions using an inductive approach and identified major themes related to the question asked. From this analysis, we hoped to identify existing perceptions regarding the extent to which algorithms should be in charge of making important decisions. This could offer those working on new AI based technologies insight into how they will be perceived.



Presenter(s): Michelle Lee, Rushi Patel, Eduard Dodan
Authors: Emma Mulry, Eduard Dodan, Michelle Lee, Rushi Patel, Matthew T. Eddy
Faculty: Matthew Eddy

Investigating a Predictive Framework for Site-Specific PEGylation of Gal3C

PEGylation is defined as the modification of a protein or non-peptide molecule by the conjugation of one or more molecules of polyethylene glycol (PEG), a non-toxic, non-immunogenic, non-antigenic, highly soluble, and FDA approved polymer (Drug Discov. Vol.10 No.21). Covalent linkage of PEG has been shown to increase the half-life of therapeutic molecules through reduction of proteolysis, shielding from immunogenic epitopes, improvements in drug stability, and increases in solubility (Adv. Drug Deliv. Rev. Vol.54 No.4). PEGylation of Galectin-3C, an N-terminally truncated form of Galectin-3, can inhibit Gal3's function when they are co-expressed by binding the same ligands and preventing pentamerization. Because of Gal3's role in cell adhesion and angiogenesis in tumors, increasing Gal-3C's viability for sustained use in the human body could be of importance. Unfortunately, despite the promising applications of site-specific PEGylation, there is no predictive framework that can provide insight into advantageous sites for PEGylation. To address these gaps in knowledge, we plan to create a Gal3C conjugate with a proline-to-cysteine mutation on a loop distant from the carbohydrate binding site. Through analysis of the conjugate's thermal stability, ligand binding, and conformational structure, we hope to better understand the criteria for selecting PEGylation sites.


Presenter(s): Aanya Manvi, Miriam Girgis
Authors: Aanya Manvi, Miriam Girgis, Nien-Wen Hu, Walter L. Murfee
Faculty: Walter Murfee

Investigating the Effect of Aging on Stromal Vascular Fraction Neovessel Formation

Stromal Vascular Fraction cell (SVF) is a population of various cell types isolated from adipose tissues and represents an emerging therapy for forming new blood vessels. Previous work in our laboratory established a method for investigating SVF dynamics in a real tissue during culture. Continuation of this work requires confirming the method. The objective of this study was to verify SVF vessel formation in the rat mesentery culture model. SVF was isolated from the adipose tissues and seeded on adult mesentery tissues, which were cultured for 3 days. To visualize blood vessels, mesentery tissues were fixed using methanol and immunolabeled for PECAM, an endothelial cell marker. Vessel density was measured for 3 groups: MEM alone, MEM + Serum, and MEM + serum + SVF. SVF caused an increase in vessel density compared to MEM alone. SVF vessel formation was supported by observation of disconnected PECAM positive segments similar in structure compared to the previous results. Compared to the MEM + serum, the MEM + serum + SVF vessel density was less. The results confirm the method of SVF derived vessel formation but motivate additional evaluation of whether the amount of growth in the tissues was due to SVF or serum.

Presenter(s): Valeria Mejia
Authors: Isabelle Gerzenshtein, Hannah Bagnis, Valeria Meijia, Whitney L. Stoppel
Faculty: Whitney Stoppel

Investigating Photocrosslinking 3D-Printed Silk Hydrogels

Crosslinked silk hydrogels, derived from silk fibroin, are biomaterials with enormous potential in biomedical applications; these include but are not limited to drug delivery systems, wound healing, tissue engineering through scaffolding & support structures, medical devices, and more. A challenge in the field is efficiently crosslinking the hydrogels while maintaining shape fidelity & adjusting mechanical characteristics to desired levels. Depending on the purpose of the hydrogel; glutaraldehyde, genipin, and physical crosslinking are the current gold standards, which are time-consuming and in some cases, biocompatibility-limiting. Our investigation suggests photocrosslinking of silk hydrogels as a more efficient, tunable, structure-preserving, safe, and environmentally friendly methodology compared to the current gold standard of silk cross-linking methodology. Current plans for 3D printing include successfully replicating a silk fibroin bioink that utilizes a combination of photocrosslinking and thermal crosslinking to 3D print biocompatible & stable hydrogels using the LumenX Light-Based Bioprinter. The process includes using Lithium phenyl-2,4,6-trimethylbenzoylphosphinate as a photoinitiator to start the photocrosslinking process, UV light, and controlled 100 Degree Celsius temperature conditions to undergo crosslinking and printing. Once we can successfully replicate this, we will alter the process to produce hydrogels specifically aligned with our aims.

Presenter(s): Melvin Osei Opoku, Tracy Qu, and Glen R. Gillia
Authors: Melvin Osei Opoku, Tracy Qu, and Glen R. Gillia
Faculty: Tyler Alsup

Unlocking the Path: Discovery of Novel Terpenoids with Predicted Terpene Synthases Genes

Natural products are chemical compounds produced by organisms and they posses pharmaceutical and commercial relevance; contributing to about 50% of commercial drug products. Terpenoids are the largest and most structurally diverse family of natural products. Surprisingly, the fascinating mechanisms of how terpene synthases (TSs) make terpenes are not fully understood. Approximately 50,000 terpenoid metabolites, encompassing nearly 400 different structural families, such as monoterpenes, sesquiterpenes, and diterpenes, have been found in both terrestrial and marine plants, liverworts, and fungi. However, only a small portion of these widespread metabolites have been identified in prokaryotes. Our research aims to identify novel terpene scaffolds by screening predicted bacterial TS genes in an engineered terpene precursor overproduction system.

Presenter(s): Akhilesh Peddu, Cooper Dunn
Authors: Kristian O'Connor, Cooper Dunn, Akhilesh Peddu
Faculty: Issa Raymond

Exploring Gesture and Speech as Natural Human-Drone Interaction Modalities in Construction

Drones are being increasingly deployed on construction sites, and the collaboration between these aerial robots and humans is expected to increase even more in the future. In fact, drones are expected to actively collaborate with onsite humans to accomplish several tasks, including material handling and aerial construction. This leads professionals to depend on more intuitive interactions between humans and drones, since traditional interaction methods like telemetry require greater pilot training and restrict the use of both hands. In this study, we demonstrate the functionality of using gesture (for human-drone interactions at farther distances) and speech (for human-drone interactions at closer interactions) as natural human-drone interaction modalities in a virtual reality (VR)-based construction environment. The contribution of this research is to improve our understanding of the design stages involved in creating gesture- and speech-controlled drones for construction.

Presenter(s): Liam Rodgers, Adelyn Richgels, Andrea Orozcotorres
Authors: Liam Rodgers, Adelyn Richgels, Andrea Orozcotorres, Bryce Shirk, Lauren Eccles, Jasmine McTyer, and Whitney Stoppel
Faculty: Whitney Stoppel

<u>Establishing Protocols to Optimize Solubility of Plodia Interpunctella Silk Fibroin Towards Future Biomedical Applications</u>

Silk, a complex biopolymer made primarily from fibroins and sericins, has been used to create various materials in the biomedical field that provide robust mechanical properties, with biocompatibility and biodegradability. Currently, this field is dominated by the unilateral study of the species Bombyx mori (BM), chosen due to its prominence in the textile industry. Despite the range of functions that BM silk has been used for, researchers are still limited in its applications and tailorability. Since silk proteins can vary greatly amongst silk producing organisms, studying alternative sources of silk fibroin (SF) proteins can expand these applications. Herein, we study the process of creating regenerated SF from an alternative silk producing organism Plodia interpunctella (PI), commonly named Indianmeal moth. First, we aim to understand the protein composition of the silk fibers by using a toluidine blue stain. Next, we aim to solubilize PI silk fibers at various temperatures (from room temperature to 60 degrees) by placing them in solutions of lithium bromide with various ratios of PI silk to solution and different amounts of time spent in solution. The results thus far demonstrate that PI silk fibers are soluble, opening the possibility for their use as regenerated SF biomaterials.

Presenter(s): Jae Sarner, Eva Frost
Authors: Jae Sarner, Sara Prater, Jayro Gutierrez, Eva Frost, Dr. Anthony Auletta, Dr. Peter DiGennaro, Dr. Andrea Lucky, Dr. Shova Mishra, and Dr. Maya Saar
Faculty: Anthony Auletta

Genetic Variations in Northern Floridian Wasmannia auropunctata

Advancing current knowledge about specific species' behavioral and genetic patterns can improve invasive species management. One such invasive species is Wasmannia auropunctata (Little Fire Ant, or LFA), which is currently disturbing Floridian habitats. Previous behavioral assays on Floridian populations of Wasmannia auropunctata revealed aggressive behavior between some populations but not others. This current genomic study aims to discover if the aggressive behavior between Floridian LFA populations is impacted by genetic differences, which can assist in understanding Floridian LFA lineage. A deeper understanding of Floridian LFA lineage will determine the extent of migration of Floridian LFA to northern parts of the United States, and thus the necessary courses of action for management. We sequenced and assembled genome samples obtained from various Floridian populations and compared them to an LFA reference genome. Assembly and subsequent visualization revealed both shared and differing genes between sample LFAs and the reference genome, allowing for a better understanding of future invasive patterns. Further research and analysis will assist in determining Floridian LFA lineage and cold tolerance, and thus the likelihood of northern migration.

Presenter(s): Janna Scholtz, Anais Mera-Sarnelli, Kristian Fischer
Authors: Janna Scholtz, Anais Mera-Sarnelli, Kristian Fischer
Faculty: Wayne Giang

Creation of a ChatGPT Experience Survey for University of Florida Students

Recent advances in generative artificial intelligence (AI) have resulted in greater public exposure to these technologies. Unlike previous AI models focused on classification, generative text-based AI (e.g., ChatGPT) is able to produce new natural-sounding language in response to prompts. Despite its impressive capabilities, there are debates about how these tools should be used in education. In this poster, we draw from research on human-automation interaction to understand and investigate how students will use these AI tools. We will create a survey that aims to capture the current relationship between students and ChatGPT in regards to human-automation systems. This includes public perceptions about new uses or possibilities, usefulness, trust, reliability, function allocation, and changes in tasks and work design. The methods used to create this survey include conducting a literature review of human-automation systems, identifying major concepts related to human-automation interaction, brainstorming how these concepts may be applied to generative AI, and creating questions to understand public perceptions about these concepts and the technology. We will distribute this survey to two University of Florida classes dealing with AI. This survey will allow us to understand public perceptions about new AI tools, and whether human-automation concepts are applicable to generative AI.

Presenter(s): Aiden Shay
Authors: Nikki Kragt, David Hibbitts, Aiden Shay
Faculty: David Hibbitts

Predicting Binding Strength of Pharmaceutical Compounds With Density Functional Theory

Catalysts are of key importance to pharmaceutical syntheses. During these processes, however, intermediates, solvents, and byproducts may end up binding to the catalytic surface, deactivating it. Rather than experimentally determining the identities of these species, which may be time and resource intensive, density functional theory (DFT) can be used to compute and accurately predict the molecule's behavior. Many molecules and surfaces can be quickly tested computationally, however pharmaceutical molecules are typically too large to be tested without significant time and cost. This project aims to develop a computational tool that can be used to predict binding energies on metallic surfaces for molecules of arbitrary size. The workflow will analyze large molecules by fragmenting them into smaller pieces whose binding energies are already stored in a library or can be quickly calculated, and apply the data to predict the binding of the entire molecule. Current results have initiated library development, which has contributed to general heuristics to include in the software. For example, atoms with lone pairs generally bond to the surface with one to two sigma bonds in either an atop or bridge conformation respectively. Further work will focus on development of an algorithm that automatically generates binding configurations.

Presenter(s): Gabriela Verez, Ana Lucia Rodriguez-Valdes, Ev Stirou, Kate Kaplan, Naya Thompson, Advaith Pramod
Authors: Morgan Yacoe, Gabriela Verez, Ana Lucia Rodriguez-Valdes, Ev Stirou, Kate Kaplan, Naya Thompson, Advaith Pramod
Faculty: Morgan Yacoe

<u>The Role of Inclusive Surgical Simulation Models in Medical Education</u>

Representation of diverse races and ethnicities is a far cry from what it ought to be, especially in healthcare and medical education, where minority groups are often left out of the picture. Medical advertisements, educational material, magazines, and models lack adequate representation of diverse skin tones. This study aims to address disparities in the healthcare field and healthcare education regarding diversity and inclusion. In the study, medical students will practice suturing techniques on diverse and inclusive suture pads exhibiting a range of six different skin tones. Participants will then be surveyed on their experience with the suture pads to gauge their experience, learning impact, and cultural implications. The major results of this study come from the survey given after students use the suture pads. The goal is that our results will demonstrate an increased understanding in the importance of inclusivity in medical training and suture training skills. An understanding and awareness of diversity in the medical field is essential to quality care among medical professionals and should be an integral part of medical education. The use of these inclusive suture pads, as well as other culturally mindful practices, can improve care and overall diversity within the industry.

Presenter(s): Allison Vollmer
Authors: Dr. Timothy Murtha, Allison Vollmer, Cole Emerine, Ryan Lewis, Jennifer St. George, Ya'Mya Roberts
Faculty: Timothy Murtha

Housing, Ecology, and Well-Being in Jacksonville, Florida

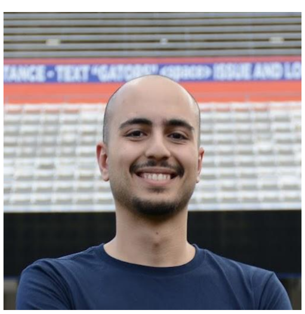
In support of the Florida Resilient Cities program, whose main focus is better understanding the relationship between water, air quality, housing conditions, and wellbeing, we conducted fieldwork in Jacksonville, Florida during the summer of 2022. We collected data for three 1.5 mile transects adjacent to the Hogans and McCoys watershed focused on the intersection between the built and natural environment. Based on our field observations, the city of Jacksonville has prioritized housing focused urbanization over community revitalization. Because of this, the city is facing socio-environmental issues such as inefficient land use and poorly maintained single family homes and urban river pollution. There appears to be a correlation between city ecological management and residential housing quality. Simply, the city is only addressing ecological issues after new housing has been constructed. Additionally, Jacksonville appeared to be in the process of replacing suburban living with apartment complexes and buying up land. This ongoing gentrification poses a threat to both the homeless population and the residents of low income areas who cannot afford the rising cost of living. In conclusion, more attention should be placed on improving the well being of the current population and cleaning the rivers rather than complete gentrification.

Student Abstracts

Presenter(s): Shayan Abbas
Authors: Shayan Abbas, Zon Thwin, Maddalena Parafati, Siobhan Malany
Faculty: Siobhan Malany

Standardizing Real-Time Contraction Analysis of 3D-Bioengineered Muscle Tissue Chips Using Digital Image Correlation

Digital image correlation (DIC) is an optical measurement technique that records changes due to physical distortion in a sequence of images against a reference image. DIC is non-invasive, non-toxic, and non-terminal to human tissue, making it a versatile tool for studying its physiological properties. Microphysiological (MPS) systems, also known as “tissue chips”, are fabricated using engineered human skeletal muscle cells and contain platinum electrodes to mimic a functional unit of muscle tissue. Our work focuses on combining the usefulness of DIC and physiologically relevant tissue chips to visualize and quantify the physiological response of skeletal muscle during electrical stimulation (E-stim). Analysis of E-stim contraction images using ‘Ncorr’, a MATLAB based algorithm, revealed that using different reference images yielded different magnitudes of contractile displacement with a range of 1.24 μm, as well as varying oscillating patterns. These findings suggest that choosing a proper reference image is crucial to the accuracy and standardization of DIC analysis applied to MPS systems.



Presenter(s): Zaid Abu-Mowis
Authors: Zaid Abu-Mowis, Christopher Ludtka, Dr. Josephine Allen
Faculty: Josephine Allen

The Effects of Complexing ssDNA with Collagen on the Inflammatory Response of THP-1 Cells

Assessing potentially therapeutic biomaterials involves evaluating their immunogenicity. Nucleic acid–collagen complexes (NACCs) represent one such interesting biomaterial since it provides the possibility of incorporating bioactive aptamers into a natural matrix like collagen. Previous studies have demonstrated the effects of aptamers and NACCs on angiogenesis, osteogenesis, and structure. However, there is little to no data on its effects on the immune system. As such, this study will focus on the effects of DNA and collagen complexation on the inflammatory response of macrophages. The protocol involves culturing THP-1 cells and then differentiating them into macrophages using phorbol myristate acetate. Five conditions are tested including a negative control and CpG ODNs 2006 and 2216 (ssDNA that act as immunostimulants) complexed with and without collagen. ELISA would be used to quantify the levels of secreted TNF-α and other inflammatory markers. Preliminary results show that the production of TNF-α was reduced for CpG ODN 2006 complexed with collagen compared to CpG ODN 2006 alone, but not statistically significant. Results suggest that collagen complexation may have the potential to reduce the inflammatory response produced by ssDNA. Further experiments would help to quantify additional inflammatory markers and determine if the effects of complexation are significant.

Presenter(s): Mohamad Adada
Authors: Mohamad Adada, Charlene Pringle
Faculty: Charlene Pringle

Death One Hour After Terminal Extubation (DONATE) Secondary Analysis: Critically Ill Children with Early Withdrawal of Life-Sustaining Therapy Are More Neurologically Impaired

The “Death One Hour After Terminal Extubation” (DONATE) validation study aims to refine our current ability to predict time of death after withdrawal of invasive mechanical ventilation of pediatric ICU (PICU) patients. This secondary analysis of DONATE aims to determine the relationship between Glascow Coma Scale (GCS) and timing of withdrawal of life-sustaining therapy (WLST) after admission. Specifically, whether children with terminal extubation earlier than 72 hours post-admission (early withdrawal) will have a lower GCS on admission compared with those with terminal extubation greater than 72 hours post-admission. Data points in this secondary analysis include age, sex, race, ethnicity, GCS at time of admission and just prior to WLST, and timing of WLST post-admission. This analysis’ population includes 84 deceased UFHealth Shands PICU patients ages 0-21. The raw odds ratio of association between early extubation and unresponsive full coma (GCS 3) at admission was found to be 3.26 with a 95% confidence interval of [1.303, 8.142] and a p-value of 0.0115 indicating that those who were extubated earlier than 72 hours post-admission are 3.26 times as likely to have been admitted with a GCS of 3. Age-based subgroup analysis did not yield any significant results due to small sample size.

Presenter(s): Maria Adamitis
Authors: Maria Adamitis, Dr. Melissa Johnson
Faculty: Melissa Johnson

Self-Efficacy in Former “Women in STEM” Professional Development Students

Women in STEM is a one-credit course offered to first-year honors students at the University of Florida. The class is structured to provide women entering STEM fields with a curriculum focusing on certain obstacles they may face in their future careers, as well as skill-building to counteract those challenges. Using Albert Bandura’s Theory of Self-Efficacy, this qualitative study reflects upon the lived experiences of course alumnae to determine the extent to which this course helps females succeed and show perseverance across the STEM fields. The study aimed to answer the following questions: What does self-efficacy mean to female students in their academics, in their social sphere, and in their aspirations for the future? How has the conceptual component of the course influenced female students’ sense of self-efficacy? How has the emotional/psychological component of the course influenced female students’ sense of self-efficacy? Open-ended survey results were coded and analyzed for themes. Preliminary findings suggest that participants benefit both academically and socially from the positive environment fostered in this course. These findings highlight the essence of the Women in STEM course experience as it impacts self-efficacy. Results can further enhance course goals and open new avenues to maintain connections among participants.

Presenter(s): Manas Adepu, Alex Garcia-Marin
Authors: Manas Adepu, Alex Garcia-Marin, Ashish Aggarwal
Faculty: Ashish Aggarwal

<u>Exploring patterns of self-regulated behavior and its affordance in order to foster mastery based learning</u>

There has been increasing research on several methods of instructional teaching in the realm of Mastery Learning in Computing Education. Many experts have pointed to the use of mastery-based learning (MBL), which allows students to develop proficiency by engaging in formative practice problems at their own pace. However, a confounding challenge in practical learning environments is often the proper time management that allows for extensive engagement with these mastery questions. Due to the asynchronous nature of mastery-based learning, it can become a challenge for some to utilize these tools at optimal productivity. So, how do we help students, especially those who need more explicit practice to engage with these mastery learning activities? In this analysis, we study students' ability to self-regulate their behavior through incentivized practice during a semester long introductory programming course. We will also examine the role of students' prior educational profile in student interaction with a mastery learning platform. We believe that the results of this analysis will, firstly, help educators and researchers understand behavioral factors that contribute to a students' ability to engage in mastery learning and, secondly, inform the pedagogical challenges of mastery based learning to support improved learning outcomes for all students.

Presenter(s): Padma Adimula, Ishanee Borde, Reema Ismail, Hailey Todd
Authors: Padma Adimula, Ishanee Borde, Reema Ismail, Hailey Todd
Faculty: Adetola Louis-Jacques

<u>Better Understanding the Relationship Between Breastfeeding and the Incidence of Non-Alcoholic Fatty Liver Disease</u>

Nonalcoholic fatty liver disease (NAFLD) is characterized by excessive lipid accumulation in hepatocytes and previous research indicates that longer duration of lactation is inversely associated with the development of NAFLD. Additionally, prior work in the lab indicates that lactation state influences the maternal gut microbiome which affects fat accumulation on the liver. The research aims to understand the molecular relationship between breastfeeding and NAFLD through a microbiome axis by comparing mice liver samples that received stool samples from breastfeeding (BF) women versus formula feeding (FF) women. We hypothesize that the liver samples from mice receiving stool samples from BF women will show less lipid accumulation compared to liver tissue samples from FF women. Data is collected from sectioned mice livers from each of the experimental groups. We perform histological analysis, using a microtome to cut the paraffin embedded liver tissue to mount on glass slides. We use hematoxylin and eosin staining methods to prepare slides for imaging in the ZEISS AxioScan.Z1 at 20x magnification. The images are then scored based on the NAFLD scoring system from 1-5. The next step is to prepare, scan, and score the 74 remaining mice liver slides and statistically analyze the results.

Presenter(s): Jennifer Adipietro
Authors: Jennifer Adipietro
Faculty: Susan Hegeman

Italiamericana Book Collection: Online Catalog and Digital Library of Italian American Novels

Though Italian Americans are readily associated with food and film, the literary legacy of this group is largely unknown, even among Italian Americans themselves. This lack of awareness, which obscures the cultural consciousness of over 16 million people in the U.S., is perpetuated by the inaccessibility of the literature. For example, many Italian American novels from the mid-20th century and earlier are out of print. Of these, the remaining copies are often in poor condition and housed in physical libraries beyond the reach of would-be readers. My project, the Italiamericana Book Collection, solves this problem. It is a free-access, comprehensive catalog of novels that were written by Italian Americans and published in the U.S. between 1829 and 1963. This online catalog currently enables visitors to discover over 150 titles, at least 65 of which are in the public domain. Some public domain books in the collection are already available to read for free straight from the catalog, with more on the way. I am also working to expand the catalog to include author biographies as well as memoirs, short story collections, children's books, and books of poetry by Italian American writers from the same time period and beyond.

Presenter(s): Reilly Afflerback
Authors: Reilly Afflerback, Hansel Montalvo-Castro, Mykela DeLuca, and David Hibbitts
Faculty: David Hibbitts

Predicting Diffusion Barriers of Hydrocarbon Rings in Proton-form Zeolites

Mass transport of hydrocarbon rings plays an essential role in zeolite-catalyzed reactions and catalyst deactivation (e.g., methanol-to-hydrocarbons chemistry). Mass transport measurements, however, are often limited due to time scale constraints. Here, we use density functional theory to study the diffusion of hydrocarbon rings within MFI zeolite catalysts. The MFI framework consists of intersecting straight and sinusoidal channels that molecules must diffuse through to reach active sites and egress as gas phase products. Our previous work on benzene and C7–C12 methylbenzenes diffusion within the silicate form of MFI (absent of proton active sites) demonstrated that barriers through the straight channel are consistently lower than sinusoidal counterparts and correlate with molecule critical diameter. Here, we extend our work to model the diffusion of hydrocarbon rings in the presence of protons across all 12 unique crystallographic T-sites of MFI, systematically modeling both straight and sinusoidal channel diffusions. Our preliminary results show that molecule adsorption energies near protons are significantly lower than their corresponding energies in silicate MFI, despite relative transition states energies remaining similar. This suggests that protons stabilize adsorbed hydrocarbon rings and thus increase diffusion barriers relative to diffusion in the empty framework.

Presenter(s): Mikayla Agbamuche
Authors: Mikayla Agbamuche, Dr. Steven Manchester
Faculty: Steven Manchester

The Beaver Creek Rosa

Roses, known for their beauty and economic value, have been around for thousands of years, but their phylogenetic history has remained largely unsolved. Recently, an unknown species belonging to the genus Rosa has been found in the Beaver Creek locality. The morphological characteristics of this specimen are similar to that of the form species Rosa hilliae, but the fine venation and marginal toothing of this specimen have yet to be described or documented in any previous literature. This opens the possibility that the specimen could belong to an unknown species of Rosa. Using macro and microphotography, images of the Beaver Creek Rosa were taken and compared to 10 photos of Rosa hilliae obtained from several palaeobotanical online databases and journals. Using comparative morphology, it was concluded that the leaf venation and the number of leaflets were the same for both the unknown specimen and Rosa hilliae. However, the leaf shape and marginal toothing of the unknown specimen were different from all the examples of Rosa hilliae. It was concluded that this unknown species belongs to the form species Rosa hilliae. However, due to the time constraint and debate around Rosa hilliae, the species of this specimen will be re-evaluated later.

Presenter(s): Sofia Ahmed, Bryan Park, Liam Wilford
Authors: Sofia Ahmed, Matthew J. Traum Ph.D., Bryan Park, and Liam Wilford
Faculty: Matthew Traum

Revealing the Bulk Mechanical Property Threshold for Thin-Metallic Samples to Support a Tabletop Stress-Strain Apparatus

Hands-on learning is vital in the mechanical engineering curriculum. Availability of inexpensive, accessible, and turnkey lab equipment for students' educational use has received growing attention. For Mechanics of Materials education, stress-strain measurement apparatuses are typically large, expensive machines that students have difficulty operating, let alone accessing. Can a smaller, more cost-effective tensile tester be produced? PASCO's AP-8214A was a product that replicated a stress-strain apparatus. However, it failed commercially because the limited force it generated required very thin samples to be used. The literature reveals that metals exhibit mechanical properties different from accepted bulk values below certain thickness thresholds. AP-8214A samples were too then and gave erroneous results. Determining this threshold thickness is an important parameter in developing tabletop stress-strain testers. This threshold was studied by testing aluminum dog-bone models of differing thicknesses (0.032in, 0.0625in, and 0.125in) on an Instron 5967 Universal Testing Machine. The dog-bones were cut from a waterjet and then speckled, enabling Vic2D software to accurately detect the sample's stretching by visually tracking the displacement of speckles. Variation of resulting measured mechanical properties with sample thickness was then tallied to determine the thickness threshold where bulk material properties emerge.

Presenter(s): Kate Aldinger
Authors: Kate Aldinger, Ashley Nechyba, Apollonia E. Lysandrou, Hugh N. Farrior, Ben Phalin, Jason Hunt, Laurie Solomon, Amanda Janner, Kent Mathias, Scott Teitelbaum, & Ben Lewis
Faculty: Ben Lewis

Sexual Compulsions Among Individuals in Treatment for Substance Use Disorders

Although sexual compulsions and substance use disorders (SUD) exhibit substantial overlap in prevalence it is unclear whether such symptoms impact treatment outcomes. Moreover, no current data are adequate to describe how sexual compulsions may change over the course of SUD treatment. Thus, the purposes of this study were to 1) characterize the trajectory of sexual compulsions during treatment, 2) identify whether trajectories differ between men and women, and 3) determine whether sexual compulsions may predict treatment readmission. Patients in residential SUD treatment (n=1,151) completed a sexual addiction screening questionnaire (PATHOS) at intake, after 30 days, and at discharge. Longitudinal analyses revealed a significant decline in sexual addiction symptomatology throughout treatment for both sexes ($p<0.001$), although women displayed a lower total PATHOS score at baseline and throughout treatment ($p<0.001$). The observed sex differences appeared driven by men more frequently endorsing preoccupation ($x^2= 6.57$; $p<0.001$), shame ($x^2=0.04$; $p=0.01$), and loss of control ($x^2=7.19$; $p=0.007$). Survival analyses indicated that sexual compulsions were associated with a 14% increase in readmission likelihood ($p=.07$), with a more pronounced risk for men. These findings highlight the utility of interventions targeting compulsive sexual behavior as adjuncts to SUD treatment for select patients.

Presenter(s): Maximillion Alegria
Authors: Maximillion A. Alegria, Dr. Gabriel Prieto
Faculty: Gabriel Prieto

Conceptualizing the Cloth of the Consecrated Child. Textiles Associated with Chimú Mass Sacrifice in Huanchaco, North Coast of Peru.

This study discusses broader questions surrounding the textile remains uncovered with the victims of the largest series of mass child sacrificial events on the North Coast of ancient Peru. Recent investigations are helping to understand Chimú sacrificial practices and the ideologies fueling their performance. In contrast, little has been done to contextualize the sacrificial garments within the overarching pantheon of Chimú weaving. To correct these breaks in scholarly thought, I have conducted in-depth visual analyses of twelve textiles uncovered with the child sacrificial victims buried at Pampa la Cruz, Huanchaco. This poster is focused on the results obtained after I recorded the construction techniques and denoted a plethora of other attributes, such as size, and material composition of the fabrics. These findings allow me to extrapolate information revolving around the weavers who created these textiles and their conceptualization of the sacrificial child. As a result, I propose three scenarios which could explain the role played by these textiles and how they could help to investigate the identity (gender, age, ethnicity, familial affiliation) of the children buried atop Pampa la Cruz.

Presenter(s): Karla Alemán
Authors: Karla Alemán, Gabriella L. Robilotto, Aaron D. Mickle
Faculty: Aaron Mickle

Assessing Functional Expression of Angiotensin Receptor Type 1 in Urothelial Cells

Interstitial cystitis/bladder pain syndrome (IC/BPS) is a poorly understood disease lacking effective treatment options. It is known that (IC/BPS) patients display increased mast cells, oxidative stress, and fibrosis—characteristics similar to the effects of renin-angiotensin signaling in other tissue types (for example: lungs, heart, and kidneys). Since there is little information about the effects of angiotensin signaling on the bladder, our initial goal is to assess angiotensin type 1 receptor (AT1R) functional expression in wild-type urothelial cells using calcium imaging. AT1R is activated by Angiotensin-II and generally promotes signaling pathways that result in inflammation. To evaluate the functioning of AT1R, calcium imaging was performed on mouse wild-type urothelial cells. During the calcium imaging process, the cells were perfused with solutions of baseline buffer and Angiotensin-II. By measuring the amounts of intracellular and extracellular calcium concentrations, we were able to assess the activity of the AT1R in the cells. We observed increased cellular calcium in some cells, suggesting AT1R expression functionality. Through this research, we hope to gain a greater understanding of angiotensin signaling in urothelial cells, and in turn, aid in the development of potential therapies for IC/BPS using FDA-approved drugs that target the renin-angiotensin mechanism.

Presenter(s): Aleena Alex, Kara Kent, Supratik Kondapalli, Ana Rodriguez
Authors: Aleena Alex, Kara Kent, Supratik Kondapalli, Ana Rodriguez, Susan Nittrouer, Matthew Masapollo
Faculty: Matthew Masapollo

Test-retest reliability of single-subject articulographic recordings during speech production

There is an urgent need in the field of speech-language pathology for valid and reliable motor assessments for developmental and acquired speech disorders. Detailed analyses of repeated measurement of speech articulator movements in individual patients with speech movement disorders could help elucidate differences in motor control that may be crucial to their diagnosis, evaluation, and treatment. However, this type of single-subject research design necessitates identifying reliable kinematic measurements across test times and repetitions of a given utterance. In the current research, we quantified the reliability of speech-related jaw and tongue movements measured by electromagnetic articulography data from six neurotypical subjects who participated in two experimental sessions involving repeating aloud simple speech stimuli. We found that most individuals displayed higher reliability for temporal control parameters (relative timing of speech movements) compared to spatiotemporal control parameters (phase angle of movement onset for one articulator, relative to another). Results suggest that the timing of speech movements is highly reliable, and that future investigations into the reliability of timing control will help evaluate responses to treatment in motor speech disorders, as well as track natural changes over time in both typical and atypical speech motor development.

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

Exogenous Ketone Body Therapy to Suppress 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, 2, 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.

Presenter(s): Diane Altidor, Sean Tzoucalis
Authors: Diane Altidor, Sean Tzoucalis, Kaylan Hebert, Tabatha Acosta, Wendy J. Dahl, Anne E. Mathews
Faculty: Anne Mathews

Test-Retest Reliability of Lifetime Food Security Surveys with Oldest-Old Adults

Little is known about how food insecurity influences the health and cognition of our nation's oldest-old adults (85+ years). Assessing food security of oldest-old adults may be flawed, not only due to the nature of self-reported dietary recall bias but compounded by age related declines in cognition. This study sought to determine if oldest-old adults can reliably report current and childhood food security status. Participants were recruited through flyers and word of mouth. They completed the USDA Adult Food Security Survey Module and 6 additional validated items to assess current and childhood food security status via two separate telephone interviews conducted about 1 week apart. Cohen's Kappa score and descriptive statistics were used to compare responses from the two telephone interviews. Participants (n=35) were 89.3±3.9 years old, and most (60%) were female Participant responses demonstrated moderate agreement to the retrospective food security questions, Kappa = 0.41 ($p<0.001$), with 31.3% reporting food insecurity during childhood at both time points. Responses regarding current food security status were highly consistent, with 88.6% reporting high food security at both time points. We can conclude that oldest-old adults can reliably report current and childhood food security status.

Presenter(s): Fabiana Amato
Authors: Fabiana Amato, Maria Carbon, Dr. Lakiesha Williams
Faculty: Lakiesha Williams

Mechanical Characterization of Adipose Tissue as an Energy Mitigator

Adipose tissue (AT) is commonly known for its numerous functions, storing energy, acting as an insulator to preserve heat, and protecting internal organs from blunt force trauma. Understanding the behavior of AT offers the possibility to translate its characteristics and properties into applications for surgical procedures and injury prevention. This study aims to characterize the mechanical properties that dictate the behavior of AT by performing unconfined compression. To conduct the experiment, subcutaneous adipose tissue (SAT) was tested since it is the first tissue to mitigate stresses due to its superficial location. Samples were sourced from the University of Florida Meat Processing Center. After harvest, the tissue was transported to the lab for immediate processing. A hollow punch of 25mm in diameter was utilized to cut the samples. Samples were later covered in gauze impregnated with PBS and refrigerated. Unconfined compression testing was performed at 1%/s with Mach-1 (Biomomentum Inc, Quebec, Canada) at 30% and 50% of the height of the sample within 48 hours of tissue harvesting. By correlating the stress-strain values obtained from testing, we hope to establish a clear relationship between the stress-induced and tissue performance during blunt trauma.

Presenter(s): Courtney Aminirad, Sarah Flannery
Authors: Courtney Aminirad, Sarah Flannery, Naim Montazeri
Faculty: Naim Montazeri

Environmental stability and host-binding capacity of Vibrio parahaemolyticus bacteriophages

Vibrio parahaemolyticus (Vp) naturally inhabit coastal waters and can cause gastrointestinal infections in humans after the consumption of contaminated raw or undercooked seafood, most notably oysters. Bacteriophages, viruses that infect bacteria, represent a potential biocontrol strategy to control V. parahaemolyticus. To further characterize two previously isolated wild-type V. parahaemolyticus bacteriophages, namely Phage 9 (P9) and Phage 10 (P10), the viruses at 6 log10 PFU/mL were exposed for 1-h to buffer solutions (pH 3-12) or heat treated at 20- 80°C. Then, residual infectious viruses were tested with overlay plaque assay. P9 and P10 were stable at pH 4-10. At pH extremes of 3 and 12, both phages reduced their infectivity to below the 1.0 log PFU/mL limit of detection ($p<0.05$). Both phages remained stable at 20-40°C. The P10 showed a slightly higher sensitivity to heat at 50°C with a 1-log10 PFU reduction, whereas an initial reduction in P9 was observed at 60°C. Both were fully inactivated at 80°C. The adsorption assay showed >90% of phage population were attached to the bacterial host after an 8-min contact time. Overall, both phages showed promising environmental stability and rapid attachment to the cells. Further research focuses on assessing the lytic activity of phages.

Presenter(s): Noah Andersen, Ethan D. Stolen
Authors: Noah Andersen, Ethan D. Stolen, Michelle L. Gaynor, Shengchen Shan, Douglas E. Soltis, Pamela S. Soltis
Faculty: Pamela Soltis

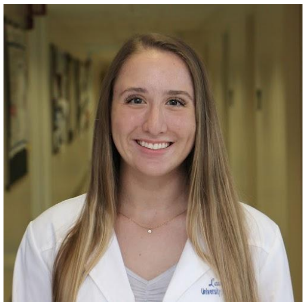
<u>The Impact of Genome Doubling on Gene Expression Noise in Arabidopsis thaliana</u>

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 noisy gene expression which results in differences in the number of copies of a protein genetically identical cells produce. 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 the green fluorescent protein (GFP) inserted in the genome of our model plant system, Arabidopsis thaliana. We tested several different concentrations of colchicine for inducing synthetic autotetraploidy. Our next step is to determine the level of gene expression using confocal laser scanning microscopy to measure the fluorescent intensity of the GFP. We hypothesize that the synthetic autopolyploid individuals will be characterized by an overall increase in extrinsic noise, due to increased variation in cellular volume.

Presenter(s): Abigail Anderson
Authors: Abigail Anderson, Drew Gillett, Jake Boles, Rebecca Walling, Malú Tansey
Faculty: Malú Taney

<u>Loss of PGRN Results in Increased Pan-Cathepsin Expression</u>

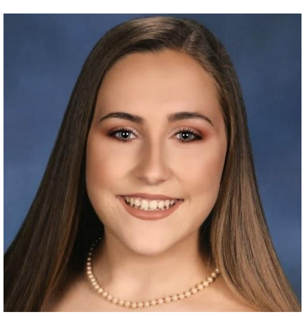
Mutations in the progranulin(PGRN) encoding gene, GRN, cause familial frontotemporal dementia (FTD) and neuronal ceroid lipofuscinosis and is also implicated in Parkinson's disease. These mutations result in decreased PGRN expression. PGRN is highly expressed in peripheral immune cells and microglia 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. 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). GRN-/- MEFs exhibit increased expression of pan-cathepsin activity relative to GRN+/+ MEFs, and significantly impacts expression of LAMP1.
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.



Presenter(s): Lauren Andrews
Authors: Lauren Andrews, Nina Erwin, Dr. Mei He
Faculty: Mei He

Encapsulation of Superparamagnetic Iron Oxide Nanoparticles in Extracellular Vesicles for Highly Precise Magnetic Particle Imaging

Extracellular vesicles (EVs) possess natural homing and cell communication abilities, making them capable of traveling through the body with specificity and ease. The high sensitivity of magnetic particle imaging (MPI) is promising for tracking EVs in vivo -- a current limitation in EV research. The encapsulation of magnetic nanoparticles (MNPs) inside EV carriers would serve to locate the biodistribution, accumulation sites, and biological barrier interactions of EVs, leading to more comprehensive imaging and understanding of the tissue microenvironment. Two encapsulation methods were tested: electroporation and cell incubation. Electroporation was optimized by the selection of voltage, pulse width, and concentration to maximize efficiency while sustaining minimal EV fragmentation. Incubation of MNPs with macrophage-like cells was also tested for cellular packaging as a method to protect EV surface properties. Macrophage-like cells were incubated with varying concentrations of MNPs to determine cell viability. Once biocompatibility was confirmed, cells were incubated with 350ug/mL MNPs for 48 hours. For both methods, the MNP-EVs were purified and characterized to determine size distribution and concentration. The incubated MNP-EVs were also imaged using transmission electron microscopy. Future work will compare loading efficiency and MPI performance, leading to an optimized MNP-EV composite for MPI in vivo tracking and imaging.



Presenter(s): Chloe Arbogast
Authors: Chloe Arbogast, Kathryn Sieving
Faculty: Kathryn Sieving

Snooping for Safety: Eastern Gray Squirrels Eavesdropping on Tufted Titmice Alarm Calls

Mammals and birds both have developed alarm calls to protect and warn their kin of predators. Tufted Titmice (Baeolophus bicolor) in particular have developed predator-specific alarm calls. Many avian species listen to the Tufted Titmices' calls to gain information for themselves, also known as eavesdropping. Few studies have looked at whether mammal species eavesdrop on these alarm calls, so we decided to see if Eastern Gray Squirrels (Sciurus carolinensis) listen to Tufted Titmice alarm calls. To see if the Eastern Gray Squirrels would respond, I used playbacks of alarm calls as well as a control call on squirrels and recorded their behavior before and after. The squirrels were most vigilant when Tufted Titmice alarm calls were played and exhibited antipredator behaviors. These results suggest that Eastern Gray squirrels are eavesdropping on Tufted Titmice alarm calls.

Presenter(s): Nathalie Are, Harrison Leslie, Paola Sullivan, Alexa Velaquez
Authors: Nathalie Are, Harrison Leslie, Paola Sullivan, Alexa Velaquez
Faculty: Larry Forthun

Informing an Intervention with Reproductive Healthcare Providers to Build Trust Behaviors with Black Women

Historically, medical mistrust between Black women and reproductive healthcare providers is a contributing factor to maternal mortality rates (Williams, 2021). This study conceptualizes trust as the interpersonal relationship established between the healthcare provider and patient as exhibited through behaviors presented by both the provider and medical team. The purpose of this research is to inform an intervention for reproductive healthcare providers to better support Black women in their reproductive care with a focus on examining the role of spirituality and mindfulness. The rapid identification of themes from audio recordings (RITA) approach is an assessment tool that allows researchers to identify recurring themes in qualitative data by listening to audio recordings (Neal et al., 2015). Preliminary focus groups conducted with Black women in Alachua County provided the basis of our analysis. We used the RITA rapid coding approach to identify themes as defined in a shared codebook. Preliminary themes reveal consistencies in behaviors that reflect active listening, individuation (humanizing), and effective communication. In the poster session, we will share how the utilization of RITA in our data analysis aided in the identification of themes and informed future interviews with reproductive healthcare providers.

Presenter(s): Rebecca Arias
Authors: Rebecca Arias, Esteban Rios
Faculty: Esteban Rios

Advancement of Cowpea Cultivars into a Dual Edible and Ornamental Crop

Food insecurity from climate change, human activity, and population growth is a global issue, affecting mostly those in developing areas. Cowpea (Vigna unguiculata [L.] Walp.) is a drought-tolerant, warm-season legume that is a source of food security in areas such as Africa, the Americas, and Asia. The purpose of this project is to develop lines of dual edible-ornamental cowpeas by mutagenesis. Sixty seeds were soaked in varying treatments of EMS (Ethyl methanesulfonate) while agitated for 3 or 4 hours. Seeds were planted in sand-soil media and placed in a grow chamber with 12 hours of light, Day/Night temperatures of 27C/22C for 3 months. ANOVA models were fitted in R. The highest EMS concentration (80 mM) resulted in shorter plants compared to all other treatments. Water controls had thicker stems than EMS treated. Lower EMS concentrations (10-20 mM) had reduced SPAD values compared to EMS 40, 80 mM, and controls. EMS 40 mM produced the highest number of pods. Cowpea seeds treated with 40 mM EMS were vigorous pod producers, with SPAD levels similar to controls. Larger repetitions will be needed to fully catalog what effects the mutagen had on the seeds, with this research lining the way for future experiments.

Presenter(s): Javier Arranz
Authors: Javier Arranz, Wayne Giang
Faculty: Wayne Giang

Computer Vision based Lane Detection System using Sobel Edge Detection for a Safety Research Project

Lane detection systems are crucial for autonomous vehicles, driver assistance systems, and in safety research to automatically detect driving errors. Different techniques, including Canny Edge Detection, Hough Transform, and Deep Learning, are used for lane detection. In this project we apply Sobel Edge Detection due to its simplicity, computational efficiency, and robustness to noise. This technique works by scanning the image pixel by pixel and calculating the gradient of their intensity values and its magnitude to identify edges within the image. The algorithm applies image thresholding to obtain a binary image, perspective transformation to get a birds-eye view, and sliding windows to identify lane pixels and draw a polynomial best-fit line to estimate lane lines. We used Sobel Edge Detection on an on-road experiment data-set to evaluate advanced driver assistance systems' benefits in reducing driving errors for individuals with Parkinson's disease. Challenges faced included faded lines, lighting changes, curbs, and other conditions. Preliminary results showed that the proposed algorithm performed well with highway videos but fell short on local roads due to irregular lane markings and extreme variations in lighting and shadows. Future approaches will involve deep learning and adaptive thresholding to work effectively under varying environmental conditions.

Presenter(s): Sofia Arvelo Rojas
Authors: Sofia Arvelo Rojas, Chang Liu, Daniel P. Ferris
Faculty: Daniel Ferris

Analysis of Frontal Lobe Activity in Young Adults during Cognitive Test using EEG

The aim of the study is to assess the electroencephalogram (EEG) power spectrum during cognitive tests of different levels of difficulty in young adults. Participants were asked to memorize a series of positions in a three-by-three grid and indicated when it matched the position n-instances before. We recorded EEG using 120 cortical electrodes. We preprocessed the EEG signals to reduce noise interference and performed independent component analysis to localize their source. We then isolated brain components using IC labeling, power spectrum analysis, and the residual variance from dipole fitting. We segmented the data into two-second epochs. We computed the average power spectrums for each of the identified brain components. We focused on the frontal lobe brain components as the frontal lobe was reported to be involved in working memory processes. We performed a preliminary study with four young adults. Preliminary results indicate that, for young adults, power spectral density tended to decrease from resting condition as the difficulty of the test increased.

Presenter(s): Jordan Attebery
Authors: Jordan Attebery,1 Sopuruchukwu Ezenwa,2 Huston Locht,1 Hansel Montalvo-Castro,1 Alexander J. Hoffman,1 Deng-Yang Jan,3 Rajamani Gounder,2* David Hibbitts1*
Faculty: David Hibbitts

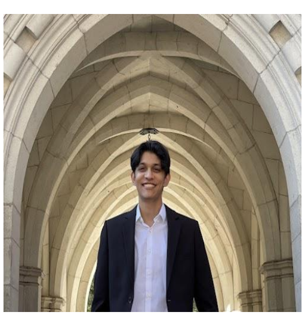
Exploring Zeolite Catalysts for Regioselective Toluene Methylation to para-Xylene

Zeolites are microporous aluminosilicates with diverse void shapes and sizes that lead to shape selective effects that have enabled wide applications for catalysis. Shape selectivity concepts have guided many synthetic design efforts to alter zeolite pore structures for regulating reactant access to the active site, allowing formation of specific transition states, or promoting the egress of certain products from micropores. We used density functional theory to explore selectivity of toluene methylation reactions in zeolite frameworks toward ortho, meta, and para-xylene isomers. The MFI-zeolite framework contains 12 unique crystallographic T-sites which provide access to a variety of reaction environments. These environments involve intersecting straight and sinusoidal channels that create a mesoporous framework of varying confinements. Previous work suggest that transition states for ortho, meta, and para-xylene formation become penalized when occurring at tighter confined environment (i.e., channels relative to intersections). The extent of these penalties is different for each xylene isomer. This increases selectivity toward para-xylene isomer, the most valuable of the three towards polymerization. We extended our study to other zeolite frameworks (e.g., BEA and TON) to explore further the role of zeolite framework on selectivity during toluene methylation reactions.

Presenter(s): Leonard Auger
Authors: Leonard Auger, Nicole Fitzgerald, Dr. Linda Cottler
Faculty: Linda Cottler

Examining Proportions of Suicide Attempt-Related 911 Dispatches Involving Suspected Alcohol and Drug Use in the U.S. Before and After the COVID-19 Pandemic, 2019-2021

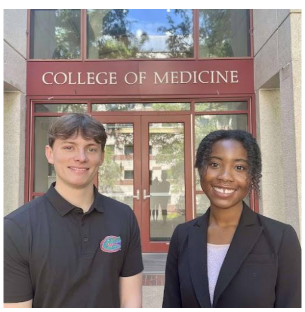
Given that suicide is a leading cause of death globally, it is important to examine how the COVID-19 pandemic may have impacted suicide attempts and related risk behaviors, such as substance use. We examined how the proportion of suicide attempts involving suspected alcohol and drug use changed in the U.S. from 2019 to 2021. This study used a database of emergency medical services (EMS) 911 dispatch calls. Suicide attempt-related calls between January 1, 2019, and December 31, 2021, in 15 states with consistent coverage and suspected alcohol (n=46,372) or drug use (n=57,697) were examined. Generalized additive models (GAMs) were used to evaluate trends in the proportion of suspected drug and alcohol-related suicide events over the study period. There was a statistically significant negative quadratic trend in the frequency of alcohol-related suicide attempts between Q1 2019 and Q4 2021 (r-squared=0.40, $p<.05$, SE=0.004). There were no significant changes identified in the frequency of drug-related suicide attempts over the study period (r-squared=0.175, $p=.176$, SE=0.001). While the proportion of alcohol- and drug-related suicide attempts peaked in Q2 2020—coinciding with the onset of the COVID-19 pandemic—there were no significant increases in attempts involving substance use during the 2019-2021 period, based on dispatch data.



Presenter(s): Kevin Avaiya
Authors: Sabrina Zequeira1, Emely Gazarov1,2, Alara A. Güvenli2, Kevin Avaiya, Johleen Seedansingh1, Erin C. Berthold5, Abhisheak Sharma3, Chris R. McCurdy4, Barry Setlow2, Jennifer L. Bizon1
Faculty: Barry Setlow

<u>Chronic Oral Administration of Delta-9-tetrahydrocannabinol (THC) Enhances Working Memory in Aged but not Young Rats</u>

Cannabis is one of the most widely used drugs in the US, and individuals over the age of 65 are the fastest-growing demographic of users. The effects of chronic oral administration of delta-9-tetrahydrocannabinol (THC; the major psychoactive component of cannabis) were evaluated on a delayed response task that assessed PFC-dependent working memory and a water maze task that assessed hippocampal-dependent spatial memory in young adult (5 months) and aged (23 months) Fischer 344xBrown Norway F1 hybrid rats of both sexes. Rats of both ages consumed either plain gelatin or gelatin containing 1 mg/kg THC daily in their home cage. Drug was administered following daily behavioral testing to dissociate chronic from acute effects. Working memory was assessed after three weeks of daily consumption. No effects of THC were observed on working memory performance in young adult rats; however, aged rats consuming THC performed reliably better than aged rats consuming control gelatin. These findings suggest that chronic THC does not impair, and may actually provide benefit to, cognition in older subjects. Mechanisms of this age-dependent cognitive enhancement are being explored.



Presenter(s): Oluwagbemisola Awonusonu, Alexander Pearce
Authors: Oluwagbemisola Awonusonu, Alexander Pearce, Matthew Brown, Kyle B. Madrid, Thinzar Myint, Todd Brusko
Faculty: Todd Brusko

<u>Evaluating the Functionality of Gene-Edited Antigen-Specific Tregs for the Treatment of T1D</u>

In healthy individuals, a subset of regulatory T cells (Tregs) suppresses self-reactive immune cells, thereby protecting pancreatic beta cells. Our work seeks to enhance the functionality of Tregs in the context of T1D by using gene-editing to enhance Treg activation and migration to sites of inflammation.To accomplish this, lentiviral transduction was used to generate Tregs expressing a preproinsulin (PPI)-directed T cell receptor (TCR). Following 14 days of in vitro expansion, PPI-TCR+ Tregs were characterized using flow cytometry to assess activation and lineage markers. After 24 hours, we observed increased activation in Tregs expressing moderate and high-affinity PPI-TCRs, whereas low-affinity PPI-TCR+ Tregs showed no differences from PPI-TCR (polyclonal) Tregs. We further examined the proliferative capacities of these PPI-TCR+ Tregs after 4 days of antigen-specific stimulation and identified significant increases in proliferation for PPI-TCR+ Tregs compared to polyclonal Tregs. Finally, we used in vitro suppression assays to measure CD8+ and CD4+ T responder proliferation by flow cytometry and observed that PPI-TCR Tregs demonstrated improved suppressive capacity compared to polyclonal Tregs after four days of co-culture. This data suggests PPI-specific TCRs can improve in vitro Treg suppressive and proliferative capacity during antigen-specific stimulation with potential implications for adoptive cell immunotherapies.

Presenter(s): Sarah Bahsoun
Authors: Sarah Bahsoun, Emily Miller, Aidan Smith, Raegan Weems, Elijah Freedman, Adithya Gopinath, Habibeh Khoshbouei
Faculty: Habibeh Khoshbouei

<u>Investigating the Role of Dopamine Transporter in the Central Nervous System Immune Landscape</u>

Dopamine transporter (DAT) regulates the dimension and duration of dopamine signaling. In the CNS, DAT reuptakes synaptic dopamine, terminating neurotransmission. While existing literature has extensively characterized CNS DAT in neurotransmission, the roles of DAT in regulating CNS immunity is less understood. Our lab has previously shown that DAT is expressed on immune cells and serves an immunomodulatory role. Microglia, the CNS-resident immune cells, exhibit morphological changes in response to CNS-immune challenges. Using animals lacking DAT (DAT-KO) and wild-type (WT) controls, we studied the effects of DAT deletion and disrupted dopamine signaling on the CNS immune landscape, focusing on microglial morphology. Following treatment with immune stimulant lipopolysaccharide (LPS), the brains of DAT-KO and WT mice were studied to determine the effect of DAT deletion on microglia. We assessed microglial morphology in the dorsal and ventral striatum, DAT-rich regions most likely affected by DAT deletion. By examining microglial projection area, complexity, and contact with surrounding vasculature and dopaminergic neurons, we aim to determine whether DAT deletion, and the resulting increase in extracellular DAT, alters microglial function and thus CNS immunity. This study will reveal the role of DAT in immunoregulation of dopamine neurotransmission.

Presenter(s): Dayita Banerjee
Authors: Dayita Banerjee, Gabrielle Gonzalez, Alex Haimbaugh, Isabela Silva, Danielle Meyer, Chia-Chen Wu, Tracie Baker
Faculty: Danielle Meyer

<u>Persistence of Transgenerational Effects of Ancestral PFAS Exposure on F3 Zebrafish Larvae</u>

Per- and polyfluoroalkyl substances are environmentally significant chemicals that are suspected to have effects on growth, development, reproduction, and neurobehavior. Because of their tendency to persist in blood and serum, organisms are most susceptible at critical development periods. This phenomenon is examined generationally in larval zebrafish, an NIH-validated model organism for human genomics and developmental toxicology. Our goal is to determine the phenotypic and transcriptomic hereditary effects of PFAS exposure on the F3 generation of larval zebrafish by examining survival, behavioral, and abnormality endpoints. In previous studies, the F0 generation of larval zebrafish were directly exposed to stepwise low concentrations of PFOA, PFOS, and a mixture of both. Larvae were not further exposed to PFAS after the F0 generation to observe transgenerational effects in the F2 and F3 generations. F3 larvae were raised to 5 days post-fertilization and evaluated for altered photomotor responses, morphological abnormalities, and gene expression. As in the F1-F2 generations, ancestral PFAS exposure dysregulated F3 larval behavior patterns and developmental abnormality rates. Our results can inform legal limits for PFAS concentrations in water and consumer products, as well as elucidate biomarkers of exposure in humans, such as changes in metabolites and signaling pathways.

Presenter(s): Jessica Barrera-Solis
Authors: Jessica Barrera-solis1,2, Taehoon Kim2, Kevin Begcy2
Faculty: Kevin Begcy

1 / 1 Agrobacterium-Mediated Rice Transformation to Characterize Protein-DNA Interactions Using Chromatin Immunoprecipitation (ChIP)

Chromatin immunoprecipitation (ChIp) is a widely utilized technique to study gene regulation and chromatin organization, particularly to characterize protein-DNA interactions. However, the implementation of ChIP experiments in plants can be challenging due to difficulties involved in obtaining suitable plant material. In order to investigate protein-DNA interactions using the ChIP technique, an Agrobacterium-mediated rice transformation method to generate transgenic rice plants that express a fused green fluorescent protein (GFP) with a gene of interest and a 3x hemagglutinin (HA) tag (GFP-Gene of interest-3xHA). We employed Agrobacterium tumefaciens strain EHA105 to introduce the GFP-Gene A-3xHA construct into totipotent calli obtained from rice embryos. Transformed rice plants were regenerated a selected using hygromycing. To confirm the integration of the transfer DNA (T-DNA) into the rice genome, we utilized polymerase chain reaction (PCR) followed by agarose gel electrophoresis. The expression of the GFP-Gene of interest-3xHA chimeric protein was then assessed via sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) and subsequent western blot analysis. The generation of transgenic rice plants expressing the GFP-Gene of interest-3xHA fusion protein has significant potential to facilite ChIP experiments, can reveal protein-DNA interactions.

Presenter(s): Eva Bayer
Authors: Satavisha Kayal, Eva Bayer
Faculty: Daniel Seidel

Oxidative Organocatalytic Desymmetrization of 4-Substituted Piperidines

Alpha-functionalized cyclic amines are ubiquitous structural motifs in pharmaceutical chemistry, yet protecting group free methods to access these compounds in an enantiopure fashion are lacking. To address this deficiency, we have developed and are continuing to optimize an organocatalytic strategy to reach these types of chiral compounds in a single-pot procedure from 4-substituted piperidines. By allowing practitioners to bypass the wasteful synthetic steps of nitrogen protection and de-protection and by contributing a novel metal-free chiral catalyst to the literature, this work improves the efficiency and sustainability of synthesizing these important compounds. Our methodology features a phase-transfer catalytic cycle that enantioselectively oxidizes the starting piperidine to the corresponding imine, which ultimately gets trapped through diastereoselective nucleophilic addition to yield the desired, enantioenriched alpha-functionalized product. To date, the best catalyst tested leads to 79% overall yield, with 88% of the product being of a single enantiomer (76% enantioenrichment). Current research efforts are focused on designing, synthesizing, and testing additional chiral catalysts in the model reaction, with the goal of exceeding 90% enantioenrichment.

Presenter(s): Hannah Bedard
Authors: Hannah Bedard
Faculty: James Goodwin

Dmitri Shostakovich: Perceptions, Debates, and Ambiguity

My research examines the historical context of Dmitri Shostakovich's Fifth Symphony and how it affected the interpretations of the symphony. Specifically, I analyze how political tension and the Soviet ideal of socialist realism created obstacles that influenced Shostakovich's conception of the symphony. In addition to the musical aspects of the Fifth, my research also analyzes perceptions of the work through statements, reviews, and memoirs of observers. My objective is to show how these factors fostered the piece's ambiguity and contributed to the debate about whether the Fifth truly appeased, or rebelled against, the Soviet government. My aim is to highlight how both sides of this argument present valid evidence, but neither side can attest to precisely what Shostakovich's intentions were.

Presenter(s): Helen Beiriger
Authors: Helen Beiriger, Jason Williams, Andrea Lucky, Lyle Buss
Faculty: Jason Williams

A Species Identification Resource for Alates of Common Pest Ants of Florida

Florida's subtropical climate makes it a suitable home to 241 ant species, including those that are native and invasive. More than a quarter of all ant species in Florida are not native and new species are becoming introduced every year. Diagnostic tools for native and non-native ant species alike are critical for rapid identification. However, these tools typically focus only on worker ants, and none exist for the identification of queen or male ants, which have wings and are often misidentified as other insects such as termites, wasps, rove beetles, and flies. These winged forms, also known as alates, are the reproductive members of an ant colony and are commonly encountered household pests. To facilitate the identification of alate ants, we examined alates of 31 different species found around Florida to develop identification tools. We took images of each species in full-face and lateral views, and of wing venation and male external genitalia to create a user-friendly pictorial dichotomous key of alates of common Florida ants. This key will be included in a guide aiding pest management professionals, homeowners, and insect identifiers at ports of entry with identification of alate ants to genus and species.

Presenter(s): Alison Bennett
Authors: Alison Bennett, Adithya Gopinath, Aidan Smith, Emily Miller, Habibeh Khoshbouei
Faculty: Wolfgang Streit

Development of a Novel Dopamine Transporter ELISA for Use in Human Immune Cells

Parkinson's disease (PD) is a neurodegenerative condition characterized by neuroinflammation and dopamine neuron degeneration. The dopamine biosynthesis pathway begins with tyrosine and produces dopamine through various chemical reactions. Dopamine transporter (DAT) protein operates at the end of the pathway and provides a marker for identifying and quantifying dopaminergic dysregulation in PD patients. Current diagnostic tests can image for DAT and identify differences in expression levels in the brains of PD patients and healthy individuals but cannot yet quantify DAT expression. Enzyme-linked immunosorbent assay (ELISA) provides a mechanism for quantification of a target protein in a sample. However, to date no ELISA exists to quantify DAT. After verifying the validity of our novel DAT antibody via Western blot, using positive and negative control tissues and an established DAT antibody for comparison (MAB369), we optimized the DAT ELISA. We identified appropriate conditions to begin quantifying DAT levels in low-DAT-expressing tissues such as peripheral immune cells. Based on our prior findings of increased DAT-expressing immune cells in PD patients, we anticipate that development of a novel ELISA test designed to quantify DAT in low-expression tissue such as blood immune cells will become an essential component of the diagnostic process for PD.

Presenter(s): Sidney Bennett
Authors: Sidney V Bennett, James C Boothroyd, Christine W Miller
Faculty: Christine Miller

Effect of Weapon Autotomy on Mating Behavior and Resource Allocation

Male-male competition, or the conflict between males of the same species for access to mating opportunities, is often focused around scarce or ephemeral resources. Competition requires a significant resource investment and can be modulated by different aspects of mating behavior, such as duration and latency to mate, in addition to physical changes like weapon loss. In the leaf-footed cactus bug, Narnia femorata, hind limbs are used as weapons to engage in male-male competition. These limbs can be lost deliberately, in a process called autotomy. Weapon loss has been shown to cause a reinvestment of resources into other traits that aid in male-male competition, specifically increased testes mass. We tested the effect of weapon autotomy on latency to mate and ejaculate size in N. femorata. The left hind leg of males was randomly autotomized at the penultimate development stage, and individuals were paired with non-autotomized females. The latency to mate, mating duration and spermatheca contents of the females were then recorded. Autotomized males did not have significantly larger ejaculates than non-autotomized males, although more research is needed to confirm this.

Presenter(s): My'Tesha Benson
Authors: My'Tesha Benson, Dr. Robert Martin Caudle, Dr. Bruna Balbino De Paula
Faculty: Robert Caudle

The effects of CGRP-Bot on pain sensing neurons

Trigeminal neuralgia is considered the most painful condition one can experience and due to poor efficacy of current therapies new therapeutics are needed. Earlier efforts toward the disease were focused on investigating the condition and how to measure its severity in patients; now, research has shifted to furthering the understanding of pathogenesis and developing effective pain management therapeutics. Our research aims to develop a novel analgesic agent, conjugate of the neuropeptide calcitonin gene related peptide (CGRP) and the light chain of botulinum toxin (Bot), to target pain sensing neurons. This agent inhibits neurotransmitter release and blocks the transmission of signals up the neuraxis, which blocks pain transmission. CGRP is a neuropeptide that has been demonstrated to mediate pain in the head and face. Several novel therapeutics for migraine headaches currently target CGRP. The CGRP/botulinum light chain conjugate targets the light chain to neurons that express receptors for CGRP, thus selectively blocking neurotransmission in those sensory neurons. The data collected during this project demonstrated antinociceptive effects of the conjugate in rodent models of TN, but the duration of its actions outlasted the duration of the pain in the models. This prevented evaluation of the full time course of its actions.

Presenter(s): Reed Berkowitz
Authors: Reed L. Berkowitz, David A. Ostrov
Faculty: David Ostrov

COVID drugs are not prepared for future coronaviruses or SARS-CoV-2 variants.

Due to the inevitable future emergence of a new coronavirus and further mutations of SARS-CoV-2 variants, currently available drugs for COVID will continue to lose efficacy. Thus, the use of these highly specific antivirals should be reconsidered. Research and development should focus on antivirals that do not target protein structures and mechanisms specific to SARS-CoV-2 or its variants. The COVID antiviral toolkit should be updated with broader-spectrum antiviral combination drugs targeting multiple distinct points in parts of the life cycle shared by all coronaviruses. This will likely increase drug efficacy while decreasing the risk that drug-induced mutations, natural mutations, or new coronaviruses render such an antiviral combination ineffective. Ideally, new antivirals work by making host cells nonpermissive to replication, rather than targeting the virus itself.

Presenter(s): Darshna Bhatt, Fransisco Somarriba, Vina Molleti
Authors: Darshna Bhatt, Fransisco Somarriba, Vina Molleti
Faculty: Frederick Kates

The Implications of Virtual Reality on Surgical Outcomes

Achieving the best possible surgical outcomes is a collaborative process that involves both the patient's medical care team and the patient themselves. In relation to the medical team, proper training and skills practice are crucial to performing successful surgeries. Alarmingly, recent studies suggest that there are real deficits in medical training such that a study done by the University of Michigan found that only a little over 30% of physicians were able to perform the Core procedures with near independence at the end of their residency (George et al., 2019). Additionally, studies have shown that surgical procedure-related anxiety "is common and perceived by many patients as the worst aspect of the surgical episode" (Eberhart et al., 2020). In recent attempts to improve both healthcare training and patient treatment experience, virtual reality (VR) technology has become a promising field for study. This study aims to use data from VR interventions in physician training, pre-operative interventions, and use during operation to understand the impacts of VR technology on surgical outcomes.

Presenter(s): Nidhi Bhide
Authors: Nidhi S. Bhide, Taylor Combs Judkins, Wendy Dahl
Faculty: Wendy Dahl

Breakfast-skipping in college students and its relationship to the prevalence of menstrual and gastrointestinal symptoms.

Diet is an extremely important part of an individual's life, and breakfast is a vital component of our daily diet. However, despite not knowing what physiological processes could be affected by the habit of breakfast-skipping, it is a common habit for adolescents and young adults. It is possible that essential nutrients, such as fiber and vitamins, are consumed at lower levels in individuals who skip breakfast, since many breakfast foods are good sources of these essential dietary components. This could influence many bodily processes that are prone to nutrition-related changes. Therefore, additional research exploring U.S. breakfast patterns and physiological discomfort are needed. Thus, the aim of this study is to investigate if skipping breakfast relates to the prevalence of menstrual and gastrointestinal symptoms in college students at the University of Florida. A Qualtrics survey that included sections on dietary habits, menstrual health, and the Digestion-associated Quality of Life Questionnaire (DQLQ) was created and distributed to graduate and undergraduate students who agreed to participate. Although data collection and analysis are ongoing, it is hypothesized that participants who skip breakfast will rate their menstrual and GI discomfort higher than those who do not.

Presenter(s): Macie Binda
Authors: Macie Binda, Garrett Ellward, Michael Bucher, Dominika Dzurny, Daniel M Czyz
Faculty: Daniel Czyz

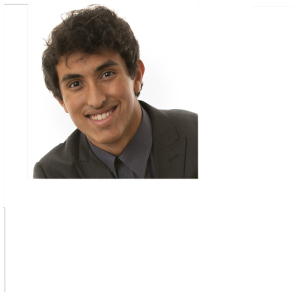
<u>A Screen of Traditional Chinese Medicinal Plant Extracts Reveals Herbs with Antimicrobial Properties</u>

Antimicrobial resistance (AMR) is a global public health crisis and the emergence of multidrug-resistant pathogens continues to rise. The rapid progression of AMR calls for novel and effective treatments against these persistent bacterial pathogens. Non-traditional antimicrobial approaches are necessary to combat these organisms. Practices of Traditional Chinese medicine (TCM) have been used historically for the successful treatment of numerous infectious diseases. However, there is a lack of development in plant-derived antibacterial drugs for use on the market. Thus, this study aims to explore alternatives in fighting against antibiotic-resistant bacteria, through the screening of a comprehensive collection of TCM extracts available from the National Cancer Institute. We employed a library of 768 extracts from 132 unique TCM plants in a screen for antibacterial properties against gram-negative Escherichia coli and gram-positive Micrococcus luteus. The extracts that displayed antibacterial properties were further tested against two additional bacterial pathogens: Staphylococcus aureus and Staphylococcus epidermidis. We found that extracts from 29 traditional Chinese herbs exhibit potent antibacterial properties. All 29 traditional Chinese herbs displayed a mode of inhibition against gram-positive bacteria only, with 25 being unique species of the TCM collection.

Presenter(s): Jordan Bishman
Authors: Jordan A. Bishman, Maura M. McGraw, Bradford W. Daigneault
Faculty: Bradford Daigneault

Embryo complementation as an alternative cloning strategy drives trophoblast stem cell development through multiple passaging

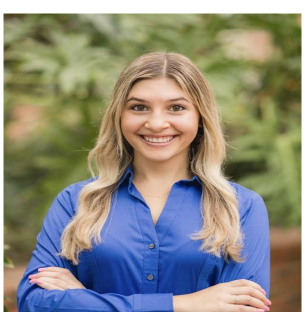
Current methods to obtain bovine embryos of high genetic merit include low efficiency cloning strategies that require skilled technicians. The overall goal herein was to identify alternative methods for producing identical embryos through blastomere complementation. To achieve this goal, bovine oocytes were matured for 24 hr and fertilized with bull sperm. Following fertilization, 4-cell embryos were split such that two individual blastomeres (cells) were co-cultured in single wells to determine the ability for continued embryo blastocyst development. Newly formed 2-cell complements were returned to incubation at 5% CO_2 and 10% O_2. A second passage of complement embryos was achieved by splitting 4-cell embryos from the first complementation to achieve duplicate 2-cell complements. First passage complementation yielded 25% blastocyst efficiency (27/106). Second passage complementation yielded 29% blastocyst efficiency (23/78). Immuno-staining of fixed complements suggest that embryos produced from multiple passages have compromised cell lineage specification as evidenced by a reduction in SOX2 expression, a marker of inner-cell mass (fetal) development. These results provide an alternative strategy for producing genetically identical bovine embryos while suggesting that passaging drives trophoblast lineage specification towards a model conducive to embryo stem cell applications.



Presenter(s): Nick Blumenthal
Authors: Nicholas Blumenthal, Malcolm Maden
Faculty: Malcolm Maden

Characterization of Immune Signaling in A. cahirinus and M. musculus in Response to Skin Wounding

Prior studies detail the unique regenerative capability of the African spiny mouse Acomys Cahirinus that lacks distinct scarring observed in mammals across tissues including skin, muscle, spinal cord, and heart. As such, delineating mechanisms which confer regeneration offer an opportunity to understand and extrapolate to non-regenerating mammals such as humans. Through comparative analysis of skin wounds between regenerative Acomys and non-regenerative relative Mus Musculus, assays characterized variations in immune signaling. Numerous pro-scarring cytokines were detected in Mus wounds relative to Acomys, demonstrating minimal inflammatory activation. Assays were performed to investigate whether respective wound environments are inhibitory to dermis skin cell migration. Mus wound environments impeded cellular migration relative to equivalent protein concentrations of Acomys wound environment. This suggests a lesser activation of immune response contributes to cellular migration in regeneration. These results suggest the regenerative phenotype involves coordination between the reduction of both pro-inflammatory and migration-inhibiting cytokines. Future work will determine the specific molecular pathways affected by observed variations in cytokine signaling that guide regeneration.



Presenter(s): Samantha Boisvert
Authors: Robert Emerson, Samantha Boisvert
Faculty: Robert Emerson

How Marketing of Franchises Through Trademarks Fares in an Interconnected World

Franchises dominate the global economy, prompting the question of how to balance uniformity with international markets, and whether this is feasible today. Specifically, the use of trademarks as consumer points of reference is being challenged in the rise of global markets and new spaces on the internet. Current international agreements on trademarks are outdated, and there is a clear lack of congruent laws governing franchise operations both domestically and internationally. When analyzing whether franchise trademark usage abroad, one must question whether operational differences are violative of franchisees' rights and social norms, including consumers' notions of a franchise or product. Further, franchises now must navigate unprecedented markets to utilize the internet and expand globally. These challenges have manifested in a global franchise market with unclear rules and guidelines, which has complicated and intensified the need for franchises to protect their trademarks. This paper concludes that new international agreements are necessary in order to maintain uniformity and consumer notions of trademarks associated with franchises. The implementation of Most-Favored Nation clauses in franchise contracts can be used to ensure uniformity is protected and enforced. Conversely, lawmakers can amend trademark laws, broadening the trademark in the global economy and on the internet.

Presenter(s): Emilie Bonilla
Authors: Emilie Bonilla, Yafang Li, Zhijian Qian
Faculty: Zhijian Qian

The role of ALKBH5 in AML1-ETO induced leukemogenesis

Acute Myeloid Leukemia (AML) is an aggressive form of cancer that originates in the bone marrow, and affects production of blood cells. The 5-year survival rate for adults diagnosed with AML in the United States is only 26%, causing a need to garner a better understanding of the disease. ALKBH5 is an RNA demethylase known to function as an oncogene in certain types of cancer, including some leukemias. Prior studies have indicated that upregulation of ALKBH5 is linked to poor patient prognosis in certain leukemic populations. The goal of this project is to elucidate the role of ALKBH5 in AML1-ETO-induced leukemogenesis. Our preliminary experiments showed that ALKBH5 knockdown by ALKBH5-specific shRNA in human cell lines with expression of AML1-ETO significantly inhibited cell growth and induced apoptosis. In addition, genetic deletion of Alkbh5 markedly suppressed the colony-forming ability of mouse primary hematopoietic stem/progenitor cells transduced by AML1-ETO. We aim to further investigate the role of ALKBH5 in AML1-ETO-induced AML in vivo. The results of this project are still pending further investigation. Our study provides a better understanding of the molecular mechanism that contributes to leukemogenesis in AML.

Presenter(s): Kiara Bookman, Gerardo H. Nunez
Authors: Kiara Bookman, Gerardo H. Nunez
Faculty: Gerardo Nunez

Root Tracing: interpreting seasonal root growth patterns in blueberries through image analysis

Roots play an integral part in plant growth. Plant roots take up nutrients and water from the surrounding soil. Over time, plants grow a larger number of roots to forage for more resources from the surrounding soil. These patterns of seasonal root growth are important because they help growers understand how plants are influenced by seasonal changes. Here we analyzed plant roots to determine overall root growth and seasonal patterns. Blueberry (Vaccinium corymbosum interspecific hybrids) root images were gathered from two varieties named Emerald and Farthing. We used a minirhizotron (CI-600 In-Situ Root Imager) from 2019 until 2021. Each plant was scanned nine times within the year to document its growth through varying seasons. These scans contain images of visible roots that are pressed towards the image screen to evaluate the root growth rate. To trace the root length, an image is selected from the minirhizotron. Then, the image is edited through an iPad. The roots are traced with a green digital marker to follow growth length. After completion of image tracing, root length data is analyzed with RhizoVision software and compared between the two varieties to determine seasonal changes on blueberry root growth.

Presenter(s): Warren Boschen
Authors: Warren Boschen, Thomas H. Mareci
Faculty: Thomas Mareci

Modeling Extracellular Free Water by Spherically Averaging Diffusion-Weighted Signal

Neuroinflammation is associated with reactive gliosis responding to central nervous system pathology, which causes changes in tissue microstructure and in the volume fractions of interstitial and intracellular water. Diffusion-weighted magnetic resonance imaging (DW-MRI) can detect such changes in tissue microstructure and water content, but simple models of tissue diffusion are unreliable since the number of white matter (WM) fibers within an image-voxel is large and axonal structure is complex. Modeling DW-MRI results from complex tissue is simplified by spherically averaging all directional diffusion measurements to remove the angular dependence. An important assumption underlying this approach is that the WM axons in a voxel have a relatively uniform caliber and are axially symmetric. With these assumptions, a two-compartment model can estimate microstructure and water content. Based on published spherical-averaging algorithms, we are developing MATLAB code to replicate and improve upon tissue-modeling approaches. We use higher diffusion-weighted data to model tissue microstructure, then use that result along with lower diffusion-weighted data to fit water content changes. We show initial results and compare them against previous modeling approaches. This work will provide better localization of neuroinflammation to guide MR spectroscopy of tissue metabolites.

Presenter(s): Adam Bouhamdan, Dr. Ara Jo
Authors: Ara Jo, Adam Bouhamdan, Lisa Scarton, LaToya O'Neal, David Cheng
Faculty: Ara Jo

Mortality Rates of Comorbidity Patients With Breast Cancer and Type 2 Diabetes

Comorbidity became more prevalent, particularly in young cancer patients. Studies have shown that patients diagnosed with type 2 diabetes (T2D) possess a higher risk of developing cancer. However, there is a lack of studies analyzing the risk or morality that is associated with a cancer diagnosis and T2D comorbidity. The purpose of this study was to compare the mortality rate between cancer only patients and comorbidity cancer patients with T2D. Descriptive analysis was conducted with bivariate analyses. Cox Proportional Hazard Survival regression was used to assess mortality rates in addition to the Kaplan-Meier curve. Non-Hispanic White was dominant in both groups while a higher proportion of minorities was served in comorbidity patients ($p<.01$). Those with comorbidity showed lower education attainment ($p<.01$) and lower income level ($p<.01$). More than 80% of comorbid patients was overweight or obese ($p<.01$). Lower survivorship was observed in the Kaplan-Meier curve; however, it was not significant. Hazard Ratios from unadjusted and adjusted models were not statistically significant (unadjusted HR: 1.20, 95% CI: 0.96-1.51, adjusted HR: 1.16, 95% CI:0.78-1.71). The finding showed no significant risk for comorbid patients with T2D compared to previous studies. They may be managed well by clinicians due to treatment or postoperative management.

Presenter(s): Kendall Breland
Authors: Kendall Breland, Amelia Westmoreland, Tracey Schafer, Todd Osborne
Faculty: Todd Osborne

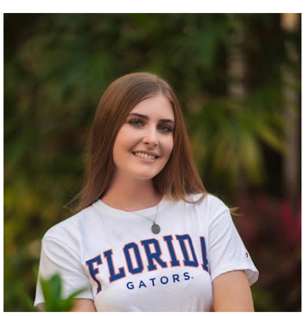
Physiological Attributes of Freshwater Bivalves as a Tool for Bioremediation in Florida's Freshwater Systems

Freshwater clams and mussels can be utilized in bioremediation efforts, but before that can happen there needs to be an understanding of their clearance rates. A plethora of research has been done regarding saltwater clams and mussels and their filtration rates, but there is a stark lack of research on freshwater clams and mussels. Three species of freshwater clams and mussels (Anodonta couperiana, Elliptio ahenea, and Corbicula fluminea) were collected in an effort to discover their filtration rates. Each species was exposed to varying amounts of algae and the concentration of chlorophyll and BGA was recorded over a three-hour span. Findings demonstrated a preliminary conclusion that the species Anodonta couperiana had the quickest clearance rate comparatively. However, a consistent clearance rate was unable to be calculated as the data collected demonstrated that the concentration of chlorophyll/BGA added had a direct impact on clearance rates of these species.

Presenter(s): Justin Broce, Dion Ming
Authors: Cameron Celeste , Dion Ming , Justin Broce, Diandra P. Ojo , Emma Drobina , Adetola F. Louis-Jacques , Juan E. Gilbert , Ruogu Fang, Ivana K. Parker
Faculty: Ivana Parker

Ethnic Disparity in Diagnosing Bacterial Vaginosis using Machine Learning

While machine learning (ML) has shown great promise in medical diagnostics, a major challenge is that ML models do not perform equally well among ethnic groups. This is alarming for women's health, as there are already existing health disparities by ethnicity. Bacterial Vaginosis (BV) is the most common vaginal syndrome among women of reproductive age and has clear diagnostic differences among ethnic groups. Here, we investigated the ability of five ML algorithms to diagnose BV. We determined the fairness in prediction of asymptomatic BV using 16S rRNA sequencing data from Asian, Black, Hispanic, and White women. ML model performances varied based on ethnicity. Hispanic women had the highest false positive rate, while Asian women had the highest false negative rate. Models generally had the highest performance for White women and lowest for Asian women. These findings demonstrate a need for improved methodologies to increase model fairness for predicting BV.



Presenter(s): Isabella Brush
Authors: Isabella Brush, Dr. Yang Lin
Faculty: Yang Lin

Impacts of biosolids application history and rate on soil phosphorus leaching loss

Soil phosphorus (P) leaching has great potential to increase P levels in local water ways and groundwater in Florida soils, impacting local water usage (Campbell, 1995;

Mylavarapu, 2009). Therefore, establishing a relationship between biosolids application, P movement, and the overall impact on water is vital to protecting our natural environments. Soil P Saturation Capacity (SPSC) has the potential to estimate P lost from soils to waterways (Dari et al., 2018). However, SPSC has not been extensively evaluated in biosolids-affects systems, where biosolids introduce external P, aluminum, and iron. The goal of this research project was to utilize SPSC to predict the potential for P leaching from biosolid-impacted soils. This was tested by simulating six weekly rainfall events on A horizon samples each treated with a different biosolid. The leachate was analyzed for soluble reactive and total P concentrations (EPA, 1978). The soil was also extracted with Mehlich-3 to be analyzed to calculate SPSC value (Dari et al., 2018). Analysis will then be done using inductively coupled plasma atomic emission spectroscopy (ICP-AES; EPA, 1994). This allows us to interpret the concentrations of each element based on the spectrometer results and use the values to calculate SPSC.

Presenter(s): Lucas Budd
Authors: Lucas R. Budd, Gordon S. Mitchell, Alexandria B. Marciante
Faculty: Gordon Mitchell

Prolonged Red Light Disrupts Circadian Hormones Associated with Phrenic Neuroplasticity

Acute intermittent hypoxia (AIH) is a therapeutic for neural injury that elicits phrenic long-term facilitation (pLTF). Melatonin and corticosterone are light-sensitive hormones that regulate neuroplasticity and molecules necessary for pLTF, particularly adenosine. We investigated the impact of dim red light on pLTF. We hypothesized that prolonged exposure to low-intensity red light during the active/dark phase (rLEN) impacts adenosine levels. Male Sprague-Dawley rats were housed in a 12 on/12 off light cycle in 3 different light conditions: normal-cycle; reverse-cycle; or reverse-cycle with rLEN (32 Lux). Serum samples were collected at mid time-points in the daily rest/active cycle (i.e. 12PM and 12AM). ELISAs were used to quantify melatonin and corticosterone levels; an adenosine assay was used to quantify spinal adenosine. During the midactive phase, melatonin levels were significantly reduced in rLEN rats ($p<0.050$) vs rats in normal and reverse cycle housing. Spinal adenosine was significantly lower in the rLEN rats ($p<0.001$). Corticosterone levels were significantly lower with rLEN ($p<0.050$). Corticosterone during the midrest phase in the normal and reverse cycle were similar, but was significantly elevated in rLEN rats (p=0.022). This investigation indicates low intensity rLEN during the active phase disrupts light-sensitive & stress-related hormones.

Presenter(s): Jordan Buisch
Authors: Jordan Buisch, Julia St. Amant, Cameron Jack
Faculty: Cameron Jack

Testing the Efficacy of Indoxacarb Against Small Hive Beetle (Aethina tumida), a Honey Bee (Apis mellifera) Pest

Small hive beetles (SHB), Aethina tumida, are frequent invaders of honey bee (Apis mellifera) hives. They create issues for beekeepers and colonies by consuming honey bee products, including brood, pollen, honey, and comb. The purpose of this project is to assess the toxicity of indoxacarb, a common form of roach bait, against SHB and honey bees. Indoxacarb was applied to SHB both topically and through pollen. The chemical was applied orally via pollen and demonstrated no significant mortality. Similarly, topical application demonstrated no significant mortality. Indoxacarb was also applied topically to honey bees to assess its risk to honey bee health and demonstrated significant mortality to honey bees. More research is needed to determine the risk of indoxacarb to honey bees via oral exposure. Low mortality rates among SHB combined with high mortality rates among honey bees indicate indoxacarb's ineffectiveness as a possible treatment for hives infested with SHB. This study provides valuable information on effective methods of SHB control while maintaining honey bee colony health. Future research that analyzes the toxicity of chemicals against SHB is required for the proper management of honey bee colonies.

Presenter(s): Aidan Burchard
Authors: Aidan Burchard, Dr. Elizabeth Johnson, Dr. Esther Mullens
Faculty: Elizabeth Johnson

Analyzing Survey Data from UF Students About Knowledge of Climate Change

Climate Change is ongoing, and likely to intensify in terms of its magnitude and impact throughout the coming years. Although University of Florida (UF) student's lives and possibly careers may be impacted by climate change, some misconceptions may still remain. In 2010, Yale University conducted a survey on climate change knowledge, and with their permission, questions from this survey were given to UF students in the Fall of 2022. Results from this new survey (N=198) will be used to determine UF student's knowledge on this subject and if knowledge about climate change has evolved since 2010. We found that students answered questions correctly more often than U.S. adults did in 2010. Further, students who reported being certain of the reality of climate change scored significantly higher on average in their knowledge than those who reported being less sure, at $\alpha = 0.05$. Additionally, students who had more confidence in their own views scored significantly higher on average, independent of their views. Additional results will be discussed, including avenues for further work.

Presenter(s): Sergio Bustamante
Authors: Sergio Bustamante, Cameron Anderson, Toshi Nishida
Faculty: Toshikazu Nishida

Design and Integration of Flexible Printed Thermocouples for Heat Stress Monitoring Systems

The continuing trend of rising global temperatures has drawn attention to the increasing need for heat stress monitoring devices for a diverse demographic. This phenomenon has widened the scope of these applications, effectively broadening the susceptible population while putting vulnerable populations at an even greater risk of heat related incidents. Our team aims to address this issue by using flexible hybrid electronics— a universally adaptable solution combining silicon and printed electronics to develop a system capable of conforming seamlessly to the body of the user. Our rigid prototype uses a temperature sensor TI reference design in tandem with four screen-printed thermocouples to deliver environmental temperature readings to a device via Bluetooth. The TI reference design includes an on-board microcontroller, the firmware of which is adapted to receive the thermocouple inputs for processing and calculation of the temperature reading. The rigid demonstrator provides proof of concept for the subsequent fully flexible design, with the eventual goal of integrating multiple flexible sensors to capture vital signs of heat stress. The necessary processing circuitry will be replicated on the same substrate used to create the printed thermocouples, creating a flexible system suitable for everyday use.

Presenter(s): Mia Cabrera
Authors: Mia Cabrera
Faculty: Patrick Inglett

Using Enzymes to Evaluate Bioavailability of Dissolved Organic Phosphorus in an Everglades Stormwater Treatment Area

Since the Green Revolution, nutrient pollution has become a widespread and challenging environmental issue. In Florida, excess amounts of phosphorus (P) unbalance entire ecosystems. In order to reduce P inputs to the Everglades, several man-made wetlands (Stormwater Treatment Areas, STAs) were constructed to remove P from the surrounding watershed inflows. Currently, the main form of P removed is phosphate, leaving dissolved organic P (DOP), which needs to be converted into soluble reactive P (SRP) to be removed. Microbial communities in soil and water columns produce enzymes (phosphatases) which hydrolyze DOP releasing phosphate. Prior research has demonstrated that adding enzymes to samples can reveal the forms and abundance of bioavailable organic P. This study examines the way proteases and phosphatases (monoesters and diesters) interact with different dissolved organic matter sources in STA 3/4 to release soluble reactive phosphorus. Results suggest that protease inhibits diesters in all cases and how it reacts to monoesters depends on the source of the dissolved organic matter. Based on these findings, the type of DOM can have effects on the DOP in the STA, and further studies should be done to determine the mechanism of this interaction to find new ways to reduce overall P.

Presenter(s): Reinaldo Cabrera Perez
Authors: Reinaldo Cabrera Perez, Eleonora Rossi, Ester Navarro, David Cañarte
Faculty: Eleonora Rossi

Connecting the dots: Social Network approaches to capture variability across the lifespan of bilinguals and its consequences for cognition

The need to communicate is a ubiquitous experience for humans, from infancy to older age. Recent research has sought new methods to describe the variability of bilingual language experience through measures to evaluate and characterize individual differences in bi/multilinguals and how they use language in different communicative and social contexts. The present study adds to the emerging area of research that investigates bilingualism through the lens of PSN looking at relationships between bilingual language use and social use of their two languages (i.e., Spanish, English) in different social settings, and over the lifespan of a bilingual speaker. The main goal of this study is to understand if language(s) use shapes individuals' social networks (SN). A total of 51 Spanish/English bilinguals were tested. Participants were asked to complete a series of behavioral measures to assess their cognitive control and an extensive SN interview that probed the SN from ages (0-13) and (14-present). The findings provide evidence that participants' SN play an important role in their performance on cognitive control tasks and how their network fluctuates across their lifespan.

Presenter(s): Valerie Cabrera
Authors: Valerie Cabrera, Sylvain Doré
Faculty: Sylvain Doré

Evidence That Subarachnoid Hemorrhage Can Be a Risk Factor for the Etiopathology of Alzheimer Disease

Alzheimer Disease (AD) is a neurological disorder characterized by mental decline and forgetfulness. AD is associated with an overabundance of Aβ plaque deposition in the brain. It has been hypothesized that subarachnoid hemorrhage (SAH), a type of stroke caused by bleeding into the subarachnoid space, can be a risk factor for AD development. This systematic review surrounding the etiology of SAH and AD aimed to determine whether patients who experienced SAH were at greater risk for developing AD. It was found that SAH survivors did have increased risk of AD. Two main factors were found to link SAH to AD: ApoE4 and cerebral amyloid angiopathy (CAA). The ApoE4 gene is a significant risk factor for AD development and SAH, as it causes the deposition of Aβ. CAA is a cerebrovascular disorder caused by the accumulation of Aβ in the leptomeninges and cerebral blood vessels. CAA was found to be connected to both SAH and AD, as it can be the underlying cause for both pathologies, suggesting that CAA may be the underlying prognostic link from SAH to AD. These results suggest that SAH may be a risk factor for AD development and onset, as both underlying acute and chronic pathologies.

Presenter(s): Thomas Caligiure
Authors: Thomas Caligiure, David Tanner, Alex Hipp
Faculty: David Tanner

Characterization of a 2-4 GHz Microwave Cavity in the Search for Dark Matter

One of the most pressing questions at the forefront of physics today is the nature of dark matter. One candidate is the axion, which was initially proposed as an explanation to the strong charge parity problem in quantum chromodynamics. To find this particle, the Axion Dark Matter eXperiment (ADMX) uses resonant cavities to detect the axion's decay into two photons. Different versions of these cavities are constructed and tested to optimize the design and ensure the main experiment can reach high sensitivities. Each prototype is tested and different characteristic parameters are measured. The data is analyzed using the python programming language via Jupyter notebooks. The data is compared to previous generations and aids in the design of the next generation cavity. This procedure was used on multiple cavities of different geometries made of copper or aluminum. It was found that certain components of the cavity lowered the quality factor Q, a measure of how lossless a cavity is. These components and designs are then updated in new cavity generations.

Presenter(s): Allison Cama
Authors: Allison Cama, Akbar Nawab, Linda Lou, Maria Guijarro, Maria Zajac-Kaye
Faculty: Maria Zajac-Kaye

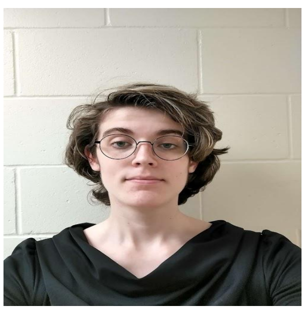
Effect of Thymidylate synthase inhibitors in pancreatic ductal adenocarcinoma.

Pancreatic Ductal Adenocarcinoma (PDAC) remains a lethal, RAS-driven cancer with the incidence increasing 60% over the last decade. Current chemotherapy does not produce an extension in survival and results in drug resistance. Thymidylate synthase (TYMS), an enzyme involved in DNA synthesis and repair, plays a direct role in promoting tumorigenesis. Overexpression of TYMS cooperates with mutant KRAS to accelerate tumor progression of PDAC. This paper aims to discuss the antitumoral effect of the TYMS inhibitor, Compound P, recently identified by the Zajac-Kaye Laboratory. To establish the cytotoxicity of the TYMS inhibitor we utilized two PDAC cell lines PANC-1 and MIA PaCa-2. We utilized a NOD/SCID (Nonobese Diabetic/Severe Combined Immunodeficiency) gamma mouse model, known as NSG mice, to study the antitumoral effect of 100 mg/kg Compound P when injecting Luc PANC-1 cells subcutaneously. Immunoblot analysis was conducted to assess the levels of TYMS. We utilized a KRAS mutant genetically engineered mouse model (GEMM) to further study the effect of 100 mg/kg Compound P. We determined that Compound P results in prolonged survival and control of PDAC progression.

Presenter(s): Andrea Camacho-Betancourt
Authors: Andrea Camacho-Betancourt, Katie Basinger-Ellis, Sean Niemi
Faculty: Katie Basinger-Ellis

Continuous Improvement of an Experiential Learning CNC Manufacturing Lab Course

Engineering students seek experiential learning opportunities to combine knowledge and theory with practical applications. This work addresses the creation and continual improvement of a hands-on computer-numerical-control (CNC) manufacturing course developed in collaboration with Autodesk Inc. to aid students in their experiential learning journey. Course structure includes: 1-hour of instructor-led lecture, 2-hours of hands-on lab, and 2-3 hours of at-home computer-aided design/manufacturing (CAD/CAM) per week. Students first manufacture an air engine using a CNC milling machine followed by a live assessment to prove proficiency on the machine. Then students create a maze and 1-2 projects of their choice. Course improvements include immediate exposure to CNC machining and increased assignments to measure students' performance. We analyze these improvements using a series of surveys and compare results to previous semesters. As a result, we expect a more rapid increase in perceived CNC knowledge and higher perceived usefulness of assignments.



Presenter(s): Valerie Campbell
Authors: Valerie Campbell, Jacob Herschberger, Eduardo Calixto, Phil Hahn
Faculty: Phil Hahn

Chemical defenses of Solanum carolinense in relation to herbivore stress and resource availability

Plants must acquire resources to grow while simultaneously protecting themselves from attack by herbivores. Because plants have limited resources, they must defend at a cost to growth. The herbivore pressure hypothesis predicts that plants growing in high-resource environments should be more defended because herbivore activity is also expected to be high, whereas the resource availability hypothesis predicts that plants growing in low-resource environments should be more defended because damage is less tolerated. We addressed this question by measuring herbivory and collecting leaves of Solanum carolinense (Solanaceae) from 12 southern USA (high-resource) and 15 northern USA (low-resource) sites. Chemical assays were performed on leaves for glycoalkaloids, which are toxic to insect and mammalian herbivores. As expected, herbivory damage was greater in the southern compared to northern sites. We found that S. carolinense in northern populations had slightly higher concentration of glycoalkaloids compared to plants growing in southern populations. These results support the resource availability hypothesis because defense is prioritized in low-resource environments in the northern USA despite low rates of herbivory. Therefore, S. carolinense populations are primarily adapting to resource availability, rather than herbivore pressure, across its geographic range.

Presenter(s): Lily Cao, Mojdeh Faraji, Jennifer L. Bizon, Barry Setlow
Authors: Lily Cao, Mojdeh Faraji, Jennifer L. Bizon, Barry Setlow
Faculty: Barry Setlow

Optogenetic Inhibition of the Ventral Hippocampus During Punishment Increases Risk Aversion

The ventral hippocampus has been linked to approach-avoidance conflict, but it is unclear how the ventral hippocampus is involved in risky decision making, which involves probabilistic negative outcomes. In order to understand the contributions of the ventral hippocampus to risky decision making, rats were trained in operant chambers on the “risky decision-making task” (RDT). In the RDT, rats made a choice between two levers: one that delivered a small, “safe” food reward and the other that delivered a large, “risky” food reward that was accompanied by varying probabilities of mild footshock. Optogenetic inhibition was conducted during discrete phases of the task in separate sessions. Depending on rats’ choice on each trial, three outcomes were possible: delivery of the small, safe reward; delivery of the large reward without footshock (large, unpunished reward); and delivery of the large reward with footshock (large, punished reward). Inhibition of the ventral hippocampus during receipt of the large, punished reward led to a reduction in choices of the large, risky reward. These results indicate that ventral hippocampus is involved in encoding information about the magnitude or frequency of punishment relative to the large reward. More broadly, these results provide evidence for a causal role of temporally-discrete ventral hippocampus activity in cost-benefit decision making.

Presenter(s): Kyra Carney
Authors: Kyra Carney, Yasmin Araujo, Sylvain Doré
Faculty: Sylvain Doré

Comparison of Market Iron Chelators for Treatment of Iron Overload Post–Traumatic Brain Injury

Traumatic brain injury (TBI) is a known threat to global public health as it contributes to many negative downstream effects. Iron overload is a key agent in worsening severe neurological deficits that occur in TBI patients. Thus, it is important to evaluate treatments capable of alleviating iron overload and the subsequent cellular damage and apoptosis. We are interested in the nuance of iron overload in varying cell types within the body and the effectiveness of current iron chelators. These chelators were compared to the effectiveness of iron chelator, HBED. HBED demonstrates clinical potential due to multiple factors, especially its ability to diffuse across the blood-brain barrier. A controlled-cortical impact model of TBI was induced in two groups of wild-type mice. Mice were injected with HBED directly after induction of TBI, 12h after surgery, and twice per day for 72h. The brains were sectioned and histologically stained. The results revealed that HBED treatment significantly increased white matter integrity after TBI and a thicker corpus callosum was observed compared to control mice. HBED should be considered a candidate for future research as a treatment post-TBI, holding the potential to translate to other neurological conditions in which supraphysiological iron levels are present.

Presenter(s): Nolan Carney
Authors: Nolan Carney
Faculty: Laura Dedenbach

Green Spaces and Sustainability

In the current day, public safety is becoming more important to ensure the protection of citizens and communities well-being. At the center of this concept is the idea of where green space is placed in cities and communities. Green space has been noted to have lowering impacts on crime within cities. Within this research, the focus was on three Gainesville locations analyzing their crime rates and seeing if there was a connection to CPTED. Sites were reviewed on CityProtect, a neighborhood crime map as well as through field observations to gain a personal perspective. Additionally, case studies looking at green spaces and their impacts on crime rates were used. Concluding the research, it was found that in Gainesville the three sites that were located closest to green spaces had reduced rates of crime when compared to those that were not. Additionally, the City of Gainesville had implemented CPTED practices within these areas contributing towards public safety. Continuing into the future, the impact green space can have on our communities is integral towards fostering an equitable environment.

Presenter(s): Stuart Case
Authors: Stuart Case, Sarah Collins MPH, Dr. Elizabeth Wood DHS, MPH
Faculty: Elizabeth Wood

Bolstering Intercultural Competency in Students Through a Global Health-Based Virtual Exchange: A Qualitative Follow-up Study

As public health expands in global impact, the need to develop intercultural competency for students grows. One initiative to promote global awareness is virtual exchange (VE) programs. VE programs promote collaborative online international learning; however, there is little research around long-term impacts of these programs. Undergraduate pre-health students from the U.S. who participated in a VE program were interviewed about their experience with Egyptian students. They were asked if their behaviors, skills, or knowledge were impacted and what improvements could be made. Mezirow's Transformative Learning Theory (TLT) served as the theoretical framework, grounding interview development and directed content analysis. Researchers also captured salient themes. Ten students were interviewed with a majority engaging in the two last stages of Mezirow's TLT: “building of self-confidence and self-competence” (60%) and “reintegration” (50%). Other themes were intercultural interactions, VE appreciation, and VE improvements. Students were able to apply lessons they learned during the VE within a 1-year follow-up period. This is beneficial, as health professionals need intercultural competency to improve health outcomes. Results from this study indicate the need for structure when conducting a VE and that changes in instruction should be implemented gradually.

Presenter(s): Catalina Castaño Urrea
Authors: Catalina Castaño Urrea, Charlie Hailey
Faculty: Charlie Hailey

<u>Designing, Making, and the Body Intuitive</u>

Embodied thinking, also termed ‘corporeal intuition,’ is the ability of our bodies to hold knowledge, to be creative, and to be an active participant in the making process. This model challenges the idea that to make is to translate something that exists only in our minds into something that exists tangibly outside of the human body. Rather, the experience of making is an integral relationship between mind and body, the body and object of work, and the hand and material. Through a series of ceramic and woodworking exercises, each with increasing scales and complexities, this research explores experiences of making to understand how the material is an active part of the thinking and making process and then speculates how this process relates to architectural education. Research methodology tracks each exercise’s steps from beginning to end, and then rigorously analyzes the roles that each material’s properties play in the process. Thinking through making raises architecture students’ awareness of all the forces that are part of a design project from concept through to final built work, and the final phase of this research looks at how specific exercises (derived from this project’s methodology) foster embodied thinking for a more holistic design process.

Presenter(s): Brandon Causing, Kristina Suarez, Ryan Elkind
Authors: Brandon Causing, Kristina Suarez, Ryan Elkind, Jason Cory Brunson
Faculty: Jason Brunson

Quantification of Lobular Structure in Murine Glomeruli

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 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 create representative Reeb graphs, we then computed extended persistent homology. Finally, we summarized select cycle features using skewness and the Gini coefficient and produced their "null" distributions by generating random graphs based on angiogenic mechanisms. Test statistics, for example Gini coefficients of cycle persistences ($p<0.001$) and of outlier scores ($p=0.105$), unexpectedly took lower values on the empirical glomeruli. Ongoing work calculates these values for each empirical glomeruli and compares them to null distributions based on these models. Future work will validate our conclusions on previously diagrammed murine glomerular networks.

Presenter(s): Reed Cecil
Authors: Reed Cecil, Harini Choula, Sylvain Doré
Faculty: Sylvain Doré

Can Circle of Willis Variants Explain the Differences in Ischemic Stroke Incidence and Outcomes?

The Circle of Willis (CoW) plays a crucial role in providing collateral blood flow throughout the brain. Variations in the CoW arteries are common and can have profound effects on the prevalence and severity of stroke. The most common variations are hypoplasia and aplasia, both known as incomplete CoW. This review aims to systematically document how CoW variants can help predict stroke incidence and outcomes and educate the Neuro-ICU attendants on their clinical implications. In the global population, more than half shows variants in the CoW. Overall, poorer anatomical and functional outcomes are observed in ischemic stroke patients with reduced collateral flow and incomplete CoW. This review emphasizes the importance of CoW variants as an independent predictor of stroke outcomes and a potential risk factor for stroke. Variations resulting in decreased collateral flow in the CoW can significantly increase the risk of an ischemic stroke and its severity. Clinical outcome data of CoW variants can shed light on effective practices to improve treatment outcomes. Understanding a stroke patient's unique CoW configuration can help predict the infarcted area, which can promote precision medicine by allowing physicians to better predict the most effective treatment for individual patients.

Presenter(s): Andrea Chacon
Authors: Andrea Chacon, John Lazzari, Muhammad Noman Almani, Shreya Saxena
Faculty: Shreya Saxena

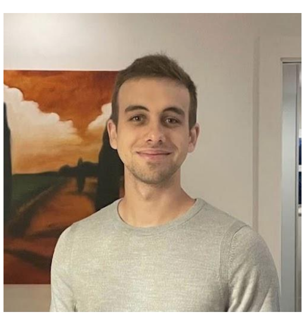
<u>Evaluating Neural Strategies of Mouse Sensorimotor Control Using Deep Reinforcement Learning</u>

The computational principles of motor control such as optimal feedback control have historically been studied using perturbations in behavioral experiments. The correspondence of these strategies with neural data has not been examined in detail due to the lack of data-driven control models for the limb. In this study, we use the right forelimb of an anatomically accurate mouse musculoskeletal model in a feedback loop, and train a recurrent neural network (RNN) as a controller that drives the forelimb through a precise set of experimentally recorded kinematics, given sensory feedback. We find that Deep Reinforcement Learning (DRL) can learn both the simulated and experimentally recorded kinematics well, with a single model achieving high kinematic accuracy across different speeds, while simultaneously achieving high correlations between the recorded neural data and the actor network activity. This allows us to validate the network solutions of the goal driven framework by confirming its accuracy on a well-researched animal species. Ongoing work includes creating parallelized environments in order to speed up training.

Presenter(s): Esha Chakraborti
Authors: Esha Chakraborti, Dr. Melissa Vilaro, Dr. Jeanette Andrade, Fidela Gjondrekaj
Faculty: Melissa Vilaro

Developing a Novel Communal Coping Cardiovascular Risk Reduction Intervention among African American Cancer Survivors

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



Presenter(s): Lars Chapman
Authors: Lars Chapman, Marlon Retana-Cordero, Gerardo H. Nunez
Faculty: Gerardo Nunez

Nutrient Solution pH Responses in Phosphorus Deficient Blueberry Plants

Blueberry plants (Vaccinium corymbosum interspecific hybrids, variety ‘Colossus’) need acidic soil for optimum growth and productivity. Plants release low molecular weight organic acids (LMWOA) that lower the pH of the soil to increase phosphorus availability for uptake. This study aims to measure the pH in relation to changing phosphorus rates in a hydroponic experiment with blueberry. Quantifying nutrient solution pH in a phosphorous deficit allows horticulturalists to study what biological processes occur and create a tailored response for growers to use when a deficiency happens. This study placed 12 plants in a hydroponic system filled with a complete nutrient solution for five weeks. Then, the nutrient solution was changed in half of the plants to be phosphorus deficient, while the other half remained the same for eight weeks. We measured pH using sensors (NeuLog pH logger sensor, NUL-206) and data loggers. We found that pH repeatedly decreased over a few days from roughly 6.0 to 4.2. Results suggest that plants in the experiment produced LMWOA under the phosphorus deficiency stress. LMWOA produced during phosphorus deficiency contributed to the decrease in pH.

Presenter(s): Miaoyan Chen
Authors: Miaoyan Chen
Faculty: Michelle Phillips

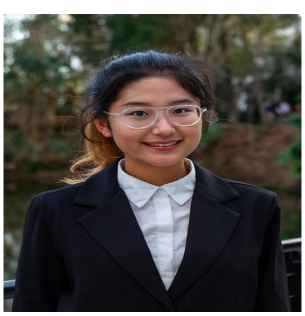
Economic Determinants and Service Provider Indicators of Healthcare Accessibility in the United States

Accessibility to healthcare is defined as receiving coverage when necessary and at an affordable cost. Patients with good access to healthcare are more likely to receive appropriate medical care and maintain good health. This paper evaluates macroeconomic variables and service provider indicators that affect each state's access to healthcare services from 2019 to 2020. Evidence and data will be collected through government organizations, and ordinary least square regression will be applied to interpret the empirical relationship between macroeconomics, healthcare resource variables, and healthcare accessibility. The study comprises a sample of 50 states in the U.S. Previous studies have established that regions with low poverty rates will have better access to healthcare, and healthcare service utilization is higher in elderly populations. My results revealed that mortality rate is associated with real disposable income, poverty rate, income inequality, number of hospital beds, active general surgeons, and median age. Furthermore, the median age is the most critical predictor for this research, as aging can deteriorate health conditions and is highly associated with the demand for healthcare. The findings can be useful to policymakers for addressing poverty reduction, allocating healthcare resources efficiently, and increasing healthcare access to elderly populations.

Presenter(s): Michelle Chen, Stephe Xhafaj, Casey Glymph
Authors: Michelle Chen, Stephe Xhafaj, Casey Glymph, Rachel Liu-Galvin, Frederick Kates, PhD
Faculty: Frederick Kates

<u>VirtuSense: An Innovative Fall Prevention System for Elderly Individuals in Enhancing Safety and Independence</u>

VirtuSense is an emerging artificial intelligence (AI) company that manufactures two devices called VSTBalance and VSTAlert to provide long-term fall prevention and at-home virtual physical exercises to train balance. Both devices are used in hospitals, skilled nursing facilities, acute care, and independent living situations. With a 73% success rate in preventing falls, VSTBalance's infrared camera captures 3D movement for gait analysis to produce continuous fall-risk assessments for clinicians to establish tailored care plans for elderly patients. It also provides residents with biofeedback training games to enhance endurance, balance, and flexibility. The bedside alerting device, VSTAlert, utilizes AI and machine vision to identify an individual's intent to get out of a bed or chair 30-65 seconds before they actually do. This new technology greatly supports providers' time efficiency, ability to respond quickly, and obtain consistent and accurate health data. Together, VSTBalance and VSTAlert are 80% effective in preventing falls and 95% effective in preventing fall-related injuries in elderly patients, enhancing safety and independence for elderly individuals.



Presenter(s): Qiaowen Chen
Authors: Qiaowen Chen
Faculty: Tie Liu

Cultivating Freshness: Exploring Factors that Affect the Shelf Life of Lettuce Cultivars

The preservation of freshness and shelf life are critical components of successful lettuce cultivation. This ongoing study aims to examine the factors that impact the shelf life of different lettuce cultivars through a series of continuous experiments on their leaves. To achieve this goal, we are utilizing various methods, including imprinting, weight loss measurement, leaf morphology analysis, hyperspectrum imaging, and RNA extraction to comprehensively examine the cultivars.

Our study seeks to potentially impact the wider agricultural industry. The development of more effective methods for lettuce cultivation and preservation could positively impact both the quality and quantity of lettuce production, not only in post-harvest field, but also in pre-harvest field. Further research will be necessary to fully understand the factors that influence the shelf life of lettuce and to optimize these methods. These efforts could ultimately lead to a more robust and reliable lettuce industry, benefitting both producers and consumers.

Presenter(s): Alexandra Chertok
Authors: Alexandra Chertok, Dr. Julia Choi
Faculty: Julia Choi

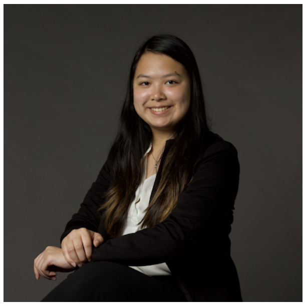
Validation of Rover Walk for Remote Gait Measurements

Routine tracking and analysis of gait parameters can be useful for detecting abnormalities and assessing fall risk among aging individuals. Rover Walk, a gait analysis and fall risk assessment system worn on the ankle, aims to deliver precise and continuous gait parameter data through an app outside of clinical settings. While existing systems with wearable accelerometers have used various algorithms to detect fall risk, Rover is the first Remote Therapeutic Monitoring system that specifically collects data on gait and balance. This study aimed to compare data collected by Rover with 3D motion capture, the gold standard for lower limb kinematics data collection. Kinematics and Rover data were collected as subjects (4 male/1 female, age 76 ± 3.29 years; 2 male/3 female, age 26.6 ± 9.6 years) walked on a split-belt treadmill under various conditions. Kinematic data were low-pass filtered using MATLAB. Rover demonstrated an excellent level of correlation (Pearson's R > 0.94) when measuring cadence, gait cycle time, and stance time, and a high level of correlation (Pearson's R = 0.86) for stride length. While the limitations of Rover must be recognized before expanding its use, an accurate remote gait analysis system has potential to improve outcomes for at-risk populations.

Presenter(s): Tryanni Chiaravalloti
Authors: Tryanni R. Chiaravalloti, Diana I. Romero, Bing Ren, Xiaofei Wu, Yong Huang
Faculty: Yong Huang

Fabrication of Porous Gelatin Microgels with Self-Releasing Chemicals for Bioprinting Applications

Porous microgels have become increasingly significant in 3D bioprinting and controlled drug delivery applications due to their potential in driving mass nutrient transport and encouraging cell infiltration and vascularization. Current porous microgel preparation methods present several challenges, such as difficulty producing stable and uniform microgels with high loading capacities. Herein, we propose a novel method to fabricate biocompatible gelatin microgels with tunable diameters and porosity, addressing current challenges and extending porous microgel applications. During the proposed fabrication process, spherical gelatin microgels are formed by complex coacervation using gelatin and Gum Arabic. Hydrogen peroxide (H2O2) is then added for decomposition, producing oxygen that is encapsulated in the gelatin microgels, inducing pore formation. Finally, transglutaminase enzymatically crosslinks with the gelatin, ensuring the microgel shape is permanently maintained. The produced microgels exhibit the yield-stress fluid property that enables their use as an ink or support bath for 3D bioprinting. Future work includes chemical encapsulation and a microgel coating process, allowing for a gradual release of the encapsulated substance. This method may be valuable for future applications of controlled and targeted delivery of antibiotics, proteins, and cells when bioprinting.



Presenter(s): Cherie Chick
Authors: Cherie Chick, Dr. Gregory Moreland
Faculty: Gregory Moreland

The Marketing and Advertising that Facilitated Reggaeton's Success with Close Analysis of Daddy Yankee's Career

Based on the mid-2021 report on Latin Revenue by the Recording Industry Association of America (RIAA), the growth of Latin music has surpassed the overall U.S. music revenues. Nowadays, reggaeton is one of the biggest influences on popular culture and shapes ideologies, but the genre's breakthrough into the mainstream was not a simple process. The success was driven by the groundbreaking marketing and advertising strategies used by the pioneers, prominently Daddy Yankee. Therefore, this research investigates the genre's rise through the artist's marketing campaign over the last 30 years. Secondary research, including examining journals and articles as well as gathering historic materials, will be the main methodology of this study. With that, observations would be made for analysis and discussions. The result of this investigation is that the genre's success is driven by first, the innovative ideas within the composition of music to attract larger audience groups. Second, the marketing strategies that adapt through the digital age, especially with the heavy use of social media. And finally, the use of earned media to boost the popularity of the genre worldwide. This study provides an understanding of this cultural phenomenon in the world and encourages future study in this field.

Presenter(s): Isabel Chris, Tarun Sama, Jared Beaufait
Authors: Isabel Chris, Ranjithkumar Chellian, Azin Behnood-Rod, Karen Lin, Grace Wing-Yan King, Jared Beaufait, Tarun Sama, and Adriaan W. Bruijnzeel
Faculty: Adriaan Bruijnzeel

Sex differences in Nicotine self-administration and Somatic withdrawal signs in Wistar Rats

Significance: Chronic use of tobacco products leads to nicotine dependence. Smoking cessation in nicotine-dependent individuals causes somatic and affective withdrawal symptoms. Clinical studies indicate that there are sex differences in nicotine intake and withdrawal symptoms. However, in preclinical studies, nicotine withdrawal symptoms in intravenous nicotine self-administration models were studied only in male models. Therefore, we investigated the sex differences in the nicotine withdrawal symptoms in both sexes that self-administered nicotine intravenously. Methods: Adult male and female Wistar rats were trained to respond for food pellets and were implanted with a catheter in the right jugular vein. The rats were allowed to self-administer saline or nicotine (0.06 mg/kg/inf) in daily 6h sessions for 36 consecutive days. Sixteen hours after the last self-administration session, spontaneous somatic withdrawal signs and anxiety-like behavior in the elevated plus maze test were studied. Results: During the 36 daily self-administration sessions, rats that had access to nicotine responded more on the active lever than rats that had access to saline. Furthermore, the females self-administered more nicotine and saline than the males. Conclusions: Female rats self-administered more nicotine than male rats, but only male rats displayed somatic nicotine withdrawal signs.

Presenter(s): Madison Chubb
Authors: Madison Chubb, Yang Zhang, Thomas George, Z. Hugh Fan
Faculty: Hugh Fan

Engineering Microfluidic Devices for Tumor Cell Isolation Studies

Circulating tumor cells (CTCs) are effective biomarkers that have shown significant utility with respect to track cancer progression and patients' responses to treatment. CTCs are cancer cells that shed from existing tumor lesions and travel through the circulating system such as the bloodstream, potentially leading to cancer's metastasizing at distant sites. However, CTCs detection is limited by its extreme rarity among billions of normal blood cells. Microfluidic devices provide great solutions for isolation and detection of CTCs. In this work, we have used microfluidic devices to capture and analyze CTCs. The microfluidic device is made of polydimethylsiloxane (PDMS) and glass. It integrates both immunoaffinity-based isolation and size-based filtration to achieve a high capture efficiency of CTCs from whole blood. This poster shows design and working principles of our microfluidic devices in capturing CTCs and subsequent analysis. We have used microfluidic devices to analyze peripheral blood samples from pancreatic cancer patients.

Presenter(s): Anand Chundi
Authors: Anand Chundi, Song Liang
Faculty: Song Liang

Assessing environmental characteristics of emerging endemic areas for human Schistosoma spp. in East Africa

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. A significant percentage of the disease burden occurs in East Africa 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 a georeferenced database on co-endemicity of S. mansoni and S. haematobium transmission. It will also contain a georeferenced environmental database including water resources, ambient temperature, rainfall, land-use, vegetation etc. Environmental characteristics associated with the endemic areas will be explored through quantitative analysis such as statistical models.

Presenter(s): Lydia Chung
Authors: Lydia Chung, Khushboo Rani, Prabhat Mishra
Faculty: Prabhat Mishra

Automatic Implementation of Secure Silicon

Hardware security cryptographic modules enable secure computation, communication and storage. Cryptographic modules must be tested for vulnerabilities before use since they are supposed to provided security to the remaining parts of the system. We are validating a wide variety of hardware implementations of security IPs including Advanced Encryption Standard (AES), Elliptic Curve Digital Signature Algorithm (ECDSA), Elliptic Curve Integrated Encryption Scheme (ECIES), Rivest-Shamir-Adleman (RSA) cryptosystem, Secure Hash Algorithm (SHA), Physically Unclonable Function (PUF), and True Random Number Generator (TRNG). To analyze the security and design of these hardware cryptographic modules, testing was done against well-known attacks, specifically finite-state machine vulnerability and laser fault injection attacks. State encoding was implemented as a mitigation to these vulnerabilities, and the security of the mitigated modules was evaluated.

Presenter(s): Reese Clarke
Authors: Reese Clarke & Malcolm Maden
Faculty: Malcolm Maden

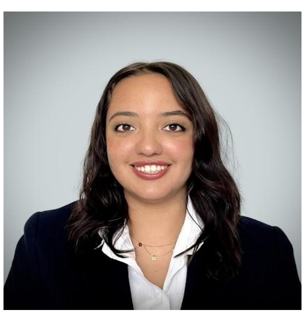
Inducing hairs in non-regenerating Mus skin wounds

When adult mammalian skin tissue is removed, wound healing includes inflammation, tissue formation, and tissue remodeling. After damage, a heightened immune response is induced, new granulation tissue is formed with immature collagen fibers and the area is covered by a new epidermal layer comprised of cells that migrate from the wound edge lacking hair follicles. African Spiny mice (Acomys), however, can fully regenerate skin, hair, and all associated components after full-thickness removal. By comparing laboratory mice (Mus) vs Acomys we can identify the genes, proteins, and molecular regulation during Acomys regeneration and apply this to Mus with the intention of improving healing outcomes. We administered immunosuppressants, mechanotransduction modulators, or growth factors to Mus full-thickness skin wounds and measured the outcome by the number of hairs induced in the wounds. The resolvin (immunosuppressant) verteporfin (mechanotransduction), and fisetin (growth factor up-regulator) samples resulted in little to no regenerated hair follicles. The CHIR (Wnt agonist), SAG (Hh agonist) and BMS (RA agonist) samples show a substantial number of regenerated hair follicles and associated dermal structures. This indicates we have developed a successful strategy for identifying anti-fibrotic, pro-regenerative compounds which may have potential applications for human conditions.

Presenter(s): Caitlyn Claverie
Authors: Caitlyn Claverie, Ann C. Wilkie
Faculty: Ann Wilkie

Biogas – Sustainable Energy for Rural Villages in Zambia

Access to reliable energy is a major challenge for developing countries where large rural populations rely on subsistence farming and cook their food over traditional wood-burning stoves or open fires. Cooking with wood-burning stoves is also a significant health hazard, causing illness and death due to continuous smoke and particulate inhalation. Biogas energy from the decomposition of organic matter in an oxygen-free environment (anaerobic digestion) offers a clean-burning alternative, much like propane or natural gas. Common feedstocks for anaerobic digestion include livestock manure, food waste and crop residues. The objective of this study was to assess the current and future potential for biogas energy in Zambia, where the electric-power grid serves only four percent of the 10.4 million mostly rural population. The impact of biogas technology was analyzed in the context of energy use, deforestation, social and climate change effects. The study indicates that biogas production in Zambia has the potential to provide clean energy in rural/remote areas, minimize deforestation, improve health and environmental conditions, and decrease greenhouse gas emissions. To realize these benefits, however, policies are needed to create a market for bioenergy, transfer knowledge from experts to villagers, and promote the use of local materials for digester construction.



Presenter(s): Vianny Collazo Barreto
Authors: Jorge Ruiz-Menjivar, Zeynep Çopur, Yong Liu, Vianny Collazo Barreto
Faculty: Jorge Ruiz-Menjivar

Exploring the Effects of Time Perspective Domains on Financial Confidence and Satisfaction: Evidence from Turkey

This study explored the impact of gender and financial socialization on financial knowledge in Turkey. This nation provides a distinctive case study as it combines economic modernization with a strong adherence to traditional gender role beliefs. The Family Financial Socialization Model was used as a guiding framework for this cross-sectional study. The sample consisted of 513 adults residing in Ankara, where the average age was 31.2, and about half were female. Our results indicated that financial knowledge levels remain low in Turkey and supported the existence of a gender gap in financial knowledge. Irrespective of gender, direct parental teaching was a catalyst for increased levels of financial knowledge. On the other hand, parental role modeling was associated with lower levels of financial knowledge. Regarding financial socialization, financial knowledge was higher among those who reported learning about money management from their fathers. Also, increased financial knowledge was higher for women whose mothers were influential socialization agents. Our findings underscore the importance of accounting for financial socialization mechanisms in designing financial literacy programs to improve national financial literacy and reduce the financial knowledge gender gap in Turkey.

Presenter(s): Chase Comprosky
Authors: Chase Comprosky, Sylvain Doré
Faculty: Sylvain Doré

Can the Non-Canonical/Non-Enzymatic Activity of LPGDS Alter the Neurological Consequences of Chronic Neurological Disease

Although LPGDS is the most abundant protein in the human brain and cerebrospinal fluid (CSF), the reason for this is not yet understood. LPGDS has canonical functions such as biosynthesis from the cell membrane, involving the intermediates arachidonic acid (C20:4) and PGH2, which has anti-inflammatory effects. LPGDS has non-canonical functions such as exhibiting peroxidase activity and acting as a chaperone on various proteins such as, Tau and beta-amyloid (Aβ) fibrils, both of which play a role in the development of Alzheimer's Disease (AD). LPGDS facilitates the transformation of Aβ fibrils into beta-sheet structures in the CSF, preventing the formation of neurotoxic agents that may arise in the absence of such changes. This process has important implications for identifying and characterizing specific disease states, such as AD, by using beta-sheet structures as biomarkers for Aβ pathology in the brain. All of this is particularly relevant to chronic traumatic encephalopathy (CTE), a condition characterized by repeated head injuries leading to dementia and AD. Additional research is necessary to gain insight into the mechanisms by which LPGDS acts, which could potentially offer a means to treat brain injuries and impede the progression of CTE to AD.

Presenter(s): Chase Comprosky
Authors: Chase Comprosky, Sylvain Doré PhD
Faculty: Sylvain Doré

The Link Between LPGDS and Traumatic Brain Injuries, Chronic Traumatic Encephalopathy, and Alzheimer's Disease

Although LPGDS is the one of the most abundant proteins in the human cerebrospinal fluid (CSF) and brain, the reason for this is not yet understood. LPGDS has canonical (common/standard) functions such as biosynthesis from the cell membrane, involving the intermediates arachidonic acid (C20:4) and PGH2, which has anti-inflammatory effects. LPGDS also has non-canonical functions such as exhibiting peroxidase activity and acting as a chaperone for tau proteins and amyloid-beta (Aβ) fibrils, which play a role in the development of Alzheimer's disease (AD). Specifically, LPGDS facilitates the transformation of Aβ fibrils into beta-sheet structures in the CSF, preventing the formation of neurotoxic agents that may arise in the absence of such changes. This process has important implications by potentially allowing LPGDS to act as a biomarker, enabling the identification and characterization of specific disease states, such as AD. All of this is particularly relevant to Chronic traumatic encephalopathy (CTE), a condition characterized by repeated head injuries leading to dementia and AD. Additional research is necessary to gain insight into the mechanisms by which LPGDS acts, which could potentially offer a means to treat brain injuries and impede the progression of CTE to AD.

Presenter(s): Mai-Brie Conklin
Authors: Mai-Brie Conklin, Tim Smith, Valerie DeLeon
Faculty: Valerie DeLeon

<ins>Predicting Adult Primate Pterion Suture Patterns through Newborn Cranial Bone Development</ins>

Pterion is a region on the lateral skull where the zygomatic, frontal, parietal, sphenoid, and squamosal bones articulate. The pattern of sutures at pterion distinguishes platyrrhine and catarrhine anthropoid primates. In catarrhines, the frontal bone articulates with the sphenoid. In contrast, in platyrrhines, the parietal articulates with the zygomatic. Scientific literature fails to identify the biological reason for this distinction and the mechanism producing sutural variations at pterion. We examined newborn primate crania using 3D virtual reconstructions from microCT scans to study comparative development of cranial bones in 3D Slicer and MeshLab. DiceCT imaging was used to relate cranial bones to underlying regions of the brain. Endocast volume and relative surface area of the bones involved at pterion showed that the parietal was significantly larger in platyrrhines than catarrhines. Catarrhines had more expansive frontal squama due to the relatively larger frontal lobes in this clade and relatively larger squamous temporals, likely related to expanded temporal lobes. The relative expansion of the frontal, squamous temporal, and alisphenoid versus the parietal bone appears to explain the difference observed in pterion patterns. This research has implications for anthropological, anatomy, and zoological research due to pterion serving as a clinically and phylogenetically important landmark.

Presenter(s): Taylor-Rose Connors, Mackenzie Farkas
Authors: Taylor-Rose Connors, Mackenzie Farkas, Apollonia E. Lysandrou, Hugh N. Farrior, Ben Phalin, Jason Hunt, Laurie Solomon, Amanda Janner, Kent Mathias, Scott Teitelbaum, Ben Lewis
Faculty: Ben Lewis

Deficits in Emotion Regulation are Associated with a Range of Negative Outcomes Among Individuals in Treatment for Substance Use Disorders

Emotion regulation deficits are important antecedents to substance use disorders (SUD). However, the potential impact of emotion regulation on SUD treatment outcomes remains uninvestigated. The current study aims to characterize relationships between emotion regulation and abstinence self-efficacy, craving, early treatment dropout, and readmission risk. Participants (n=1,188) in residential treatment for SUD completed assessments at intake, after 30 days of treatment, and at discharge. Analyses included longitudinal mixed models, logistic regression, and cox proportional hazards regression. Results revealed that emotion regulation deficits were associated with lower abstinence self-efficacy and greater cravings (ps<0.001). Importantly, emotion regulation accounted for approximately 54% of the variance in abstinence self-efficacy. Finally, lower emotion regulation was associated with increased treatment dropout (OR = 1.23; p=0.03) and likelihood of treatment readmission (OR = 1.29; p=0.003). Given extant literature highlighting the import of emotion regulation, these results are compelling due to both their strength and novelty. However, interpretation of these findings would benefit greatly from subsequent analyses of causal inferences. Regardless, these data highlight the import of evaluating and addressing deficits in emotion regulation in SUD treatment.

Presenter(s): Chloe Copti
Authors: Chloe Copti
Faculty: Rae Yan

Doki Doki Literature Club as a Feminist Work: Subverting Its Genre's Inherent Male Gaze

My poster will analyze Doki Doki Literature Club in terms of its genre and trope subversion, engagement with mental health awareness, representation of complex character identity, and rejection of the male gaze. In the narrative dating game simulator Doki Doki Literature Club, potential dateable girl characters such as Sayori, Natsuki, Yuri, and Monika break free of their roles as archetypal romance options. The dating simulator genre typically utilizes the male gaze by featuring these kinds of attractive girl characters who all unquestioningly adore the player character. I argue that in defiance of these conventions, Doki Doki Literature Club plays with the concept of gazing upon women, through showing the player shocking visual effects and events more appropriate for a horror game. Players are made unable to gaze upon the female characters without anticipating gruesome or surprising images, dialogue, and storylines. In addition, the female characters demonstrate agency and resist objectification by expressing complex emotions and thoughts in a way that challenges its genre conventions. My work examines both the original base game content as well as the new Doki Doki Literature Club Plus content expansion that has not so far received much critical attention.

Presenter(s): Kimberly Correia
Authors: Kimberly Correia, Megan Mey, Hannah Hardegree, Gemma Casadesus
Faculty: Gemma Casadesus

Exploring the role of the CNS Luteinizing hormone receptor in central and peripheral functions

The luteinizing hormone receptor (LHCGR) is central for the regulation of reproductive function through the hypothalamic-pituitary-gonadal (HPG) axis function. Recent research has identified the presence of the gonadotropin luteinizing hormone (LH) and the LHCGR in the central nervous system. Specifically, expression of LHR has been identified in several brain regions, including the hypothalamus, the key integrator between central and peripheral functions. However, the role of this receptor in this area is completely unknown. Therefore, to address the potential roles of the LHCGR we knocked down this receptor within the arcuate nucleus, a key regulator of physiological roles involved in feeding, metabolism, fertility. We determined activity measurements and surveyed metabolic and reproductive endpoints to address if LHCGR loss impacted metabolic or reproductive function. Our preliminary data suggest that loss of LHCGR impacts estrous cyclicity in females and peripheral glucose metabolism. These changes are associated with shifts in home-cage activity. Importantly, some of these changes show sexual dimorphism. Taken together our data show that the hypothalamic LHCGR is functional and may regulate important homeostatic and reproductive functions.

Presenter(s): Cameron Courtney
Authors: Jordan Stokes, Zhihang Shen, Cameron Courtney, Yuanqing Lu, Chenglong Li, Sihong Song
Faculty: Sihong Song

Overexpression of Computationally Designed Human IL-10 Mutants

Interleukin-10 (IL-10) is an immunoregulatory cytokine that can mediate both anti-inflammatory and proinflammatory effects. Studies have shown that the interaction of IL-10 with IL-10 receptor beta subunit (IL-10Rβ) on T cells is critical for the proinflammatory effect. We aimed to develop IL-10 mutant drugs that have anti-inflammatory function, but no pro-inflammatory effect for the treatment of inflammatory bowel disease (IBD). Using structure-based computational approach, we have designed several IL-10 mutants and generated vectors expressing these mutants. Plasmid transfection of these vector to HEK293 cells showed that high levels of IL-10 mutants were detected by human IL-10 ELISA in the culture medium. These results indicate: 1) our expression system works well; 2) the mutations did not affect the detection of the proteins. We are currently performing experiments to evaluate the functions of these IL-10 mutants.

Presenter(s): Patrick Craig
Authors: Nathan Jessurun, Patrick Craig, Shajib Ghosh, Navid Asadizanjani
Faculty: Navid Asadi

Rethinking PCB Component Classification using VAE Latent Spaces

Clustering is an unsupervised learning technique used to identify natural groupings of input data based on their features. The use of raw pixel values as features suffers from the curse of dimensionality and low feature salience, resulting in poor clustering performance. Techniques such as Principal Component Analysis(PCA) can extract more meaningful features by reducing the dimensionality of the dataset as well as improving model performances. However, the resulting clusters may not be interpretable to the human practitioner, hindering the extraction of new, meaningful class labels. This paper argues that Variational Auto(VAE) latent spaces are an effective method for interpretable class label extraction in clustering. VAEs are deep feature extraction models that are able to capture more complex and meaningful patterns within data. Our experimental results on a dataset of Printed Circuit Board(PCB) components show that clustering using VAE-based latent spaces yields more interpretable clusters than traditional clustering with PCA eigenvector features. Latent spaces also provide a more flexible framework for generating synthetic data points and for exploring the feature space. Thus, we conclude that VAE-based latent spaces are an effective tool for interpretable class label extraction in clustering.

Presenter(s): Emma Crall
Authors: Emma Crall, Molly Jacobs, MS, PhD
Faculty: Molly Jacobs

Fibromyalgia Syndrome: Evaluating Symptom Identification and Diagnosis

Fibromyalgia Syndrome (FMS) is characterized by chronic musculoskeletal pain but, in the absence of a reliable biomarker, diagnosis is difficult and inconsistent. Using diagnostic criteria American College of Rheumatology (ACR) and the 2018 National Health Interview Survey (NHIS), this study identified respondents whose symptomology matched the ACR criteria for FMS and compared the relative likelihood of having "identified FMS" and clinically diagnosed FMS among demographic, socioeconomic, and geographic sectors of the US populations. The likelihood of having "identified FMS" was higher among females, Blacks, those with an income less than $75,000, and residents of the South. The likelihood of being diagnosed with FMS, however, was higher among older ages, Hispanics, and those with incomes below $35,000. These results highlight the difficulty in FMS diagnosis and the need for consistent, clinical procedures to identify and manage this condition.

Presenter(s): Alexandra Crespin
Authors: Alexandra Crespin, Dr. Song Han, Dr. Steven Hughes
Faculty: Song Han

Combinational Targeting Therapy for Pancreatic Cancer

Pancreatic cancer has one of the lowest five-year survival rates of all cancer types. Hence there is a great need for new therapeutic options for patients with pancreatic cancer. RAS mutations have been linked with over 90% of cases of pancreatic cancers. Recent research has shown that BCL-XL is a critical target pathway that cooperates with MEK inhibitors to enhance their activity in RAS mutant cell lines. We hypothesize that optimal inhibition of RAS mutant cancers may require the combination of MEK inhibition with a BCL-XL inhibitor. In this study, we tested the combination of MEK inhibitor trametinib and a novel BCL-XL/BCL-2 proteolysis targeting chimera (PROTAC) 753b on primary pancreatic cancer cells. Our data showed that the combinational treatment provided synergistic inhibitory effects and cell death induction in 3 out of the 4 cell lines tested. Future work of validation of this observation in in vivo studies may lead to a novel clinical trial for KRAS-bearing pancreatic cancer patients.

Presenter(s): Megan Crotty
Authors: Megan Crotty
Faculty: Carma Bylund

Coding Empathic Communication in Dignity Therapy

Presenter(s): Aviv Cutler
Authors: Aviv Cutler, Lauren Goldsby, Gerardo H. Nunez
Faculty: Gerardo Nunez

Nitrogen Rates and Weed Pressure in Southern Highbush Blueberry

Weeds are detrimental to farm productivity because they compete for resources. Effective weed management is a crucial aspect of integrated pest management and sustainability. The less fertilizer that can be used to produce economically sustainable yields, the less fossil fuels that will be consumed to produce fertilizer. Understanding how fertilization practices affect weeds can help growers optimize their management strategies. This research investigates how nitrogen fertilization affects weed pressure in evergreen blueberry (Vaccinium corymbosum cv. 'Sentinel') farms in Florida. Blueberry plants were grown with three nitrogen fertilization rates (5 lb/A/year, 125 lb/A/year, and 400 lb/A/year) with seven replications per treatment in an experimental plot at the Plant Research and Education Unit in Citra, FL. Weed leaf area and biomass were determined every two weeks between January and April 2022. ImageJ was used to determine leaf area to compare the weed and blueberry canopies. Weeds were destructively harvested, dried for one week at 65°C, and weighed. At the end of spring, total nitrogen content in the weed biomass will be measured. These data will be used to compare the nitrogen assimilation and competition across nitrogen treatments. Improving fertilizer use efficiency and weed pressure can reduce expensive fertilizer and herbicide use.

Presenter(s): Aaron D'Zurilla
Authors: Aaron D'Zurilla
Faculty: Paul Richards

Applications of Modal Theory in Modern Popular Music

The question of this research is whether or not there are any connections between modern popular music and modal music theory. The results of this research aim to provide educators with supplemental analytical subjects for instruction in modal music, through expanding beyond historical examples and incorporating subjects largely familiar to students. This analysis was completed through qualitative assessments of popular music in comparison to aspects of modality. These claims were then supported by a statistical analysis of different musical aspects from a sample size of popular music. The sample size for this research was Billboard's Hot 100 Decade-End Chart for the 2010's. This research found that there is a connection between modality and popular music through modal ranges and tonal ambiguities. While other areas of analysis revealed intriguing trends, these were either inconclusive in the validity of their connections, or otherwise largely insignificant. The analysis of popular music through modal practices yielded novel results, but sweeping comparisons between the two eras of music would require further study and a larger sample size to more accurately determine trends.

Presenter(s): Franchesca Dalugdug
Authors: Franchesca Dalugdug, Erica Goss
Faculty: Erica Goss

Global Warming and an Emerging Environmental Pathogen: Investigating Temperature Effects on Pythium insidiosum Sporulation

Pythiosis is a severe lesion-causing infection with limited treatment options. This disease primarily affects humans, dogs, and livestock with the capacity to disrupt agricultural activities. Caused by Pythium insidiosum, a water-borne fungi-like pathogen, there is a need to better assess pythiosis incidence risk and to understand how external conditions prime P. insidiosum for reproduction. The current literature has limited information on P. insidiosum's spore production at temperatures beyond 37℃. To add to this knowledge base, our study conducted heat-shock treatments to investigate the relationship between spore yields and increasing temperatures. Our study quantified sporulation of four P. insidiosum field isolates at 30°C, 35°C, 38°C, and 41°C. We developed a protocol using hemp agar to prime isolates for sporulation on St. Augustine grass, creating better-stabilized P. insidiosum inoculum. After stimulating sporulation, samples were placed in light and were counted hourly for sporulation yields at different temperatures. We found high sporulation counts from 35°C to 41°C. This suggests adaptation by P. insidiosum to reproduction at a range of environmental and host internal temperatures. The development of rapid field detection protocols may be aided by further investigating biochemical interactions between hemp substrates and sporulation.

Presenter(s): Caroline Davidson
Authors: Caroline Davidson, Anna Montelongo, Samantha Smith, Kimberly Nguyen, Daniela Zambrano, Sara Burke
Faculty: Sara Burke

Response-based learning in Aged Rodents across Different Behavioral Modalities

It is well-known that age-related cognitive decline can significantly reduce an individual's quality of life. Therefore, understanding how different cognitive capabilities decline is critical in order to develop specific therapies that promote the independence of elderly adults. The Burke lab uses rodents to model aged and young human populations. Previous work has shown that aged rodents show deficits in place-based learning and a consequential reliance on response-based learning. It's thought that place-based learning is localized in the hippocampus (HPC), a region that is very vulnerable to age-related decline. However, the dorsal striatum (DS), where response-based learning is localized, shows greater resilience. This distinction supports the idea of an age-associated shift from HPC to DS-dependent learning. This learning pattern has already been observed in rodents using the Morris water-maze task. We are currently exploring if this age-related response-driven behavior persists across behavioral paradigms by testing aged and young rodents on the T-maze task on land. We will also characterize response-based behavior on the object-place paired associated task and, in a water-based plus maze. By modifying the context and demands of a behavioral task, we will better characterize the learning strategies and motivation of aged and young populations.

Presenter(s): Morgan Davidson, Alva Mihalik
Authors: Morgan Davidson, Alva Mihalik, Dr. Kaitlin Allen-Tapondjou, Dr. Walter Paulin Tapondjou Nkonmeneck
Faculty: David Blackburn

Phylogenetic Analysis of African Night Frogs in the Genus Astylosternus

Astylosternus is a genus of small-to-medium size frogs native to West and Central Africa. Twelve species have been officially recognized under this genus, colloquially referred to as African night frogs. Polyploidy has been recorded in Astylosternus, resulting in challenges with presenting a successful phylogenetic analysis of the species. Organisms occasionally possess more than one pair of homologous chromosomes, termed polyploidy, which can result from hybridization or errors during cellular division. While nuclear DNA is typically used for genomic analysis, polyploidization poses a unique issue for such analysis, as nuclear genomes are difficult to construct for polyploid organisms. Using preserved museum specimens and tissue samples to conduct analyses such as morphological measurements, genome sequencing of both mitochondrial and nuclear DNA, and coding 16S genes, the intent of this research is to establish the evolutionary history of Astylosternus and generate a framework for phylogenomic analysis of other polyploid species. While polyploidy has been studied in plants, there is relatively little research regarding polyploidy in animals. This phylogenetic information regarding Astylosternus will assist in determining evolutionary patterns of other animals who exhibit polyploidy.

Presenter(s): Erika Davis
Authors: Erika S. Davis, Joshua D. Perlin, Erin C. Westgate
Faculty: Erin Westgate

Do Spoilers Really Spoil?

People often go to great lengths to avoid spoilers, that is, information about unexpected events in a narrative before naturally reaching such a point in the plot. But do spoilers actually make the experience worse, or do people just think they do? Affective forecasting research (Wilson & Gilbert, 2005) suggests that people will overestimate their negative affect at having received a spoiler (i.e., they think they will enjoy it less than they actually do) and recent research on meaning forecasting (Westgate et al., in prep) suggests that individuals will underestimate the meaningfulness of experiencing the now-spoiled story (i.e., they think they will find it less meaningful than they actually do). Given this, we predicted that participants will underestimate how enjoyable and meaningful they will find reading stories, regardless of whether they have received a spoiler. However, we further hypothesize that meaning underestimation will be stronger for spoiled stories, given that people will underestimate how much sense can be made of the whole story now that they know the ending from the outset.

Presenter(s): Thais De Moraes Campello
Authors: Thais De Moraes Campello
Faculty: Benjamin Johnson

A Grounded Theory Exploration of Air Taxis in Florida- Motivations for Adoption

This study investigates Floridian's perspectives on an upcoming mode of transportation: air taxis, technically known as e-VTOL (electric vertical take-off and land). This qualitative study aimed to identify the primary motivations for fostering acceptance and adoption by the general public. Three significant themes and eleven sub-themes were identified through a grounded theory exploration of 13 in-depth interviews. The main themes encompass trust, a sense of agency, and prolonged intrinsic motivations. Initial findings indicate that trust needs to be gained from the public through education, a guarantee of safety, and credible communication to generate acceptance of this new technology. However, Floridians view air taxis as a one-time entertainment, which does not guarantee adoption. Prolonged intrinsic motivation and making passengers feel a sense of agency over their lives and time indicates that it will then lead to adoption. The findings suggest that a communication strategy to promote e-VTOL should be based on the three themes to ensure acceptance and adoption. Florida's future mobility plans can benefit from this qualitative research to reimagine future cities, as few studies have assessed or investigated public motivations around this innovation.

Keywords: air taxis; motivations; adoption; e-VTOL; technology

Presenter(s): Sophia DeLeon
Authors: Sophia DeLeon
Faculty: Jessica Harland-Jacobs

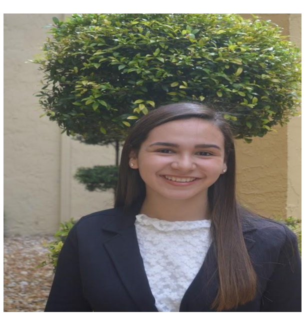
More Than Mortal Grief: The Evolving Nature of Folklore in the Irish Nationalist Movement

Folklore plays a unique role within cultural histories. Often conceptualized as stagnant, it is in reality a living network of stories and traditions that transforms with the people who share it, shedding light onto the values and ideals of a culture at any given point in time. This research centers around the use of folklore within the Irish Nationalist Movement of the late nineteenth and early twentieth centuries, examining primary accounts of folklore in tandem with concurrent social and political histories in order to examine how and why these stories change over time. Focus is placed on three particular legends within Irish folklore: Banshees, Death Coaches, and Féar Gortach. These stories, all three of which center around mortality and grief, provide a unique insight into how death was conceptualized and processed through a nationalistic lens. By examining how these legends were reshaped and reutilized to reflect Ireland’s efforts towards cultural and political autonomy, we are able to glean a deeper understanding of the Irish notion of national identity while also recognizing the inherently ever-changing nature of such a concept. This in turn provides perspective on how people use storytelling to contextualize themselves and their experiences within history.

Presenter(s): Dhruv Desai
Authors: Dhruv Desai, Abdel Alli (Ph.D), Ahmed Elshika (Ph.D), William Clapp (M.D) Mark Segal (M.D, Ph.D), Bettina Proneth (Ph.D), Markus Conrad (Ph.D), Borna Mehrad (M.D), Laurence Morel (Ph.D) and Yogesh Scindia (Ph.D)
Faculty: Yogesh Scindia

Linking renal tubular epithelial cell ferroptosis to glomerular and tubulointerstitial pathology in lupus nephritis

An end organ manifestation of systemic lupus erythematosus (SLE) is Lupus Nephritis (LN). Traditionally, LN research has focused on glomerular cells (filtration assembly of the kidney). However, it is now known that the injury to tubular epithelial cells of the kidney is a better predictor of outcomes than glomerular injury. Iron accumulates in proximal renal tubular epithelial cells (PTEC) in LN patients and nephritic mice. Ferroptosis is an iron dependent form of regulated cell death that involves uncontrolled lipid peroxidation. This study investigates the role of ferroptosis in contributing to PTEC injury in LN. Our study shows that unlike healthy patients, renal biopsies of LN patients stained positive for ferroptosis markers. These observations were recapitulated in murine models of LN. Protein and gene markers of ferroptosis were also upregulated in nephritic mice. Analysis of renal lipid oxidation products further confirmed occurrence of ferroptosis in the nephritic mice. Ferroptosis was observed in human PTECs exposed to LN patient serum. This was attenuated by Liproxstatin-2 (a novel ferroptosis inhibitor). Thus, our study demonstrate occurrence of intra renal ferroptosis in lupus nephritis and suggest ferroptosis inhibitors as potential adjunct therapies to alleviate LN severity.



Presenter(s): Guadalupe Diaz, Rodrigo Medina, Kirthana Sane
Authors: Dr. Edith Kaan, Ph.D., Dr. Souad Kheder, Ph.D., Rodrigo Medina, Guadalupe Diaz, Kirthana Sane
Faculty: Edith Kaan

Adaptation of Control Processes in Code-Switching

Code-switching, the conversational alternation between different languages, is common amongst bilinguals. There are various types of code-switching, ranging from using one word in the other language to switching many times. The Control Process Model (Green & Wei, 2014) hypothesizes that different types of code-switching involve different engagement of cognitive control. Prior research has reported that readers inhibit irrelevant information after reading written code-switched compared to unilingual sentences (Adler et al., 2020). We aim to examine how the type of code-switching affects inhibition in a non-verbal task. Participants will be Spanish-English bilinguals in the US who learned Spanish from birth and English before age 12. Participants will listen to sentences that are unilingual or have different types of code-switching. After each sentence, participants see a Flanker trial and respond by indicating the middle arrow's direction. We will collect reaction times and accuracy of the responses. Statistical analysis will be performed to see how performance on the Flanker trials is affected by the type of code-switch. This study will help us determine whether varied bilingual speech involves various control processes.

Presenter(s): Daniel Ponciano Diaz
Authors: Daniel Ponciano Diaz
Faculty: Gabriel Prieto

Identification of Archeological Shark Remains on the North Coast of Peru

This project focuses on archeological shark remains from the North Coast of Peru. The site of Gramalote is unique in that it is dry and salty aiding in the preservation of organic remains. In Gramalote shark remains are found in unusually large numbers, and identifying these remains to their corresponding species is key to understanding past diets and subsistence strategies. A challenge in identifying these shark remains is that they consist predominantly of vertebrae, which can be very difficult to identify morphologically. This means that the only surefire way to identify ancient vertebrae to its species is through aDNA analysis, a process which is destructive, expensive, and does not always yield results. This Project is intended to explore an alternative method of shark vertebrae identification that uses top-down X-ray imaging. Identification is carried out by cross-referencing archeological samples, with the samples from the Florida Museum of Natural History. This method may help archeologists and biologists identify ancient shark remains in a low-risk low-budget manner.

Presenter(s): Jordan Dickens
Authors: Jordan Dickens
Faculty: Bonnie Ernst

Access to Adequate Reproductive Care in Florida's Women's Prisons and Jails

Mass incarceration is a pervasive issue in the United States, with women, particularly women of color, becoming the fastest growing population in prisons. Despite this, many carceral institutions lack the infrastructure to provide female inmates with adequate reproductive healthcare, and states often lack policy providing for adequate reproductive care. This paper examines the women's prisons and jails of Florida, serving as both an analysis of the care offered to inmates and the policies that have been passed in the state legislature. Additionally, it examines the potential impacts of the Supreme Court's 2022 decision to overturn Roe v. Wade, and Florida's subsequent legislation restricting abortion access. Through this analysis, this paper finds that more protections are needed at both the state and the institutional level for reproductive healthcare in Florida's women's prisons and jails, particularly after the overturning of Roe v. Wade.

Presenter(s): Samantha Dicker
Authors: Samantha Dicker, Renis Maci, Tautvydas Shuipys, Vanessa Toussaint, Naim Montazeri
Faculty: Naim Montazeri

Coronavirus Persistence on Food Contact Surfaces at Different Temperatures and Relative Humidity Levels

This research aimed to investigate the persistence of coronavirus on food contact surfaces under different temperatures (4 and 25°C) and relative humidity levels (Rh;

45 and 65%). Coupons of polyethylene terephthalate clamshells, polystyrene coffee cup lids, and laminated menus (1.5×1.5 cm) were dry inoculated with ~8-log10 PFU of Phi6 bacteriophage, a surrogate for SARS-CoV-2, and overlay plaque assays were performed to examine the residual infectious viruses over a span of six-days. Coupons were placed in an airtight chamber, and the Rh was adjusted using the ASTM Standard E104-20a protocol. For all contact surfaces, there was a significant viral reduction over time across all conditions ($p<0.05$). Clamshells at 65% Rh and 25°C showed a 2.6-log10 PFU greater inactivation over six days than the coupons stored at 45% Rh and 25°C. At 45% Rh and 25°C, clamshells, cup lids, and laminated menus showed an averaged 2.2-log10 PFU inactivation over the six-day period. Data for the coffee cup lid for 65% at 25°C are currently being collected and will allow us to better understand the persistence of coronavirus across various conditions. Data from this study will help contribute to the establishment of risk assessments to identify high-risk food contact surfaces.

Presenter(s): Danielle Dietz
Authors: Danielle Dietz
Faculty: Daniel Smith

Moving Out: Household Transmission of Party Registration among Young Voters

The impact of the primary household unit on the political affiliation of youth voters has long been a topic political science scholars have studied. Despite its prominence, there is little literature on the partisan socialization of young voters that explores how partisan transmission might withstand both physical distance and time. I seek to understand and contextualize the extent to which the primary household units' influence lasts following separation from where a young voter initially registered to vote. Existing studies that analyze survey data are limited in addressing this question, I analyze a new data source — voter registration data. Unlike survey data, voter registration data allows me to track registrants' party registration over time. I leverage multiple snapshots of the statewide Florida voter file, clustering the youth voters' addresses into three categories based on the registered residential and mailing addresses. I analyze the differences in the longevity of the parental units' influence on party registration concerning the varying distance over time. I expect that an increase in distance over time will lead to a decrease in the influence of the parental unit on partisan affiliation and that effective transmission will differ by the initial partisan affiliation of the youth voter.

Presenter(s): Mary Kate DiFresco
Authors: Dr. Alison Adams, Mary Kate DIFresco
Faculty: Alison Adams

The affects of the Covic-19 Pandemic on College Students' Civic Engagement

I will need to resubmit this! I just wanted to register in time for the fair, it did say online a week ago that we had until March 17th.
The COVID-19 pandemic has had significant impacts on communities – and residents' ability to engage with their communities – over the past two years. The impacts of this may be particularly pronounced for local environmental and environmental justice organizations as they heavily rely on the civic engagement of community members to identify, educate, and communicate the needs of both the community and the environment. Research has established that the lockdowns associated with the pandemic has had many positive and negative impacts on the environment and our communities.

Presenter(s): Demi Lance Dionela
Authors: Demi Lance Dionela, Renja Zhong, Lan Wei-LaPierre
Faculty: Lan Wei-LaPierre

Investigating The Effectiveness of 2,4-Dinitrophenol as a Treatment for Amyotrophic Lateral Sclerosis

Amyotrophic Lateral Sclerosis (ALS) is a neuromuscular disease that results in loss of motor neuron and muscle function over time. Currently, the underlying cause of ALS remains unclear, but two theories have been generated: excess calcium and reactive oxygen species (ROS) production. This project tested the validity of these theories by observing the efficacy of 2,4-dinitrophenol (DNP), a drug with the ability to indirectly reduce mitochondrial calcium influx and ROS production, in treating ALS. This study observed a cohort of the well-characterized ALS mouse model hSOD1G93A. DNP was administered to cohorts of mice daily through oral gavage from 4 weeks old at dosages of 1 mg/kg and 0.5 mg/kg. DNP- and vehicle-treated hSOD1G93A mice were assessed by a battery of longitudinal behavioral studies for motor and overall muscle function from 6 weeks old. At 18 weeks old, analysis of neuromuscular junction structure in limb muscles revealed more preserved neuromuscular junctions in DNP-treated ALS mice than vehicle-treated controls. Results in this study indicate that DNP was effective in preserving motor function and reducing neuromuscular junction defect in ALS mice. Larger cohorts of mice are currently being tested. This pre-clinical study suggests that DNP may be a potential new treatment for ALS.

Presenter(s): Anthony Dispensa
Authors: Anthony Dispensa, Jeanette Mary Andrade
Faculty: Jeanette Andrade

The Relationship Between Protein Types and Hs-CRP on eGFR

Few studies have measured the relationship between protein types and inflammation on kidney function among US adults. The objective was to identify the relationship between protein types (animal, dairy, plant, seafood) and high-sensitivity C-reactive protein on estimated Glomerular Filtration Rate (eGFR). A cross-sectional secondary analysis using NHANES 2017-2018 data was performed on 4252 adults with an eGFR of >15 ml/min/1.73m2. At least one 24-hour recall was used to categorize the protein type. Descriptives, frequencies, Pearson correlation, and multiple linear regressions were conducted using SPSS v28 with a significance of $p<0.05$. Participants were females (50.1%), had a mean age of 50.1 years, and self-identified as non-Hispanic White (36.5%). A majority consumed animal and dairy products compared to seafood and plant products. A negative association was observed between consumption of plant proteins and inflammation on eGFR ($p<0.05$). In the adjusted regression model, non-Hispanic Black race had a positive influence on eGFR, while female and age had negative influences on eGFR ($p < 0.001$). Reduced consumption of plant proteins with elevated inflammation can decline kidney function. Future studies should focus on frequency and amount of proteins consumed and inflammation to reduce the progression of chronic diseases such as kidney disease.

Presenter(s): Colin Dobbins
Authors: Colin Dobbins
Faculty: Michelle Phillips

An Air of Uncertainty: Examining the Relationship Between Particulate Matter Concentration and Crime

The harmful physical effects of particulate matter are well documented; however, the cognitive effects are less well known. Prior studies have found evidence that higher concentrations of air pollution can impair cognitive function and lead to more aggressive, and even violent, behavior. The purpose of this study is to test if this could lead to a relationship between the concentration of particulate matter PM2.5 and the rate of crime.

Presenter(s): Madisen Domayer
Authors: Madisen R. Domayer, Renjie Liu, Gregory A. Hudalla
Faculty: Gregory Hudalla

Investigation on Co-assembly Granule formation conditions

Peptide-based materials are widely used in many biomedical applications. Previous work from our lab developed a series of complementary co-assembling peptide pairs based on charges, also known as “CATCH (+/-)”. When combined in solution CATCH peptide pairs assemble into materials ranging from nanoscale granules to macroscopic hydrogels [1]. However, the mechanisms of granule assembly are largely phenomenological. To study granule assembly in more detail, we used the inverted florescent microscope to evaluate the effects of peptide type, crowders, and proteins on the formation of the granules over a 24-h period. Experiments were also conducted to test toxicity of granules toward 3T3 fibroblasts. The data shows that granule shape, size and assembly kinetics are impacted by a plethora of variables, including type and concentration of peptide and crowder, and can therefore be controlled. In general, granules were not cytotoxic toward 3T3 fibroblasts, suggesting their potential as vehicles for protein or cell delivery.

Presenter(s): Salma Drew
Authors: Salma Drew, Beatriz e Silva Veronese, Noah Benscher, Zhe Ma
Faculty: Zhe Ma

The Role of ORF67 in KSHV Pathogenesis

Kaposi's Sarcoma-Associated Herpesvirus (KSHV) is a known oncogenic virus responsible for causing cancers such as Kaposi's Sarcoma (KS) and Primary Effusion Lymphoma (PEL). KSHV establishes long infection due to successful immune evasion strategies that have not yet been fully revealed. Previous research has identified the critical roles of the cGAS/STING pathway in host innate immunity against KSHV infection, but its counteracted by KSHV-encoded proteins. Among these viral proteins, we aim to focus on ORF67 in this study and delineate how the cGAS/STING pathway is regulated by KSHV. Consistent with previous screening results based on luciferase reporter, when transfected into EA.hy926 cells, ORF67 inhibited the cGAS/STING dependent phosphorylation of endogenous TBK1 and IRF3, and suppressed endogenous IFNβ at the transcription level. Next, we aim to further study ORF67's role during KSHV infection. Using a KSHV genome containing Bacterial Artificial Chromosome 16 (BAC16) system, we created ORF67 3XSTOP mutants and ORF67 3XFLAG mutants using two-step red-mediated recombination-based methods. Successful clones were validated by pulse-field gel electrophoresis and Sanger sequencing. We will use these mutants to study how ORF67 mutation will affect KSHV lytic infection by regulating the cGAS/STING pathway. We believed that analysis of the role of KSHV viral regulators such as orf67 in KSHV pathogenesis provides valuable knowledge on KSHV infectivity, cGAS-STING modulation, and potential therapeutic routes.

Presenter(s): Dalia Dryden, Ayaan Tadimarri
Authors: Dalia Dryden, Ayaan Tadimarri, Brooke Broder, Valerie Ngyuen, Yoosook Lee
Faculty: Yoosook Lee

<u>Building Scientific Basis for Studying Understudied Malaria Vector, Anopheles Squamosus, in Africa</u>

Despite the tremendous effort to minimize the impacts of malaria in southern Africa, including Zambia, it has yet to be eliminated from this region. Many understudied mosquito vector species inhabit this area and may perpetuate malaria transmission in pre-elimination zones. Anopheles squamosus is one of the most abundantly caught mosquito species in southern Zambia. This species is also frequently infected with Plasmodium falciparum, a causal agent of human malaria. This leads to the hypothesis that An. squamosus is a critical vector of malaria transmission in Zambia and prevents the country from reaching full elimination status. However, this species is understudied due to previous notions that it is not medically significant to humans. Currently, literature on An. squamosus is scattered in multiple articles, some of which are no longer accessible online. This poses a challenge for students and researchers to synthesize the current knowledge and build a new hypothesis to improve our understanding of the biology of this important species. Here, we present a summary of the literature review on An. squamosus mosquito biology research findings relevant to Zambia and neighboring southern African region.

Presenter(s): Audrey DuBose, Alana Cruickshank, Ceasar Rodriguez, Anthony Chung
Authors: Audrey DuBose, Alana Cruickshank, Ceasar Rodriguez, Anthony Chung
Faculty: Marguerite Hatch

<u>Comparison of HC-1 and LS Strains on Metabolic Oxalate Levels Using Mice Models</u>

Excess urinary oxalate is the primary contributor to calcium oxalate stone formation in the kidney. As shown in the study by Hatch & Freel, reduction of urinary oxalate can be mediated through Oxalobacter formigenes, an oxalate-metabolizing bacterium native to the mammalian intestinal tract. Their results showed that the presence of Oxalobacter correlated with a decreased colonic oxalate absorbance, resulting in significantly lower excretion of urinary oxalate. In this comparative study, we investigated the effects of two strains of Oxalobacter on oxalate metabolism in C57BL/6 mice models: a human strain (HC-1) and a lake sediment-derived strain (LS). Male and female mice were primed with an oxalate-rich diet. The mice were then provided with HC-1 or LS via oral gavage and a control, non-colonized group was included. Colonization status was periodically assessed via fecal assay. We hypothesized that HC-1 and LS colonization would produce similar effects on urinary oxalate levels, which were evaluated via spectrophotometric assay. We anticipate that the results will provide insight on differences between HC-1 and LS, their relative effectiveness in colonizing the mammalian gut, and on the scientific community's understanding of possible probiotic interventions.

Presenter(s): Sanjana Dundigalla, Rohan Shah, Gokul Muralidharan
Authors: Sanjana Dundigalla, Rohan Shah, Gokul Muralidharan
Faculty: Ashish Aggarwal

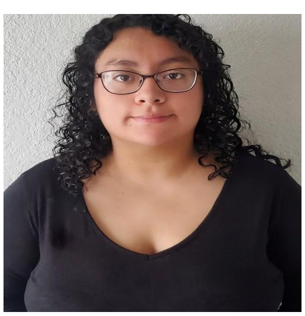
Exploring the Effect of Incentivized Practice to foster Consistent Engagement with Mastery Learning in an Introductory Programming Course.

Over the past decade, computer science has grown in popularity, and programming has become increasingly applicable in most fields of study, making computational skills very valuable. However, understanding computational concepts can be challenging, especially in introductory programming classes, where students deal with unique topics like abstraction that are not intuitive. From this arises the need to create comprehensive programs to aid in programming education, and help students from all backgrounds with varying programming experience. To understand how students learn and engage with learning tools, we analyzed a survey of students in an introductory programming class who were asked about their programming experience and perceptions of programming, and gathered data on class performance. We collected data from 141 students over one semester, and hope to see how these factors affect whether a student interacts with an extra credit practice program based on mastery learning, and to what extent they used it. From this analysis, we hope to identify the types of students who engage with extra credit educational tools. By understanding these trends, we can more accurately predict whether a student uses them, which can help CS educators in understanding behavioral patterns and motivations among students.

Presenter(s): Faith Dunlap
Authors: Faith Dunlap (1), Cory McKinstry (1), Arik Hartmann (1), Kuttichantran Subramaniam (2), Veronica Guzman-Vargas (3), and Ana Longo (1)
Faculty: Ana Longo

Chelonian community surveys following a mortality event of Florida softshell turtles (Apalone ferox) in an isolated wetland

Turtles are among the most threatened vertebrate groups, primarily attributed to overexploitation and habitat loss. Emerging pathogens also threatened turtle biodiversity, and outbreaks of Ranavirus have impacted freshwater turtle populations across North America. A newly described pathogen, turtle fraservirus 1 (TFV1), was isolated from mass mortality events of wild freshwater turtles in Florida. Following a mortality event that killed at least 22 Florida softshell turtles (Apalone ferox) in a small, isolated wetland in 2022, we conducted mark-capture-recapture surveys of the impacted turtle community to identify possible causes and describe impacts or associations of infection. We collected oral and cloacal swabs to test for Ranavirus and TFV1, and assessed turtles for gross signs of disease, such as lesions or mucosal discharge. So far, we have only screened for Ranavirus, which we did not detect in any of the samples, suggesting TFV1may be to blame. The majority (>50%) of turtles captured were Florida mud turtles (Kinosternon steindachneri). We captured very few softshell turtles, which may indicate that the population at this site is in decline. As chelonian pathogens become more prevalent, it is important to identify drivers of infection and geographic ranges to inform conservation strategies.



Presenter(s): Nephtali Dzubin
Authors: Nephtali Dzubin
Faculty: Jaime Ahlberg

Moral Guilt, Dirty Hands Dilemmas, and the Dark Ghetto

The non-ideal conditions of the dark ghetto often force residents into dirty hands dilemmas: that is, dilemmas in which a moral agent must weigh between two courses of action that are both wrong but not equally wrong. For instance, one might have to decide between stealing and survival. The moral remainder of having done such acts invokes feelings of guilt, shame, or regret within the moral agent who has committed the infraction, even if it was the right thing to do all things considered. Deontology, or duty ethics, is an ethical system that validates dirty hands dilemmas as genuine cases, and I will use a deontological approach to argue that guilt is appropriate as a form of moral remainder for agents who emerge from dirty hands dilemmas having done things that are usually considered wrong.

Presenter(s): Dominika Dzurny
Authors: Autumn Dove, Dominika Dzurny, Wren Dees, Nan Qin, Carmen Nunez Rodriguez, Lauren Alt, Garrett Ellward, Jacob Best, Nicholas Rudawski, Kotaro Fujii, and Daniel Czyż
Faculty: Daniel Czyż

Silver Nanoparticles Enhance the Efficacy of Aminoglycosides Against Antibiotic-Resistant Bacteria

The World Health Organization declared antimicrobial resistance (AMR) as one of the top ten global public health threats confronting society. With the rise in AMR causing over 1.2 million deaths worldwide, the need for developing alternative antimicrobials is crucial. Since ancient times, silver has been noted for its antimicrobial properties in treating burns and wounds; however, only recently, the developments and technological advancements relating to silver nanoparticles (AgNPs) have revealed new antimicrobial applications. Besides having antimicrobial properties, evidence suggests that AgNPs also inhibit antibiotic resistance mechanisms, evoking the need to further investigate this compound. Our study examined the antimicrobial efficacy of AgNPs alone and in combination with antibiotics using minimum inhibitory concentration (MIC) and checkerboard assays. We found that, in addition to their potent antimicrobial property, a non-toxic and non-effective concentration of AgNPs increased the antibacterial activity of aminoglycoside antibiotics, particularly amikacin, by over 20-fold. Furthermore, we employed the Caenorhabditis elegans model to determine the effect of AgNPs on an intact metazoan organism, revealing an effect on motility but not lifespan. These results support the application AgNPs in a clinical setting as a potential standalone therapy or antibiotic adjuvant.

Presenter(s): Julia Eby
Authors: Julia Eby, Jane Hsi, Mario Mietzsch, Austin Nelson, Paul Chipman, Jenny Jackson, Peter Schofield, Daniel Christ, Joanne Reed, Neeta Khandekar, Grant Logan, Ian E. Alexander, Robert McKenna
Faculty: Robert McKenna

Evading Human Monoclonal Antibodies: Mutational Strategies in Adeno-Associated Viruses

The use of adeno-associated virus (AAV) as a gene transfer method has gained traction for clinical use since the FDA approval of Zolgensma®. This drug uses AAV9, one of thirteen AAV serotypes. AAV9's ability to transduce many tissues and to cross the blood-brain barrier makes it ideal for the treatment of spinal muscular atrophy (SMA) in children. However, many people have pre-existing neutralizing antibodies against AAV9 that may hinder the efficacy of gene therapies, potentially leading to the exclusion of patients from treatment. As a result, our work focuses on engineering vector capsids to escape antibody recognition in the hope that individuals with neutralizing antibodies will still be able to receive treatment. Using cryo-electron microscopy, we are able to determine the location in which these antibodies bind. Then, we compare the location in which the antibody binds on AAV9 to the same location on AAV serotypes where the antibody is non-reactive. Following this, we alter the AAV9 capsid by designing single-point amino acid mutations on its surface. These mutations help resemble the topography of those other serotypes to allow AAV9 to evade those antibodies as well.

Presenter(s): Micah Edvenson
Authors: Micah Edvenson, Molly Gardner
Faculty: Molly Gardner

Doing Right by Mammoths: New Considerations in The Ethics of De-Extinction

One of the most exciting and controversial developments in biotechnology is the science of what is commonly known as “de-extinction” the series of processes by which extinct species, or something much like them, may be re-created and re-introduced into the environment. The scientific plausibility of individual de-extinction efforts remains an open-ended empirical question, but bioethicists have recently become interested in questions regarding the ethics of carrying out de-extinctions. For our research we surveyed recent work on de-extinction in the bioethics literature and evaluated a few of the arguments and assumptions that are commonly held in the field. Our resulting paper advances novel criticism of such commonly held positions in the field, such as those that argue the primary considerations to account for are anthropocentric. We also provide an analysis of how considerations concerning both harm and benefit to the creatures being created ought be taken more into account, in contrast to those who have argued that only harming considerations are strong. We conclude that strong reasons for de-extinction can be given, and it is an open question whether these reasons will be defeated by others.


Presenter(s): Samantha Eggleston, Francesca Apito
Authors: Samantha R. Eggleston, Zaafir M. Dulloo, Elham Yaaghubi, Amanda F. Ghilardi1, Renan B. Ferreira, Ion Ghiviriga, Francesca Apito, Brian K. Law, Ronald K. Castellano
Faculty: Ronald Castellano

<u>Synthesis of Amine-Containing Cyclic Thiosulfonates for Affinity Purification & Labeling Studies</u>

EGFR, HER2 and HER3 are regulators of normal cell proliferation but have shown to help with the initiation and progression of breast cancers. Disulfide bond Disrupting Agents (DDAs) developed in collaboration with Dr. Law causes the parallel downregulation of EGFR family members and the oligomerization and subsequent activation of Death Receptors 4 & 5, leading to cancer cell death. Optimization efforts led to the discovery of tcyDTDO as the most potent second-generation DDA. Pulldown assays using a biotinylated DDA probe and Streptavidin revealed some protein disulfide isomerase family members as direct cellular targets of the DDAs. Our goal is to synthesize an amine containing tcyDTDO for further affinity assays and labeling studies. An epoxy diester was synthesized from a cyclohexene diester. Then, an epoxide opening with NaBH4 afforded two alcohol diastereomers separated using column chromatography. The alcohol with the undesired stereochemistry was obtained as the major product. To convert the stereochemistry of the OH from axial to equatorial, an SN2 reaction is currently being performed utilizing OTf and OBz groups. Future reactions will involve conversion of the alcohol to an amine. After formation of the cyclic thiosulfonate, this amine group will be employed for affinity studies using a biotinylated probe.

Presenter(s): Kanishka Ekanayake
Authors: Kanishka Ekanayake, Emily Barlow, Sylvain Doré
Faculty: Sylvain Doré

Role of Soluble Tumor Necrosis Factor Receptors in Inflammation Caused by IS, ICH, and TBI

Inflammation is characteristic of most neurodegenerative diseases, including IS, SAH, ICH, and TBI. In stroke pathology, cerebral infarction is modulated by the pro-inflammatory cytokine tumor necrosis factor (TNF), causing upregulation of apoptotic genes and long-term neurological impairments. For this reason, therapeutic treatment of cerebroinflammation often targets TNF signaling. One drug, XPro1595 is a dominant-negative mutant of TNF that selectively inhibits soluble TNF, thus impeding the effects of TNFR1. Pre-clinical trials show reduced glial reactivity ($p<0.001$), prevention of dendritic degeneration ($p<0.05$) and plasticity ($p<0.01$), and improved functional outcomes post-TBI. Concentrations of TNF are also affected by the bioavailability of membrane-bound and soluble-form receptors. Studies demonstrate agonistic and antagonistic effects of the soluble receptors on TNF regulation oftentimes have confounding factors such as disease, the onset of ischemia, and the affected brain region. Furthermore, given most studies utilize a murine model, humanized mice containing human TNF and receptors must be generated for transferable outcomes which introduces a host of complications. This review of the role of TNF receptors in neurodegenerative disease seeks to clarify some of these confounding variables and evaluate potential therapeutic strategies.

Presenter(s): Jasmine Elghazzaowi
Authors: Jasmine Elghazzaowi, Jinyun Li, Alexander Fast, Nian Wang
Faculty: Nian Wang

<u>Biocontrol of Citrus Canker Using Beneficial Bacteria</u>

Citrus canker is a devastating bacterial disease that is caused by Xanthomonas citri subsp. citri (Xcc) worldwide. All commercial citrus cultivars are susceptible to citrus canker. Antimicrobials including copper-based products and antibiotics have been used to control citrus canker in Florida. However, frequent use of copper might lead to copper resistance in Xcc population. In addition, copper application is known to have negative effect on the environments including soil microbes. Beneficial bacteria have been used to control plant diseases by promoting plant growth, increasing the stress tolerance of plants, suppressing the virulence of pathogens, and increasing disease resistance in plants. Here we tested the control effect of beneficial bacteria isolated from roots, leaves, and stems of citrus plants against citrus canker. A total of 70 bacterial isolates were collected. Antagonism against Xcc was tested using nutrient agar plate assays, which required overnight cultures of bacteria. Bacterial isolates with antagonistic activity were identified by PCR amplification and sequencing of 16S rRNA gene. In total, 13 beneficial bacteria isolated in this study had inhibitory effect against Xcc, which will be further tested for canker control in greenhouse and field trials. Beneficial bacteria present a promising alternative to chemical pesticides.

Presenter(s): Lauren Ellis
Authors: Lauren Ellis, Bonnie President, John Aris, & Wesley Bolch
Faculty: Wesley Bolch

<u>A Histology-Based 3D Microscale Model of the Salivary Gland</u>

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

Presenter(s): Sophia Emmons
Authors: Sophia Emmons, Gabriel Prieto
Faculty: Gabriel Prieto

<u>Analyzing Stone Fish Net Sinkers in the North Coast of Peru: inquiring its functional and symbolic aspects.</u>

Maritime communities flourished along the northern coast of Peru for thousands of years due to the abundance of marine life, which inspired these communities to create specialized tools to aid in the fishing process. One of these tools was cotton fishing nets (not always preserved in the archaeological record) but its stone sinkers are very common in midden deposits. This paper analyzes the variability of the fish net sinkers from two sites in Huanchaco, Peru: Pampa La Cruz, and Jose Olaya, Iglesia Colonial. Additionally, this paper will compare the differences in stone net sinkers between cultural occupations spanning over centuries starting with the earliest of the Salinar occupation (400-200 B.C.), the Virú (B.C. 100 – 450/500 A.D.), and the Moche (450/500 – 800/850 A.D.). By analyzing the similarities and differences of the fishnet sinkers, one can infer the types of fishing nets used by maritime communities and their social implications. Fishnet sinkers found in ceremonial context had evidence of being intentionally broken in half, which shows that they were part of elaborate rituals. Studying these lithics gives insight into how integral fishing was in people's daily lives and the ceremonial practices that occurred in these communities.

Presenter(s): Kayla Ernst
Authors: Kayla Ernst, Darius Ramkhalawan, Gloria Montoya Vazquez, Nadja Makki
Faculty: Nadja Makki

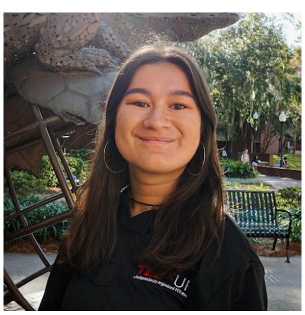
Genetics of Adolescent Idiopathic Scoliosis

Adolescent idiopathic scoliosis (AIS) is an abnormal curvature of the spine appearing in late childhood or adolescence, affecting 2 to 3 percent of children in the US. Severe cases may lead to restricted movement and abnormalities in the spine, shoulders, hips, or rib cage. Treatment includes a restrictive brace, while severe cases require spinal fusion surgery. Genome-wide association studies (GWAS) identified genomic loci associated with AIS susceptibility, but their mechanistic contributions remain unidentified. Many have been found to be in non-coding genomic regions, suggesting that the loci affect gene regulatory elements. SOX6 was recently identified as a novel AIS susceptibility locus. SOX6 is a transcription factor that plays a key role in cartilage and muscle development. By using H3K27ac ChIP-seq data, which identifies active enhancers, and overlapping it with single-nucleotide polymorphisms (SNPs) that are associated with AIS through genome-wide meta-analysis, we identified enhancer candidates at the SOX6 locus. We carried out enhancer assays in a chondrocyte cell line and identified active enhancers at the SOX6 locus. Activity of one of these enhancers varied dependent on which SNP allele is present (AIS-associated or unassociated allele), demonstrating that this SNP influences enhancer activity and may contribute to AIS susceptibility.

Presenter(s): Michael Ettlinger
Authors: Andrew Zimmerman, Michael Ettlinger, Edzard van Santen
Faculty: Andrew Zimmerman

Chemical Variation in Florida Reclaimed Water: An Examination of Temporal, Geographical, and Treatment Technology Trends

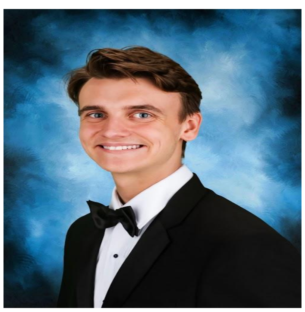
Reclaimed water, also called recycled wastewater, has proven extremely effective at conserving water resources when reused for beneficial purposes such as irrigation in agriculture, landscaping, and recreational facilities. In the state of Florida, the leading producer of reclaimed water in the United States, more than 800 million gallons of this water is reused for beneficial purposes each day. Although the chemical composition of this resource has critical implications for its impact on Florida's agriculture and environment, there is little understanding of how its chemistry varies across the state, seasonally, geographically, and by treatment method. Thus, we analyzed data provided by the Florida Department of Environmental Protection's discharge monitoring reports to identify trends in the chemical composition of reclaimed water for the chemical factors most likely to have the biggest impact on plant productivity and the environment (namely, nitrogen, phosphorus, chloride, sodium, sulfate, fecal coliform, and pH). We conducted analysis of variance tests to analyze these data with the hypothesis that the greatest influencing factor on chemical differences will be treatment technology. The results of this study will be used as the basis for further research on the effect of reclaimed water on plant productivity and environmental quality in Florida.



Presenter(s): Zoe Fang
Authors: Zoe Fang, Santosh Rananaware, Carlos Orosco, Jordan Lewis, Lilia Yang, Grace Shoemaker, Katelyn Meister, Piyush Jain
Faculty: Piyush Jain

Enhancement of CRISPR-Based Diagnostics Using Novel Cas12i Protein for Detection of Infectious Diseases

The discovery of CRISPR-Cas systems has revolutionized the fields of gene editing and diagnostics. CRISPR-based diagnostic methods utilize the nonspecific trans-cleavage activity of certain families of Cas (CRISPR-associated) proteins, cutting any nearby ssDNA upon activation by recognition of a target sequence. Reporter molecules added to the reaction are designed such that a fluorescent signal is observed once they are cleaved. When coupled with a CRISPR RNA that has a complementary sequence to the DNA of an infectious genetic element, these Cas proteins become activated and cut reporter molecules, inducing measurable fluorescence used for detection. Cas12i is a recently-discovered family of Cas proteins that exhibit trans-cleavage activity. Scholars have already proven that Cas12i can be used for gene editing, but literature on its diagnostic capabilities is scarce. After performing trans-cleavage assays with Cas12i that demonstrated detectable fluorescence, we determined that these proteins can indeed be successfully used for CRISPR-based diagnostics. Subsequent experimentation even showed that Cas12i can be used in conjunction with other Cas proteins to intensify the fluorescence signal. We further explored different reaction operation conditions to develop an enhanced detection system that can be applied towards a wide variety of pathogens.



Presenter(s): Ryan Faulkner
Authors: Ryan Faulkner, Brian Odegaard, Alan Lee, Addison Sans, Isaac Lee, Leo Ng, Andrew Haun, Dana Chesney, David Rosenthal, Francis Fallon
Faculty: Brian Odegaard

Possibility of Misrepresentation in Saccadic Change Blindness

Change blindness refers to the inability to see a change in a stimulus. One type of change blindness occurs if changes are introduced when the eyes move (saccades). Are we conscious of changes that occur to images when our eyes move? Higher order theorists in consciousness research are interested in how we may misrepresent information when we fail to notice changes. Specifically, when observers fail to notice changes, their higher-order awareness may be of one attribute (the pre-change feature), but the image may have updated to the post-change feature. If empirical research found evidence showing that this occurred, this would provide empirical support for Higher-Order Theory. To evaluate if we could find evidence of this phenomenon, we conducted a change-blindness experiment where subjects viewed images that changed during a saccade, and then answered questions about their experience. The critical question happened after “miss” trials, when subjects had to report whether their awareness was of the pre-or post-change item. Results showed that pre- and post-change attributes were selected at relatively equal rates regardless of refixation, but when subjects re-fixated the changed item, the post-change attribute was selected more. This finding provides some evidence in support of higher order theories of consciousness.

Presenter(s): Rei Favis, Dr. Paramita Chakrabarty
Authors: Rei Favis
Faculty: Paramita Chakrabarty

<u>Using rAAV-mediated expression in cell culture and in transgenic mouse models to evaluate tau</u>

Alzheimer's disease (AD) is a neurological disease that leads to the death of brain cells and as a result, compromises cognitive-behavioral skills in everyday function as well as self-sufficiency. As this dementia exponentially affects more than fifty-million people globally all the way up to being the sixth leading cause of death in the United States. With such devastation, it is vital that AD is analyzed through its pathological components, all the way up to its protein structure. Specifically, tau is a microtubule protein that when hyperphosphorylated, will cause an imbalance of protein kinases and phosphatases, which in AD, results to be a ß-amyloid peptide (Aß); this is important to study as the Overproduction of amyloidosis is what is attributed to the onset of Alzheimer's. By studying the role of tau and its interactions with beta-amyloid interactions, scientists will be able to understand Alzheimer's on a component level and this insight will help researchers in developing new ways of creating new drug therapies and ways of diagnoses that can prevent the onset of such a tragic illness.

Presenter(s): Kylie Fernandez, Julia Javier
Authors: Kylie Fernandez, Julia Javier, Susan Nittrouer
Faculty: Susan Nittrouer

<u>The Effects of Parental Language Input and Parental Knowledge of Child Development on Child Language</u>

Past experiments showed that amount and kind of parental language input affects language development, and poverty-related delays in language development have been attributed to poor parental language input. Concern has been raised, however, that parental language input styles may largely relate to how knowledgeable parents are about child development. This ongoing study addresses this concern by examining how parental language input is mediated by parental knowledge of child development. Twenty parent-child dyads across socioeconomic levels are being tested using five measures. Parent-child dyads are recorded constructing Tinkertoy models to measure (1) parental language input. The child completes measures of (2) vocabulary knowledge and (3) auditory comprehension of language. The parent completes two surveys measuring (4) general knowledge of child development and (5) knowledge of best parenting practices. Statistical analyses involve: (1) computing correlations between parental language input, parental knowledge of child development, and child language outcomes; (2) computing partial correlation coefficients to assess the extent to which parental language input explains unique variability after controlling for parental knowledge; and (3) comparing the ability of both parental knowledge measures to explain variability in parental language input and child language outcomes.

Presenter(s): Melissa Filgueiras
Authors: Joseph H. Bisesi PhD, Deirdre Love MPH, and Melissa Filgueiras
Faculty: Joseph Bisesi

<u>Investigating the Effects of Alpha-Cypermethrin Insecticide Treated Nets on Daphnia Magna</u>

This project examines the toxicity of leaching from alpha-cypermethrin treated insecticide mosquito nets (ITNs) to D. Magna to better understand the effects of ITN fishing in Sub-Saharan Africa. In an attempt to reduce the malaria burden, large government agencies have been over distributing ITNs, which are effective at repelling malaria carrying mosquitos. Since these ITNs are highly concentrated with toxic pyrethroid chemicals, these chemicals may leach from the nets into water which have shown to bioaccumulate in fish, which may be a source of exposure to humans. Several 7-day experiments have been conducted with different exposure variables to accommodate for different scenarios in which the nets could be used for. These variables include different ITN net sizes, the duration ITNs are in water with D. Magna, and the number of pre washes of ITNs. D. Magna mortality was measured every 24 hours. When unwashed alpha-cypermethrin ITNs were used there was 100% mortality at 24 hours, and in a 1-time pre-wash of alpha-cypermethrin ITNs showed 100% mortality in all treatment groups except for the ITN size of 1cm2 by 72 hours. In conclusion, these alpha-cypermethrin ITNs are highly toxic to aquatic ecosystems, however, pre-washing may reduce the toxicity.

Presenter(s): Juan Florez
Authors: Juan Florez
Faculty: Janna Lower

How El-Sistema Inspired Programs, MMP and YOLA, Directly Impact Underserved Youth in Miami and LA

This research is in the form of a collective case study focused on the Miami Music Project (MMP) and the Youth Orchestra of Los Angeles (YOLA). This study explores the various functions and goals of these programs, and how they directly serve and impact under-represented communities. It also explores the impact on the youth's future and what these experiences tangibly and indiscriminately provide for their futures, be it beneficial or detrimental. Through virtual, individual interviews with various subjects that were either current alumni of these programs, recent graduates at the college age, or adults in the field, I was able to record their responses. This allowed me to generate a holistic view of how these programs serve their students, thus resulting in answers that are representative of a larger population. Results showed commonalities between responses that trended towards highly positive results from being students in MMP/YOLA. In conclusion, this clearly demonstrates that these programs have left positive, tangible impacts on their current and former students.

Presenter(s): Joshua Fosen
Authors: Joshua Fosen
Faculty: Ranga Narayanan

K-12 Experiments that Demonstrate Concepts in Chemical Engineering

This paper explores the impact of Science Technology Engineering and Mathematics (STEM) outreach on middle school students' perception of the importance of STEM, their interest in STEM, and their competence in STEM. Many different demonstrations and activities have been developed to bring to classrooms and engage with the students. A survey is given to the students before and after the STEM activities to assess the short-term impacts of the outreach program. The target group for this outreach is sixth and seventh grade students in the Gainesville, FL area. The outreach program is ongoing and the results and conclusions of this study are pending.

Presenter(s): Stephen Franks
Authors: Stephen Franks, Adithya Gopinath
Faculty: Habibeh Khoshbouei

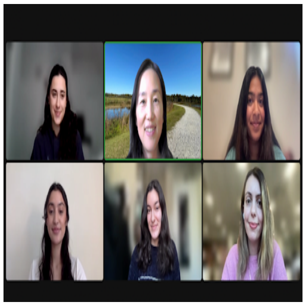
Longitudinal Studies Reveal Parkinson's Disease Progression is Marked by Changes in the Phenotypes of Immune Cells

In our prior work, we showed that clinical onset of idiopathic Parkinson's disease (iPD) is associated with an increase in immune cells expressing dopamine transporter (DAT) and tyrosine hydroxylase (TH). However, we had acquired a cross-sectional snapshot at a single timepoint of a variety of PD patients. It is still not known whether the increased DAT+/ TH+ PBMCs we observed in PD patients is associated with disease progression or response to treatment. In the present study, we sought to determine whether these markers can monitor disease progression and treatment response, as correlated to Universal Parkinson's Disease Rating Scale part 3 (UPDRS III), and to the DATscan, an imaging-based biomarker which can detect movement disorders. In addition, we sought to determine whether a specific Parkinsonian TH mutation presents immunologically in a similar manner to iPD. As we would expect, motor phenotype worsened following disease onset and improved following treatment. In contrast to iPD patients, this subject exhibited baseline levels of DAT+/TH+ PBMCs at the time of diagnosis that increased over the course of the study until initiation of treatment. Following treatment, DAT+ PBMCs decreased while TH+ PBMCs remained elevated. CD14+ inflammatory monocyte counts increased following an increase in DAT+/TH+ PBMCs.

Presenter(s): Emily Fussell
Authors: Emily Fussell, Asha Rao, Valeria Mejia, Elizabeth Aikman, Dr. Whitney Stoppel
Faculty: Whitney Stoppel

<u>Engineering and Mechanical Testing of a Biomaterial-based Skeletal Muscle Tissue Platform</u>

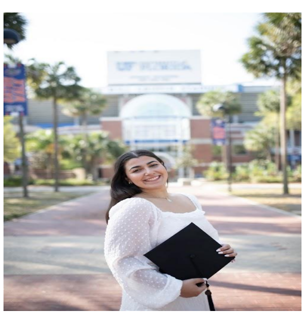
Skeletal muscle cells can repair small tears, including exercise induced tears, without surgical interventions. When large volumes of skeletal muscle tissue are damaged or diseased, neighboring cells are unable to repair these damages. Engineered tissue allows for the potential to regenerate skeletal muscle within the body [1]. Three-dimensional aligned porous scaffolds are commonly used in skeletal muscle engineering, and anisotropic alignment within the scaffolds promotes cell differentiation, and the formation and alignment of myotubes [2], mimicking the native morphology of the skeletal muscle extracellular matrix. Our goal is to understand the ability of these scaffolds to withstand repeated cycles of stretching to determine their utility in skeletal muscle tissue engineering. Mechanical testing was performed to determine the viscoelastic response of silk fibroin scaffolds over time. I performed amplitude sweeps via dynamic mechanical analysis where the distance the sample was stretched increased linearly between data points, with a range of 0% strain to 100% strain or complete failure, while maintaining frequency at 1 Hz. Future work focuses on skeletal muscle cell function within the scaffolds for later use in improving skeletal muscle treatment options. [1] Somers et al., Tissue Engineering: Part B, 2015. [2] Jana et al., Adv Mater, 2017.



Presenter(s): Shreya Gadikota, Catherine Cardenas, Melisa Sumer, Agustina Salomon
Authors: Shreya Gadikota, Catherine Cardenas, Melisa Sumer, Agustina Salomon, Anna Thodhori, Dr. Feihong Wang
Faculty: Feihong Wang

Differences in Coping Strategies between Gender and the Perceived Impact on Students' Academics

The unexpected COVID-19 pandemic evoked significant levels of distress among college students (Straup et al., 2022) and disrupted students' academic schedules (Martinez et al., 2022), requiring the use of stress-coping strategies to manage their well-being (George & Thomas, 2021). This study examines the differences in behavioral coping strategies between genders and how they are related to students' perceived academic impact from COVID-19. Based on the survey data provided by 186 consenting students enrolled in general psychology in Spring 2020 at the University of Florida, we found 62.3% of females and 37.3% of males engaged in behavior-coping strategies, with 38.9% of participants using activity engagement strategies. The chi-squared test indicated variability between the coping strategies used ($p<0.001$), while the one-sample binomial test indicated variability between the genders ($p<0.001$). Furthermore, the academic pursuit strategies used are positively correlated with perceived academic impact among males ($p<0.016$, $r=0.284$), whereas the females' activity engagement strategies are positively correlated but report no impacts ($p<0.003$, $r=0.280$). Our findings indicate college students use engagement-based coping strategies to cope with stressful situations, which higher education institutions can focus on to support students in the pandemic.



Presenter(s): Giuliana Gamero-Faggiano
Authors: Giuliana Gamero-Faggiano, Xan Burley
Faculty: Xan Burley

If You Think About It

Overthinking is among the most common experiences within the human condition; dancers are not exempt. It could be best described as a cycle of repetitive self-doubt which one finds extremely difficult to surmount. In the context of dancers, this brings about a number of questions that this study seeks to find. This research not only focuses on the quantitative data but also delves into the emotional aspect through a choreographed work and film. This paper intends to answer: What sorts of gestures emerge in a dancer when they are overthinking in the context of a class and/or in a performative setting? How does overthinking affect one's mental well-being, in the context of live performance? Are there any solutions to assuage this particular experience? This study uses both qualitative methods of finding data as well as a choreographed portion based on these initial findings. The qualitative method entails a questionnaire that surveyed the dance majors at the University of Florida while the movement component of this research uses the responses of the dancers, background research, and the dancers' experiences to give the study an emotion-based component. This research is important because although many think of overthinking as something that is usual and inconsequential, however, it is actually self-harming in the way that we re-think interactions and minute details of our life.

Presenter(s): Brianna Garcia
Authors: Brianna Garcia (Mentors: Dr. José A Lemos (PI) and Alexandra Peterson (PhD candidate)
Faculty: José Lemos

Characterization of a MerR-type regulator involved in the control of ion metal homeostasis in the dental pathogen Streptococcus mutans

Streptococcus mutans is the keystone pathogen of dental caries. Zinc (Zn) is an essential trace metal that exerts cellular toxicity at high concentrations. Because it has both antimicrobial and anti-inflammatory properties, Zn is commonly added to dental products. We recently discovered that S. mutans displays higher Zn tolerance than all other streptococcal species. This is attributed to the unique Zn exporter ZccE and cognate MerR-type transcriptional activator ZccR. This project investigated the role of a second transcriptional MerR-type regulator, herein MerR2, identified in a zccR mutant suppressor screen as potentially involved in zccE regulation. To accomplish this goal, the S. mutans lab strain UA159 was used to generate merR2 truncated and full deletion strains and genetically complemented strains. The merR2 mutants' capacity to grow in Zn presence was assessed using the Bioscreen automated growth reader, Kirby-Bauer disk diffusion and titration plating assays. Unexpectedly, both merR2 mutants grew faster than parental strain in the absence of stress and displayed no obvious phenotype when grown with Zn. Studies are ongoing to determine the MerR2 regulon's scope via RNA-sequencing, to directly assess MerR2's contribution to ZccR-mediated zccE regulation, and to investigate MerR2's possible association with other types of metal and non-metal stresses.

Presenter(s): Julia Garcia
Authors: Julia Garcia, Gregory Takacs, Christian Kreiger, Defang Luo, Jeffrey Harrison
Faculty: Jeffrey Harrison

Characterization of Inducible Nitric Oxide Synthase (iNOS) Expression in Glioma-associated Immune Suppressive Myeloid Cells

Glioblastoma (GBM) is a highly malignant primary brain tumor, characterized by a tumor microenvironment (TME) consisting of infiltrating bone marrow-derived immune cells. Monocytic myeloid-derived suppressor cells (M-MDSCs) are a subset of these infiltrating immune cells and are identified by their co-expression of CD45/CD11b/Ly6Chi/Ly6G-/CCR2/CX3CR1. M-MDSCs can suppress the proliferation and function of both helper CD4+ and cytotoxic CD8+ T cells. Nitric oxide, a free radical produced by the enzyme inducible nitric oxide synthase (iNOS), is a potential mechanism of action for MDSC-induced suppression of T cells. Expression of iNOS was visualized in vivo in both KR158B and GL261 murine glioma models via immunohistochemistry (IHC). IHC identified both myeloid and non-myeloid cell populations within the TME that expressed iNOS, including CCR2+/CX3CR1+ M-MDSCs and CCR2+ myeloid cells. Flow cytometry was also performed to quantify iNOS expression in different cell populations within the glioma TME. The role of iNOS in MDSC suppression of T cells was studied in vitro via co-culture suppression assays, with preliminary data suggesting a recovery of T cell proliferation in the presence of an iNOS inhibitor. Future research directions include further characterization of iNOS expression within GBM to determine susceptibility for potential therapeutic targeting.

Presenter(s): Ma. Andrea Gatmaitan
Authors: Ma. Andrea Gatmaitan, Clancy Short, Daniel Hahn
Faculty: Daniel Hahn

The Role of Protein Storage in Life Cycle Timing in the Fruit Fly

Amino acids are the building blocks of proteins that are essential for development, reproduction, and other important biological functions in insects. Insect storage proteins called “hexamerins” are hypothesized to be a potential mechanism that insects use to measure their protein stores and inform their behavior and life history timing. In the fruit fly, Drosophila melanogaster, the hexamerin larval serum protein 2 (LSP-2) is produced by the fat body during the late larval stage and is secreted into the blood. LSP-2 could act as a circulating signal that provides a reliable measure of protein store quantity so flies may assess their internal nutritional status to initiate important events like maturation. To test this hypothesis, we used a binary expression system to perform lsp-2 knockdowns in whole animals and brain neurons. We tested the extent to which lsp-2 knockdown prevents or delays the successful completion of different stages of D. melanogaster development, including the third instar larval stage (final stage of juvenile development) and pupation (juvenile-adult transition). Our preliminary results show that lsp-2 knockdowns decreased the proportion of flies that successfully completed their developmental stages, particularly their third instar larval and pupal stages.

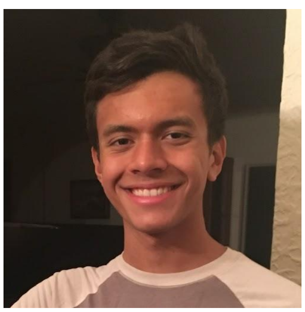
Presenter(s): Katherine Gegoutchadze
Authors: Katherine Gegoutchadze, Julia R. Bonney, Anna C. Rushin, Matthew E. Merritt, Boone M. Prentice
Faculty: Boone Prentice

Detection of Glucose in Mouse Pancreas Using Imaging Mass Spectrometry

Diabetes is characterized by the body’s inability to produce or utilize insulin to regulate blood glucose levels. The pancreas is an important organ involved in insulin

homeostasis, consisting of islet endocrine cells comprised of many cell types (e.g., beta cells that produce insulin and alpha cells that produce glucagon, which are responsible for signaling the liver to store and release glucose, respectively, to regulate blood sugar levels). The role of the exocrine tissue, which makes up 98% of the mass of the pancreas and secretes digestive enzymes, in diabetes has been relatively understudied. Despite a significant amount of research into type 1 diabetes, much remains unknown about the metabolic pathways responsible for disease pathophysiology.

Imaging mass spectrometry (IMS) is a label-free analytical technique that enables the spatial mapping of metabolites directly in tissues. In this work, we have employed a mouse model of pancreatic tissue slices leveraging heavy labeled glucose to track spatial metabolism (specifically, glycolysis and the tricarboxylic acid cycle) in mouse pancreatic tissue. We have successfully detected 12C and 13C glucose from standards and 12C glucose in mouse pancreas IMS experiments. We are currently developing IMS methods to detect 13C glucose in perfused mouse pancreas samples.



Presenter(s): Hajymyrat Geldimuradov.
Authors: Hajymyrat Geldimuradov.
Faculty: Jaehan Bae

Investigating Spectral Energy Distribution of a Star System for Circumstellar Disks from Various Observer Positions

In this research project, we aim to investigate the spectral energy distribution of a star system to detect any possible candidate for a circumstellar disk (CPD) from different observer positions. Circumstellar disks are fundamental to planetary formation and their detection and characterization can provide critical insights into the evolution of planetary systems. The spectral energy distribution of a star system can reveal the presence of a CPD; the observer's position plays a crucial role in detecting it. We will perform modeling and simulations to identify and analyze the signatures of a CPD based on the observer's position. We expect to obtain a detailed spectral energy distribution of the star system, which will allow us to determine the presence or absence of a CPD candidate. Our simulations will provide information on how the observer's position affects the detectability of a CPD and the nature of the detected signatures. Our research project aims to provide a better understanding of the spectral energy distribution of a star system and the role of observer position in detecting CPD candidates. Our findings will be valuable in future planetary formation studies and the search for potential exoplanetary systems.

Presenter(s): Sebin George
Authors: Sebin George, Sylvain Doré
Faculty: Sylvain Doré

Investigating the Potential of CRF Receptor (CRFR) Drugs as a Therapy Against Consequences of Stroke

Cerebrovascular incident poses a relevant concern for a variety of demographics, with potential consequences that include a cohort of neurological deficits, physical disability, and death. Recent studies on the effects of CRFRs in stroke pathology have presented evidence of both acute and long-term influence in injury pathways, and neural recovery functions. Typically, corticotropin releasing factor (CRF) expression presents in time-dependent fluctuations, with an initial advantageous phase where CRFR activation allows for anti-inflammatory response and stress regulation. Varied subsequent levels of CRF have been shown to present neurodegenerative effects on cells expressing CRFRs, such as the aggravation of glial cells, blood-brain barrier, and hippocampal/cortical neurons. Current knowledge dictates that CRFR1, CRFR2 accommodates the peptide family of CRF and urocortin (UCN) 1, 2, and 3. UCN 1 has high affinity for both receptors, while CRF usually binds to CRFR1, and UCN 2, 3 bind to CRFR2. Further investigation is necessary to determine individual effects of the CRF peptides on stroke, and the expected change in neuroanatomy following ischemia. This is a critical review of the literature to investigate the potential of individual CRFR pathways as treatment options for ischemic stroke and their alleviatory properties that may expedite convalescence in stroke victims.

Presenter(s): Owen Gillen
Authors: Owen Gillen, Zijing Xu, Kevon Jolly, Fan Zhang
Faculty: Fan Zhang

Synthesis and Characterization of Dendrimer-based Lipid Nanoparticles for Targeting Tumor-infiltrating Monocytes

The in situ engineering of immune cells, such as tumor-infiltrating monocytes (TIMs), using mRNA-lipid nanoparticles (LNPs) has shown promise for cancer immunotherapy. However, there are still challenges associated with mRNA-LNPs, such as poor payload release, non-specific targeting, and uncontrollable adjuvant effects. To address these challenges, we propose to construct and screen a library of dendrimer-based nanoparticle formulations for efficient mRNA delivery to TIMs with low toxicity. Dendrimers are a unique class of polymeric molecules, with highly mutable properties that allow for broad structural control and a high degree of molecular uniformity. Specifically, we synthesized 162 dendrimer-based ionizable lipids from 6 initiators and 4 lipid functional groups through Michael addition, amidation, and epoxide ring opening reactions. These lipids were purified via preparative thin layer chromatography and formulated with mRNA to form dendrimer-based LNPs for targeting TIMs with low toxicity. Our in vitro experiment has identified several candidates with comparable transfection efficiency to an FDA-approved LNP formulation and high cell viability. High-performing formulations were characterized using dynamic light scattering for zeta potential and hydrodynamic diameter and nuclear magnetic resonance for structure elucidation. Future work includes in vivo biodistribution and toxicity studies and establishing structure-function relationships between dendrimer-based formulations and mRNA delivery efficiencies.

Presenter(s): Paton Glaze
Authors: Paton Glaze, Debbie Miller, Mack Thetford, Gina Mangold
Faculty: Debbie Miller

<u>Fertilizer Enhancement of Flower Production for Conservation of a Rare Bee, Hesperapis oraria</u>

Hesperapis oraria is a rare, monolectic, endemic, ground nesting bee restricted to the coastal mainland and barrier island of the Gulf Coast from the eastern barrier islands of Mississippi to the coastal mainland of Panama City Florida and to patches of Balduina angustifolia within 0.5 km landward of the Gulf of Mexico. B. angustifolia is the bee's only pollen source. Coastal landscapes where the bee and floral host reside are threatened by extreme weather events and human development. Increasing B. angustifolia flower production may increase H. oraria food resources. We compared the effects of Milorganite organic nitrogen fertilizer (6-N, 4-P2O5, 0-K2O) at 0, 0.5, 1, and 2 times the midsummer annual flower rate (1X) of 97.6 g/m2 on plant height, diameter, and flower production for B. angustifolia growing within the coastal landscape, and total foliar cover. We found plant height and diameter increased with Milorganite at 195.2 g/m2 compared to no fertilizer addition beginning 90 days after treatment (DAT). Flower production also increased at 195.2 g/m2 126 DAT with two times more flowerheads compared to no fertilizer addition. Milorganite at 2X the recommended rate provided more pollen (flowers) for the bee without increasing total cover or altering flower phenology.

Presenter(s): Alexa Goldberg
Authors: Alexa Goldberg, Dr. Amy Williams, Dr. Kennda Lynch
Faculty: Amy Williams

<u>Mars Analog Thermochemolysis</u>

One of the most present topics of astrobiology is determining whether past or present life exists on Mars. Specialized instrumentation such as gas chromatography mass spectrometry (GC-MS) on the SAM instrument on the NASA Curiosity rover can detect organic molecules and to assess their origin. To better understand the performance of TMSH thermochemolysis to yield organics from Mars-analog samples, comparable experiments can be performed in terrestrial labs with samples from Pilot Valley, Utah. Four experiments were conducted on each sample: 1) flash pyrolysis at 500℃ or 2) ramped from 50 to 500℃ at 35℃/min (mimicking the SAM instrument), 3) with and 4) without TMSH. Results from sample 4-2-8-Geo were representative of the sample suite. With analysis 1+4, alkane/alkene doublets (aliphatics) were present and ranged from C9-C27,.With analysis 1+3, , the FA C14, C16, and C18 were detected, as well as the aliphatics from 1+4. Analysis 2+3 yielded the same results as 1+4. Through these data analyses of the samples run, we can conclude that organic biosignatures in microbially active samples are detectable without thermochemolysis. The FA results are puzzling, as the active microorganisms in these samples should yield robust FA profiles. Future work will assess the optimal temperature of TMSH thermochemolysis.

Presenter(s): Samantha Goldstein
Authors: Samantha Goldstein, Jane Morgan Daniel, Liana Hone
Faculty: Liana Hone

A Scoping Review of Menstrual Cycle Influence on Alcohol Use

This scoping review will establish whether patterns of alcohol use vary across menstrual cycle phases. Gender gaps in alcohol use disorder (AUD) and alcohol consequences are narrowing: rates of high-risk drinking and alcohol dependence are rising among women (Ruiz & Oscar-Berman, 2013). Incorporating menstrual cycle effects (i.e., distinct phases of hormone fluctuation) in alcohol research is necessary to achieve equitable health outcomes. We searched PsycINFO (EBSCOhost), PubMed, and Web of Science (Clarivate Analytics) from 2018 to 2023 for English language articles. We will include RCTs, non-randomized controlled trials, pre-post studies, analytical observational studies (i.e., prospective/retrospective cohort studies), case-control studies, and analytical cross-sectional studies that feature female assigned-at-birth participants of reproductive age (15-45). Search results will be uploaded into Covidence for title and abstract screening. Full-text articles will be retrieved, and screening questions and forms based on the inclusion and exclusion criteria will be developed and tested to facilitate data extraction. The results of the search and study inclusion process will be reported and presented in a Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) flow diagram. A narrative synthesis of included studies will be presented.

Presenter(s): Sarah Gontarski
Authors: Sarah Gontarski, Gabriel Prieto
Faculty: Gabriel Prieto

Changes in style through time; An analysis of Salinar Pottery in the North Coast of Peru

The late Early Horizon (400-200 BCE), also known as the Salinar in the North Coast of Peru, was a prolific moment in Andean Prehistory since it was immediately after the influence of Chavin de Huantar sphere of interaction. The people of this period left behind vast amounts of pottery, many of which carry distinct designs and motifs that have never been properly studied. This poster presents a first systematic analysis of the various designs on ceramics found on Salinar occupational levels at residential and ceremonial sites in Huanchaco. This analysis yields a timeline of designs presented on Salinar pottery throughout this period in order to show the changes in design through time along with changes in frequency of design by the type of archaeological site (ceremonial or residential). These changes are reflecting functional, environmental, political, ritual, or cultural perspectives that the people of the Salinar period experienced. Overall, the distinctive white on red ceramic style of the Salinar period gives way to a distinctive timeline of change that can tell us more about the sociocultural aspects of this period and their experiences through the use of the painted, carved, applied, and sculpted deigns placed on their pottery.

Presenter(s): Gabriela Gonzalez
Authors: Sarah Anderson, Gabriela Gonzalez
Faculty: Rachel Mallinger

Assessing network metrics in plant-pollinator networks across Florida habitat types

Anthropogenic changes modify natural ecosystems dramatically. With a growing human population, there is a rapid increase of land use changes. These changes include converting natural habitats into agricultural and urban areas. Native Florida pollinators are impacted by these changes through modifications in floral resource availability. Plant-pollinator network metrics are often used to assess the stability of plant-pollinator networks in the face of environmental changes including land-use change. We collected plant-pollinator networks across 29 sites visited over 2 years, making over 250 unique visits. Sites were categorized by the dominant land cover type as agricultural, urban, or natural. We assessed connectedness, nestedness, and partner diversity at each site. We then compared these site-level metrics across natural, agricultural, and urban habitats. We hypothesized that connectedness, nestedness, and partner diversity would be greater in urban areas as compared to natural and agricultural areas. Previous work has found urban areas to have strong plant-pollinator networks. If these metrics are greater in urban areas than in agricultural and natural areas, this might suggest that plant-pollinator networks in urban areas are more resilient to the impacts of further land-use change than networks in natural and agricultural areas.

Presenter(s): Julianne Gonzalez
Authors: Julianne Gonzalez
Faculty: David Foster

Relationship Between Magmatism and Continental Extension in the Sacramento Core Complex

The Sacramento Metamorphic Core Complex, located in the southern U.S. Basin and Range, formed as a result of rapid crustal extension along the Chemehuevi-Sacramento detachment fault system. Proterozoic, Mesozoic, and Miocene intrusive rocks from the footwall of this detachment fault that crystallized at about 10-15 km depth were exposed at the surface during extension. This study addresses the relationship between the generation and intrusion of magma into the crust and rapid extension through analyzing granite and granodiorite samples from the Sacramento Core Complex. Data on the major, minor, and trace elements of 11 samples were collected and analyzed to gain insight on the sources of magmas. The mineralogy of the samples was also analyzed through thin-section analysis to make conclusions on the composition and metamorphism of the rocks. The magma intrusion ages were analyzed through U-Pb geochronology of zircon grains and were found to be ~17-18 Ma for diorite to granite emplaced during extension and ~1.3 Ga for host rocks. These data combined with published estimates of cooling rates for the rock and rates of extension from published reconstructions indicate that the magmas were intruded synchronously with rapid extension and rapid exhumation.

Presenter(s): Lisa Gonzalez, Megan Nakamura, Eleonora Rossi
Authors: Megan Nakamura, Lisa Gonzalez, Melanie Gonzalez, Eleonora Rossi
Faculty: Eleonora Rossi

Early Behavioral and Neural Signatures of Novel Language Learning in Bilinguals

The disciplines of cognitive neuroscience and psycholinguistics have long been fascinated by the bilingual experience. This study focuses on understanding bilingualism and how it shapes the earliest neural signatures of novel language learning that emerge as rapidly as only 8-10 hours post-learning. This study implements a mini-longitudinal design that consists of a pre-test, 10 days of novel language learning, and a post-test. The main task is semantic categorization. This was administered once during the pre-test and again post-test but counterbalanced word order across all participants. This task prompts participants to evaluate semantic word meaning (in the target novel language) in terms of animacy and relative size. We utilize Electroencephalography (EEG), more specifically ERPs or Event-Related Potentials, to measure the neural signatures of novel language learning during the semantic categorization task. We expect the N400— a negative-going waveform that represents semantic processing—to be significantly reduced in the post-test compared to the pre-test, supporting the claim that neural signs of novel language learning are present after a short language learning period. This study directly relates to the overarching topic of neuroplasticity in language which can be further researched through other neuroimaging techniques.

Presenter(s): Maya Gonzalez
Authors: Maya Gonzalez, Taylor Stein
Faculty: Taylor Stein

Assessment of Visitor Perception of Natural Resource Impacts to Water-Based Recreation Areas

The demand for recreation in protected wetlands is ever-increasing, especially in the state of Florida. Yet, despite the many benefits nature-based recreation brings to persons and communities, all outdoor activities disturb the natural environment in some capacity, even at low levels of use. Research on the ecological impacts of nature-based recreation continues to accumulate while the social consequences of these resource impacts remain incompletely understood. On-site visitor surveys were conducted among five water-based recreation areas in north-central Florida to examine visitor characteristics that may influence perceptions of natural resource conditions. While participants throughout all study sites were weakly perceptive of all surveyed recreation impact types, factors such as prior use, frequency of use, and management intensity were found to have some influence on how visitors notice resource changes and how they feel it affects their recreation experience. Despite natural variability in the resource quality of each recreation site, visitor evaluations of such resources were unchanging across all sites.

Keywords: visitor perceptions, recreation ecology, water-based recreation, prior experience.

Presenter(s): Carmelina Gorski
Authors: Carmelina Gorski, Quan Vo, Dina Nacionales, Isaac Smith, Lyle L. Moldawer, Philip A. Efron, Paramita Chakrabarty
Faculty: Paramita Chakrabarty

Investigating the Effect of Acute Sepsis on Amyloid Beta Deposition and Gliosis

Sepsis is the leading cause of acute critical illness, characterized by a dysregulated immune response and organ dysfunction. Due to improvements in its management, there are more sepsis survivors, with many elderly survivors experiencing long-term cognitive dysfunction. It is hypothesized that a history of dementia worsens cognitive decline after recovery from sepsis. The primary aim of our study is to investigate the relationship between sepsis and dementia. Alzheimer's disease and related dementias are characterized by amyloid beta (Aβ) deposition and gliosis. Therefore, we used a mouse model of Aβ deposition to test the hypothesis that preexisting Aβ deposits would worsen the outcome of sepsis. A rodent model overexpressing mutant human APP (causative of Alzheimer's disease) was used. This mouse model, CRND8, is characterized by the presence of copious amounts of Aβ deposits by 3 months of age. We induced sepsis through cecal ligation and puncture in 3-month-old and 6-month-old CRND8 mice. Brain samples were harvested one week after sepsis induction. Aβ, astrocyte, and glial staining was performed, and each was quantified using Aperio ImageScope. We found acute sepsis to cause a glial response and astrocyte proliferation, while not affecting Aβ burden. Future work will investigate the long-term effects of sepsis.

Presenter(s): Ragan Grantham, Molly Jacobs, Charles Ellis
Authors: Ragan Grantham, Molly Jacobs, Charles Ellis
Faculty: Charles Ellis

Long Covid Among Young Adults: Findings from the Household Pulse Survey

COVID-19 is recognized for diverse symptomology and having a profound effect across the globe. Many of these symptoms can persist well past the average recovery time. Some individuals recovering from COVID-19 continue to experience a range of symptoms that persist beyond 3 months. These debilitating symptoms may include fatigue, difficulty thinking or concentrating, memory problems, shortness of breath, and dizziness. This symptoms profile has been defined as “long COVID.” Little is known about long COVID among young adults who have been most likely to recover from COVID-19 and have been less likely to experience negative outcomes. The objective of this study was to explore the nature of long COVID among young adults. We utilized data from the Household Pulse Survey that was developed by the US Census Bureau during the pandemic. Participants were asked about their experiences with COVID-19 and long COVID symptomology. Twenty-seven percent of young adults surveyed who experienced COVID-19 reported having long COVID symptoms. Symptoms reported included difficulty with understanding, hearing, and remembering things more than three months past infection. These findings suggest it is critical that we understand why young adults are being affected by long covid and how that impacts their lifestyles.

Presenter(s): Grace Granum
Authors: Sara Pickernell, Sparsha Muralidhara, Paige Sidwell, Grace Granum, Grace Hey, Preya Patel, Darragh P. Devine
Faculty: Darragh Devine

Defining the social defeat stress model through analyzing depressive-like behavior in rats.

Major depressive disorder (MDD) is one of the most common disorders on a worldwide scale, and is characterized by persistent and prolonged despair and anhedonia. Social stressors have been shown to play a role in defining MDD, and because of this, has been studied via the social defeat model using rodents. Dominant and submissive behaviors in the model have been studied using mice, but never rodents- this investigation will be analyzing the changes in dominant and submissive behavior in rats observed over time. Specifically, the investigation will analyze whether or not dominance behavior in resident rats during the training session is stable or dynamic when interacting with a novel group, as well as if there is a relationship between dominance behavior seen in residents and submissive behavior seen in intruders (and if this dynamic changes over time). While the investigation is currently analyzing the residents' behavior when interacting with a novel group, data from the trainer residents have shown that the time for residents to defeat an intruder decreased over the 8 days, revealing that the territorial dominance of residents increased as they became familiarized with the social defeat model.

Presenter(s): David Griffin
Authors: Griffin, David
Faculty: Michael Gorham

Discourse on the 2022 Invasion of Ukraine on Russian-Language Telegram

The full-scale invasion of Ukraine by Russia on 24 February 2022 has led to a protracted conflict entering its second year. The war has spurred on the further growth of the Russian-made social media application Telegram—the most popular instant messaging service in Russia. Among its most popular channels are many which extensively cover news related to the war. We used a multinomial logistic regression model to systematically categorize over 100,000 posts by topic from the influential Telegram channels "Дмитрий Медведев", "Kadyrov_95", "Медуза — LIVE", "Прямой Эфир", "РИА Новости", "СОЛОВЬЁВ", and "WarGonzo", each of which has over a million subscribers. The frequency of different post topics by channel over the period of 1 January 2022 to 31 December 2022 provides a framework for analyzing how these news outlets presented their narratives of the important events in the first year of the war.

Presenter(s): Pietro Guarisco
Authors: Pietro Guarisco
Faculty: Joann Mossa

A Multiscalar Assessment of Mining in River Floodplains of the Southeastern United States

The mining of sediment is a profitable activity involving clearing and digging out large tracts of land and transformation of the topography. Often, these mines, as well as the pits, ponds, and piles of sediment are near or within the floodplains of a fluvial system. During flood events, the river will overtop and erode riparian areas that separate it from the mine, and flow into the pit and cause planform changes including avulsions. The USGS has mapped mining sites across the United States, but still have multiple omissions. Google Earth Pro was used to collect point data on mines that are less than 300 m from rivers and creeks in the southeast, a region of high biodiversity. Google Earth extracted data was compared to USGS data using ArcGIS Pro, and their proximity to floodplains and channels was analyzed. Distance between the channels and pits prior to avulsion was measured using Google Earth Pro to assess potential risk for other sites. The findings supported the conclusion that current data sets, while thorough, are still incomplete and that a better understanding of site location can reduce the risk of avulsions, which can impact infrastructure, property boundaries, and flood risk.

Presenter(s): Amiya Gupta
Authors: Amiya Gupta, MaryBeth Horodyski, Cong Chen, Scott Banks
Faculty: Scott Banks

Quantifying Changes in the Cervical Spinal Canal during Emergency Positioning Maneuvers

Suboptimal spinal stabilization procedures can decrease the space available for the spinal cord (SAC) and cause neurologic deterioration during emergency positioning maneuvers. To study the efficacy of stabilization procedures, a novel method was developed to quantify the SAC in the cervical spinal canal during maneuvers. Data was collected during a cadaver study which tracked the spine movement during different emergency positioning maneuvers. The cervical spines were instrumented with fiducial markers and CT scanned, which were then segmented to create patient-specific geometry. During the maneuvers, motion measurements were collected in 6DOF with electromagnetic Polhemus sensors. Coordinate transforms were developed to produce the relative-body motion of the C5 and C6 cervical vertebrae from the CT segmentations and motion capture data. From these kinematics, the 2D SAC was calculated using image processing techniques. Future work will focus around determining the volumetric changes in the SAC and understanding the changes in the SAC of the lumbar spine.

Presenter(s): Michael Guyot
Authors: Michael Guyot, MacKenzie Williams, Benjamin M Bumgarner, Maigan Brusko, Martha Campbell-Thompson, Clive Wasserfall, Brittany Bruggeman
Faculty: Brittany Bruggeman

Using Artificial Intelligence in Pancreatic Cell Classification

We developed a robust Artificial Intelligence classification algorithm containing both supervised components to quantify and classify the various pancreatic cells into their respective subtypes, including supporting cells such as vasculature, endocrine cells (can be further broken down into alpha, beta, delta and pancreatic polypeptide producing cells) and exocrine cells (can be further broken down into acinar and ductal cells). From this, we plan to extract relevant feature information such as cell size, number and density among others. After we have the architecture solidified, we hope to use it to analyze differences in the disease and control pancreata. We hope this will uncover previously overlooked information that may prove critical to the understanding of the mechanism of disease progression of T1D. This panel has been tested in formalin-fixed paraffin embedded (FFPE) pancreatic tissue sections from one control donor. Preliminary images have been collected with successful imaging of several exocrine and endocrine pancreatic proteins. With these images, a supervised thresholding classification algorithm was applied with relatively high accuracy. However, further work is needed to optimize and improve accuracy.

Presenter(s): William Hachmeister
Authors: William Hachmeister, Philip Mackie, Sarah Bahsoun, Habibeh, Khoshbouei
Faculty: Habibeh Khoshbouei

Brain Immunologic Changes precede α-synuclein Pathology in a Mouse Model of the Braak Hypothesis

Parkinson’s Disease (PD) is the second-most prevalent neurodegenerative movement disorder. The widely supported Braak Hypothesis posits the origin of PD to be in the gut and spread to the brain through the Vagus nerve. This is evidenced by the appearance of α-synuclein aggregates in the gut, their proliferation through the gut-brain axis, and gastrointestinal dysfunction, such as gastroparesis in PD patients. The neurophysiologic mechanisms behind gut dysfunction are poorly understood. The stomach is heavily innervated by vagal efferents originating in the brain at the dorsal motor nucleus (DMV). To examine the Braak Hypothesis, we injected the gut wall of C57B6/J mice with preformed fibrils of α-synuclein to induce enteric synucleinopathy. Synucleinopathy was observed 30 days post-injection in the gut as evidenced by increased pathologic α-synuclein. We also observed increased stomach distension at 30 days, suggesting impaired gastric motility. However, we did not find any α-synuclein pathology in the DMV. We examined microglia morphology in the DMV via sholl analysis which showed increased complexity at 30 and 60 days post-injection, potentially indicating early microglia reactivity to sub-microscopic α-synuclein seeds that precedes bona-fide synucleinopathy. Current work is examining synaptic engulfment by DMV microglia to evaluate potential sources of DMV dysfunction.

Presenter(s): Marion Hagstrom
Authors: Marion Hagstrom, Parker Kotlarz, Marcelo Febo, Juan C. Nino
Faculty: Juan Nino

Aging in the Human Brain Network

There is growing literature establishing functional differences in normal cognitive aging versus abnormal cognitive decline, such as Alzheimer's disease. However, less is known on healthy aging differences in functional connectivity between young and old subjects. Investigating functional network organization between the two age groups is needed to understand cognitive decline. In this study, we assessed functional connectome measures of five significant network quantifiers, including node strength, in young (19-27 y/o) and old (>60 y/o) individuals using high-density node sampling strategy for resting state fMRI signal. We focus on node strength as it is well established that functional connectivity between regions of cognitive and sensorimotor networks are weaker in older individuals with cognitive dysfunction relative to matched controls. Data was obtained from the University of Florida NEPAL study (n=87). We applied graph theory-based calculations to weighted undirected matrices of 300 nodes. We observed significant differences between the age groups in clustering, both on a nodal and global scale. The transition of the brain in aging can be quantified via these significant parameters with promise of predicting brain age and providing a better model of comparison for neurodegenerative disorders.

Presenter(s): Madison Halcomb
Authors: Katherine M. Gonzalez1,3, Madison Halcomb2, Mojdeh Faraji1,3, Anna Haymov2, Vicky S. Kelley1, Barry Setlow2,3, Jennifer L. Bizon1,3
Faculty: Barry Setlow

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

Aging is associated with changes in prefrontal cortex-mediated cognition; however, most rodent models have almost exclusively used males. We evaluated young adult (6 mo.) and aged (22 mo.) Fischer 344 x Brown Norway F1 hybrid rats of both sexes on several executive function tasks. In the intertemporal choice task, rats selected between a small, immediately delivered food reward and a large, delayed food reward. Aged males preferred the large, delayed reward more than all other groups. In the working memory task, rats had to recall the location of a lever following a delay. Aged males performed less accurately than all other groups. In the probabilistic reversal task, rats differentiated two levers with different probabilities of delivering a food reward when selected, and these probabilities switched multiple times per session. Females performed more reversals than males. In the progressive ratio task, rats were given one lever, and the number of lever presses needed to receive a food reward increased after each reward earned. Aged males earned fewer food pellets than all other groups. Together, these data suggest that aging has different effects on executive functions in males and females, highlighting the importance of including both sexes in aging studies.

Presenter(s): Aria Harding
Authors: Brian Fazzone, Aria Harding, Mark Beveridge, Kerri O'Malley
Faculty: Scott Berceli

The Role of Skeletal Muscle Stem Cell Behavior in Vascular Disease

Chronic kidney disease (CKD) is common in chronic limb-threatening ischemia (CLTI) patients and may hinder skeletal muscle recovery after surgical revascularization. Uremic metabolites in CKD patients impair skeletal muscle stem cell (MuSC) proliferation and differentiation; however, the concomitant effects of CKD and CTLI on MuSCs are unknown. The goals of this study are to (1) identify the dominant mechanism of MuSC dysfunction in CKD, CLTI, and CKD-CLTI using a cell culture model; (2) evaluate the effects of ischemia-reperfusion injury on MuSC proliferation, apoptosis, and differentiation. Murine C2C12 cells were cultured under normal conditions and conditions mimicking CKD. CKD was modeled through the addition of uremic toxins to culture media in varying concentrations to mimic early (low-dose) and late (high-dose) stage renal dysfunction. MuSC proliferation and apoptosis were assessed using BrDU and apoptosis cellular assays. Our preliminary results demonstrate that MuSC proliferation is significantly decreased in advanced CKD environments yet preserved in early CKD. Our imminent project goals are to evaluate the degree of oxidative stress in cell culture and grow cells in a CLTI-environment. To mimic CLTI, we have acquired a hypoxia chamber which will be used to grow cells in a hypoxic environment like the ischemic limb.

Presenter(s): Natalie Heaton
Authors: Natalie M. Heaton, Thomas H. Murphy, Lucas C. Majure
Faculty: Lucas Majure

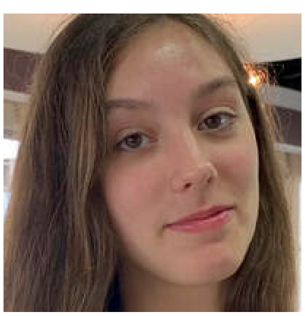
An Integrative Taxonomic Approach to Species Delimitation within the Smilax lasseriana Species Complex

Smilax is a taxonomically difficult genus consisting of dioecious vines that exhibit wide intra- and interspecific variation. For some Smilax collected from the Guiana Shield, relationships remain unclear, and morphological discrepancies among certain specimens suggest the existence of previously undescribed species. Multiple lines of evidence, including morphology, anatomy, and phylogeny, were considered in order to investigate a putative new species from Suriname, and over 80 Smilax specimens were examined. Geometric morphometric data were extracted from specimens in the form of leaf outlines before being analyzed using PCA, and linear morphometric data on stem, leaf, and reproductive characters were also collected and analyzed using ANOVA and PCA. Stomatal impressions taken from select specimens were used to measure characters such as stomatal density, which were then analyzed using ANOVA. Plastome data were assembled and used to reconstruct a phylogeny using maximum likelihood. Both linear and geometric morphometric analyses allowed for the distinction of the putative new species. Although stomatal anatomy could not be used to distinguish this putative species from S. lasseriana, possible connections between stomatal anatomy and climactic characters are discussed here, along with evolutionary relationships between the species in the complex.

Presenter(s): Brandon Hertzendorf
Authors: Brandon Hertzendorf,1 Jaya Mallela, BA,1 Andrea L. Fidler, PhD, MPH,1 Manuela Sinisterra, MS,1 Deborah M. Ringdahl, DNP, APRN, EBP-C,2 & David A. Fedele, PhD ABPP1
Faculty: David Fedele

<u>Sleep Transition after Hospitalization in Adolescents and Young Adults: A Qualitative Overview</u>

Sleep quality is important for recovery, especially following hospitalizations. Some providers believe lost sleep while hospitalized can be recouped when the patient gets home, yet there is little standardized research on this transition. This study aims to explore 1) themes of how patients' sleep changes during the transition home after hospitalization and 2) the duration of time it takes for them to return to their typical sleep. Participants included 12 adolescent and young adults aged 13-26 years (Mage=18.92) who were hospitalized on pediatric non-intensive care units. Participants completed a semi-structured interview as part of a larger mixed-methods project examining inpatient sleep. Some patients described experiencing negative changes in their sleep after returning home, whereas others reported improvements. The most frequent difficulties included adjusting to a different bed (50%) and experiencing night interruptions (42%). Of those asked how long it took to return to their normal sleep patterns at home, half of the participants took two to three days. Sleep stabilized within one week which is why additional research is needed to explore how poor sleep habits from the hospital may also transition home. Findings suggest sleep concerns could be proactively addressed by providing individualized recommendations for sleep at discharge.



Presenter(s): Claire Hiaasen
Authors: Claire Hiaasen, Patrick Saldaña, Andrew Altieri
Faculty: Andrew Altieri

<u>Analyzing Ocean Deoxygination as a Predictor of Coral Morphology Changes with Depth</u>

As climate change continues to increase the average temperature of the ocean, sessile organisms are becoming more and more vulnerable to the understudied effects of ocean deoxygenation. This paper focuses on the shift in coral morphology with depth given normoxic and hypoxic conditions. On the northeast coast of Panama, in the Bocas del Toro province- 6 sites were chosen to conduct transect photo-surveys. Of these sites, three are hypoxic and three are normoxic. One fifty-meter transect was laid out at each site, with a meter quadrat photographed every other meter mark. These photographs where processed in UC San Diego's CoralNet software, using the framework to generate a set of 50 randomized points within each quadrat to estimate percent coverage for mounding and erect coral growth morphologies. Coral coverage for each growth form was estimated using the percent abundance of randomized points multiplied by total transect area, and three PERMANOVA tests were conducted in the statistical software R to determine the influence of each factor on coral area. Though hypoxia was not an effective predictor of morphology, this paper finds that coral cover is influenced by a cross between depth and morphology-though with some variation.

Presenter(s): Morgan Himes
Authors: Morgan Himes, Preshanth Jagannathan, George Heald
Faculty: Preshanth Jagannathan

Bias in Polarization CLEAN Imaging

Various deconvolution algorithms, such as Hogbom CLEAN, have been developed to construct images of the sky from radio interferometric data. The algorithms used for interferometric synthesis imaging are typically not robust for the accurate reconstruction of linearly polarized flux of sources with nonzero rotation measures. This project focuses on linear polarization in Stokes Q and U and the bias introduced in CLEANing linearly polarized sources. We propose a hybrid method of CLEANing based on QU fitting to reduce this bias. This method acquires a fit for the source's spectral index, polarization angle, total intensity (Stokes I), polarized fraction, and rotation measure from a dirty image and uses these parameters to form a model that is used for CLEANing. Preliminary results show that this method converges faster than the existing imaging methodologies but introduces some degeneracies in the fitted parameters.

Presenter(s): Lee Hoffman
Authors: Lee Hoffman
Faculty: Neil Weijer

Extra Extra Read All About It: Alternative Press

Zines (pronounced Zeen) are ephemeral booklets, made by hand and published independently. My research addresses the themes of temporal connection through alternative forms of print communication, which aims to challenge the obsolescence of print technology, highlight concepts of DIY print culture, and inspire others to engage in print creation. Zines are a cultural apparatus for the production of information and self-expression. Other forms of small and amateur publications, like fine press print and poetry broadsides, parallel the conception of zines. UF's Special Collections contain historical examples of fanzines, poetry booklets, and broadsides produced throughout the twentieth century. I have compared these to the zines at the Civic Media Center's (CMC) Travis Fristone Zine collection. The CMC is a local infoshop that holds zines from all over the nation, produced from the 1980s to the present. The thematic threads that tie amateur publication history together include the practice of copyright, reuse of grafted imagery, dialectic discussions, and reliance on "outdated" printing techniques. We write to remember, and concomitantly we write to be remembered. Print is an action of connection, dispersing information far across time and space, dependent on the intentionality of the creator and reader.

Presenter(s): Alyssa Holmquist
Authors: Alyssa Holmquist
Faculty: Anne Donnelly

Political Party and Mental Health

This project investigated the link between political party and mental health in the United States. Data was gathered from previous U. S. elections, Mental Health

America, and the Substance Abuse and Mental Health Services Administration and analyzed to investigate the relationships in four studies. The first analyzed current associations between state mental health rankings and voting margins in the 2020 presidential election. The second analyzed this same connection but over the years 2008-2020. The third compared the percentage of liberal control in the government with the percentage of American adults receiving mental health care services. The fourth analyzed voting margins and state mental health rankings at the end of the term to determine if mental health was associated with being governed by the party for which the state voted. Studies 1, 2, and 4 were found to have significant relationships after statistical analysis. This indicates that voting liberal is associated with better mental health rankings at the state level, both currently and throughout previous elections. It also signifies that being governed by the party for which the state voted is associated with better mental health at the state level. In future studies, it may be beneficial to conduct individual assessments to determine if this relationship only exists at the state level.

Presenter(s): Anna Hooks
Authors: Anna Hooks, Nicole Jones
Faculty: Nicole Jones

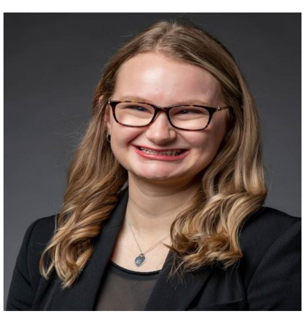
Hook-Up and Dating Culture among BIPOC Sexual and Gender Minorities

This study will seek to understand how queer women and nonbinary people of color experience sexual racism in hookup culture and dating through a series of qualitative interviews. Sexual racism looks specifically at the intersection between heterosexism and racism. While all members of the LGBTQIA+ community experience heterosexism, whether it be internalized or external discrimination, members within the community can still perpetuate racism or experience it themselves from other members of the community. An in depth literature review as well as a series of semi-structured qualitative interviews are in the process of being conducted, which will then be analyzed using Patricia Hill Collin's sexual racism framework. While interviews are ongoing, a literature review has highlighted that women and nonbinary people of color face unique forms of discrimination within hookup culture on college campuses.

Presenter(s): Ashlyn Hu
Authors: Usa Suwannasual, Ashlyn Hu, Yiling Xu, Hans Ghayee, Chalermchai Khemtong
Faculty: Chalermchai Khemtong

Investigation of Branched-Chain Amino Acid Metabolism Genes in Pheochromocytoma Cells

Pheochromocytoma (PCC) is a form of neuroendocrine tumors found in the adrenal glands. It is now known that an aggressive phenotype of PCC harbors a mutation in the citric acid (TCA) cycle and lacks enzyme succinate dehydrogenase subunit B (SDHB), leading to changes in substrate metabolism into the TCA cycle. We hypothesized that the metabolism of branched chain amino acids (BCAA) is different in SDHB-deficient PCC cells compared to wild-type (WT) PCC cells. In the present work, we investigated expression levels of genes involved in BCAA metabolism in PCC cells with and without SDHB mutations. Human progenitor cell lines (hPheo1) derived from a human PCC tumor were studied, with WT hPheo1 cells serving as the control and SDHB knock-out (KO) hPheo1 cells serving as the more aggressive form. Results show increased expression of branched chain amino acid transaminase 2 (BCAT2), branched-chain alpha-ketoacid dehydrogenase complex (BCKD), protein phosphatase, Mg^{2+}/Mn^{2+} dependent 1K (PPM1K) in hPheo1 KO compared to the WT cells. Expression of branched-chain α-ketoacid dehydrogenase complex (BCKDDH) was not statically different between the two types of cells. Our results suggest increased metabolism of BCAA in SDHB-deficient hPheo1 cells and targeting this metabolic pathway could be a potential therapeutic approach for PCC.



Presenter(s): Bailey Huttel
Authors: Bailey Huttel, Ian Germaine, Lisa McElwee-White
Faculty: Lisa McElwee-White

Tungsten Dithiolene Complexes as Single-Source Precursors for Tungsten Disulfide via Aerosol Assisted Chemical Vapor Deposition

This project focuses on deposition of tungsten disulfide (WS2) films through the use of aerosol assisted chemical vapor deposition (AACVD). Layered transition metal dichalcogenides, such as WS2, have gained attention due to their applications in photoelectrochemical and photovoltaic cells, dry electrodes for batteries, and gas sensors. WS2 films have been grown using several different techniques, but we focused on using AACVD to synthesize thin films of WS2 on silicon substrates. In addition to AACVD, we employed what are called single-source precursors (SSP's), which contain all of the desired film atoms into one molecule, simplifying the deposition procedure. In sum, we evaluated tungsten dithiolene complexes and assessed their performance as SSP's for AACVD. We used a series of instruments to evaluate our films and confirm WS2 was deposited.

Presenter(s): Phong Huynh, Xiang Li
Authors: Phong L. Huynh, Xiang Li, Abdul Rouf Dar, Rongrong Yu, Melisa S. Gonzalez, Brian Chen, Morgan E. Stankos, Rebecca A. Butcher
Faculty: Rebecca Butcher

Towards the Synthesis of Nemamide Side-Chain to Investigate the Biosynthetic Pathway of Nemamide

Small-molecule pheromones and hormones produced by a model organism, Caenorhabditis elegans, influence its development, metabolism, fertility, and lifespan. Because these signaling molecules are also present in parasitic nematode species, studies of chemical signaling in C. elegans can aid in the development of chemical tools to interfere with the life cycles of parasitic species. One of these signaling molecules is nemamide, a hybrid polyketide-nonribosomal peptide that promotes recovery from and survival during starvation-induced larval arrest. Nemamide is biosynthesized by a hybrid polyketide synthase-nonribosomal peptide synthetase (PKS-1) and nonribosomal synthetase (NRPS-1) in an assembly line manner. The low abundance of nemamide in worms with no known biosynthetic pathway to produce this small molecule have made it difficult to perform bioassays. We are working on the organic synthesis of nemamide side-chain to elucidate key enzymatic steps involved in biosynthesis of nemamide. The proposed reaction starts from 3-trimethylsilyl (TMS) propynal followed by Grignard reaction, enzymatic acylation, and osmium tetroxide oxidation to extend the length of the chain and generate two stereocenters. The current progress on synthesizing key intermediates and the proposed biosynthetic pathway of nemamide will be presented.

Presenter(s): Alivia Ishee
Authors: Alivia Ishee, Garret Rubin, Yousong Ding
Faculty: Yousong Ding

Detecting Novel RiPPs by Structural Approximation

Ribosomally synthesized and post-translationally modified peptides (RiPPs) such as lanthipeptides and graspetides are an important family of structurally and functionally diverse natural products. Over 42 classes of RiPPs have been discovered so far based on final peptide structures and enzymes that catalyze the post-translational modifications. To uncover cryptic biosynthetic gene clusters (BGCs) of RiPPs with novel functions and chemistry, a comprehensive genomic approach is necessary to leverage ever-expanding genomic data. These detection tools widely rely on algorithms that detect protein sequences with similar chemistry based on high sequence similarity to the knowns. However, they fail to detect proteins with low sequence similarity that nonetheless can have a high degree of structural similarity. To address this gap in identifying truly novel RiPPs, we developed a program to annotate putative natural product BGCs based on predicted structural and functional similarity to known tailoring enzymes. To estimate the similarity parameter in a computationally friendly manner, open reading frames (ORFs) are aligned with target protein sequences to predict their activity as a RiPP enzyme using alignment score, predicted secondary structure, and residue chemistry and size. We expect that this new approach aids in the search for novel RiPP classes.

Presenter(s): Andrea Iturbe
Authors: Andrea Rivasplata, Jose Torrellas, Quan Vo, Michael Strickland, Matthew Farrer, Paramita Chakrabarty
Faculty: Paramita Chakrabarty

Studying The Role Of Interferon-γ in Neurodegeneration

Interferon-γ (Ifn-γ) is a central regulator of innate immunity. We tested whether Ifn-γ signaling would underlie degenerative phenotype in the brain. We showed that while expression of Ifn-γ in the brain leads to selective loss of nigro-striatal neurons in wild type mice, expression of Tumor necrosis Factor a (Tnfa), another pro-inflammatory cytokine, does not. Follow-up experiments in mice lacking Ifn-γ receptor or STAT1 showed that the degenerative effect of Ifn-γ is mediated through canonical signaling pathways. Recent data has shown that one of the physiological targets of Ifn-γ is Leucine-rich repeat kinase 2. We hypothesized that synergistic interaction between LRRK2 and Ifn-γ activation would underlie inflammation and PD-typical neurodegeneration. Mutations in the LRRK2 gene are found in familial and idiopathic cases of Parkinson's disease (PD).To test our hypothesis, we expressed Ifn-γ in the brains of mice harboring the PD-associated Lrkk2 G2019s mutation. We then expressed Ifn-γ in the brains of wild type mice. We confirmed that Ifn-γ expression caused robust gliosis in both Lrrk2-G2019S mice and wild type mice. We next tested whether Ifn-γ expression led to preferential early ablation of nigrostriatal pathway in Lrrk2-G2019S mice compared to wild type mice. Our results indicate that both Lrrk2-G2019S and wild type mice are equally vulnerable to Ifn-γ stimulus.

Presenter(s): Julia Jamieson
Authors: Frederick Ashby, Julia Jamieson, Alex McNally, Kimberly Hawkins, Joseph DeCosmo, Lingbao Ai, Tim Garret, Priya Shil, Coy Heldermon
Faculty: Coy Heldermon

Differential Metabolomic Pathway Response to the Ketogenic Diet in Sanfilippo Syndrome Type-B Mice

We investigated if the use of the ketogenic diet in MPS IIIB C57BL/6 mice would have a different effect on the metabolome compared to wild-type control C57BL/6 mice. MPS IIIB mice were fed either a ketogenic diet (N=6) or a ketogenic-control diet (N=6) and harvested 8-weeks after weaning with a protein extraction of the whole brain. Control mice were also fed ketogenic (N=6) and ketogenic control (N=6) diets and harvested at the same time point. Mass spectrometry was performed on the brain protein extracts, and the resulting dataset was normalized by sum. The dataset was logarithm transformed and underwent Pareto scaling, and differences between each genotype's respective keto-control and ketogenic diet were assessed with a metabolite cutoff of $\alpha=0.05$ and fold-difference of 2. We found that wild-type C57BL/6 mice primarily had differential metabolite activity in amino acid metabolism pathways, sucrose metabolism, and glutathione metabolism. In contrast, MPS IIIB mice primarily had differential metabolite activity in Vitamin B6, with far less involvement of amino-acid metabolism pathway metabolites compared to wild-type mice. This may provide insight to the impairment of normal amino-acid metabolism in GAG-excess states and suggests a possible significance of cofactors in compensating for this disruption.

Presenter(s): Camille Jastrzebski, Mackenzie Williams
Authors: Camille Jastrzebski, Mackenzie Williams, Sylvain Doré
Faculty: Sylvain Doré

Iron Chelators as an Emerging Therapeutic Treatment Option for Subarachnoid Hemorrhage

Subarachnoid hemorrhage (SAH) is a stroke condition characterized by blood accumulation within the subarachnoid space surrounding the brain. An overload of unbound iron in the brain, which results from the breakdown of hemoglobin, has been shown to exacerbate natural physiological mechanisms, leading to iron toxicity and the formation of hydroxyl radicals. The generation of these radicals in turn disrupts the blood-brain barrier, allowing blood to enter the cerebral cavity, and promotes neurotoxicity, apoptosis, and oxidative damage. Iron chelation therapy effectively reduces the presence of unbound iron in the brain by using iron chelators to bind ferric iron (Fe^{3+}), thus sequestering it. The sequelae of SAH may include cerebral vasospasm, brain edema, cognitive impairment, and hydrocephalus, with cerebral vasospasm being the most common, occurring in about 70% of SAH patients. Eleven preclinical studies had positive results when examining the efficacy of iron chelators such as deferoxamine (DFX), deferiprone (DFO or CP20), 2,2'-dipyridyl (DP), and desferrioxamine (DFXA) in mitigating the conditions that may arise after SAH through iron chelation therapy. This scoping review aims to highlight the cerebroprotective capacity of iron chelators shown in preclinical trials, making it a promising therapeutic option for SAH.

Presenter(s): Sofia John
Authors: Dr. Ferrall-Fairbanks, Sofia John
Faculty: Meghan Ferrall-Fairbanks

Mathematical Model of the Two Strike Hypothesis in Bladder Cancer

Bladder cancer is a global issue, causing over 165,000 deaths annually. Although BCG immunotherapy is the standard treatment for high and intermediate-risk non-muscle invasive bladder cancer, recurrence and progression rates remain high, highlighting the need to better understand the heterogeneity in patient response to treatment.

This project offers a two-pronged approach to address this issue. The first approach involves using a mathematical model to identify optimal therapeutic schedules based on the use of both BCG and anti-PDL1 therapy, driven by a “two-strike” strategy. The approach aims to decrease the tumor population into one phenotype and deplete the remaining phenotype, potentially leading to better treatment outcomes.

The second approach involves conducting a statistical analysis on an mRNA gene dataset to identify specific pathways that differ in responders versus nonresponders. This analysis could reveal potential biomarkers or new therapeutic approaches, leading to more personalized and effective treatmentslal
patients.

Both approaches may offer clinical guidance to physicians for patient treatment and improve the understanding of the diversity in patient response to BCG. Given the impact of bladder cancer, improving treatment outcomes and identifying new therapeutic approaches are essential in reducing morbidity associated with this disease.

Presenter(s): Manoj Kambara
Authors: Manoj Kambara, Farhad Dastmalchi, Dominick Lemas
Faculty: Dominick Lemas

The Impact of Maternal Obesity on Perinatal Cancer Outcomes Using Electronic Health Records

Cancer is one of the leading causes of mortality for women of reproductive age. Obesity is one of the most common risk factors for cancer; however, population-level data suggest that cancer patients that are either overweight or obese have lower mortality rates. Despite this observation, there are limited population-level investigations to understand the relationship between obesity and cancer risk. The objective of this project is to investigate the impact of perinatal cancer on maternal and infant outcomes. We analyzed electronic health records from the Integrated Data Repository, linking maternal-infant health records to estimate maternal obesity from pre-pregnancy and delivery BMI and perinatal cancer status from ICD9/10 codes. Our analysis included statistical tests to study perinatal cancer and maternal and infant outcomes. In our preliminary analysis of 28,530 records, we identified 280 deliveries with at least one cancer outcome. Our results showed that mothers diagnosed with cancer had significantly lower BMI, and infants born to mothers with cancer had significantly lower birth weight and gestational age compared to those without cancer. These findings suggest that perinatal cancer negatively impacts infant outcomes. Our results have translational impact to improve clinical management of cancer patients in perinatal populations with obesity.

Presenter(s): Rachana Kandru, Saketh Damera, Mansi Patel
Authors: Rachana Kandru, Saketh Damera, Mansi Patel
Faculty: Ajay Mittal

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

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

Presenter(s): Erin Kang
Authors: Erin Kang, Charmi Desai, Sophia Moret, Jacob Borukhin, Ashmitha Satish, Jonah Juergensmeyer and Karina Alviña
Faculty: Karina Alviña

Examining the Efficacy of Swimming Exercise in Counteracting Stress and Anxiety in Male Mice

Stress can have detrimental effects on the brain, such as impaired cognition and increased anxiety-like behaviors. Previous research has demonstrated that exercise can have neuroprotective effects including increased neurogenesis and elevated release of BDNF. Exercise can also counteract the negative effects of stress via the release of myokines, such as Irisin, to protect against cognitive decline. To investigate the stress-reducing effects of a chronic swim protocol in male mice, wild type mice were divided into sedentary and exercise groups. The exercise group underwent chronic swimming for 20 minutes daily for 20 days, while the sedentary group remained in their home cages. After the exercise protocol, half of each group was subjected to acute stress paradigms. All the mice completed a combined open field and Novel Object Recognition test to assess cognitive function, with data quantified using manual and software analysis. The results indicate that the exercise-stress group showed a higher preference index than the sedentary-stress group. In NOR 1, the exercise group had a higher count of unsupported rearing than the sedentary group, suggesting that exercise could alleviate anxiogenic behaviors to a certain extent. However, the results did not provide statistically significant evidence that exercise is beneficial in counteracting stress.

Presenter(s): Maya Kantor
Authors: Maya Kantor, Alayna Shoenfelt, Didem Pehlivanoglu, Amber Heemskerk, Ziad Hakim, Matthew Grilli, Matthew Huentelman, Gary Turner, Nathan Spreng, Natalie C. Ebner
Faculty: Natalie Ebner

Susceptibility to Online Deception in Aging

Financial exploitation of older adults has become an increasing problem, especially in the era of digital information. Older adults may be more susceptible to financial fraud than younger adults. Furthermore, older adults at risk for Alzheimer's Disease, indicated by the presence of apolipoprotein (APOE) e4 allele, may be even more susceptible to online deception. The purpose of this study was to determine whether older adults were more susceptible to online scams than younger adults in the lab and in the real world and if this was moderated by APOE risk status. Data was collected using the Phishing Email Suspicion Task (PEST), an ecologically valid lab-based measure, and the Phishing Internet Task (PHIT), a real-world simulated phishing task. The results showed an age-related decline in the ability to discriminate between genuine and phishing emails. Additionally, older adults were more likely than younger adults to click on links in the simulated phishing emails. Further, presence of APOE risk allele did not moderate any findings. Future analyses will consider loneliness as a moderating factor for susceptibility to deception in aging.

Presenter(s): Ava Kaplan
Authors: Ava Kaplan
Faculty: Sharon Austin

DeSantis Administration Higher Education Policy and The University of Florida

This study investigates how students and employees of the University of Florida perceive and are impacted by the higher education policy of the DeSantis administration. Qualitative interviews conducted during fall semester 2022 and early spring 2023 with a variety of students, faculty, and staff of the university ask what different members of the UF community perceive to be the biggest issues impacting UF and how state politics impact their day-to-day as a member of the UF community. The results demonstrate a variety, with faculty being more impacted and aware than students regarding the relationship between higher education and state politics but students becoming increasingly aware as policy becomes more extreme. Interview data shows that overall the DeSantis administration's policy is having a negative impact on the quality of education at the University of Florida.

Presenter(s): Morgan Kaplan, Sarah Garan, Tiffany Curry, Lauren Sanchez, James Clikas
Authors: Morgan Kaplan, Sarah Garan, Tiffany Curry, Lauren Sanchez, James Clikas, Dominic Hall, Douglas Nabert, Nicole Chambers, Michael Millett, Mark Moehle
Faculty: Mark Moehle

Conditional Knockout of GNAL in the Cerebellum Leads to Dystonic Phenotypes in Mice

GNAL-linked dystonia is an adult-onset disorder in which loss-of-function mutations produce involuntary twisting movements and muscle contractions. GNAL is a gene that encodes the alpha subunit of the heterotrimeric G-protein, G-alpha olf. Gaolf is expressed in both striatal and cerebellar neurons which are critical for coordinating movement. Prior models of GNAL-linked dystonia do not lead to dystonic phenotypes. Therefore, we created a GNAL floxed mouse. Upon injection with a cre virus, Gnal is conditionally knocked out in the area of injection. Previously we found that Gnal knockout in the striatum leads to dystonic motor phenotypes and additional motor deficits. In the current study we used a cre virus to knock out Gnal in the cerebellum and examined motor behavior. We conducted a motor battery and observed that cerebellar Gnal conditional knockout mice showed worse motor performance than controls. Overall, cerebellar Gnal knockout produces motor deficits which differ from those observed from striatal Gnal knockout. This suggests that cerebellar and striatal Gnal differ in its function in movement. To date, this is one of the only dystonia models to show overt symptoms, therefore the Gnal floxed mouse is a promising animal model with which to study dystonia pathology and treatment.

Presenter(s): Nicholas Kapsos
Authors: Nicholas Kapsos
Faculty: Dominique Laroche

Schrodinger-Poisson Simulation of Bilayer Ge/SiGe Devices

Bilayer Si/Ge heterostructures are appealing as novel quantum computing platforms due to the potential of spontaneous interlayer coherence occurring within them. A Schrödinger-Poisson simulation to model bilayer Si/Ge heterostructures has been made and improved upon in order help identify the underlying mechanisms and supplement experimental results. An analysis of the effect of a magnetic field on bilayer Si/SiGe devices was made using the Schrödinger-Poisson simulation, demonstrating that for the current experiment an applied field has an unmeasurable effect on the energy of the states associated with the layer degree of freedom. Furthermore, simulations were performed to establish the optimal inter-layer separation that minimizes inter-layer tunneling while maintaining small inter-layer separation. Additionally, the simulation was extended to also model electron holes in p-type Ge/SiGe devices. The predicted hole density and band structure of the device will serve as an estimate for when the physical Ge/SiGe are fully fabricated and measured.

Presenter(s): Vedant Karalkar
Authors: Vedant Karalkar, Brooke Armfield, Parisa Rashidi, Tezcan Ozrazgat-Baslanti, Yuanfang Ren, Tyler Loftus, Benjamin Shickel, Azra Bihorac
Faculty: Benjamin Shickel

Comparing Wearable Accelerometers to Measure Actigraphy as a Prediction of Delirium in ICU Patients

Objective: Many patients in the intensive care unit (ICU) suffer from poor sleep and insomnia, predisposing them to delirium. Wearable accelerometers can provide us with detailed actigraphy data on a patient's activity status in the ICU. The objective of this review is to examine association between actigraphy data obtained from various wearable accelerometers and delirium in ICU patients. Data Sources: We searched Web of Science, PubMed, EMBASE, CINAHL, Cochrane Library, and ProQuest for articles published since 2018. The search identified fifteen studies meeting the criteria for inclusion. Key data were extracted from the selected articles. Results: Studies showed that various accelerometers have been used to measure actigraphy associated to delirium in ICU patients. Results showed that 93% of the studies successfully studied delirium using wearable accelerometers. Of these studies, 50% used the Actiwatch and 29% used the Actigraph devices. Data from a previous study has shown that an individual's actigraphy signature may change prior to the onset of delirium. Conclusion: Data suggests that the sleep/wake activity cycle of patients can be tracked using accelerometers and that the impact of interventions toward managing delirium can be monitored in ICU patients and can help determine a patient's risk for developing ICU-induced delirium.

Presenter(s): SriVarsha Katoju
Authors: SriVarsha Katoju, Marina Klimenko
Faculty: Marina Klimenko

Analyzing college-age students' Instagram posts to gauge COVID-19's impact on cognitive schemas

The Covid-19 pandemic has affected people's mental health, causing anxiety and depression (e.g., Shevlin et al., 2020). Little is known about how these changes to cognitive schemas (Janoff-Bulman, 1989) appear in social media posts. This study aimed to analyze Instagram posts from college-age students (n=320) at a US university during three time periods: pre-pandemic (February 2020), pandemic(March 2020), and post-pandemic (January 2022). Positivity and connectedness were coded in each post. A generalized estimating equation (GEE), repeated Poisson log-linear with time, gender, and the total number of posts as predictors found that females (β =.426, SE = 0.22) and those with more posts posted more positive pictures (β =.002, SE = 0.00), and more positive posts were made after the pandemic (β =-.485, SE = 0.19). Females also posted more connectedness posts than males(β =.732, SE = .3021), and those who posted more often posted more connected posts ((β =.003, SE=.0006). The results indicate positive posts increased after the pandemic which could be attributed to “posttraumatic growth” (Olson et al. 2020). In addition, active users display potential empowerment via connectedness, reflecting self-presentation for social desirability (Hjetland et al. 2022).

Presenter(s): Faith Kern
Authors: Kern, Faith. Pan, Cheng-Yen. Castellano, Ronald.
Faculty: Ronald Castellano

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

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

Presenter(s): Saba Khan
Authors: Saba Khan, Michael Moorhouse, Ben Lewis, Hugh Farrior
Faculty: Michael Moorhouse

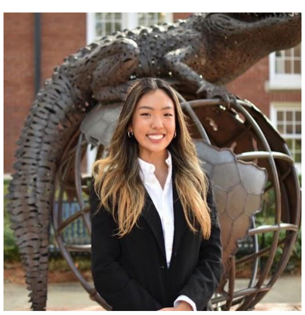
Analyzing Methods of Prevention in Improving Outcomes for Patients with Opioid Use Disorder

Approximately 187 Americans die from opioid overdose each day, resulting in over half a million deaths since 2002. Current prevention methods include cognitive behavioral therapy (CBT), medication-assisted treatment (MAT), and involuntary commitment. While research has examined CBT and MAT in relation to opioid use disorder (OUD), no research exists which examines these methods along with involuntary commitment. We hypothesized that patients who receive CBT, MAT, and seek treatment voluntarily will report lower cravings, experience lower relapse rates while in treatment, and will experience a lower risk of readmission following discharge. Data was collected from the Florida Recovery Center (FRC) over the last 5 years from patients who had received inpatient treatment for an OUD. Treatment interventions were analyzed across the following three outcomes: self-reported cravings, use-in-treatment, and readmission to the FRC following discharge. We found that reported cravings were greater for patients receiving fewer CBT sessions or committed to treatment, and that patients involuntarily committed were more likely to use substances while in treatment. This research supports the use of CBT at reducing patient cravings while in treatment and opposes the use of civil commitment (involuntary treatment) at reducing patient cravings and substance use in treatment.

Presenter(s): Saba Khan
Authors: Saba Khan, Sylvain Doré
Faculty: Sylvain Doré

A Systematic Review: Avenues to Increase the Effectiveness of Thrombolytic Clot Buster Drug, tPA

Each year, approximately 800,000 people in the United States experience stroke, with an >85% ischemic stroke majority. Although tissue plasminogen activators (tPA) are considered the singularly recommended and FDA-approved pharmaceutical treatment for cases of acute ischemic stroke (AIS) in the United States, tPA is only used for a small fraction of these patients who must meet inclusion criteria and present within 4.5 hours of stroke onset. This poor reality and discrepancy of care can be attributed to the following reasons: decreased access to stroke centers, provider hesitation, and caution surrounding the negative effects associated with delayed tPA administration, such as hemorrhaging and edema. The following FDA-approved drugs have been researched in combination with tPA and have been shown to limit the negative effects of tPA administration: edaravone (a drug approved for AIS treatment in Japan and China), minocycline, ascorbic acid, and blood pressure statins. Both edaravone and ascorbic acid have been labeled as antioxidants with free radical scavenging activity. Minocycline and statins have been demonstrated to exert indirect antioxidant effects. This review of the literature will serve to shed light on these parallel effects and, in turn, spark further investigation of tPA combination therapy for future clinical application.



Presenter(s): Andie Kim
Authors: Andie Kim, Dayane Oliveira, Jose Carlos Netto-Ferreira, Marcelle Nascimento, Mateus Garcia Rocha
Faculty: Mateus Rocha

Synthesis and Characterization of Silver-Arginine Nanoparticles

The aim of this study was to synthesize light-responsive silver-arginine nanoparticles (AgNP-L-Arg) and characterize their spectrophotometric absorption, morphology, size, distribution, and composition. To synthesize the AgNP-L-Arg, stock solutions of 1mM $AgNO3$ and 2 mM $NaBH4$ were prepared in addition to 1-, 2.5-, and 5-mM concentrations of L-Arginine (L-Arg) solutions mixed with deionized water. The solutions were placed in an ice bath for 20 minutes. In three separate 200 mL volumetric flasks, 20 mL double distilled water, 10 mL $NaBH4$, and the L-Arg solutions will be stirred at 50°C for 20 minutes. In this mixture, 5 mL of the silver precursor was added to obtain the silver nano-colloidal solution. A negative control was created using the same methods with polyvinylpyrrolidone. Solutions were analyzed using a UV- VIS spectrophotometer and physical appearance was analyzed using an electron transmittance microscopy coupled with energy-dispersive X-ray spectroscopy. For results, the AgNP-L-Arg solution presented an absorption band range of 450-800 nm and the control showed absorption band range of 350-550 nm. TEM analysis showed a spherical shape of the Ag-L-ArgNP and a light gray halo surrounding the nanoparticle, confirming L-Arg. In conclusion, AgNP-L-Arg particles are spherical in size and can absorb green light.

Presenter(s): Emily Kim
Authors: Emily Kim, Jessie Pelosi, Brad Barbazuk, Emily Sessa
Faculty: W. Brad Barbazuk

Gene expression patterns between gametophyte and sporophyte life phases and sex determination in ferns

Ferns, like all land plants, have diploid sporophyte and haploid gametophyte life phases. However, they are unique in that the large, leafy sporophytes and reduced gametophytes are nutritionally independent. The mechanism that drives these morphological and functional disparities, including sexual differentiation in gametophytes, is unknown. Despite this, the two life phases share similarities in the genes expressed and their levels of expression. Studies using Ceratopteris and Polypodium looked at differential gene expression (DGE) and proposed that alternative splicing (AS) may contribute to expression differences. To start unraveling the genetic underpinnings that drive these differences, we will explore DGE and AS in Dryopteris ludoviciana, part of a clade previously unstudied. Sporophytes from a population in Gainesville were collected and acclimated to greenhouse conditions at the University of Florida. Spores from these samples will be grown in the same conditions to sexual maturity. RNA will be collected from newly developing fronds and gametophytes to sequence nine RNA libraries. A reference transcriptome will be de novo assembled using these libraries and reads will be mapped to the reference to analyze DGE and AS. The results of this project will contribute to the understanding of genetic happenings in male and female gametophytes and sporophytes.

Presenter(s): Isabella Kirshteyn
Authors: Felix Enciso-Rodriguez, Isabella Kirshteyn, Juliana Benevenuto, Satya Swathi Nadakuduti, Patricio Munoz
Faculty: Felix Enciso Rodriguez

Assessing the Fast-TrACC Method for Delivering Gene Editing Reagents in Vaccinium corymbosum L.

Molecular plant breeding has been growing in recent years due to rising interest in increasing crop yields, supplying higher quality produce, and improving environmental sustainability. However, plant genome editing has proven to be costly and time consuming. Vaccinium corymbosum L, the common blueberry bush, is no exception and has exhibited a notably low rate of successful in vivo mutagenesis. In this project, we will attempt to knockout the phytoene desaturase (PDS) gene in the Colossus variant of southern highbush blueberries by implementing the Fast-TrACC method (Fast Treated Agrobacterium Co-Cultures). Employing the CRISPR/Cas genome editing technique, we aim to target exonic regions of the PDS gene. Successful knockout of PDS, which is crucial to the biosynthesis of carotenoids in blueberries, will result in an albino mutant; thus, the efficacy of our process will be quickly and superficially identifiable in transmuted samples. Ultimately, in testing the efficiency of the Fast-TrACC method of mutagenesis in Vaccinium corymbosum L, we hope that the results of this experiment will provide an inexpensive and reliable technique for verifying the competence of CRISPR/Cas9 reagents before attempting stable transformation in blueberry plants.

Presenter(s): Milayna Kokoska
Authors: Amanda Dossat*, Milayna Kokoska*, Jessica Whitaker-Fornek, Sarah Sniffen, Aishwarya Kulkarni, Erica Levitt, Daniel Wesson
Faculty: Daniel Wesson

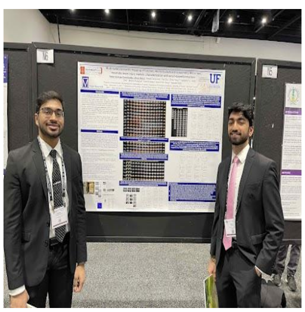
Glucagon-like Peptide-1 Receptors in the Gustatory Cortex Influence Food Intake

The gustatory region of the insular cortex (GC) processes taste information important for taste-guided behaviors, including food intake. Additionally, GC activity is influenced by physiological states including hunger. The specific cell-types and molecular mechanisms that afford the GC with such abilities are unclear. Glucagon-like peptide 1 (GLP-1) is produced by neurons in the brain whereafter it can act upon GLP-1 receptor-expressing (GLP-1R+) neurons in several brain regions. In these brain regions, GLP-1 receptor (GLP-1R) agonism suppresses homeostatic food intake and dampens the hedonic value of food. We report that cells within the GC express Glp1r mRNA and, by ex vivo brain slice recordings, GC GLP-1R+ neurons are depolarized by the selective GLP-1R agonist, exendin-4 (Ex-4). We found that chemogenetic stimulation of GLP-1R+ neurons, and pharmacological stimulation of GC-GLP-1Rs, both reduced homeostatic food intake. While maintained on a high-fat diet, obese mice exhibited impaired food intake responses upon Ex-4 administration into the GC. Switching obese mice to a low-fat diet restored Ex-4's effect – indicating that GC GLP-1R influences may depend upon palatability of the food. Together, these results provide evidence for a specific cell population in the GC which may hold roles in both homeostatic and hedonic food intake.

Presenter(s): Shruti Kolli
Authors: Shruti Kolli, Adonis Lysandrou, Ashley Evering, Eleana Manousiouthakis, Christine E. Schmidt
Faculty: Christine Schmidt

Particle Based Biolinks for 3D Printing

Spinal cord injury is a significant medical concern impacting over 17,000 new cases in the United States each year without a cure to be found. There is a need to develop testing platforms that accurately mimic the cellular environment in patients with spinal cord injury so that appropriate treatments can be developed. Hydrogels provide a promising bioprinting platform to study the interactions of microparticles and neural growth in sites of injury, using a liquid-like solid printing material that is able to transition between solid and fluid conditions when a shear force is applied. In combination with Polyethylene glycol (PEG) and extracellular matrix components, the mechanical properties of these gel prove to be an ideal bioprinting platform. This project aims to assess the viability of various compositions of GMHA and Collagen-derived hydrogels through line printing and rheology with fractured particle GMHA gels. Through the determination of an optimal composition for a hydrogel, this gel can be incorporated in future clinical studies to allow for more direct translation for therapeutics and drug-delivery systems for spinal cord injury patients.



Presenter(s): Rohan Kommireddy, Shray Mehra
Authors: Rohan Srinivas Kommireddy, Shray Mehra, Marcelo Febo, Kevin K.W. Wang, Rawad Daniel Arja, Tian Zhu, Zhihui Yang, Yueqiang Fu, Jiepei Zhu, Marjory Pompilus, Firas Kobaissy
Faculty: Marcelo Febo

<u>Multimodal parametric mapping of function, microstructure and relaxometry MRI in two traumatic brain injury models: characterization with serum-based biomarkers</u>

Human traumatic brain injury (TBI) is heterogeneous in terms of severity, cause, and in terms of the underlying pathophysiological mechanism involved. These can include axonal injury, white matter integrity, microvascular injury and neuroinflammation. The failure of numerous Phase 3 clinical trials in TBI has prompted a re-thinking of our animal models and TBI study design to improve translation of preclinical results to be applied in the clinical. A primary objective of this study was to analyze data obtained from two rat TBI models, the lateral fluid percussion injury model (L-FPI) and controlled cortical impact (CCI). We investigated a panel of biofluid-based time-varying biomarkers and MRI-based neuroimaging sequences in vivo with the objective of addressing a range of clinically relevant TBI pathological mechanistic subphenotypes. Our imaging results showed distinct time varying changes, which included tissue signal changes in T2 and T2*, lower FA for white matter (WM) relative to naïve controls at d2 and this change persists to a lesser extent by d30. In contrast, mean diffusivity (MD) is high in WM at d2 and remains high in the lesion site. Our data suggest the feasibility of using blood-based temporal biomarkers and MRI neuroimaging precision biomarkers in assessing TBI subphenotypes.

Presenter(s): Katherine Konyayev
Authors: Melissa Fenton, Emily Smail, Katherine Konyayev, Julia Doyle
Faculty: Melissa Fenton

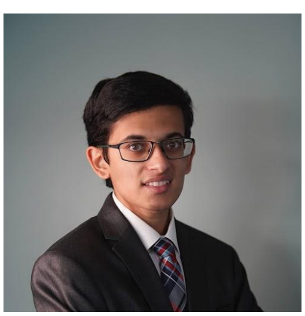
A Scoping Review of Research on Greenspace and Substance Use in Adolescents and Young Adults

Background: Research has shown that exposure to nature/greenspace is associated with substance use; however, these relationships remain unclear among adolescents and young adults. Objectives: The purpose of this scoping review is to synthesize and analyze current research on adolescent substance use with a connection to greenspace exposure. Methods: Initially, 8894 studies were identified through database searches of scholarly databases and grey literature conducted by a systematic review librarian. Using PRISMA guidelines, titles and abstracts and then full-texts are screened for inclusion into the review to reduce bias. This review's inclusion criteria required that the study be an original empirical study written in English, have an adolescent or young adult sample, include greenspace or nature as a variable, and include substance use or misuse as an outcome. Results: Titles and abstracts are currently being screened for these inclusion criteria, with 124 studies meeting inclusion criteria for full-text screening, 6559 excluded, 1004 duplicates removed, and 1004 studies remaining to be screened. We anticipate finishing full-text screening and data extraction in April. Conclusion: This scoping review has potential future implications for substance use prevention and intervention programs for youth and young adults.

Presenter(s): Kendall Kristjanson
Authors: Kendall Kristjanson, Apollonia E. Lysandrou, Ben Phalin, Jason Hunt, Laurie Solomon, Amanda Janner, Kent Mathias, Scott Teitelbaum, Ben Lewis
Faculty: Ben Lewis

Social Support Improves Pain Symptomatology among Patients in Treatment for Substance Use

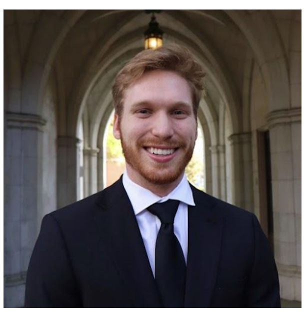
Social support plays an important role in the management of chronic pain, however, the directionality of this relationship and the degree to which they may interact to impact substance use disorder (SUD) treatment outcomes remains unclear. The current work aims to investigate this and we anticipate that individuals with low social support and high pain would be particularly vulnerable. Further, we hypothesized that social support would causally impact pain endorsement. Individuals (n=455) receiving residential SUD treatment completed assessments of peer social support, pain, and abstinence self-efficacy at intake, after 30 days, and at discharge. Crossed-lagged model analyses revealed a causal relationship during late treatment, such that social support predicted subsequent change in pain, but not vice versa (p=.01). As expected, longitudinal analyses reflected an interaction between pain & social support, such that, pain predicted lower abstinence self-efficacy for individuals of lower levels of support only (p<.001). This suggest that pain effects on abstinence self-efficacy may be mitigated when social support is high. Taken together, our results highlight the need for strong social support in the recovery process and suggest that low social support may be an indicator of particularly high risk among chronic pain populations.



Presenter(s): Achyudhan Kutuva
Authors: Achyudhan Kutuva, Reinhard Laubenbacher, and Henrique de Assis Lopes Ribeiro
Faculty: Henrique de Assis Lopes Ribeiro

A Boolean Network Model of Gene Regulation in Airway Epithelial Cells in SARS-Coronavirus Treatment

SARS-CoV-2 is a viral respiratory illness that causes COVID-19, which was first detected in December 2019. Based on the public health crisis involving this disease and with current knowledge of the various biological mechanisms that COVID-19 employs, we developed an integrative Boolean network model. This model discretely represents actions that take place continuously in the human body, specifically focusing on viral effects on pneumocytes. By incorporating elements of various cellular processes, including the AKT-mTOR pathway, the ACE 2-Angiotensin pathway, and other major viral pathways, this model documents how biological mechanisms interact upon infection with COVID-19. With an ensemble of 250 asynchronous networks ran independently, the model currently supports five of seven noted genes, given expression data at 24 hours following infection. Many of these mechanisms also overlap in responses to other major viruses and diseases, providing motivation to generalize this model while maintaining relative simplicity and high accuracy. We also hope to employ novel computational techniques to iteratively improve node connections and regulatory functions based on time-series gene expression data. By developing these model variants, we wish to explore the space of potential networks that can be formed to ascertain how deterministic these networks exist in the real world.



Presenter(s): Michael Lafferty
Authors: Michael Lafferty, Hugh Farrior, Ben Lewis, Scott Teitelbaum, Ben Phalin, Laurie Solomon, Amanda Janner, Kent Mathias
Faculty: Ben Lewis

<u>Sleep Disturbance Trajectories in Substance Use Treatment: Effects of OUD and Pain</u>

Relative to other substance use disorders (SUDs), sleep disturbances appear particularly pronounced in opioid use disorder (OUD) and are exacerbated by chronic pain (which commonly co-occurs with OUD). The current study aims to characterize how sleep disturbances may change across treatment as a function of OUD and chronic pain. We hypothesized that the effect of pain and OUD would be multiplicative. We further hypothesized that these effects would be independent. Participants included 1,091 treatment seekers at the Florida Recovery Center. Measures were taken at treatment entry, 30 days into treatment, and at discharge. Overall, participants' sleep improved throughout treatment, with mean PSQI scores of 9.2 at baseline and 5.2 at discharge. Importantly, OUD and pain effects appeared additive; the hypothesized interaction was not observed. Additionally, OUD interacted with time, such that patients with OUD improved in sleep quality more rapidly, achieving similar levels as those without OUD by discharge ($p = .02$). While patients with OUD recovered to similar levels of sleep quality as those without OUD by discharge, patients reporting pain exhibited more persistent sleep disturbance, suggesting the potential utility of sleep-focused interventions in this group.

Presenter(s): Jennavieve Lambeth
Authors: Jennavieve Lambeth,Katie Franklin, Tim Smith, Valerie DeLeon
Faculty: Valerie DeLeon

Primate Dental Sacs, the Driver of Craniofacial Growth

In both humans and non-human primates, tooth development occurs in dental follicles, or dental sacs, with replacement teeth forming as extensions mesial-lingual to the deciduous teeth. In this study, we demonstrated how dental sac volume and location influence overall craniofacial growth, specifically in the rostral and lateral expansion of the bones of the jaw. Using conventional micro CT and diffusible iodine contrast-enhanced computed tomography (dice-CT) scans from postnatal Aotus nancymaae we visualized 3D models of dental anatomy at multiple stages
All metrics recorded increased in size. Notably, in the first two weeks postnatal, width between lingual surfaces of the maxillary first molar increased by 30.7%. Our reconstructions show lateral displacement of the M1 sacs. Although we see large increases laterally, we only see a slight increase of 5.4% in the rostrocaudal dimension of the maxillary tooth row. Across multiple stages of Aotus, we observed development of replacement teeth pushing deciduous teeth both rostrally and laterally. These measurements were unsurprisingly found to be correlated with linear measurements of surrounding bone. Our most notable result implies more growth laterally than rostrally. Understanding spatial reconfiguration of dental sacs can aid in the explanation of ontogenetic sources of biological variation in the facial skeleton.

Presenter(s): Lianna Larson
Authors: Lianna Larson
Faculty: Cătălin Voiniciuc

A Putative O-Fucosyltransferase is Required for the Cell Wall Architecture at the Seed Surface

Arabidopsis thaliana has become the guinea pig of the plant science world because of its small size, fast propagation time, and its easily manipulated genome. The characterization of mutants is beneficial because they can lead to faster and more efficient production of tailored materials such as cell wall polymers, or to identify methods of reversing harmful defects caused by naturally occurring mutations. My undergraduate research project focuses on the characterization of a novel Arabidopsis mutant, called peeling walls1 (peel1), which affects a member of the large glycosyltransferase 106 (GT106) family. Related GT enzymes found in humans catalyze post-translation modifications of epidermal cell growths proteins. In Arabidopsis, the peel1 seeds display signs of the impaired polysaccharide attachment, with irregular pieces of cell wall detaching from the seed surface upon hydration in water. Compared to the wild-type seeds, which release a large, gelatinous capsule of mucilage, the peel1 mutant displays spotty mucilage release and increased seed flotation. Biochemical analysis of mucilage extracts, surprisingly, did not reveal any significant differences in polysaccharide composition. Therefore, the mutation of the PEEL1 putative GT may cause cell wall peeling via a noncarbohydrate modification or by altering the molecular distribution of extracellular polymers.

Presenter(s): Karina LaRubbio, Ethan Smith
Authors: Karina LaRubbio, Ethan Smith, Ethan Wilson, Sanjeev Koppal, Sophie Jörg, Eakta Jain
Faculty: Eakta Jain

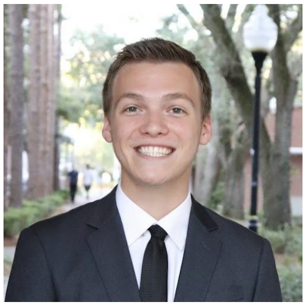
Give me some room please! Personal space bubbles for safety and performance

Personal space bubbles are implemented in virtual environments to protect users from physical harassment. When activated, an impermeable boundary encloses the user completely and complicates collaborative tasks, such as passing objects or performing social gestures. When personal space protection is not balanced with functionality, the personal space bubble becomes a gilded cage. In this paper, we raise the possibility of alternate designs for personal space bubbles and test their impact on task performance within a workplace training context. Our early findings suggest that alternate bubble designs have the potential to balance safety and performance metrics such as task completion.

Presenter(s): Judah Lebofsky
Authors: Judah Lebofsky, Jodi Lane
Faculty: Jodi Lane

Generation 9/11: Perception of Terrorism Among Individuals Without Memories of the September 11th Attacks

The impact of the terrorist events of September 11, 2001, continues to affect those who experienced it. There is a significant body of literature over the last twenty years examining terrorism perceptions among adults who lived through this day, which sheds light on how those impacts vary based on personal characteristics. However, there is very little information about how these events affect people who were too young to remember or who were born after that day. To help fill this research gap, we use bivariate and multivariate statistics to examine the impact of personal characteristics, perceived risk, and media consumption of 9/11 and other programs about terrorism on terrorism perceptions among college students without personal memories of 9/11. We hypothesize that these college students will have low fear of personally becoming a victim of terrorism and will not worry much that their family and friends will become victims. This study will both add information to the literature regarding how terrorism events reverberate over time and inform policymakers about the long-term effects of this event two decades later.



Presenter(s): Jake LeClaire
Authors: Jake LeClaire
Faculty: Elias Sayour

RNA Modifications in mRNA Therapeutics

In recent years, there has been a marked increase in research on the therapeutic applications of mRNA. This is largely due to the urgent need for a vaccine to combat the coronavirus disease of 2019 (COVID-19), as well as promising results of mRNA in cancer immunotherapy. Compared to DNA-based therapeutics, mRNA offers several benefits, including increased efficacy and reduced oncogenic potential, making it attractive for future research and development. However, the current synthetic mRNA molecules do not fully mimic the structure and function of native mRNA in cells, leading to reduced expression levels and stability, which can limit their therapeutic efficacy. Advancements in RNA synthesis techniques and the development of novel formulations are actively being pursued to further optimize mRNA as a promising therapeutic molecule. The aim of this review is to provide a comprehensive summary of the latest advancements in RNA modifications and their potential applications for future mRNA-based therapeutics.

Presenter(s): Lensay Leon
Authors: Lensay Leon
Faculty: Ali Zarrinpar

Understanding How a Single Prophylactic Dose of PEG-IDO Ameliorates Ischemia Reperfusion Injury

In transplantation, trauma, myocardial infarction, and stroke, immune and inflammatory processes such as ischemia/reperfusion injury (IRI) lead to adverse clinical outcomes that can result not just in organ damage and failure but also death. The problem is not a lack of druggable targets, but rather the deleterious systemic side effects and toxicities of existing options. To address these problems, Dr. Zarrinpar's research team is innovating a new therapeutic approach aiming to program immune cells toward a metabolic state blocking excessive inflammation in the setting of liver IRI by directing tryptophan metabolism. Thus, the aim of my research in this study is to better understand how PEG-IDO mediates its anti-inflammatory effect in a mouse model of partial (70%) warm hepatic IRI. We aim to delineate which mechanisms IDO acts through. Whether its through 1) Tryptophan insufficiency activating metabolic stress sensor general control nonderepressible 2 (GCN2), mTOR and PKC-θ for regulation of immune cell cycle, and inducing suppressive phenotypes in multiple innate and adaptive cell types, or whether it's through 2) Kynurenine pathway metabolites causing suppression by activation of the aryl hydrocarbon receptor (AhR) ant-iinflammatory program and consequently inducing suppressive phenotypes in innate cells.

Presenter(s): Melanie LeTourneau, Kira Alqueza
Authors: Melanie LeTourneau, Kira Alqueza, Joni Splett
Faculty: Joni Splett

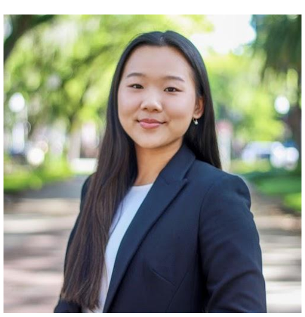
Understanding Florida School Districts' Implementation of State Mental Health Education Requirements

Florida school districts are legally required to provide students in grades 6 through 12 with five hours of mental health education per year. Districts must also submit annual implementation plans that delineate their instructional practices to the Florida Department of Education. However, the strengths and weaknesses of these plans have yet to be systemically evaluated. To address this gap, we review implementation plans from the 2021-2022 school year to assess (1) who provides instruction, (2) what materials are used, and (3) key limitations. We find that nearly all districts utilize classroom teachers in the delivery of their mental health curricula (n=71, 93%), with 63% leveraging the expertise of school-based mental health professionals. The majority (n=54, 74%) of districts' implementation plans include packaged curriculums that provide instruction via online, self-paced modules. Finally, implementation plans are generally limited in their descriptions of how content is differentiated across grade levels, as well as in their descriptions of curriculum adaptations for students receiving special education services. Ultimately, the quality and scope of implementation plans vary widely across districts, demonstrating the need for more robust instructional requirements that ensure students throughout Florida receive appropriate mental health education.

Presenter(s): Albert Li, Elizabeth Wright, Amelia Chambers
Authors: Albert Li, Elizabeth Wright, Meghan Cum, Amelia Chambers, Ryo Iwata, Jocelyn Santiago Perez, Nancy Padilla-Coreano
Faculty: Nancy Padilla-Coreano

<u>Mapping the Social Brain: Investigating Competition Behavior through c-Fos Expression in Mice</u>

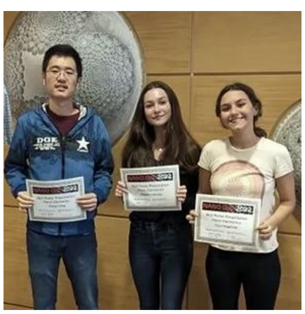
The neural circuits responsible for competition behavior are not fully understood. The purpose of this study is to locate and quantify the differences in brain activity related to competition states. We assessed brain activity of brain regions implicated in competition, social rank, and sociability after a reward-based assay. The assay consisted of training mice in an operant chamber to associate an auditory cue with a food reward. We studied 16 adult male mice; half of the subjects competed for the reward while the other half were alone receiving the rewards. After the reward-based assay, we extracted their brains for immunostaining. We stained for c-Fos, an early response gene used as a marker of neuronal activity, in the following brain regions: A32, A24a, A25, basolateral amygdala, medial thalamus, and lateral hypothalamus. We determined the total number of cells expressing c-Fos within these specific brain regions to calculate and compare cell densities (cells/mm^2). Preliminary results suggest that both the alone and competition conditions induce strong activation in this network of brain regions. Future experiments using electrophysiological recordings could reveal that the pattern of activation is distinct and future manipulations could modify competition behavior.



Presenter(s): Michelle Li
Authors: Michelle Li, Colton Yu, Jia Chang, Hong Huang
Faculty: Dr. Jia Chang

The Potential Benefit of MAOI-Class Antidepressants on Oral Inflammatory Bone Diseases

Antidepressants are one of the most prescribed medications to manage mental disorders. In a previous in-vitro study, our group found Tranylcypromine, one MAOI-class antidepressant, may benefit bone health and inhibit osteoclastogenesis by preventing LSD1 activity in vitro. Therefore, it is critical to explore the effect of Tranylcypromine on bone turnover in the periodontal alveolar bone in mice. Tranylcypromine intraperitoneal (i.p.) injections were performed in mice; 8 mice received sham injections and 8 mice received Tranylcypromine i.p. injections at 10mg/Kg, once a day for two weeks. The three-dimensional bone morphology was evaluated on excised mouse jawbones with a Bruker Skyscan 1172 µCT (Kontich, Belgium). The bone histomorphometry analysis was performed according to the guideline for assessing bone microstructure in rodents using micro-computed tomography. We found that a short time i.p. injection of Tranylcypromine increased bone mineral density (vBMD) and percent bone volume (BV/TV) of the periodontal alveolar bone in the furcation region of the 1st maxillary molar and the interdental area between the 1st and 2nd maxillary molar. This research will help us understand the potential impact of MAOI-class antidepressants on dentistry and how this medication affects homeostatic activities in the jawbone.



Presenter(s): Chenyu Liang, Erica Hengartner, Abygale Cochrane
Authors: Chenyu Liang, Erica Hengartner, Abygale Cochrane, Mitchell Litvinov, Matthew Barrett, Amanda Snyder, Alexa Ziff, Tian He, Habibeh Khoshbouei, Min Lin, Christopher McCurdy, Lance McMahaon, Bruna Balbino de Paula, Basak Ayaz, Robert M. Caudle, Dietmar Siemann, Xin Tang
Faculty: Xin Tang

ll-Optical Electrophysiological and Mechanobiological Interrogation System

The objective of this project is to re-innovate our previously established SPIM technology and improve its efficiency to study in vivo neurons. We selected the voltage imaging system for its ability to accurately visualize large neural populations through high frame rates and signal-to-noise ratio. To break down its setup, the LEDs illuminate an area of interest in the sample to achieve single-cell-resolution. The blue laser fires to stimulate the cell membrane, while the red laser and camera are responsible for returning the action potential data. One way in which we have been able to increase the flexibility and efficiency of the imaging system is through the compilation of a new-generation of LabVIEW software. Analog and Digital signal outputs (AO/DO) have been utilized throughout our code to enable multiplexed communications, such as triggering equipment timing with precision or providing voltage settings to laser outputs.

Presenter(s): Benjamin Liberles
Authors: Benjamin Liberles, Jason Dittmann
Faculty: Jason Dittmann

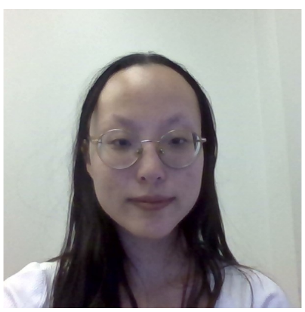
A Statistical Interpretation of the Size Distribution of Single and Multi-Planetary Systems

Each planetary system is unique. However, the properties of a host star in a planetary system have a direct correlation to the properties of its planets. For example, hot Jupiters have been determined to correlate with metal rich host stars. From our previous work we have determined that compact multiple planetary systems are preferentially found around host stars with a lower metallicity than for single planet host stars. Thus, it can be questioned if higher metallicity stars form compact multiple planetary systems that get disrupted by growing too big and self-scattering or through the formation of a Jupiter-like planet that then excites the system. Here we examine 176 metal-poor M-dwarfs and late K-dwarfs which contain a planetary system. We find that the planetary radii distributions of single planetary and multi-planetary systems show evidence of possible differences.

Presenter(s): Chiara Licata
Authors: Chiara M. Licata, Alexia N. Obrochta, Gregory C. Marino, Shahar Almog, Meredith S. Berry
Faculty: Meredith Berry

Visual Exposure to Natural Environments Decreases Delay Discounting in Substance Users

Previous studies have demonstrated that exposure to natural (vs. built) environments, can reduce delay discounting (i.e., the decay in the subjective value of a reward due to a delay in receiving it, considered to be impulsive choice). Although steep delay discounting is associated with harmful substance use, research with this population is lacking. The purpose of this study is to examine the effects of visual exposure of natural environments on delay discounting among regular substance users. In this study, Amazon MTurk workers who frequently use alcohol, cannabis, or cigarettes completed two surveys, at least 5 days apart, where they watched a 5-minute slideshow of either built or natural environments, before completing a delay discounting task. Results show significant decreases in delay discounting following exposure to natural environments ($p=0.014$). Moreover, an order effect was found, where the nature effect is greater when presented in the second session, across all substance groups. This indicates the potential efficacy of nature exposure as an adjunctive treatment for substance-use disorders, and especially with repeated exposures. However, more research is warranted; this study is currently being expanded to include in-person sessions for an undergraduate population of regular substance users.



Presenter(s): Yanan Lin
Authors: Lin Yanan, Castaneda Blanca, Bendezu Maria Fe
Faculty: Juan Andrade

Analysis of Protein Fortification of Pasta with Desiccated Asian Carp Powder

Waste from the invasive Eurasian Carp was used to produce a carp flour with high protein quality as an upcycled material to reduce the species' environmental impact. Pasta is generally not considered a protein-dense food product as wheat has low protein digestibility; thus, carp protein was added at concentrations of 5%, 10%, and 20% to determine if its addition would provide a significant increase in protein digestibility without impacting consumer acceptance. Texture Profile Analysis was conducted, and pasta samples with the addition of carp flour were not significantly different in hardness, toughness, and brittleness compared to the control after drying. The main differences were perceived in color and aroma. Flavor acceptability was not evaluated since the carp flour was not made in a food-grade facility. Based on the PDCAAS analysis of the protein levels after the addition of carp, the fortified pasta provides an improved protein profile for consumption, though the quality of protein added by carp is less than that of similar fish products. However, this product provides a function to waste products from an invasive species that would not otherwise be used, and merits further investigation.

Presenter(s): Yu Tin Lin
Authors: Yu Tin Lin, Manal Zabalawi, Lane Smith, Peter Stacpoole, Charles McCall, Ramon Miranda Quintana, Boone Prentice
Faculty: Boone Prentice

<u>Novel Variance Stabilization Algorithms For Imaging Mass Spectrometry Using Subset Normalization And Extended Similarity-Based Clustering</u>

Sepsis causes 270,000 deaths and over $38 billion in hospital management costs each year in the United States, yet effective treatments remain elusive. Imaging mass spectrometry (IMS) is a powerful analytical tool to study the spatial metabolomics of sepsis, providing label-free detection of metabolites in tissue samples with high sensitivity. However, variabilities in sample preparation for imaging mass spectrometry limit reproducibility across replicate experiments, which poses challenges for comparative studies. Intensity normalization is one existing strategy to reduce variabilities. However, commonly used normalization methods do not always successfully account for the signal variance in replicate experiments. To improve reproducibility in untargeted normalization approaches, we describe a novel normalization algorithm that utilizes only a portion of the mass spectrum (i.e., normalization on spectral subsets). Our method improves robustness by generating multiple normalization factors and selecting the optimized normalization factor. An analysis of immunometabolic marker itaconate across mouse heart technical replicates (n = 18) demonstrated successful variance stabilization from 18.34% to 7.34% relative standard deviation upon subset normalization. To further increase robustness, a novel clustering algorithm based on extended similarity is explored.

Presenter(s): Emma Lipori
Authors: Lipori, Emma; Cabrera, Catalina DVM, MPVM; Diehl, Brittany DVM, MS; Bittar, Joao, DVM, MS, PhD; Jones, K., MS, PhD; Rae, Owen, DVM, MPVM; Megahed, A., DVM, MS, PhD
Faculty: Catalina Cabrera

Characterization of the reproductive seasonality of Florida Native Sheep

The Florida Native Sheep (FNS) will be important in expanding sheep production into the Southeast due to genetic parasite resistance and heat and humidity tolerance. However, literature regarding FNS reproductive characteristics is lacking. This study aims to establish reproductive seasonality and pubertal age of FNS to improve reproductive management and breed preservation. Randomly selected adult FNS ewes (n=24) and spring-born FNS ewe-lambs (n=12) were studied from June 2021 to July 2022.
Progesterone concentrations ≥1ng/mL in weekly or monthly serum samples indicated ovulation (active cyclicity)—50% of individuals achieving this established onset of cyclicity or puberty. In adults, 12.5% entered cyclicity by June 28 and 70.8% by July 6, marking the beginning of breeding season. Pubertal age in ewe-lambs ranged from 6-10 months with a mean of 8m. 50% were cycling by mid-October and 100% by November. All ewe-lambs entered seasonal anestrous by mid-January. Although considered a tropical breed, FNS display moderate seasonality influenced by photoperiod. Lambs enter puberty later than other temperate breeds, although effects of birthing season warrant further investigation. Results obtained provide information that can help improve reproductive management, potentially enhancing onset of cyclicity and yearling pregnancy rates in FNS, which could enhance profitability of Southeastern sheep production.

Presenter(s): Elizabeth Littler
Authors: Elizabeth Littler, Dr. Candice Prince, Dr. Benjamin Sperry
Faculty: Candice Prince

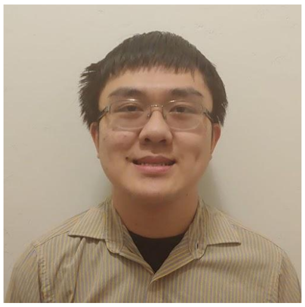
Effect of Iron on the Competition between Pistia stratiotes and Eichhornia crassipes

Aquatic invasive plants are a major problem in the state of Florida, with management costing $15- 20 million a year. Two of the most problematic plants are water hyacinth (Eichhornia crassipes) and water lettuce (Pistia stratiotes). These species create dense mats on the surface of water bodies which block sunlight from reaching organisms underneath, preventing aeration and transportation. Our experiment evaluated competition between these two species, and the effect of iron on their interspecific competition. Plants were placed in 94.6-L mesocosms at 5 different ratios of water hyacinth to water lettuce plants (0:10, 3:7, 5:5, 7:3, 10:0). All mesocosms were fertilized with 10 g of MiracleGro, and half of them received an additional 2 g of chelated iron. There were four mesocosms per treatment. We recorded plant number and harvested final biomass. The experiment was conducted twice (2021, and 2022). In both trials, the number of water lettuce plants was significantly affected by species ratio, as well as the interaction of species ratio and the presence of iron. In both trials, the ratio of hyacinth to lettuce also had a significant effect on the number of water hyacinth after 4 weeks, as well as the biomass of both water lettuce and hyacinth. Iron increased numbers of water lettuce but made smaller individuals, with the opposite being true for water hyacinth.

Presenter(s): Emily Liu
Authors: Emily Liu, Mingxi Zhou, Zhonglin Mou
Faculty: Zhonglin Mou

<u>Dissecting the Role of SAG101 in Extracellular NAD(P)-Mediated Immune Signaling</u>

Plants are the primary source of food for all animals, but they are often infected by microbial pathogens, which reduces crop yield and threatens global food security. Therefore, plants have evolved sophisticated defense mechanisms to fend off microbial infections. EDS1, PAD4, and SAG101 are well-characterized plant immune regulators. While the EDS1-PAD4 complex has been proven to be necessary for extracellular NAD(P) [eNAD(P)]-mediated immune signaling, the function of the EDS1-SAG101 complex in this pathway has yet to be determined. This research aims to study whether SAG101 is required for eNAD(P) signaling. We genotyped the Arabidopsis T-DNA insertion mutants SALK_022911C and SALK_030411C and identified SALK_022911C as the sag101 homozygous mutant. NAD(P)-induced defense responses in the sag101 mutant were compared to those in the eds1 and pad4 mutants. Exogenously applied NAD(P) induced FMO1 and ALD1 gene expression, as well as resistance to the bacterial pathogen Pseudomonas syringae pv. maculicola ES4326 in sag101. However, this induction was completely blocked in eds1 and pad4. Our results demonstrate that the EDS1-SAG101 complex is not involved in the eNAD(P) signaling pathway and supports the model that the EDS1-PAD4 and EDS1-SAG101 complexes function differently in immunity.



Presenter(s): Jackie Liu
Authors: Jackie Liu, Similoluwa O. Ogundare, Opeoluwa F. Iwaloye, Mollie Huber, Hector R. Mendez-Gomez, Dingpeng Zhang, Jing Chen, Clayton E. Mathews
Faculty: Clayton Mathews

Use of Induced Pluripotent Stem Cells to Reveal Genetic Mechanisms of Type 1 Diabetes Pathogenesis

Reactive oxygen species (ROS) are thought to contribute to type 1 diabetes (T1D) development. ROS produced by cell types that participate in this disease (immune cells and pancreatic islet cells) damage insulin producing, islet beta cells resulting in beta cell dysfunction and death. I propose that genes contributing to T1D cause improper responses to stress resulting in increased ROS and damage to cells. A lentivirus containing a fusion protein that serves as a fluorescent ROS sensor was used to transduce human beta cells and induced pluripotent stem cells (iPSC). To introduce T1D-risk genotypes, genome editing was employed to modify mt-ATP6 or mt-ND2. Human beta cells or iPSC were exposed to stress and ROS production was detected via a 5-laser Cytek Aurora flow cytometer. Using a cybrid technique, human beta cells were successfully edited to encode different mitochondrial chromosomes along with a static nuclear genome. Exposure of ROS-sensor transduced beta cells to hydrogen peroxide at increasing concentrations resulted in elevated fluorescence of the sensor (405nm). The ROS sensor is effective to measure ROS production and cellular stress. With a productive ROS sensor and edited beta cell lines, the system is ready to test the hypothesis on risk genes and ROS production.

Presenter(s): Emily Lobosco
Authors: Emily Lobosco, Heidi Boisvert
Faculty: Heidi Boisvert

The Biophysical and Emotional Effects of Partnering in Dance

The research on dance's emotional and biophysical effects on a person has expanded to include numerous studies. However, little evidence presents the correlation between dance partner-work and the body's response. Recently, the limitations of engaging in partner-work due to COVID-19's social distancing measures created a heightened interest in this area of research. With this, an experimental study was conducted to explore potential correlations between partner dancing and the body. The methodology included recording biophysical data from two dancers as they performed a choreographed duet. Wearable technology measured each dancer's temperature, muscle contraction, heartbeat, electromyography, and spatial information. Brain function was also measured via a fourteen-channel EEG headset that allowed for whole-brain sensing. This data was recorded as the dancers moved together and independently from each other to compare the effects of varying degrees of contact on the body. To generate additional data, the anxiety levels of each subject were quantified through survey responses after they danced. Preliminary results support the assumption that different interaction levels during dance directly impact a person's physical and emotional state. This study highlights the need and potential implications for additional research on brain-body responses to partner movement in dance.

Presenter(s): Noah Long
Authors: Noah Long, Zachary Ray, Xin Zhao
Faculty: Xin Zhao

Pac Choi-Radish: Exploring Factors of Grafting Compatibility

Herbaceous grafting is primarily used to enhance disease resistance, but it also has the potential to yield dual crops. Grafting pac choi onto radish has shown promise in reducing food waste and production space, but in previous studies the size of the radish taproot was consistently reduced. Although research in this field is limited, promising combinations of various pac choi and radish cultivars were grown to achieve proportional growth of shoots and roots. To accomplish this, pac choi and radish seeds of four cultivars were grown to maturity. The plants were grafted relatively early in their life using the splice-grafting technique, and placed into a healing chamber with high humidity. After a period of about two weeks, the plants were taken out of the chamber and counted for their survivability. Surviving plants were grown to maturity, harvest, and multiple biometrics were taken to compare the growth of each combination. End results showed that one combination of cultivars promoted more equal growth than other treatments. Multiple reasons were responsible for this unequal growth found in the other treatments including adventitious root growth, shorter hypocotyls, and possible dominance within either the radish or pac choi. Although this project was very experimental in nature, the results showed promise for possible future crop-grafting combinations.

Presenter(s): Victoria Lopez-Scarim
Authors: Emma Ivantsova, Isaac Konig, Victoria Lopez-Scarim, Cole English, Savannah R. Charnas, Christopher L. Souders II, Christopher J. Martyniuk
Faculty: Christopher Martyniuk

Molecular and Behavioral Toxicity Assessment of Tiafenacil, a new PPO-inhibiting Herbicide, in Zebrafish Embryos/Larvae

Tiafenacil is a newly registered contact herbicide within the pyrimidinedione chemical family classified as a protoporphyrinogen IX oxidase (PPO) inhibitor. Studies are lacking that investigate the potential for sub-lethal effects of PPO-inhibitors in aquatic species. As such, we conducted a series of toxicity assays using tiafenacil in zebrafish and measured molecular, biochemical, and behavioral endpoints in embryonic and larval fish. We hypothesized that tiafenacil induces apoptosis, oxidative stress, and behavioral toxicity in zebrafish. Embryos and larvae were exposed to tiafenacil at concentrations ranging from 0.1 µg/L up to 10 mg/L depending on the assay for 7-days post-fertilization. Decreased survival in about 50% of the population were noted at exposure concentrations >1 mg/L. This coincided with an increase in reactive oxygen species in larvae treated with 10 µg/L. We also measured eighteen transcripts related to oxidative stress and mitochondrial complexes I through V in larval fish but did not detect any change in steady state transcript abundance. Hypoactivity was noted in the light-dark preference test in larvae exposed to 100 µg/L. These data contribute to risk assessment evaluations for a new class of herbicide and suggest that tiafenacil poses low acute toxicity in developing zebrafish.

Presenter(s): Michael Lunin
Authors: Michael Lunin, Ye Yang, Rachel Newsome, Michael Dougherty, Maria Hernandez, Christian Jobin
Faculty: Christian Jobin

<u>Development and optimization of a chemical screen to derive hydrogen sulfite deficient bacteria utilizing chemical-induced mutagenesis</u>

Sulfate-reducing bacterium are anaerobic microorganisms that produce hydrogen sulfide (H2S) and are common constituents of the human intestinal microbiome. Evidence links a H2S-producing bacteria, Bilophila wadsworthia, to colon cancer. This study's aim was to develop and optimize a chemical screen utilizing mutagenesis to create a mutant strain of Bilophila wadsworthia lacking ability to produce H2S. Bacteria were treated with ethane methyl sulfonate (EMS), a mutagen that creates point mutations through G:C to A:T transitions induced by guanine alkylation. B. Wadsworthia was exposed to 1% EMS for 3 hours, followed by a 24-hour recovery period. Bacteria were then plated on 0.1% FeSO4 supplemented Wilkins Chalgren agar plates. B. Wadsworthia mutated in gene pathways essential for H2S production will appear as clear colony whereas wild-type bacteria will appear as dark colonies. After screening over 1000 colonies, no mutants were identified from this experimental design. Subsequently, bacteria were exposed to 1%, and 2% EMS and after recovery, plated on a variation of "Mega Media" agar plates, a complex and rich media allowing cultivation of fastidious bacterial strains. All colonies screened in this novel experimental design reveal dark colonies. Thus, these findings suggest that sulfate reduction pathways may be indispensable for B. Wadsworthia survival.

Presenter(s): Nicole Lunsford
Authors: Nicole Lunsford, Keith Willmott
Faculty: Keith Willmott

Disentangling Neotropical Butterfly Diversity

Many insect species are externally similar, through common ancestry, or through mimicry. Mimicry is a common defense mechanism among many insect species which can result in unrelated species looking similar. The primary subject of this study is Adelpha basiloides, a butterfly species ranging from western Ecuador through the southern United States. The purpose of this study is to identify whether or not Adelpha basiloides is a single species with different haplotypes or two separate species. To do so, I gathered existing DNA ‘barcode’ (the mitochondrial gene COI) data and sequenced additional samples across the range of the species. Then, to test whether or not different haplotypes represent different species, I explored the use of the internal transcribed spacer 2 (ITS2) region of nuclear ribosomal DNA as an alternative ‘barcode.’ Using tissue from frozen samples, I extracted DNA and did PCR to amplify the barcode region of COI, as well as ITS2, from several possible cryptic species complexes. Samples were then sent for sequencing. The resulting DNA barcodes and ITS2 sequences were then analyzed and edited in order to identify areas of homology as well as areas where amino acid base differences occur. I discuss my results to date.

Presenter(s): Carley Lustig
Authors: Carley Lustig, Anaïs Ortiz, Erin C. Westgate
Faculty: Erin Wesgate

Social Media and Happiness on Vacation - Our Two Selves

Would we take the same vacation if all of our memories were erased afterwards? According to Kahneman (2005) we have two selves: our experiencing-self and our remembering-self. Our experiencing-self is only capable of experiencing things in the moment, while it is the job of our remembering-self to construct the stories of events afterwards. The opinions of these two selves do not always align. Posting vacation photos to social media may give our remembering-self more positive memories to reflect on, but the act of posting on social media itself and the consequences that come with it - like social comparison - may work to decrease the happiness of the experiencing-self during the vacation. To find out, I randomly assigned 400 UF undergraduates to take daily photos while on vacation and either post them to social media or keep them to themselves. I predicted that posting photos would decrease people's happiness during their vacation (experiencing self), but increase how happy they recalled the vacation as having been once they returned (remembering self).

Presenter(s): Sapna Maharaj
Authors: Sapna Maharaj, Angelica Velez, Paola Rodriguez Freitez, Nathaniel Haas, Robert Claar, Damon G. Lamb
Faculty: Damon Lamb

<u>Brain structural correlates of emotional and executive alterations in PTSD and mTBI</u>

Post-Traumatic Stress Disorder (PTSD) and mild traumatic brain injury (mTBI) have higher prevalence among Veterans than the civilian population. Furthermore, the high comorbidity of mTBI and PTSD suggests that mTBI may be a predisposing injury, increasing the likelihood of developing PTSD. As such, mTBI in the Veteran population may be related to both the cause and the prevalence of PTSD for many. In this study, structural magnetic resonance (MRI) images were analyzed using FreeSurfer to parcellate and segment brains in subject-native space into cortical and sub-cortical anatomic regions of interest. We evaluated the relationship between the structural measures key regions of interest within executive and limbic (emotional) brain networks and neuropsychological measures of cognitive function and PTSD symptoms.

Presenter(s): Ria Malhotra
Authors: B. Souza Simões, T. M. Adeoti, M. Nehme Marinho, M. C. Perdomo, F. T. Saputra, U. Arshad, A. Husnain, R. Malhotra, Z. Sarwar, C. D. Nelson, and J. E. P. Santos
Faculty: Dr. Jose Eduardo Santos

Rumen Protected Arginine

In the project, Rumen Protected Arginine, cattle were studied to discover the effects of an addition of the amino acid, arginine, to a cows diet. More specifically, if said additive would increase the net milk yield in those treated. Cattle either received a control or rumen protected arginine (RPA) supplement in their feed twice a day during their prepartum and postpartum periods. Milk was collected twice a day for about 2 months after which it was discovered that those receiving the RPA did in fact have a significant increase in their net yield of milk.

Presenter(s): Charlotte Maloney, Buse Utkan, Jonathan Brito
Authors: Charlotte Maloney, Buse Utkan, Jonathan Brito, Sharon M. Difino, PhD, CCC-SLP, Charles Ellis, PhD, CCC-SLP, Molly Jacobs, MS, PhD
Faculty: Sharon DiFino

Disparities in Access to Care Among Spanish Speaking Adults

Many Americans lack access to quality healthcare systems and providers, which has significant implications for health-related outcomes and the cost of care. (Chaudhry, 2022) Data from the National Healthcare Disparities Report has consistently shown that many Americans have trouble obtaining access to care, with worse access among minoritized and low-income Americans (Agency For Healthcare Research and Quality, 2021). In particular, individuals who primarily speak Spanish are susceptible to poor access to care, and can be negatively impacted by a system that primarily consists of English speakers. The purpose of this project is to examine disparities in healthcare access among Spanish speaking adults using a national and diverse sample of Americans captured from the Centers for Disease Control Behavioral Risk Factor Surveillance System Survey (BRFSS). Data from the 2021

BRFSS telephone survey was used to compare healthcare access among more than 400,000 English and Spanish speaking adults. Group comparisons indicated that Spanish-speaking adults were less likely to have a health plan, personal healthcare provider, and a routine checkup within the last 2 years when compared with their English-speaking counterparts. Unsatisfactory healthcare outcomes among non-English speaking adults may be associated with the lack of concordance of languages between patients and providers.

Presenter(s): Pravalika Manda
Authors: Pravalika Manda, Jesus Peñaloza, Richard Coffey, Natale Hall, Erica Dale
Faculty: Erica Dale

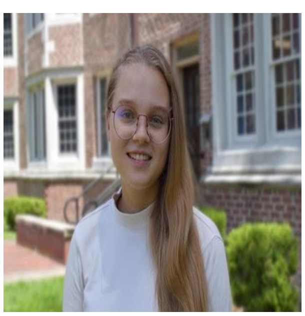
Evaluating the Plasticity of Diaphragm Muscle Fibers after Closed-loop Epidural Stimulation in Cervical Spinal Cord Injuries

Spinal cord injury (SCI) is a traumatic occurrence that can negatively impact motor, autonomic, and sensory function. Of the annual 250,000-500,000 novel SCI cases globally, over half occur in the cervical spine, often leading to paralysis and respiratory complications due to diaphragm atrophy and subsequent loss of diaphragm function. Therefore, treatments to prevent diaphragm atrophy are critical to reducing morbidity and mortality in SCI patients. Closed-loop electrical epidural stimulation (CLES) holds therapeutic potential to restore motor function post-SCI. The aim of this study was to develop a workflow to determine if chronic, sub-threshold CLES can prevent diaphragm atrophy following SCI. We analyzed diaphragms from rats that received a cervical-level-2 hemisection injury followed by either CLES. Diaphragm fiber cross-sectional area and fiber type proportion were quantified by immunostaining for laminin gamma-1 and myosin heavy chain (MyHC) isoforms MyHCI, MyHCIIa, MyHCIIb followed by analysis with semi-automated quantification software. Optimization of immunostaining and semi-automated analysis enabled the successful quantification of diaphragm fiber CSA and classification of individual fibers based on MyHC isoform expression. Future analysis of diaphragm samples using this workflow will be used to assess the effect of CLES on diaphragm atrophy following SCI.

Presenter(s): Stephanie Manrique
Authors: Stephanie Manrique
Faculty: Karly Caples

Bioengineered 24-well System for Studying Skeletal Muscle Disease and Therapeutics

3D cell-based systems are being engineered in order to reduce reliance on animal studies and provide an opportunity to study complex biological systems such as skeletal muscle. In order to address the needs of skeletal muscle research, the Malany laboratory developed a skeletal muscle micro physiologic system, or “tissue chip” with built-in platinum electrodes for electrical stimulation to model neuronal input. We have adapted our tissue chip to a standard 24-well microplate in order to increase our experimental capabilities to study skeletal muscle disease and potential therapeutic. To validate the functionality of our 24-well platform in the study of muscle disease, we have completed analyses of bundles produced from myoblasts of healthy male donors for overall cell health and proper formation of key contractile complexes. We also generated force measurements using a force transducer with electrical stimulation applied for both twitch and tetanic force. Further studies of our muscle myobundles will be used to evaluate the biomechanics of contraction, bioengineered vascularized skeletal muscle co-cultures, and study the therapeutic targets to combat atrophy. The latter is the subject of a graduate thesis project.



Presenter(s): Viktoria Marcus
Authors: Viktoria Marcus, Sanaz Motamedi
Faculty: Sanaz Motamedi

Pedestrians and Fully Automated Vehicles: Technology Acceptance and Design of External Communication Interface

In 2022, over 30,000 pedestrians were killed in traffic accidents which were caused by human error (NHSTA). Level 5 Automated Driving Systems (ADSs) have the potential to create safer roads by eliminating human error. However, this can only happen if Level 5 ADSs are accepted and easy to interact with, especially for pedestrians, who are the most vulnerable road users. The interactions between pedestrians and ADSs are not fully understood; this study seeks to understand what factors affect pedestrians' acceptance of Level 5 ADSs, and determine a safe and efficient external human-machine interface (eHMI) to facilitate communication between ADSs and pedestrians. A 62-question survey was conducted with 37 participants, with sections for demographics, pedestrian behaviors, personal innovativeness, and acceptance factors including attitude, safety, trust, perceived behavioral control, understanding, social norm, compatibility, and behavioral intention to cross in front of an ADS. To explore eHMI designs, a lab activity was conducted with 70 students enrolled in a Spring 2023 semester Human Factors and Ergonomics Design class within Industrial and Systems Engineering. The data collected will be analyzed using qualitative and quantitative analyses. This study's goal is to understand pedestrians' acceptance of and interaction with ADSs.

Presenter(s): Viktoria Marcus
Authors: Viktoria Marcus, Sanaz Motamedi
Faculty: Sanaz Motamedi

<u>Lessons Learned from COVID-19: Generation Z Students' Acceptance of E-Learning Technology</u>

The COVID-19 pandemic forced schools worldwide to adapt to online instruction. E-Learning technology was met with acceptance and rejection by Generation Z students. To explore ways to improve the acceptance of E-Learning technology by Generation Z, a theoretical framework based on the Technology Acceptance Model (TAM) was created. In addition to the core four factors in TAM, the external factors included in this framework were: Perceived Severity of COVID-19 and Voluntariness, Information Quality, Privacy and Security, Accessibility and Service/System Quality, Compatibility and Perceived Interaction, Instructor Computer Self Efficacy, and Student Computer Self Efficacy. An online survey with 66 questions was conducted with Generation Z university students, with sections for demographics, personality and learning style, and external factor items. Over 2000 responses were collected from students of University of Florida. The data was first cleaned, and will be analyzed using quantitative methods. The goal of the project is to provide insight into Generation Z's use of online learning technology, especially during the COVID-19 pandemic.

Presenter(s): Brian Marra
Authors: Brian Marra
Faculty: Lillian Guerra

Queering Miami Politics: The Impact of the LGBTQ+ Community in Magic City

This paper will explore the implications of the LGBTQ+ community on Miami's political sphere. From the 1940s to the 1990s, the queer community has played an active role in Miami's political discourse at points being exploited and at other times being empowered. In the 1940s, Miami was seen as a tropical paradise where tourists flocked to escape their daily lives. Queer Miamians became the exotic performers of the paradise exploited for their sexuality and gender. The 1950s and 1960s saw the inherent discrimination of queerness by the local government following in lockstep with Cold War McCarthyism and "delinquency." In the 1970s, the Sexual Revolution opened up discourse surrounding sexuality, yet the revival of anti-queer activism hampered hopes of true equality. By the 1980s and 1990s, queer Miamians had organized into powerful political organizations, partnered with the Democratic Party, yet still remained tied to contradictory beliefs that limited total queer liberation. Above all, this paper will demonstrate a symbiotic relationship between queer and anti-queer factions through analysis of LGBTQ+ archival material and secondary sources. The relationship formed between queer and anti-queer entities in Miami was unique and encouraged a fluid and vibrant political state that still exists today.

Presenter(s): Krista Marrocco
Authors: Krista Marrocco, Erin Patrick Ph.D., Kristy Spear Ph.D., Mark Law Ph.D.
Faculty: Erin Patrick

Incorporating Games and Peer Collaboration to Teach Concepts of Circuits Reduction

The goal of this research is to design a new collaborative learning activity for the Circuits 1 course at the University of Florida for Electrical and Computer Engineering students. In the process of creating an activity that will be effective at both engaging students and improving performance, the situation must be examined from a broader context. A literature review was conducted to explore what techniques are currently being used and what aspects would make our module additive to the current methodology. Through the background research, it was determined that circuit learning activity could most effectively incorporate include a gaming aspect and a collaborative aspect. Gamifying the concept can encourage active learning. Additionally, collaboration with peers can encourage diversity of thought. The activity's impact on students will be analyzed to answer the question "Does incorporating games and peer collaboration when teaching the concept of circuits reduction improve retention?". The circuit reduction questions will focus on reducing series and parallel combinations. The results from this research will form the basis of a potential study that can be proposed to IRB in the future.

Presenter(s): Gabriela Martinez, Isabelle Rodriguez, Emily Tuliao
Authors: Julian Tobon, Isabelle Rodriguez, Emily Tuliao, Gabriela Martinez, Latin American Genetics Consortium
Faculty: Paola Giusti-Rodriguez

Functional genomics studies of psychiatric disorders in individuals from Latin American countries: a systematic review

Psychiatric genomics research has allowed for the identification of genes involved in psychiatric disorders and the understanding of their fundamental biology in order to inform clinical practice. However, most of this growing body of research has focused on subjects that are of Caucasian and European descent, and there is a huge underrepresentation of minorities, particularly Latin-Americans. An advanced PubMed search for current literature focusing on Latin-American functional genomics to study psychiatric disorders was conducted to investigate current functional genomics findings for Latin-American subjects. There are only approximately 57 papers concerning themselves with explicitly Latin-American subjects in psychiatric genomics research. Of these papers, most focused on schizophrenia (N=8), major depression disorder (N=11), and bipolar disorder (N=11).

DNA methylation techniques were most predominant and most subjects are Brazilian or Mexican. These studies demonstrate the need to expand psychiatric genomics studies using samples from Latin-American individuals to have a complete picture on both the genetic and genomics of psychiatric disorders in these populations. Correcting this underrepresentation could provide insights on the basis of psychiatric illness in diverse groups of individuals.

Presenter(s): Juan Martinez
Authors: Juan Martinez, Dr. Meghan C. Ferrall-Fairbanks
Faculty: Dr. Meghan C. Ferrall-Fairbanks

Modeling tumor ecology in non-small cell lung cancer

Lung cancer is the second cancer with the highest incidence worldwide, accounting for approximately 2.2 million cases and 1.8 million deaths in 2020. Of lung cancer cases, 85% were diagnosed as non-small cell lung cancer (NSCLC), and 15% were small cell lung cancer (SCLC). In Florida, lung cancer is the deadliest type of cancer in the UFHCC catchment area. Given our community's high lung cancer mortality, this research project aims to develop a mathematical model of lung cancer eco-evolutionary dynamics using a generalized Lotka-Volterra approach. In addition, NSCLC has a high overall recurrence of around 50% and needs better treatment strategies to effectively treat this disease. Generally, high levels of CD8+ T cells are associated with favorable NSCLC prognosis and may enhance tumor suppression. Conversely, tumor-infiltrating lymphocytes like regulatory T cells (Tregs), macrophages, and myeloid-derived suppressor cells (MDSCs) are hypothesized to block T cells' tumor suppression abilities by releasing immunosuppressive cytokines. Using these assumptions, we propose to model NSCLC based on the interactions between the anti-oncogenic immune cells (T cells) and pro-oncogenic cells (macrophages). This framework advances our understanding of NSCLC growth dynamics under a variety of selective pressures and serves as a platform for developing evolutionary-based therapies for NSCLC.

Presenter(s): Rohan Master
Authors: Rohan Master, Lei Wang, Yufeng Xiao, Nan Hua, Yuewan Luo, Daohong Zhou, Guangrong Zheng, Weizhou Zhang
Faculty: Weizhou Zhang

Developing a PROTAC-based NR4A1 degrader for melanoma cancer therapy

Melanoma is one of the most common cancers, with nearly 100,000 new cases yearly. Recent studies have highlighted the role of NR4A1in melanoma for cancer survival, invasion, and metastasis. Our project aims to identify a degrader of NR4A1 using a PROTAC strategy. PROTACs consists of three domains: a warhead that binds to the protein of interest, a ligand to an E3 ligase, and a linker that brings both domains in proximity to one another. The PROTAC can recruit an E3 ligase to ubiquitinate NR4A1 and degrade it via the ubiquitin-proteasome system (UPS).

Our first goal was to screen PROTAC candidates that effectively degraded NR4A1. We identified NR-V04, which demonstrated a dose-dependent degradation of NR4A1. When comparing NR-V04 treated and untreated CHL1 cells, NR-V04 was able to significantly decrease melanoma cell viability. NR4A1 knockout in CHL1 also showed decreased melanoma cell viability, but when comparing NR-V04 treated and untreated in NR4A1 knockout, there was no further decrease in melanoma cell viability. As for in vivo models, NR4A1 knockout in CHL1 and A375 exhibited slower tumor growth compared to the wild type. Western blot analysis of tumor tissue provides support for the ability of NR-V04 to degrade tumor-intrinsic NR4A1.

Presenter(s): Ana Mata-Acosta
Authors: Ana Mata-Acosta, Gerardo H. Nunez
Faculty: Gerardo Nunez

Exploring cuticular conductance rates in blueberry plants

Plants control the amount of water they lose through the opening and closing of their stomata. However, they also lose water from their epidermal cells through the cuticle (cuticular conductance). This process is not controlled by the plant and may negatively affect the water status, especially of young plants. Cuticular conductance may be an important factor in the success of blueberry plants in Florida, but no prior research has been done on this subject. We hypothesized that cuticular conductance rates are different among blueberry varieties. We assembled a dark dehydration chamber that allows leaf water loss across the cuticle while stomata remain closed. We placed 10 mature leaves from southern highbush blueberry (Vaccinium corymbosum interspecific hybrids) varieties Colossus, Sentinel, and FL17-142 in the chamber and periodically weighed them as water mass was lost. Cultivar Sentinel exhibited the highest cuticular conductance rates, followed by Colossus, and finally FL17-142. Results suggest cuticular conductance rates differ among varieties. Studying this relationship further across leaf age will be critical to understanding the importance of cuticular conductance in the complete growth cycle of blueberry plants.

Presenter(s): Hailey Maurer
Authors: Hailey Maurer, Dr. Bala Rathinasabapathi
Faculty: Bala Rathinasabapathi

Evaluating Hybrid Vigor in Newly Developed F1 Chili Pepper Hybrids

The Rathinasabapathi laboratory has developed four advanced inbred lines of chili peppers (Capsicum annuum), each with a unique combination of traits. There is potential to develop F1 hybrids of these inbreds given the possibility of hybrid vigor expression for various traits. The objective of this research is to generate F1 hybrids of selected inbreds via controlled crosses, to measure fruit quality traits of each line, and to measure the degree of hybrid vigor exhibited in the F1. Previous work established two groups of chili pepper varieties: Group A, consisting of ‘Ruby’ and ‘Jade’, and Group B, consisting of ‘Jasper’ and ‘Topaz’. Specimens of each inbred line were grown in greenhouse conditions and evaluated for a variety of characteristics. Several notable differences were found between Group A and Group B. Group A plants produced short, triangular fruit while Group B plants produced elongated fruit. A series of controlled crosses were made between members of Group A and Group B to establish the F1 hybrid generation; in the future, data will be collected from the parental lines and F1. They will be used to study the inheritance of traits across generations and to propose methods to generate F1 hybrids using inbred lines.

Presenter(s): Madeleine E McCreary
Authors: Madeleine E McCreary, Ryland D Swearinger, Sarah Stenberg, Daniel P Ferris, Erika M Pliner
Faculty: Erika Pliner

Evaluating the Efficacy of Strobe Goggles for Challanging Balance

Falls account for the majority of injury related hospitalizations in older adults. Balance training paradigms have the potential to reduce fall incidents. Physical perturbations during balance training (e.g. moving platform) reduce fall risk, but the implementation of these paradigms require costly, custom equipment and fall-arrest systems. There is a need for balance training paradigms to be more accessible. Balance control requires integration of the visual, vestibular, and sensorimotor systems. The visual system can be perturb through affordable eyewear. This study investigates the effectiveness of visual perturbations via strobe goggles in challenging balance. Participants were equipped with strobe goggles and completed two 6-min standing trials on forceplates comprising of a bilateral and tandem stance, order randomized. The trials comprised three periods: 1-minute no strobe, 4-minute strobe, 1-minute no strobe. The center of pressure (COP) was quantified across the forceplates. Balance was assessed from the COP 95% confidence ellipses, where a higher value is indicative of more challenged balance. Elliptical area increased from the no strobe to strobe period, and did not change from the strobe to no strobe period, regardless of stance condition. These results are likely due to fatigue and disorienting effects of the goggles.

Presenter(s): Karen McGilvery
Authors: Karen McGilvery
Faculty: Erin Westgate

Choosing Who to Help: When Expressing Distress Backfires

What induces us to help others? Helping others who are in distress is an important prosocial behavior that can be done informally and professionally. I propose that systematically varying emotions cues and perceived motivation can affect predicted and actual helping behavior, so that there is an interaction effect and a main effect of motivation. In study 1, six hundred thirty-seven undergraduate students completed an online study. They watched one of four two-minute videos with anxious and motivated, anxious and unmotivated, frustrated and motivated, or frustrated and unmotivated behavioral scripts and predicted whether they would help the student depicted among other measures. In study 2, which is ongoing, participants completed a thirty to forty-five-minute in-person experiment. They underwent a fifteen-minute "puzzle period" in which a confederate performed one of four similar scripts. The confederate recorded instances and frequency of helping behavior during the "puzzle period." Overall, there were no significant differences among the groups in terms of helping behavior. However, motivated and anxious actors in study 1, were perceived as more likable and moral, and more likely to have a "good" life, suggesting that these behaviors may be evaluated more positively by potential helpers.

Keywords: Helping behavior, motivation, anxiety, frustration

Presenter(s): Reagan McGinley
Authors: Reagan McGinley, Michael Chung, Juan Guan
Faculty: Juan Guan

Quantitative Imaging of the Cellular Uptake of Liposome-mRNA Nanoparticles for mRNA Vaccines and Immunotherapy

Empirical trial-and-error optimization in nanoparticle engineering inevitably approaches plateau with modest improvement in treatment efficacy and diagnosis capabilities. Novel use of quantitative assays and measurements that provide mechanistic insights into the nanomaterial assembly process may point to alternative routes in areas currently under-developed in nanomedicine. Here, we used fluorescence microscopy to track nanomaterial assembly and cellular uptake in a model RNA-liposome system, in real time, with high specificity, spatial resolution, and throughput. Cellular uptake of nanoparticles was quantified using a machine-learning algorithm designed to identify cells and nanoparticles by their fluorescent signals. We showed that the nanoparticle assembly occurs in discrete steps after mixing of mRNA and cationic liposomes in aqueous solution. Following the initial mRNA adsorption, the mRNA-coated liposomes self-assemble into heterogeneous conglomerates spanning several orders of magnitude in size. Physics-driven modeling prompts modulation of the initial liposome concentration, leading to changed nanoparticle size distribution and dramatically improved cellular uptake. As this RNA-liposome assembly is the basis of an ongoing FDA-approved clinical trial for cancer immunotherapy, this work reveals quantitative fluorescence imaging has enormous translational potential.

Presenter(s): Cory McKinstry
Authors: Cory McKinstry, Arik Hartmann, Faith Dunlap, Tristan Vratil, Robert Ossiboff, David Rodriguez, Ana V. Longo
Faculty: Ana V. Longo

<u>Multi-parasite Surveys of North-Central Florida Reveal Variable Infection Patterns</u>

Herpetofauna is increasingly threatened by emerging wildlife pathogens. One such pathogen, Ophidiomyces ophiodiicola (Oo), has contributed to the decline and extirpation of snake species across the United States from Snake Fungal Disease (SFD). Other infective agents, such as Ranaviruses and Cryptosporidium, may also be helping to drive snake declines as added pathogen pressure within the landscape. However, little is known about how multiple pathogens affect host susceptibility. To understand how Oo is interacting with endemic parasite communities and if these interactions are modulating host infection dynamics, we monitored the presence of three pathogens: Oo, Ranaviruses, and Cryptosporidium, using quantitative PCR on samples from a wild snake community in North-Central Florida. We detected low parasite prevalence, but infections showed correlations with specific species and habitats, indicating that impacts of emergent disease may be disproportionate in snake communities. Infections were not always coupled with visible signs of disease, but high pathogen loads of Oo were detected in rare and declining species with moderate-severe symptoms of SFD. Overall, we show that several emerging pathogens of snakes infect a variety of species across taxonomic and ecological groups in North Florida, which may be used to guide future disease mitigation and conservation strategies.

Presenter(s): Drew McNally
Authors: Drew McNally
Faculty: Dr. Adrienne Strong

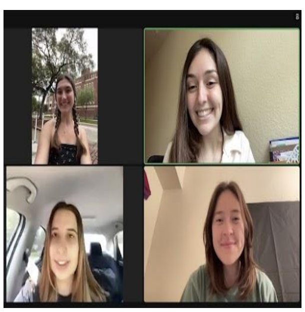
Shame, Stigma, and STI's: The Impact of Education and Sex Culture on University Students

Imagine a world without sex; it feels nearly impossible to do so. When someone comes down with strep throat or mononucleosis, it is commonplace to go to the doctor and get treatment. Chlamydia and gonorrhea are examples of infections as well, yet are transmitted differently, through sex. Due to the historical dark cloud of taboo that looms over sex, this topic is poorly educated on and typically not discussed publicly leading to shame and guilt for younger generations. This research looks at how students define the culture of sex at the University of Florida and their understanding of testing, protection, symptoms, treatment, and communication regarding sexual practices and health. The data consists of 176 survey participants and 5 interviews with undergraduate students. The results indicated a consensus of confusion about what sexually transmitted infections are, how they are presented, and what types of protection are used for. Words and phrases such as "toxic", "risky", "unsafe", and "careless" were reported to describe the culture of sex on the University of Florida's campus. The link between shame and confusion circles back to the initial lack of education about sex leading to shame, unsafe practices, and high STI rates in this demographic.

Presenter(s): Andrea McPherson
Authors: Andrea McPherson, Kariman Shama, Kathrina Etinenne, Brittany Taylor PhD
Faculty: Brittany Taylor

Automated Fiber Alignment Analysis Tool for In Vitro Models of Tendonitis

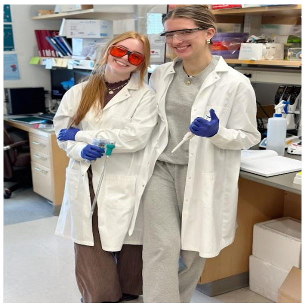
In order to better understand cellular response to structural changes in diseased tendons, in vitro models that resemble the physiological fibrous matrix must be established. Fiber orientation, fiber diameter, and the extracellular matrix (ECM) proteins vary between different tendon pathologies. In tendonitis, the tendon ECM have more immature and cartilage-like matrix proteins and less organization. Therefore, a tendonitis in vitro model would ideally have less aligned fibers with smaller diameters than the matrix of a healthy in vitro tendon model. To this end, we electrospun 50% w/v polycaprolactone (PCL) scaffolds at 505 and 137 RPM to produce aligned and unaligned scaffolds, respectively. The frequency of fiber diameters and aligned fibers within -90° to 90° were previously quantified with ImageJ. However, ImageJ uses vector field thresholding instead of fast Fourier transforms, which is one of the most accurate methods to quantify fiber parameters. To optimize the analysis accuracy, we created an automated analysis tool using MATLAB to convert the binary image into a frequency space expressed in polar coordinates to define the normalized orientation distribution function. This tool will confirm the physiologically similar matrix characteristics of our in vitro models to diseased and healthy tendons.



Presenter(s): Samantha Meador, Charlotte Maloney, Buse Utkan, Shantzie Ponce
Authors: Samantha Meador, Charlotte Maloney, Shantzie Ponce, Buse Utkan, Sharon DiFino, Ph.D, CCC-SLP, Sterling Sheffield, Au.D., Ph.D., CCC-A
Faculty: Sharon DiFino

Understanding Language Use and Background of Spanish Heritage Speakers

This study sought to understand background factors that impact language use among Spanish Heritage Speakers (SHS). SHS are defined as individuals who are exposed to Spanish language input from caregivers while simultaneously immersed in a predominantly English-speaking environment during language development. While copious amounts of literature describe language use among native speakers and those that learn a second language, it is limited in its ability to explain the experiences of bilingual SHS. An online 10-minute survey of language background and use was distributed to SHS living in the U.S. Of the 123 responses received, 71 respondents qualified to be included for analysis. Responses were analyzed for Spanish use in five environments: familial home, current home, academic, work, and social environments. Respondents used Spanish most in their familial home, followed by their current home and social environments, and least in academic and work environments. Spanish use varied greatly across SHS and the factors that influenced Spanish use varied across environments. Language of comfort, network size, and county's Hispanic population accounted for most variability in responses. The results of this study can be used to guide future research on SHS language use and to understand factors that influence their Spanish use.



Presenter(s): Katelyn Meister, Jordan Lewis
Authors: Katelyn S. Meister, Jordan G. Lewis, Santosh R. Rananaware, Luke Samuel W. Sandoval, Emma K. Vesco, Grace M. Shoemaker, Brianna L.M. Pizzano, Piyush K. Jain
Faculty: Piyush Jain

PAM Independent Nucleic Acid Detection with CRISPR-Cas12a

The type II class V CRISPR-associated protein complex- Cas12a, has been widely utilized for the detection of nucleic acid biomarkers due to its innate trans-cleavage activity. However, its ability as a diagnostic tool is restricted by the requirement of a protospacer adjacent motif (PAM) site on the target double-stranded DNA (dsDNA) for CRISPR-Cas recognition. The universally recognized PAM for Cas12a is TTTV, and it can tolerate non-canonical 'C' containing PAMs to a lesser extent. Nonetheless, Cas12a cannot recognize 'A' and 'G' containing PAMs. In this work, we have developed a technique for the recognition and cleavage of non-canonical PAM targets with LbCas12a entitled PAM-independent detection of nucleic acids with CRISPR-Cas12a or PICNIC. It has been shown that Cas12a doesn't require the presence of a PAM site for the recognition and cleavage of single-stranded DNA (ssDNA). We utilized this property within our method in which we separate dsDNA into two ssDNA strands by subjecting the target to a high-temperature and high-pH environment, allowing for the detection of the ssDNA in a PAM-independent manner. By coupling PICNIC with Reverse Transcriptase - Recombinase Polymerase Amplification (RT-RPA) we can achieve sensitive and specific detection of nucleic acid targets, without the constraint of the PAM sequence.

Presenter(s): Ananya Mellacheruvu
Authors: Ananya Mellacheruvu, Charlene Pringle CPNP-AC/PC, FCCM, Silvana Carr MD
Faculty: Charlene Pringle

Ventilator-Associated Tracheitis and Pneumonia in Children – A Retrospective Study

Ventilator-associated pneumonia and tracheitis (VAT/VAP) are common nosocomial infections in critically ill-intubated children that could result in prolonged mechanical ventilation and length of hospitalization. Currently, the epidemiology and associated risk factors of VAT/VAP are not as well documented in pediatric patients as they are in adult patients. A retrospective chart review of all pediatric patients, admitted to the University of Florida Shands Children's Hospital, supported with mechanical ventilation between 01/01/20 and 06/30/20, was conducted to examine the epidemiology and clinical features of patients who did and did not develop VAT/VAP infection. 105 subjects were analyzed, of which 22 developed VAT/VAP, while 83 did not. It was found that among the patients that did develop VAT/VAP, the median age was 14.50 months and 63.60% were male. Among patients that did not develop VAT/VAP the median age was 19.00 months and 63.90% were male. Overall our analysis showed that prolonged time on a positive pressure ventilator and other factors were found to correlate with the development of VAT/VAP. In the future, understanding VAT/VAP will be important for prevention and treatment options.

Presenter(s): Ananya Mellacheruvu, Kristen Nethercott, Sara Rottink
Authors: Ananya Mellacheruvu, Kristen Nethercott, Sara Rottink, C. Krystyn Linville, CPNP-AC
Faculty: Krystyn Linville

Clinical Course Comparison of Children with Acute Respiratory Failure Secondary to COVID-19 and Viral Infection compared to Viral Infection Alone

There has been conflicting data with whether co-infection with COVID-19 in bronchiolitis is associated with more severe courses than a single infection. This study aims to determine if patients admitted to the PICU with acute respiratory failure in the setting of viral illness have a different hospital course when having the additional diagnosis of COVID-19. A retrospective chart review is being conducted for patients admitted to the PICU with the use of ICD-10 codes encompassing viral illness associated with influenza, viral pneumonia, bronchiolitis, or acute lower respiratory infection compared with the additional diagnosis of COVID-19 from January 2020 to March 2022. Additional data being collected includes patient demographics, type of respiratory support the patient was on, and the severity of illness for the patient calculated using pSOFA scores. The main data being analyzed in this study are the length of stay, maximum level of respiratory support needed, whether there is a new respiratory baseline at discharge, and a comparison of the severity of parenchymal disease seen on chest X-rays. These will be compared between the two cohorts described above.

Presenter(s): Alessa Mikaela Mendoza
Authors: Alessa Mendoza, Allison Dehnel, Saif Malook
Faculty: Adam Wong

Investigating How Temperature Affects Chemical Resistance in the Whitefly Bermisia tabaci

Bemisia tabaci, also known as the sweet potato whitefly, is a common agricultural pest throughout the southern United States and most other tropical or subtropical climates. Whiteflies cause significant economic and pathogenic damage to crops, and their resistance to insecticides makes controlling them challenging. We are investigating whether the microbiome of the whitefly contributes to its chemical resistance by rearing whitefly colonies and testing their imidacloprid resistance through LC50 insecticide assays. This assay determines the concentration of imidacloprid that results in 50% mortality in the population. Therefore, a significant part of our investigation requires LC50 assays. We have observed significant variation in the results at different temperatures. As a result, we hypothesize that LC50 assays for Bemisia tabaci can be optimized and standardized at a higher, controlled temperature of 32° C. To verify this hypothesis, we are currently testing LC50 assays in separate growth chambers at 25° C and 32° C.

Presenter(s): Nicholas Mesa
Authors: Forrest Masters, Pedro Lomónaco
Faculty: Forrest Masters

A Landscape Asssessment of North American Wave and Wind Facilities

The National Full-Scale Testing Infrastructure for Community Hardening in Extreme Wind, Surge, and Wave Events (NICHE) is a National Science Foundation (NSF) Mid-Scale Research Infrastructure 1 project that aims to meet a critical need for full-scale testing for natural hazards resilience in the 21st century. The current project serves to establish an integrated design testbed (IDT) that will facilitate the design of a full-scale NICHE facility. This paper provides an overview of a landscape assessment of wind and wave facilities across North America that will be used to inform the design of the physical experimentation portion of the IDT. The landscape assessment provides a comprehensive review of wind and wave facilities by expanding upon their research, capabilities, specifications, and equipment. In doing so, it is the paper's intent to detail the critical need for a facility like NICHE in the nation's research infrastructure while providing a database for wind and wave research that can promote future research and collaboration.

Presenter(s): Paris Mihaj
Authors: Paris P. Mihaj, Dr. Georges E. Khalil
Faculty: Georges E. Khalil

Can We Promote Smoking Prevention in Adolescents? A Qualitative Analysis of Adolescents' Perceptions of Tobacco Products

This thesis paper aims to address the serious issue of tobacco use among adolescents by developing a compelling and effective design of a tobacco prevention intervention that resonates with them. To achieve this, a participatory approach will

be employed to ensure that the content is designed for adolescents by adolescents. The research project seeks to answer two main questions: (1) what are adolescents' perceptions about certain messages of tobacco? and (2) what are adolescents' beliefs and attitudes towards tobacco use and different products?
The research will be conducted using focus group interviews that involve qualitative data collection methods. Adolescents between the ages of 13 and 18 will be recruited from schools and youth organizations to participate in focus groups and surveys. The data collected will be analyzed using thematic analysis to identify the key themes that emerge from the data.
The goal of the research project is to develop a successful library of tobacco risk-communication messages that can be implemented in a future social game-based intervention. The findings from this research will contribute to the development of effective tobacco prevention interventions that are designed for and by adolescents, and ultimately reduce the prevalence of tobacco use among this age group.

Presenter(s): Aspen Miller
Authors: Aspen Miller, Dr. Flavia Gallo, Dr. Yang Yang, Dr. Michele V. Manuel
Faculty: Michele Manuel

Active Infrared Thermography for Nondestructive Evaluation of Weld Joints

A major concern with any large-scale infrastructure, such as roads, bridges, and highway barriers, is the impact of weld defects on catastrophic failures and potential mass hazards. Due to this, a desire for a quick, straightforward, and nondestructive way to test these pieces of architecture has risen. The aim of this project is to evaluate the effectiveness of a nondestructive technique based on active infrared thermography (IR-TNDT) for identifying and characterizing both surface and subsurface weld defects. The proposed IR-TNDT is mainly focused on the thermal gradients which appeared on the surface of weld joints due to local differences in thermal conductivity between the weld metal and the hot gas inside the defect cavity. An infrared thermal camera (FLIR T620) was utilized to image a series of steel and aluminum welded specimen, each with a different manufactured defect and surface condition to mimic realistic in-field situations. The intended use of this method as a quick, on-site diagnostic test has proven to be largely effective for surface defects, but not straightforward for subsurface defects. Further research is being conducted to determine if data processing techniques can be used to spot patterns not obvious to the human eye that indicate subsurface defects.

Presenter(s): Emily Miller
Authors: Emily Miller (presenting co-author), Adithya Gopinath, Phillip M. Mackie, Leah T. Phan, Rosa Mirabel, Aidan R. Smith, Stephen Franks, Ohee Syed, Tabish Riaz, Brian K. Law, Nikhil Urs and Habibeh Khoshbouei
Faculty: Habibeh Khoshbouei

Who Knew? Dopamine Transporter Activity Is Critical in Innate and Adaptive Immune Responses

The dopamine transporter (DAT) regulates the dimension and duration of dopamine transmission. While conventionally studied in the CNS and within the context of neurological and neuropsychiatric diseases, DAT is also expressed at the plasma membrane of peripheral immune cells such as monocytes, macrophages, T-cells, and B-cells. DAT acts as an immune suppressor via an autocrine/paracrine signaling loop. In the current study, we tested the hypothesis that in DAT knockout mice, innate and adaptive immunity are perturbed. We found that genetic deletion of DAT (DAT−/−) results in an exaggerated baseline inflammatory phenotype in peripheral circulating myeloid cells. In DAT−/− peritoneal macrophages, we identified increased MHCII expression and exaggerated phagocytic response to LPS-induced immune stimulation, suppressed T-cell populations at baseline and following systemic endotoxemia and exaggerated memory B cell expansion. In DAT−/− mice, norepinephrine and dopamine levels are increased in spleen and thymus, but not in circulating serum. These findings in conjunction with spleen hypoplasia, increased splenic myeloid cells, and elevated MHC-II expression, in DAT−/− mice further support a critical role for DAT activity in peripheral immunity and points to a much broader implication of DAT activity than previously thought.

Presenter(s): Daniel Min
Authors: Daniel Min, Kevin G. Senior, Geoffrey D. Keeler, Cristina D. Gaddie, Christopher Chan, Olivia Wilson, Maya Baker, Brad E. Hoffman
Faculty: Brad Hoffman

Liver-Directed Gene Immunotherapy Induces Functionally Suppressive MOG-Specific Regulatory T Cells

Presenter(s): Victor Moncada
Authors: Victor M. Moncada, Ajeet Kumar, Khalil. A. Abboud, and Ronald K. Castellano*
Faculty: Ronald K. Castellano

Synthesis and Self-Assembly of [3.3]Paracyclophane Urea and Carbamate Derivatives

[n.n]Paracyclophanes ([n.n]pCp) exhibit transannular π-π interactions through their closely situated aromatic rings. Because of their unique stereochemical and optical properties, they function as molecular scaffolds for a variety of industrial applications. In 2016, the Castellano Group reported the first supramolecular polymer based on this architecture, named [2.2]paracylophane-tetracarboxamide ([2.2]pCpTA). This monomer undergoes self-assembly to form one-dimensional structures through four anti- aligned hydrogen bonding amide units. As part of the continuing investigation of the relationship between the structure and observed properties, the amide connectivity can be changed from the 'C-centered' configuration, with the carbon of the amide connected to the aromatic ring, to the 'N-centered' configuration ([2.2]pCpNTA), with the amide mirrored and the nitrogen connected to the aromatic ring, demonstrating stronger assembly. This prompted further research into N-centered units, such as urea groups and carbamate groups in favor of the standard amide group. Additionally, we expanded the bridge length of the [n.n]pCp from n=2 to n=3, resulting in altered self-assembly, particularly poor rigidity due to increased conformational freedom. Further tuning of [3.3]pCp self-assembly can be manipulated by installing various hydrogen bonding groups onto the structure.

Presenter(s): Julia Moncrieff
Authors: Julia Moncrieff, Talia Jacobson
Faculty: Cătălin Voiniciuc

Two Endo-β-Mannanase Genes Influence Arabidopsis Thaliana Seed Mucilage Biosynthesis

Beta-1,4-linked mannans are a type of hemicellulose, one component of the cell wall of plants. Previous studies have demonstrated that mannan is important in the formation and release of seed mucilage in Arabidopsis thaliana. Mucilage is a polysaccharide-rich gelatinous cell wall that could protect seeds and promote germination in adverse conditions. The hydrolytic cleavage of mannan polymers into smaller fragments can be catalyzed by endo-β-mannanase (MAN) enzymes. Eight MAN genes have been identified in the Arabidopsis genome and many of them are expressed during seed development, but their functions in cell wall biosynthesis and modification remain unclear. The single mutants affecting MAN2 or MAN5 genes had no observable effects on the mucilage amount nor composition. However, a man2man5 double mutant reduced the thickness of the seed mucilage and the content of mannan glycosidic residues compared to wild-type seeds. Contrary to our initial hypothesis that man mutants would have higher mannan content, these results suggest that some MAN genes may be required to facilitate galactoglucomannan synthesis. New insights into MAN function could thus be used to fine-tune seed germination time and cell wall properties for industrial applications.

Presenter(s): Colleen Mondell
Authors: Colleen Mondell, Ann C. Wilkie
Faculty: Ann Wilkie

The Sustainable Uses of Kenaf (Hibiscus cannabinus)

Kenaf, an herbaceous annual, soft fiber crop may have the potential for commercial success in the state of Florida due to the high yields that can be obtained in the state's warm climate. The crop can be cultivated for both fiber and seed production. In Central and North Florida, the climate makes kenaf cultivation more suitable for fiber production. The fibers can be used in various ways, such as for papermaking, as a raw material for composites, and as a sustainable oil absorbent to clean up spills. The core, as a waste product of fiber production, has the ability to be utilized as a growth medium for containerized plants and to be used as a filtration aid for pools. In South Florida, higher seed yields are obtained because the climate is more suitable for seed production in the region. Seeds can be utilized as a source of seed supply for other regions, and may even be used as a source of edible oil as a by-product. If the correct measures are taken, kenaf could become a valuable cash crop for the state and a sustainable alternative for use in various industries.

Presenter(s): Caroline Monokandilos, Ioanna Lysandrou, Priyal Ganguly,
Authors: Caroline Monokandilos, Ioanna Lysandrou, Priyal Ganguly, Apollonia E. Lysandrou, Scott Teitelbaum, Ben Phalin, Jason Hunt, Laurie Solomon, Amanda Janner, Kent Mathias, & Ben Lewis
Faculty: Apollonia Lysandrou

<u>Pain and Sleep Disturbances in SUD Treatment: Disentangling Chicken From Egg</u>

Chronic pain and disrupted sleep are major antecedents and consequences of substance use disorders (SUD). While the two are associated, we lack thorough understanding regarding which may be the greater risk factor and therefore, more advantageous treatment target. We aimed to investigate the directionality of this relationship by applying statistical models that facilitate causal inference and extended our examination of this relationship among individuals with Alcohol Use Disorder (AUD) and Opioid Use Disorder (OUD) separately. Patients receiving residential SUD treatment (n=973) completed assessments of pain and sleep quality at intake, after 30 days, and at discharge. All cross-lagged panel models revealed that pain predicted subsequent changes in sleep quality ($ps \leq .007$). Interestingly, while this relationship was only significant during early treatment for the OUD subgroup ($p < .001$), it persisted until discharge in those with AUD. These data provide novel evidence that in the context of SUD treatment, pain may be a particularly important intervention target in ameliorating sleep disturbances. Given the import of pain and sleep to both quality of life and treatment success, these results provide important and actionable guidance to treatment providers. Future studies should extend this work and consider substance-specific effects in greater detail.

Presenter(s): Anna Montelongo
Authors: Anna Montelongo, Caroline Davidson, Samantha Smith, Kimberly Nguyen, Daniela Zambrano, Sara Burke
Faculty: Sara Burke

Assessing Sex and Age Differences in Response-Based Learning

Millions of older adults are increasingly affected by age-related cognitive decline, making it crucial to better understand the neurobiological principles that may be contributing to impairment. Prior research conducted in Dr. Sara Burke's laboratory has used rodent models to investigate changes in mnemonic strategy use that may be attributed to advancing age and that can be linked back to neurobiology. While the hippocampus (HPC) is a brain structure known to decline with age, the dorsal striatum (DS) has been hypothesized to remain resilient to functional impairment, particularly in tasks that assess spatial learning. The Burke lab is currently exploring the relationship between spatial learning, associative learning, and age-related increases to 'response-driven' behavior/mnemonic strategy usage. Although the Burke lab has previously shown that the female estrous cycle does not influence associative learning in young or aged female rats, prior work has reported that the phase of the estrous cycle is important for spatial learning. The current study characterizes response-based behavior across cognitive modalities and accounts for the female estrous cycle.

Presenter(s): Madison Moore
Authors: Madison Moore, Dr. Jeanette Andrade
Faculty: Jeanette Andrade

Nutrition Information on TikTok: A Qualitative Exploration of Posts from Registered Dietitian Nutritionists (RDN) and non-RDNs.

Registered Dietitian-Nutritionists (RDN) are using TikTok to promote their services and public nutrition knowledge. However, their viewer's engagement and comments have yet to be explored. A descriptive qualitative study was conducted to identify the difference in posts by RDNs and non-RDNs. For one month, the engagement on posts from 4 creators (n=2 RDNs and n=2 non-RDNs) was recorded. The number of positive and negative comments and common comment topics were identified. Four post categories were identified: preparing meals, consuming nutritious food/meals, nutrition/diet tips, and indirectly nutrition related. Likes were the most common form of engagement. Most comments were positive (70%). The creators with more followers received more negative comments (27%) than those with less followers (6%). RDNs received more comments asking for nutrition advice (n>44) than non-RDNs (n<13). RDNs posted more about preparing meals and nutrition/diet tips while non-RDNs posted more about consuming nutritious food/meals and indirectly nutrition related. Informing RDNs of the usefulness of TikTok and of the expectations of their audience is important as the use of social media in health care is increasing. Thus, further research is important to ensure that we can inform RDNs on the best social media practices.

Presenter(s): Mia Morin, Meagan Michalik
Authors: Mia I. Morin, Meagan C. Michalik, Ricardo L. Couto-Rodríguez, Julie A. Maupin-Furlow
Faculty: Julie Maupin

Insight into Sir2-type Sirtuins and their Association with DNA-binding Proteins in Archaea

Sirtuins are promising targets to promote longevity and treat diabetes, aging, cancer, and neurodegenerative diseases. These enzymes couple lysine deacetylation with the conversion of NAD+ to O-acetyl-ADP-ribose and nicotinamide. Sir2-type sirtuins mediate transcriptional silencing through the deacetylation of chromatin-binding proteins including histones in yeast and Alba in Sulfolobus, an archaeon lacking histones. Alba is absent from certain archaea, including the haloarchaea that have histone-fold proteins that function as transcription factors, adding complexity to understanding Sir2-mediated transcriptional silencing evolution. Here we purified Sir2 from the haloarchaeon Haloferax volcanii and found Sir2 to bind OxsR, a TrmB-like protein that functions as a thiol-based transcription factor. OxsR is not related to histones yet binds intergenic and intragenic regions of the chromosome, suggesting roles in controlling gene expression beyond its function at intergenic promoter regions. LC-MS/MS analysis of the H. volcanii proteome identified OxsR to be acetylated at a conserved lysine residue (K71) during hypochlorite stress, while the Sir2-bound form of OxsR was not lysine-acetylated based on immunoblotting analysis with anti-acetyllysine antibodies. Future work is focused on using site-directed mutagenesis to identify the amino acid residues required for Sir2 to bind OxsR.

Presenter(s): Hailey Muchnok
Authors: Hailey Muchnok, Ann C. Wilkie
Faculty: Ann Wilkie

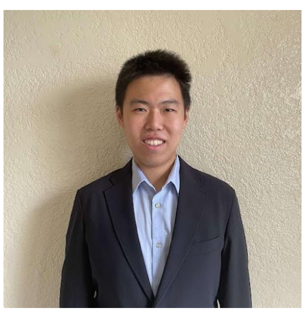
Selecting Optimal Berry Bushes for a Community Garden

Maintaining a fruit garden can have multiple benefits for human health and nutrition, as well as ecosystem benefits such as attracting pollinators and increasing biodiversity. However, prior to establishing a fruit garden, there are many factors to consider such as site selection, local climate and temperature, soil type and textures, irrigation methods, and exposure to sunlight. When selecting cultivars, one must consider which fruits will propagate best in the aforementioned conditions, as well as nutrient requirements, space, time of bloom, susceptibility and resistance to pests, and chill requirements. The community fruit garden located at the University of Florida's BioEnergy and Sustainable Technology Laboratory contains fruits such as blueberry and blackberry bushes, and can be accessed by students and faculty who wish to connect with local nature. Optimal berry bushes for this community garden were selected based on available space and time to fruiting.

Presenter(s): Trisha Mutisya
Authors: Trisha M. Mutisya, Anuj Sharma, and Jeffrey B. Jones
Faculty: Jeffrey Jones

Further investigation of density-dependent volatile-induced antimicrobial activity by Xanthomonas perforans

Bacterial spot of tomato and pepper, both devastating diseases, are caused by several species of phytopathogenic bacteria within the genus Xanthomonas including X. perforans and X. euvesicatoria. The disease symptoms include brown necrotic lesions on infected leaves that can lead to extensive defoliation, yield losses, and reduced marketability of fruit. In a recent investigation, X. perforans produced a novel bacteriocin with antimicrobial activity against X. euvesicatoria. Production of the bacteriocin only occurred in Petri dishes with high populations of X. perforans. Since the growth of X. perforans increases the pH of nutrient agar (NA) due to ammonia production, we hypothesized that the bacteriocin is activated at high pH. To demonstrate this, two different experiments were performed. First, an antagonism assay was performed on unbuffered NA, and NA buffered at a series of pHs revealed that a high pH affects bacteriocin activity. In the second experiment, the pH of the agar media was elevated following exposure to exogenous ammonia fumes, indicating that high pH increases bacteriocin activation. Altogether, these results display that a high pH will increase the bacteriocin activity of X. perforans. Further work is needed to uncover the importance of this bacteriocin in successful host colonization by X. perforans.



Presenter(s): Mohammad Naem
Authors: Mohammad Naem, Sylvain Doré
Faculty: Sylvain Doré

Can Haptoglobin Phenotyping Improve Therapies Against the Anatomical and Neurological Consequences of Intracerebral Hemorrhage (ICH)?

ICH is a type of stroke characterized by bleeding in the brain tissue, causing brain swelling/edema, neurological deficits, physical disability, and death. Haptoglobin (Hp) is the second most abundant protein in the blood that binds and clears free hemoglobin, preventing its toxic downstream effects. There are 3 main Hp phenotypes: Hp1-1, Hp2-1, and Hp2-2. Review of the literature has provided that Hp phenotypes may be associated with the severity and outcomes of ICH. Specifically, individuals with the HP2 allele may have worse functional outcomes compared to those with Hp1-1. A proposed mechanism is that HP2 may be less efficient in binding and neutralizing free hemoglobin, leading to increased oxidative stress and inflammation in the brain tissue following ICH. In addition, HP2 may hold different structural and functional properties compared to HP1, such as differences in glycosylation and protein-protein interactions, which could affect its ability to modulate the immune response and repair processes after ICH. Efforts of the Dore Lab suggest that Hp phenotyping may have a role in predicting ICH prognosis and informing personalized future therapies. This literature review highlights the critical context of the Hp polymorphism in understanding functional outcomes of various types of bleeding in the brain.

Presenter(s): Justin Nagovskiy
Authors: Justin Nagovskiy, Cameron Anderson, Toshi Nishida
Faculty: Toshikazu Nishida

Development of a Hardware Prototype for Temperature Monitoring with Printed Thermocouples in Wearable Technology Applications

Flexible Hybrid Electronics (FHE) systems have a wide range of applications due to the ability of flexible printed circuit boards (PCBs) to bend, in contrast to rigid PCBs. This makes them particularly useful for high-stress environments such as wearable technology, which is likely to be subject to external forces resulting from human use. As global temperatures rise and heat wave events become more common, the demand for wearable temperature monitoring increases. Those working in jobs that are at an increased health risk due to excessive heat would benefit from wearable devices that can monitor heat stress risk factors like rising core temperature. A rigid prototype of an FHE system was designed with the goal of integrating printed flexible temperature sensors with the necessary processing circuitry. Thermocouples, a type of temperature sensor, can be directly integrated into the flexible system without the need for connectors. A reference system design was modified to support four independent printed thermocouples, along with a four-input amplifier and a filter at each input to remove noise. A calibration curve was derived experimentally to convert the voltage value measured across the thermocouple to a temperature.

Presenter(s): Kayla Nguyen, Sonali Vijay
Authors: Matthew E. Brown1, Puchong Thirawatananond1, Lindsey K. Sachs1, Kayla Q. Nguyen1, Sonali Vijay1, Elise J. Kern1, Collin C. Lahde1, Akash A. Shah1, Melanie R. Shapiro1, Todd M. Brusko1,2
Faculty: Todd Brusko

<u>Monoclonal Antibody Blockade of CD226 Decreases Spontaneous Diabetes in the NOD Mouse by Diminishing T Cell Cytotoxicity and Augmenting Treg Suppressive Capacity</u>

Type 1 Diabetes is an autoimmune disease in which the body's T lymphocytes erroneously attack insulin-producing pancreatic β-cells. We present a strategy for reducing diabetes incidence in the NOD mouse using a monoclonal antibody to block the T1D-risk associated T cell costimulatory receptor, CD226. Female NOD mice treated with α-CD226 between 7-8 weeks of age showed reduced insulitis severity at 12 weeks and decreased disease incidence at 30 weeks compared to isotype-treated mice. Ex vivo analysis performed five weeks post-treatment revealed α-CD226 mAb persists in vivo, reducing the availability of CD226 on CD8+ T cells and Tregs. α-CD226 inhibited the proliferation of both CD4+ and CD8+ T cells in vitro and ex vivo. Splenocytes treated with α-CD226 exhibited a more immunoregulatory cytokine profile with decreased IFN-γ and increased IL-10 production. This was further corroborated by 51Cr-release assays demonstrating reduced cell-mediated lympholysis by α-CD226 mAb treated autoreactive T cells. Ex vivo phenotyping of FOXP3+Helios+ Tregs revealed increased CD25 expression following α-CD226 mAb treatment, with Tregs displaying augmented suppression of CD4+ T cell responders in vitro. These data suggest that CD226 blockade reduces T cell cytotoxicity and improves Treg function, with important therapeutic implications for the prevention or suspension of T1D.

Presenter(s): Javlon Nizomov
Authors: Javlon Nizomov, Kathryn Stofer
Faculty: Kathryn Stofer

What Do Floridians Think About Chronic Disease Management via Telemedicine from Cooperative Extension?

The Cooperative Extension System helps people manage chronic disease, improve their nutrition, and live healthy lives through education and supportive lifestyle programs. Telemedicine provides access to healthcare especially for people who face transportation, money, and time barriers for attending in person, such as those in rural areas. UF/IFAS Extension is piloting telemedicine provision in county offices for people with certain chronic conditions aligned with social prescriptions to Extension health programs. To assess the need for and opinions on telemedicine and UF/IFAS Extension for effective chronic disease management, we designed a survey for Floridians. Our survey examines their views on the importance of nutrition education, the acceptability of telemedicine, and satisfaction with previous UF/IFAS Extension programming. It also explores how opinions on traditional in-person programs compare to potential innovative offerings such as virtual education and differences between people who have experienced Cooperative Extension and those who have not. We will use descriptive statistics and parametric and non-parametric inferential statistics to answer our research questions. Through our findings, we hope to inform the expansion of telemedicine to more of Florida's rural and high-poverty counties and provide insight into improving chronic disease management.

Presenter(s): Olivia Elena Norenberg
Authors: Olivia Norenberg, Allison Dehnel, Saif Malook
Faculty: Adam Wong

Optimizing Behavioral Assay to Investigate Effects of Microbes on N. viridula

The southern green stinkbug, Nezara viridula, is a notorious agricultural pest due to its feeding behavior, which has been reported to reduce seedling germination, emergence, and survival. The gut microbiome and its interactions have played a crucial role in the health and behavior of the southern green stinkbug and can influence its feeding habits. To better understand these interactions, the behavioral response of N. viridula to different microbes was examined. In this study, we aimed to optimize assays to study stinkbug-microbe interactions by testing several variables, including starvation time, enclosure type, technique to introduce stinkbugs into the enclosure, and method of introducing stinkbugs to different microbes in a choice assay. Preliminary results suggest that allowing the stinkbugs to acclimate to the testing arena and providing indirect access to bacterial samples via volatiles from the bacteria have produced the best results. By optimizing the behavioral assay, our work paves the way for a better understanding of how microbes can influence the behavior of the stink bug, potentially aiding the development of new stinkbug control methods, such as microbial attractant or repellent. This may also lead to more reliable and accurate data and aid in the development of effective pest management strategies.

Presenter(s): Brianna Novillo
Authors: Brianna K. Novillo, Katherine R. Weber, Ricardo Couto-Rodriguez, Julie A. Maupin-Furlow University of Florida, Microbiology and Cell Science
Faculty: Julie Maupin-Furlow

Site-directed mutagenesis to understand post-translational modifications of ferredoxin reductase during cellular oxidative stress

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

Presenter(s): Dylan O'Brien
Authors: Dylan O'Brien
Faculty: Janise McNair

Testing Power Consumption by Common Devices in IoT Applications

The Internet of Things is rapidly becoming a permeating technology in all areas of life. However, while it can be useful to have many small devices spread out, collecting data, and performing as actuators, it can be difficult to power them. Research being done by the University of Florida's IoT - ACRES (Internet of Things - Applied Construction Research and Education Services) group is investigating potential solutions to providing power to this decentralized network of devices.

This project seeks to characterize the power consumption of different devices frequently used in IoT applications, as well as the communication protocols they utilize; namely Zigbee and BLE. Devices were programmed to perform very simple communications with each other at a specific rate, and the power consumption of these devices was measured. These tests showed that power consumption in these devices were low, close to 30 mW in Zigbee devices. The consumption could be further reduced by using efficient coding techniques and by using sleep modes that are available on most devices. These findings will be used to create a power management architecture consisting of solar panels, batteries, and other small scale power sources to manage a field of homogeneous IoT devices.

Presenter(s): Aryn O'Dell
Authors: Aryn O'Dell, Nurkuisa Rametov, Muhkit Orynbayev, Syrym Kopeav, Jeremy P. Orange, Samantha Sawyer, Mikeljon P. Nikolich, Jason K. Blackburn
Faculty: Jason Blackburn

Evaluating Livestock and Wildlife Commingling in a Brucellosis Risk Zone in Kazakhstan

Brucellosis is a zoonosis caused by Brucella spp. bacteria. Brucellosis is global with high burden in underdeveloped countries. Kazakhstan reports high human/livestock burden and high-cost animal test/slaughter. Brucella spp. show high host affinity and vaccines are Brucella spp. specific. Spillover between livestock and wildlife species is high risk requiring knowledge of commingling between host populations. We measured commingling between livestock and wildlife in Kazakhstan on privately owned farms in Kazakhstan, using 12 motion-triggered cameras (2018-2021). We created kernel density estimates of species' diel grazing patterns and plots of commingling between sheep and other livestock. We found overlaps in diel activity for most livestock. Livestock showed three grazing peaks: morning, afternoon, evening. Wild roe deer were crepuscular. Significant direct commingling occurred between sheep and cattle. 18.18% of the time sheep grazed, cattle grazed. This was ~28% when multiple livestock grazed together. Sheep directly commingled with all livestock species. Sheep/cattle interactions are most likely for brucellosis transmission; molecular evidence suggests shared Brucella spp. in both species. Additionally, cattle indirectly commingled with roe deer on forested farms in the study area. These data aid policy makers in effective intervention strategies to reduce brucellosis.

Presenter(s): Grant Oberle, Kayleigh Burge, Abigail Lebedeker, Ana Rodriguez
Authors: Grant Oberle, Kayleigh Burge, Abigail Lebedeker, Ana Rodriguez, Susan Nittrouer, & Matthew Masapollo
Faculty: Matthew Masapollo

Effects of auditory feedback on inter-articulator speech coordination in congenitally deaf talkers who received cochlear implants

This study investigated the effect of auditory feedback on inter-articulator speech coordination by congenitally deaf adults who received cochlear implants (CIs). Two CI users recorded nonsense, disyllabic /tV#Cat/ utterances using electromagnetic articulography, with alternative V (/ɑ/-/ɛ/) and C (/t/-/d/), across variation in rate (fast-slow) and stress (first syllable stressed-unstressed). There were two feedback conditions: implant processor turned on versus off. Six normal-hearing (NH) controls were also recorded producing the utterances with and without noise masking to minimize access to immediate auditory feedback. Two articulatory kinematic measures were obtained: (a) the timing of tongue-tip raising onset for medial C, relative to jaw opening-closing cycles; and (b) the angle of tongue-tip raising onset, relative to the jaw vowel cycle phase plane. Any manipulation that shortened the jaw opening-closing cycle reduced both the relative timing and phase angle of tongue-tip movement onset, for both groups in both feedback conditions. Critically, however, these relations were stronger for CI users in the implant processor off condition. This differential response to a change in auditory feedback suggests that CI users struggle to integrate immediate auditory feedback with ongoing speech movements and/or rely more on somatosensory inputs from the vocal tract.

Presenter(s): Alexia Obrochta
Authors: Alexia N. Obrochta, Chiara M. Licata, Gregory C. Marino, Shahar Almog & Meredith S. Berry
Faculty: Meredith Berry

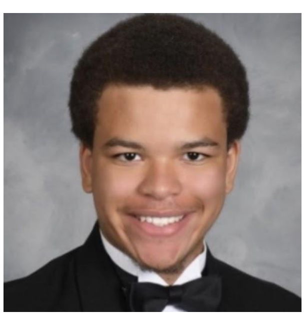
Long-Term Ketamine Therapy: Exploring Demand and Misuse Potential

In the 2000s, studies showed that ketamine could be a treatment alternative for depression, and esketamine (Spravato), became FDA-approved in 2019. Off-label use is common and has caused a surge of ‘ketamine clinics’, where ketamine is administered by an infusion or injection. A typical ketamine treatment involves a varying dose of 6-10 infusions once or twice a month. After the treatment course, some patients may opt to receive booster infusions in the future or are prescribed ketamine troches. Although clinical trials have not found significant misuse potential, only 1-6 treatment infusions have been included in their methods. The recreational use of ketamine, or ‘Special K’, is also rising in popularity and is classified as a Schedule III drug. The purpose of the study is to collect real-world data through survey methodology on the risk of ketamine misuse potential of patients who receive long-term ketamine treatments. Recruitment methods are through collaboration with The Ketamine Taskforce organization and via clinics. The ongoing survey aims to identify risk factors and determine whether patients develop a liking, craving, demand, or misuse of ketamine over time, as well as to modify behavioral economic demand tasks in the context of ketamine.

Presenter(s): Sharon I. Ochoa
Authors: J. Stephanie Gonzalez, Sharon I. Ochoa, Ciobha McKeown, Timothy R. Vollmer
Faculty: Jeanne Gonzalez

Teaching Children to Recall Events in the Past

Remembering past events is a vital skill typically developing by age 3 or 4. Research has compared the differences in remembering skills between typically developing children and children with autism or intellectual disabilities. However, limited literature has demonstrated methods to teach remembering to children that struggle. These deficits might be related to skill or performance deficits. Our current study utilizes differential reinforcement or probe fading to teach children to discuss what they engaged with prior. This experimental procedure includes different phases of treatment, starting with baseline, in which the participant engage with toy stimuli in three different contexts stimuli. After a set delay, the experimenter asks the participant what they did in each context stimuli. Movement across phases is contingent on error patterns or mastery, defined as three sessions with all questions correct. Measures such as, but not limited to, engagement with context stimuli, latency to respond, and error patterns are evaluated for their potential effects on correct or incorrect responding. One participant has completed the procedures, and two others are currently in treatment. The presentation will include data for all three participants and a discussion on the potential reasons for response variation.



Presenter(s): Elijah Ohaegbualm
Authors: Elijah Ohaegbulam, Gerardo H. Nunez
Faculty: Gerardo Nunez

Measuring Xylem Functionality in Developing Blueberries

One of the most important qualities of any fruit is its firmness. Fruit firmness is augmented by the accumulation of calcium, which reinforces polysaccharides that maintain cell wall rigidity. Calcium is internally transported in the xylem of the plant. However, as fruits develop, their uptake of calcium decreases. Previous research has connected calcium uptake decline to loss of xylem function during fruit development. Declining calcium uptake has been observed in blueberries. However, research into blueberry xylem function is sparse. By tracking the movement of apoplastic dye, acid fuchsin, through the fruit xylem, the xylem functionality in blueberries can be pinpointed. We hypothesized that, as blueberries grow, uptake of the dye decreases until uptake plateaus at color change. We tested this hypothesis by connecting the xylem of blueberry fruit to a micropipette tip filled with dye. When the blueberry is placed in a dehydration chamber, transpiration draws the dye into the fruit. By cutting the blueberry open, dye movement through the xylem can be traced. Results suggest that smaller berries have higher rates of dye uptake. Regardless of berry size, dye is concentrated in the equatorial part of the peripheral vascular bundle, endocarp, and distal end near the calyx.

Presenter(s): Michael Olagbiyan
Authors: MIchael Olagbiyan, Justin Silberman, Erika Moore Ph.D
Faculty: Erika Moore

Macrophage Phenotypic Interactions In 2D And 3D Environments.

A macrophage's primary role is to destroy harmful pathogens. They can be stimulated to influence their behavior. The M1 macrophage is associated with inflammation whereas the M2 type is associated with healing. Macrophage stimulation is dependent on their environment. Various cues can influence macrophages to exhibit more M1 or M2 characteristics. In addition, several macrophage characteristics are known to change when introduced to a 3-dimensional environment. The purpose of this work is to investigate how macrophage phenotypes influence each other when in proximity to others of different phenotypes and how these interactions vary in a 3-dimensional environment. To accomplish this, RAW 264.7 macrophages were encapsulated at several different phenotypic ratios in a polyethylene glycol hydrogel. This system is functionalized with the incorporation of cell-cleavable and adhesive proteins. 2-dimensional studies were also conducted for comparison. Their stimulation was then characterized based on inos and arginase-1 expression. Preliminary work has suggested that M1 macrophages decrease their stimulation both in the presence of

M2 macrophages and in a 3-dimensional environment. This study emphasizes the need for greater consideration to be placed on how macrophage stimulation may vary based on their interactions with each other across 2D and 3D environments.

Presenter(s): Karina G. Ortega
Authors: Karina G. Ortega, Amanda Rico-Chávez, Dr. Juan Andrade PhD.
Faculty: Juan Andrade

Effects of Controlled Elicitation on the Total Phenolic Content and Antioxidant Activity of Celery (Apium graveolens L.)

Plants are constantly exposed to environmental stressors which increase the harmful oxidative chemical species in their cells. To mitigate cellular damage, plants depend on antioxidant defense mechanisms including the biosynthesis of specialized metabolites such as phenylpropanoids. These phenolic compounds protect plant tissues from oxidative damage and confer antioxidant activity to fresh vegetables, thereby promoting the health of their consumers. Consequently, controlled elicitation, which consists of deliberately exposing a crop to low stress, has emerged as an agricultural practice to increase metabolite biosynthesis and thus enhance the functional and nutraceutical properties of crops. In this study, we aimed to describe the effect of two chemical elicitors on the total phenolic content and the antioxidant activity of celery. In the experiment salicylic acid and hydrogen peroxide were exogenously applied to celery leaves in three doses each. The total phenolic content was determined by the Folin-Ciocalteu method, and the antioxidant activity was measured using the DPPH and ABTS spectrophotometric assays. The results show that elicitation influences the total phenolic content and the antioxidant activity of celery in a dose-dependent manner. These findings suggest that both elicitors could be used to improve the quality and functional properties of celery.

Presenter(s): Hafsa Ouaakki
Authors: Hafsa Ouaakki, Laxmi Rathor, Sung Min Han
Faculty: Sung Min Han

<u>Neuropeptides: How small neuropeptides regulate healthspan in C. elegans</u>

Organisms often modify their activity in response to environmental conditions. Recent research in model organisms has shown that an organism's ability to sense and adapt to changes in its environment has a significant impact on the aging process. Neuropeptides have been implicated to play an important role in the integration of sensory information to produce desired outputs and communicate them to distal tissues to regulate aging and healthspan. However, little is known about these neuropeptide circuits for signaling. Our study illustrates how the nervous system detects and processes environment signals to regulate longevity through signaling. Here, using C. elegans as a model, we systematically interrogated the role of various neuropeptides in healthspan. Additionally, we find that the frpr-18(0) mutant decreases healthspan by suppressing resistance to oxidative stress. The overall significance of our research is gaining deeper insight into the FLP-2 receptor, FRPR-18, and its contribution towards possibly enhancing longevity. Our future research aims involve studying the signaling pathway mechanisms of FLP-2 and other behaviors, like sleep.

Presenter(s): Robert Ovalle Jr.
Authors: Robert Ovalle Jr., Jessica Aldrich, Blanka Sharma
Faculty: Blanka Sharma

<u>Assessing the Structure-Function Relationship of Manganese Dioxide Nanoparticles in Physiological Environments</u>

Oxidative stress, the imbalance between reactive oxygen species and antioxidants, has been implicated in the onset and progression of osteoarthritis (OA), the leading cause of disability in the US. Antioxidative therapy is one approach for combating oxidative stress but presents many challenges. Our group has engineered manganese dioxide nanoparticles (MnO_2 NPs) to provide chondroprotection and perform antioxidative functions. MnO_2 NPs were formulated with different molecular weights (MW) of polyethylene glycol (PEG) and characterized for size, zeta potential, hydrogen peroxide scavenging capacity, and colloidal stability. Nanoparticle stability in physiological environments was measured in models of blood (pH 7.4) and the endosome (pH 5.5-6.5). The antioxidant enzyme-mimicking functions (catalase and superoxide dismutase) of the MnO_2 NPs were assessed in primary human OA chondrocytes and juvenile bovine chondrocytes. Nanoparticles conjugated with PEG-3400 demonstrated improved colloidal stability. Exposure to acidic environments has a visible effect on MnO_2 structure and composition, likely recapitulating what occurs in physiological environments. This work confirms the role of PEG-3400 on particle stability and evaluates the effects of physiologically relevant environments on MnO_2 structure and function, which are necessary to advance toward clinical translation.

Presenter(s): Lily Padgett
Authors: Lily Padgett
Faculty: Mark Jamison

Effect of Limited Face-to-Face Interaction on Business Use of Social Media Following the COVID-19 Pandemic

The onset COVID-19 pandemic had an immediate and negative effect on business. During the first few months of the pandemic, information about the proper response was constantly changing, which led to the implementation of infection control measures by national, state, and local governments. As a result, many businesses were temporarily or permanently closed. To communicate these closures with their clients, many businesses turned to Facebook, Instagram, and other social media networks. This paper examines the relationship between business communication on social media and the limitation of face-to-face interactions as a result of the COVID-19 pandemic. A multiple linear regression model was used to analyze how businesses' communication practices changed during the initial months of the COVID-19 pandemic. The study uses Facebook's Data for Good Business Activity Trends Data as its measure of business communications. This dataset compares the number of publicly available posts and page visits on a business's Facebook page before and after the outbreak of COVID-19 in March 2020. Understanding how businesses and consumers respond to information about crises and government restrictions will help policymakers and business owners better react to future disasters.

Presenter(s): Anamaria Palencia
Authors: Anamaria Palencia, Dominick Padilla, Sonya Stahl, Bala Rathinasabapathi
Faculty: Bala Rathinasabapathi

Inheritance of Quantitative Fruit Quality Traits in Pepper (Capsicum annuum)

Peppers (Capsicum annuum L.) are important vegetables and spice crops worldwide. Fruit quality traits such as fruit color, shape, wall thickness, sugar, and acid content determine consumer preference for the crop. Although the genetics of fruit quality traits in peppers are known for many traits, we do not have primary data for some of the fruit quality traits, including the inheritance pattern of specific fruit quality traits. To investigate the inheritance of fruit quality traits, a population of F2 plants was generated by crossing an heirloom sweet pepper and a hot pepper inbred line 'Ruby". Ripe fruit from each of more than 120 F2 plants will be collected, and quality traits will be recorded. We will test the expected segregation based on Mendelian logic for qualitative traits. For quantitative traits, we will use quantitative genetic tools.

Presenter(s): Lucia Papadopulos, Julia Ball, Marne Quigg, Bella Gonzalez, Victor Remley, Jesus Rodriguez
Authors: Lucia Papadopulos, Julia Ball, Marne Quigg, Bella Gonzalez, Victor Remley, Jesus Rodriguez
Faculty: Miguel Acevedo

Prevalence of Malaria Parasites Infecting Anolis gundlachi following Hurricane Maria

Catastrophic stochastic disturbances such as hurricanes can disrupt ecological processes including host-parasite dynamics. Here we are investigating how Hurricane Maria¬—an almost category 5 hurricane that hit Puerto Rico in 2017—impacted rates of Plasmodium spp. infection in the lizard Anolis gundlachi. Studies have shown little to no effects on rates of parasitism from previous hurricanes in the 20th century, but none have been as devastating as Hurricane Maria. Over six years, our lab group collected blood samples from A. gundlachi captured either by hand or lasso at El Verde Field Station, located in the El Yunque National Forest in Puerto Rico. Their blood drops were transferred onto cellulose paper for molecular diagnosis. From these samples, we examined infection rate differences between the summer immediately following Hurricane Maria (2018) and the summer nearly two years after (2019). We hypothesize that Plasmodium prevalence in A. gundlachi would be lower shortly after the hurricane disturbance in summer 2018 compared to summer 2019. Using PCR diagnostics, we found that malaria prevalence was higher in 2019 (42.86%) than in 2018 (11.11%). Therefore, Hurricane Maria resulted in a decreased rate of parasitism likely due to a decrease in host densities. Nevertheless, parasitism recovered relatively quickly.

Presenter(s): Mansi Patel, Caroline Rossi, Arshia Goyal
Authors: Mansi Patel, Arshia Goyal, Caroline Rossi, Victoria Vailoces, Danelle Antelo, Ajay Mittal, Mark Segal
Faculty: Mark Segal

<u>Mobile ECGs in Detection of Subclinical Atrial Fibrillation in High Risk Outpatient Populations</u>

Background: Outpatient populations are at a greater risk of developing arrhythmias. A Smartphone-based Mobile ECG screening can potentially provide a cost effective and preventive mean of detecting atrial fibrillation (AF) at outpatient clinics with a rhythm strip.
Methods: A survey and 30-second ECG recording with the KardiaMobile ECG device was taken on enrolled participants across 4 clinic sites (Nephrology, Sleep, Ophthalmology, Urology). All participants agreed to partake in the study and answered a questionnaire aimed at revealing potential risk factors for cardiovascular disease. Physicians were notified if AF was detected in patients and followed-up with a 12-lead ECG or equivalent order.
Results: As of October 17th, 2022, 1,707 of 3,930 (43%) participants have enrolled in the

study. 232 abnormal readings were reported through the KardiaMobile rhythm strip: 63 readings were labeled as possible AF, 138 readings were labeled unclassified, and 28 were unreadable. These readings are currently under analyzation by a cardiologist. Conclusions: Data collection is ongoing and still in its initial stages. However, the preliminary data shows promise regarding the feasibility of using KardiaMobile ECGs for the prevention, treatment, and diagnosis of cardiological disease in outpatient clinics.

Presenter(s): Prem Patel
Authors: Prem Patel, Sylvain Dore
Faculty: Sylvain Dore

Reviewing potential Cerebro protective effects resulting from the interactions between L-PGDS with Bilirubin and Biliverdin.

Lipocalin-type prostaglandin D synthase (L-PGDS) is an enzyme that catalyzes the synthesis of prostaglandin D2 (PGD2) from prostaglandin H2. While L-PGDS is primarily known for this, it also interacts with other molecules, including bilirubin and biliverdin. Bilirubin is a yellow-orange pigment that is produced during the breakdown of heme, while biliverdin is an intermediate in the heme degradation pathway that can be converted to bilirubin by the enzyme biliverdin reductase. Bilirubin is an important antioxidant and has anti-inflammatory properties, while biliverdin is involved in various physiological processes including heme metabolism. In a study done by Inui T et al. In 2014, it was found that L-PGDS binds to heme, biliverdin, and bilirubin at high affinities (KD=3-18nmol/L) compared to other small lipophilic ligands such as retinoids, and thyroid hormones (KD>300nmol/L). The high binding affinities of L-PGDS to heme metabolites, coupled with its rapid shift from the intrathecal space to the blood and elimination through urine within 6 hours, suggest that it acts as a scavenger of biliverdin in the cerebrospinal fluid of patients with subarachnoid hemorrhage and eliminates it from the body. The results of this study and prior research suggest potential Cerebro protective effects of this interaction warranting further investigation.

Presenter(s): Pritika Patel
Authors: Pritika Patel, Jean-Francois Roulet, Mateus Garcia Rocha, Dayane Oliveira
Faculty: Jean-Francois Roulet

<u>Spectral Analysis of Different Accessories of a Multi-Wave LCU</u>

The study characterized a light curing unit (LCU) and accessories. A LCU (Valo-X) with different accessories (pointcure-lens, proxicure-ball-lens, translume-lens, interproximal-lens, and diffuser-lens) placed on a spectrophotometer (MARC LC) measuring power, irradiance, spectral-power, and radiant exposure. The LCU has two curing modes (standard and xtra-power), fixed-time settings, and diagnostic modes (white and black light). The five accessories yielded 13 groups examined with lateral beam profiles using 0.05% rhodamine solution. Anova and Tukey tests analyzed the data. Digital lateral beam profile showed irradiance through the depth of light penetration. Using FTIR with Valo Cordless (400 mW/cm2 irradiance) determined radiant exposure to cure 2 bulkfill composites. In curing mode, extra power was significantly higher than standard (2585mW vs. 1623mW); radiant exposure was the same (11.9 J/cm2 v 12.1 J/cm2). Using proxicure-ball and pointcure lenses, lower power was measured (170mW – 353mW) resulting in significant differences. Proxicure-ball-lenses (39.2J/cm2 standard and 38.3J/cm2 xtra-power) and pointcure lenses (34.3J/cm2 and 34.6J/cm2) showed no radiant exposure differences. Diagnostic accessories showed power between 0.1 mW-134 mW with significant differences. Lateral beam profiles demonstrated excellent collimation in curing modes. The proxicure-ball-len's lateral spread allows for proper interdental cure. LCU performance simplifies curing by automatically setting curing time for consistent radiant exposure.

Presenter(s): Rahi Patel
Authors: Rahi Patel, Adrienne Strong, Shivani Vancheeswaran
Faculty: Adrienne Strong

iPhone Pregnancies: Self-testing as Surveillance and Care in the Trying to Conceive Community

In addition to a proliferation of apps to track menstrual cycles, there has also been a boom in cheap, easily accessible technologies to track other aspects of cycles. When trying to conceive, many people now rely on these technologies to help them time sex, confirm ovulation, to indicate signs of health problems contributing to infertility, confirm the success of infertility treatments, and/or detect and track early pregnancy. We explore this growing phenomenon from the perspective of self-testing as surveillance care for the trying to conceive (TTC) individual or couple and their current and future fertility and pregnancy. Through an analysis of anonymous posts in fora in these apps, as well as in other online spaces, such as Reddit, we argue that surveillance care provides those TTC with a sense of agency and control over inexact bodily processes about which many lack sufficient prior knowledge. For some, this fastidious self-testing (sometimes for multiple hormones multiple times per day) provokes anxiety while others find it empowering. Here, surveillance care enacted on the self is more about care for the hoped for future pregnancy, and resulting baby, as opposed to one's own current health status. At times, surveillance care results in TTC couples needing to "take a break" or "just not track anything" for a cycle, as surveillance care exacerbates feelings of pressure and dashed hopes when couples get repeated negative pregnancy tests or endure the emotional ups and downs of chemical pregnancies resulting in early loss.

Presenter(s): Sarah Patuel
Authors: Sarah J. Patuel, Cole English, Victoria Lopez-Scarim, Isaac Konig, Emma Ivantsova, Christopher L. Souders II, Christopher J. Martyniuk
Faculty: Chris Martyniuk

Transcriptome and Phenotypic Responses in Zebrafish (Danio rerio) Embryos/Larvae Following Exposure to Novel Insecticide Broflanilide

Pesticides are commonly used to mitigate unwanted pests. However, they pose a health risk to humans and aquatic wildlife due to exposure. Broflanilide is an insecticide that functions to block gamma aminobutyric acid receptors (GABA) in insects. It is new to market, and little is known about its potential toxicity to organisms. The objective of this study was to determine the sub-lethal toxicity potential of broflanilide to developing zebrafish. To determine this, gene expression, behavior, and deformities of zebrafish were assessed when exposed to varying broflanilide concentrations. The insecticide did not affect hatch rate, deformities, and the survival of zebrafish exposed up to 500 μg/L for a 7-day period. There was no effect on oxidative consumption rates in embryos exposed up to 1000 μg/L broflanilide nor reactive oxygen species induction in 7-day-old larvae fish exposed up to 100 μg/L broflanilide. Gene expression levels were unaffected, except for Solute Carrier Family 6 Member 1b (slca1b), in fish exposed up to 500 μg/L broflanilide. Locomotor activity of larval fish at 7 days was decreased by broflanilide exposure based on a visual motor response test, and anxiolytic-type behaviors were impacted. This study improves the current understanding of the toxicity of broflanilide to fish.

Presenter(s): Jamie Paul
Authors: Jamie Paul
Faculty: Valerie Hampton

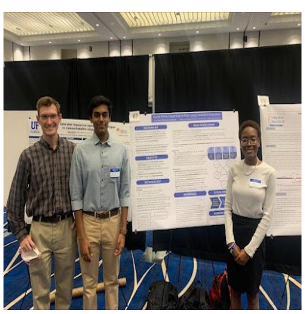
Of Smith and Rune: How Vikings Infused Spirituality into Metalworking

Embarking from their Scandinavian homelands between the age of 800 to 1050 CE, the Vikings were not only characterized by their seafaring and raiding nature, but were incredibly adept at culminating wealth through their crafted goods. Leaders of their community's flourishing social networks, craft artisans both spearheaded long-distance exchange, but also made decades of built-up workshop debris and grave hoards to be uncovered by contemporary archeologists. From their material culture, the Vikings soar beyond a superficial image of brutality and ravaging in their wake, into a society marked by complexity, notions of valor, and deep creativity. These physical artifacts provide more than just evidence into the day-to-day of Viking life; they are often constructed with consideration into Viking spiritual practices and beliefs – in particular, the honorable lineage tracing back to their ancestors, tethering humanity to their gods. Therefore, this presentation aims to understand the interweaving of the Vikings' crafted artifacts with their oral and written beliefs, with a concentration in metalworking.

Presenter(s): Ximena Paz
Authors: Ximena Paz
Faculty: Luis Mejia-Puig

Examining Environmental Influences on Pain Perception Using Virtual Reality

Virtual reality (VR) and biophilic design are two emerging areas of research in interior design and medical settings. VR is a rapidly developing technology which has revolutionized the field of interior design. This technology allows designers to create immersive environments that simulate the scale and depth of real spaces, while biophilic design focuses on incorporating natural elements into interior spaces to promote a human centered approach to design. Studies have found an association between the use of biophilic design elements and improved patient outcomes in the medical setting. However, little research has been conducted on how changes in the built environment may impact pain perception. This study aims to explore the impact of VR and biophilic design on human pain perception. Pain perception will be measured via pain-pressure thresholds using a pressure algometer. The study will involve a series of experiments comparing participants' pain perceptions while immersed in virtual spaces using VR technology. The research will focus on the effects of biophilic design elements on pain perception using plants, colors, and natural materials.



Presenter(s): Abhinav Penmetcha, Omolola Suleiman
Authors: Abhinav Vishnu Penmetcha, Omolola A. Suleiman, Divya C. Patel, Jason Cory Brunson
Faculty: Jason Brunson

Racial Ethnic Disparities in Post-Transplant Outcomes for Lung Recipients

Lung transplantation is a thoracic procedure where a patient's lung is replaced with a donor's lung. As donor lungs are limited, an organizational system was implemented in 2005 in which waitlisted patients are prioritized by a score calculated from several aspects of the patient's health. This score is predictive of outcomes after transplant, along with other dimensions of health. However, as with other health outcomes, social determinants may also play a role. Of these determinants, the race/ethnicity of the patient is of particular interest. Our goal in this project is to construct a mediator model describing the relationship between race/ethnicity, a curated set of covariates, and post-transplant outcomes. We conducted a literature review to identify determinants of post-transplant outcomes and we integrated the studies from this review into a causal framework involving four variable sets: race/ethnicity, social determinants, health factors, and outcomes. We are currently conducting a survival analysis on the United Network for Organ Sharing lung transplant dataset which will allow us to validate our causal framework. Finally, we will conduct a mediation survival analysis to quantify the mediating role of social determinants on any racial-ethnic outcome differences.

Presenter(s): Emery Perrin
Authors: Emery Perrin, Sylvain Doré
Faculty: Sylvain Doré

Status of Potential Protein Biomarkers for Neonatal Hypoxic Ischemic Encephalopathy

Neonatal hypoxic ischemic encephalopathy (HIE) is caused by a lack of blood flow and subsequent lack of oxygen fed to the brain. Manifesting as neonatal asphyxia, 2% of full-term infants and 60% of premature infants will suffer from HIE. Although hypothermic treatment has been implemented, HIE remains a common cause of neonatal death and long-term disability leaving surviving neonates at risk for conditions including, learning disabilities, epilepsy, and cerebral palsy. Currently, HIE research has been focused on identifying potential biomarkers for HIE in plasma, cerebrospinal fluid, urine, and umbilical cord blood serum. Identification of reliable biomarkers would allow clinicians to monitor disease progression, identify the location of injury within the brain, and assess the efficacy of current cerebroprotective strategies in medicine. Current research indicates that proteins and microRNAs such as Glial Fibrillary Acid Protein (GFAP), Ubiquitin C-terminal Hydrolase L1 (UCH-L1), S100B protein, and Tau protein stand as potential biomarkers. With further investigation of these proteins, concentrations could be established to differentiate between mild and severe HIE neonates, leading to improved patient outcomes.

Presenter(s): Dylan Philpot
Authors: Dylan Philpot
Faculty: Greg Stitt

High Level Synthesis Targeting FPGAs using SYCL

SYCL is a higher-level programming model to improve programming productivity on various hardware accelerators. It is a single-source embedded domain-specific language based on pure C++17 developed by Khronos Group. SYCL builds on the underlying concepts, portability and efficiency inspired by OpenCL that enables code for heterogeneous processors to be written in a “single-source” style using completely standard C++.

Presenter(s): Jean-Pierre Pierantoni
Authors: Jean-Pierre Pierantoni, Eric Hill, Alexander Kwiatkowski, Gregory Hudalla, Benjamin Keselowsky
Faculty: Benjamin Keselowsky

Post-Translational Glycosylation of Polypeptide Tags for Receptor Targeting

Liver cell based therapies using biomaterials can take advantage of the tolerogenic properties of the liver. Influencing the tolerance of liver immune cells to specific antigens provides an opportunity to utilize biomaterial-based drug delivery systems with minimal inflammatory signs and rejection. We have generated a glycosylatable tag fused with a reporter protein that is able to effectively bind to the C-type lectin receptors of HepG2 cells, a model hepatocyte cell line, at a higher rate than non glycosylated protein. The fusion protein utilized is a product generated by transfected E.Coli populations, which is then purified and glycosylated with UDP-N-acetyl-galactosamine in the presence of ppGalNAcT2 to target liver cells. The modification of the protein is performed by MALDI-TOF mass spectrometry analysis and adherence to HepG2 cells is observed by flow cytometry and GFP mean fluorescent intensity. This biomaterial has the potential to be employed as a vehicle for immune modulating enzymes and antigens to the liver. With the observed high rates of uptake by HepG2 cells, the potential uses of this protein for in vivo is to be characterized in further studies.

Presenter(s): Sarah Pilley
Authors: Sarah Pilley
Faculty: Sarah Gamble

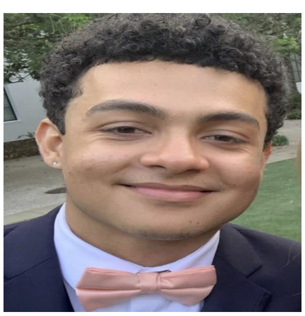
Walking and Sketching as a Tool for Architectural Design

This research explores the use of prescriptive walking and complementary sketching exercises to foster intentional observation and create a cohesive tool for architectural design. Prescriptive walking exercises instruct how to embark on a walk, usually with a motive to learn about the surrounding environment. Within architectural design, walking is a valuable tool for preliminary site analysis. Complementary sketching exercises create an opportunity to enhance the walking experience. They prompt questions of composition, scale, and technique. Sketching requires interpreting what exists physically through the hand, revealing new intricacies and patterns in the walking environment. Sketches create a tangible memory to reflect upon during the design process. The primary walking exercises studied and developed are the Radius Walk, Synesthesia Walk, and Dérive. This research complements Architectural Design 6 and 7, which focus on the urban condition. The author, followed by Architectural Design 6 students, tested and provided feedback on the usefulness of the exercises in their design process. Findings indicated that the exercises grounded the rendering and narrative of studio projects in the urban context. Future research involves developing a guidebook on the history of walking and sketching and their adaptation for use in architectural design.

Presenter(s): Pritham Pinni
Authors: Pritham Pinni, Yahya Khan, Abhay Tak, Sylvia "Katie" Murphy, Kayla Tran, Kyle Morman, Dr.Aaron Costin, Dr. Andrew J Wehle,
Faculty: Aaron Costin

<u>Efficacy of Bluetooth-Operated Heart Rate Monitors for Use in Construction and Mining Settings</u>

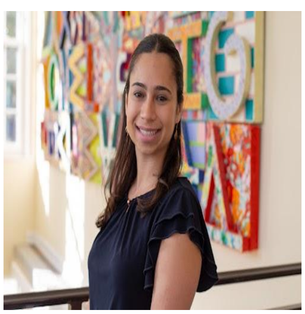
In the construction industry, workers are constantly exposed to many different environmental and health hazards that pose risks to their health. Bluetooth-connected devices host the potential to reduce health risks to workers by allowing the tracking of heart rate, particularly upon implementation into an Internet of Things (IoT) framework. As such, an experimental study was conducted to determine whether heart rate could be monitored in an IoT system to accurately portray real-time worker conditions, and which devices would be most applicable for this purpose. An experiment was conducted which required participants to perform a specific activity to compare the accuracy of different types of monitors. The devices used included the Viatom Wellue O2Ring finger monitor, Polar Ignite GPS Fitness Watch wrist monitor, and the Polar H10 chest monitor. All three devices were able to connect to the IoT system and transmit data within a specific timeframe correctly. Covariance and standard deviations, measuring differences between devices, measured for the Viatom Wellue O2Ring finger monitor and the Polar Ignite GPS Fitness Watch trials among participants were above normal thresholds, indicating there were disparities in their accuracy. Overall, Bluetooth-connected-devices to track workers' heart rate have potential applicability to improve safety in hazardous environment.



Presenter(s): Camille Powers, Hannah West, Jalen Jackson, and Jacob Melby
Authors: Camille Powers, Hannah West, Jalen Jackson, Jacob Melby, Nichole Scaglione
Faculty: Nichole Scaglione

A Multiple Regression Analysis of Individual, Interpersonal, and Societal Factors on First Semester College Women's Drinking Behaviors

The gender gap in college student drinking is shrinking, suggesting women drink more than they used to. This study used an SEM-based multiple regression framework to explore the relative impact of individual (e.g., age of alcohol initiation), interpersonal (e.g., perceived parents' drinking norms), and societal (e.g., socioeconomic status) risk factors on drinking behaviors (quantity and frequency of heavy drinking) to inform prevention efforts for first-semester college women . Participants ($N = 235$) completed a web-based survey of alcohol initiation age, perceived mother/father drinking quantity, family income, and personal drinking behavior. Lower age of onset was associated with higher weekly alcohol consumption ($b = -1.480$, $SE = 0.497$, $p = 0.004$) and more frequent heavy drinking ($b = -0.286$, $SE = 0.093$, $p = 0.002$). Although perceived mother's (but not father's) drinking also approached significance for typical weekly drinking ($b = 0.232$, $SE = 0.142$, $p = 0.106$), neither parents' drinking nor household income were associated with heavy drinking frequency. Results identified alcohol initiation age as a robust predictor of drinking behaviors and a potential target for prevention efforts aimed at college women. Additional research is needed to examine other risk and protective factors across levels of the SEM.



Presenter(s): Zoe Primack
Authors: Zoe Primack
Faculty: Joni Splett

Teacher Stress, Teacher Unintentional Bias, and Teacher Well-being before and after COVID-19

Half of all teachers in the United States report high levels of daily stress from teaching, making it one of the most stressful jobs in the country (DiCarlo et al., 2019). Teacher stress is detrimental to one's health and well-being, leading to poor academic outcomes for students and a hostile classroom environment. (DiCarlo et al., 2019). The COVID-19 pandemic has exacerbated teacher stress levels (Ozamiz-Etxebarria, 2021). Individual factors that contribute to stress are linked to the tendency to rely on automatic cognitive processes rather than more controlled processes; these factors lead to discriminatory acts toward minoritized students (Bradshaw et al., 2010; Girvan et al., 2017; Xu, Y et al., 2014). Uncovering the syndemic relationship is crucial to understanding the root causes of minoritized students' experience of disproportionate discipline that may be influenced by teacher stress. Subjective well-being (SWB) skills can provide opportunities to mitigate the effects of daily stressors on unintentional biases by being mindful of fast decision-making and unexpected behaviors. The data includes self-reports from middle school teachers and various scales prior to randomization and intervention implementation. This study aims to understand how preexisting conditions of teacher stress and SWB have perpetuated unintentional biases and interacted with the COVID-19 pandemic.

Presenter(s): Hannah Prudencio
Authors: Hannah M. Prudencio, Emily J. Fox
Faculty: Emily Fox

Association of Caffeine Consumption with AIH-Induced Respiratory Gains in Individuals with Chronic High-level SCI

While acute intermittent hypoxia (AIH) by itself has been shown to enhance plasticity in respiratory neural motor systems in animal studies, there are many possible ways to optimize the therapeutic benefits of the intervention. Based on an interaction between a serotonergic-dependent cellular mechanism and an adrenergic-dependent cellular mechanism at phrenic motor neurons, AIH combined with pre-treatment with adenosine 2A (A2A) receptor antagonists may enhance AIH -induced respiratory plasticity. However, the effects of this combinatorial treatment on respiratory function are largely unknown. To address this gap in the literature, we obtained the daily caffeine consumption of sixteen individuals with high-level chronic spinal cord injuries who underwent two 5-day protocols of either daily AIH or sham AIH. The maximal inspiratory pressure (MIP) from each intervention was analyzed to determine if caffeine consumption would enhance AIH-induced respiratory gains. The results indicated that frequency of caffeine consumption does not have an effect on AIH-induced gains in maximal inspiratory pressure. Future research should conduct more studies exploring immediate pretreatment of A2A receptor antagonists on AIH to resolve some of the uncertainty associated with this combinatorial treatment method.

Presenter(s): Akash Ram
Authors: Akash Ram, Eric Fonseca, Pawan Prakash, Angel Albavera-Mata, Sijin Ren, Richard Hennig
Faculty: Richard Hennig

Investigation of transition metal complex representations for machine learning structure-property relationships

Single molecule magnets have potential applications in magnetic spintronics and quantum computing. Monometallic transition metal complexes are candidate molecular magnets. These molecules have been shown to have strong spin anisotropy below their blocking temperature. Modeling of these complexes is computationally expensive and is difficult due to coupling effects. From a dataset containing over 86,000 transition metal complexes, we investigate the performance of crystal graph neural networks (CGNN). These properties have been calculated using the TPSSh-D3BJ exchange-correlation functional. Here, we see if the CGNN can predict the metal ion charge, HOMO/LUMO gap, and other computed energies. We then compare the model performance of the CGNN against artificial neural networks which have been trained with the smooth overlap of atomic positions (SOAP) structural descriptor. A completed model can then be used in high throughput screenings to quickly filter out candidate molecular magnets. This work provides the first steps in the development of a machine-learning model for the property prediction of transition metal complexes and for single molecular magnet discovery.

Presenter(s): Asha Rao
Authors: Asha Rao, Emily Fussell, Valeria Mejia, Elizabeth Aikman, and Dr. Whitney Stoppel
Faculty: Whitney Stoppel

Evaluating the Mechanical Properties of Silk Fibroin Scaffolds through Tensile Testing Frequency Sweeps for Use as An In Vitro Culture Platform

Currently, animal models are used to study muscular diseases, but they fail to replicate the biological mechanisms of some rare muscular dystrophies. An alternative in vitro culture platform using a silk fibroin biomaterial seeded with muscle cells is under investigation. To achieve contractility of the muscle cells, mechanical stimulation can be applied during the differentiation and maturation process. To apply these methods to study the progression of rare muscular dystrophies, our scaffold material must withstand over 8 weeks of mechanical stimulation. To explore the feasibility of a long-term in vitro culture platform, we measured the mechanical properties of the silk fibroin scaffolds under different conditions. We performed analyses of tensile mechanical properties and my work focuses on frequency sweeps, which analyze the impact of the rate of a reoccurring 10% strain on the material, a requirement for our in vitro model. The frequency was increased from 0.1 Hz to 10 Hz for all analyses. The results show that the materials are not frequency dependent as the slope of the storage and loss modulus remained linear for all conditions. Future work focuses on the maintenance of cell density and viability over 8 weeks in culture.

Presenter(s): Gabrielle Ray
Authors: Gabrielle Ray
Faculty: Adrienne Strong

<u>Feminine Knowledge in the Digital Age: How Social Media Affects Understandings of Pregnancy and Childbirth</u>

Members of Generation “Z” are bombarded daily with new innovations in technology within a rapidly globalizing world, leading to a constant shift in modes of connectivity and communication. The new wave of social media, especially TikTok and Instagram, arrive in parallel to increasing social awareness of previously taboo topics. Women’s health issues, especially including the topics of menstruation, sex, pregnancy, and childbirth were hardly spoken about publicly less than a decade ago. However, this is changing, and there is a growing number of influencers using internet platforms to normalize conversations surrounding women’s health. This research uses interview-based methodology to gather a better understanding of opinions on social media as an avenue for women’s health knowledge. These opinions have come primarily from young female students at the University of Florida, with some supplemental viewpoints from women’s healthcare providers.

These diverse perspectives have produced a more multifaceted understanding of how social media can be so impactful and therefore why it has the ability to shape perceptions of a condition such as pregnancy.

Presenter(s): Toni Reeves
Authors: Toni Reeves, Dr. Karen Hicklin
Faculty: Karen Hicklin

Using Simulation Modeling to Improve Decision Making for Maternal Health.

Simulation modeling of prenatal care is used to identify opportunities for interventions that reduce risk of complications and racial disparities in maternal outcomes. We use simulation modeling to understand the care pathways for two target groups, normal and high-risk patients. We developed a discrete event simulation (DES) of prenatal care for normal and high-risk pregnant women. Considering hypertension, diabetes, and a body mass index (BMI) of 30+ as indicators for high-risk pregnancy, we can evaluate the different care pathways for normal and high-risk pregnancy. Output measures from the model include, risk of mortality and complications during delivery and postpartum stratified by race. A literature review of prenatal care practices, patient pathways, and high-risk pregnancy factors was conducted to develop the DES and data analysis of patients was conducted to parameterize the model. Preliminary analysis shows 4105 ±3 total pregnancies in our dataset, 49.1% of which are White patients and 36.4% are Black patients. Hypertension and a BMI of 30+ are the most prevalent risk factors in the population, which increases chances of morbidity and mortality during pregnancy. Statistical analysis, literature review, and DES provides insight into prenatal care pathways that will lead to informed decision making for interventions.

Presenter(s): Rogina Rezk
Authors: Deepak Chhangani, Rogina Rezk, Akhil Patel, Aryan Shah, Swapnil Pandey, Lorena de Mena1 Pedro Fernandez-Funez, Diego E. Rincon-Limas
Faculty: Deepak Chhangani

Polr3c alters TDP-43 toxicity in a fly model Amyotrophic Lateral Sclerosis

Tar DNA binding Protein-43 (TDP-43) is a major DNA/RNA binding protein involved in multiple cellular processes including transcriptional regulation, mRNA splicing and stress granules formation. Mutations in TDP-43, such as TDP-43 M337V, cause Amyotrophic Lateral Sclerosis (ALS). Abnormal accumulation and phosphorylation of TDP-43 is also associated with Frontotemporal Dementia (FTD) and Alzheimer's disease (AD). Despite its contributions to several devastating diseases, the toxic properties of TDP-43 are less understood, and hence, lesser is known about modifiers of its toxic effects. Here, we report the first genetic screen of over six thousand next generation RNAi lines in a Drosophila model expressing human TDP-43 M337V. We found ~200 genetic modifiers of TDP-43 toxicity using a degenerative fly eye phenotype as a screening platform. We discovered a large number of genes encoding various transcription factor and RNA polymerase subunits, as robust modifiers of the proteinopathy in Drosophila eye. In particular, we found that knockdown of Polr3c suppresses TDP-43M337V toxicity in the eye, reduces phospho-TDP-43 staining in the adult brain. Polr3c knockdown also significantly improves locomotor activity, climbing ability and survival of flies pan-neuronally expressing TDP-43 M337V. We anticipate
that modifying or altering PolR3c can suppress the toxic effects caused by pathological TDP- 43 mammalian models and may lead to the development of potential therapeutic approaches against TDP-43 proteinopathies. This work was supported by NIH grant R01059871.

Presenter(s): Tabish Riaz
Authors: Adithya Gopinath, Tabish Riaz, Emily Miller, Leah Phan, Aidan Smith, Ohee Syed, Stephen Franks, Luis R. Martinez, Habibeh Khoshbouei
Faculty: Habibeh Khoshbouei

Methamphetamine Induces a Low Dopamine Transporter Expressing State Without Altering the Total Number of Peripheral Immune Cells

Methamphetamine is a widely abused psychostimulant and one of the main targets of dopamine transporter (DAT). Methamphetamine reduces DAT-mediated dopamine uptake and stimulates efflux leading to increased synaptic dopamine levels many folds above baseline. Methamphetamine also targets DAT-expressing peripheral immune cells, reduces wound healing and increases infection susceptibility. Peripheral immune cells such as myeloid cells, B cells and T cells express DAT. DAT activity on monocytes and macrophages exhibits immune suppressive properties via a signaling mechanism, where deletion or inhibition of DAT activity increases inflammatory responses. In this study, utilizing a mouse model of daily single dose of methamphetamine, we investigated the impact of the drug on DAT expression in peripheral immune cells. We found in methamphetamine-treated mice that DAT expression was down-regulated in most of the innate and adaptive immune cells. Methamphetamine did not change the total number of innate and adaptive immune cells but changed their immunophenotype to low-DAT-expressing phenotype. Moreover, serum cytokines were altered in methamphetamine-treated mice. Therefore, resembling its effect in the CNS, in the periphery, methamphetamine regulates DAT expression on peripheral immune cell subsets, potentially describing methamphetamine regulation of peripheral immunity.

Presenter(s): Cate Richardson
Authors: Kara Anazia, Cate Richardson, Matthew Eddy
Faculty: Matthew Eddy

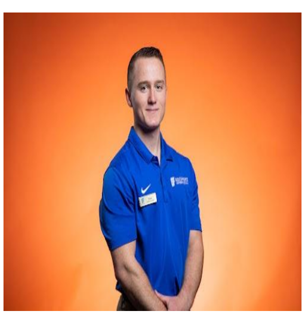
Magnesium Impacts the Stability and Function of a Stimulatory Signaling Protein and Its Disease-Associated Variants

GαS is the alpha subunit of a stimulatory, heterotrimeric G protein, which relays cellular signals from G protein-coupled receptors (GPCRs) through their interactions with guanine nucleotides, GDP and GTP. Magnesium has been shown to facilitate the binding of the G protein with guanine nucleotides and can enhance its GTPase activity. This research presents the use of biophysical tools, such as circular dichroism and intrinsic tryptophan fluorescence, to study the role magnesium plays in the thermal stability and function of GαS and GαS variants associated with diseases. We also explore the impact of magnesium on designed GαS variants. We observe that magnesium decreases the stability of GαS when bound to both GDP and GTP, with a more pronounced effect seen for complexes with GDP. Mutations of residues near the magnesium binding site showed varied results in both thermal stability and GTP activation compared to mutations of residues that do not interact with the binding pocket. Our results will provide a better understanding on the role that physiologically-relevant magnesium plays in the process of G protein activation and provide a better understanding of the interplay between magnesium and disease-causing mutations.

Presenter(s): Adelyn Richgels
Authors: Adelyn Richgels, J. Martin Zapien-Macias, Gerardo Nunez
Faculty: Gerardo Nunez

Adapting low-cost NIR sensors to agricultural uses

The standard process of examining plant leaf nutrient contents is time-consuming, expensive, and utilizes potentially hazardous materials. This creates a need for non-destructive, affordable tools that give a clear reading on the elemental content and structure of plant organs. Working with near-infrared light (NIR), the SCiO™ molecular sensor fulfills these requirements for materials like pills and corn but is not built in a way that allows it to be successful with blueberry plants (Vaccinium corymbosum interspecific hybrids). The objective of this project is to use CAD software to design, build, and test attachments for the SCiO™ molecular sensor that will enable measurement of blueberry leaves. This project aims to create a series of accessories for the SCiO™ molecular sensor, including 1) a light-isolating clip for leaf examination, and 2) a small cuvette for individual fruit examination. We have designed and tested four different prototypes for functionality, ergonomics, and optical properties. This poster highlights the performance of prototype IV for leaf NIR spectral analysis. The spectra data collected utilizing this prototype will be compared in terms of efficiency and accuracy to the current standard method.



Presenter(s): Finn Rimay
Authors: Finn Rimay, Xzaviar Solone, Chloe Wykle, Xin Zhou, Mu Yu, Dietmar Siemann, Juan Guan, Frederic Kaye, Robert Mckenna, Lizi Wu
Faculty: Lizi Wu

Studying the Role of AREG in Lung Cancer with LKB1 Mutations

LKB1-mutant lung cancer is a highly prevalent, aggressive, and treatment-refractory disease, emphasizing the urgent need to identify new therapeutic strategies. Our single-cell RNA sequencing analysis revealed that amphiregulin (AREG), an EGFR ligand, as one of the top upregulated targets after LKB1 loss in a mouse model of lung cancer. We hypothesized that LKB1 loss induces AREG expression, activating EGFR signaling that is crucial for lung cancer growth. This study aims to investigate the role of AREG in LKB1-mutant lung cancer. We found that AREG expression was up-regulated in mouse and human LKB1-mutant lung cancer cell lines, and was reduced upon LKB1 reintroduction. Disrupting the CRTC/CREB interaction decreased AREG expression. Moreover, reducing AREG expression via a shRNA approach or blocking AREG activity via the EGFR inhibitor Erlotinib reduced cell viability in LKB1-muntant lung cancer cells. These preliminary findings suggest that AREG expression is induced by CRTC activation following LKB1 loss and that AREG is critical for supporting the growth of LKB1-mutant lung cancer. Therefore, EGFR inhibitors may represent a promising therapeutic option for this type of lung cancer. Future studies will validate the findings in multiple cancer cell lines and further assess the efficacy of EGFR inhibitors in LKB1-mutant lung cancer.

Presenter(s): Michelle Rincones-Rodriguez
Authors: Michelle Rincones-Rodriguez, Erin Westgate
Faculty: Erin Westgate

The role of perceived difficulty on boredom, satisfaction, and happiness.

Boredom is a common feeling that everyone has experienced at some point in their life. Previous research by Westgate, Wilson, & Gilbert (2017) suggests that people can be bored when something is too hard or too easy, because it is difficult to sustain attention in both. I will experimentally manipulate task difficulty to investigate its effects on perceived boredom, satisfaction, and happiness. In Study 1, I will manipulate difficulty by randomly assigning participants to either an easy or difficult math condition, where participants will be tasked with solving math problems for ten minutes. I predict that higher difficulty will cause higher levels of boredom, and less of satisfaction and happiness. In Study 2, participants will select if, after completing the prior math task, they would rather complete an interesting or enjoyable task. I predict that participants previously in the difficult math condition will select an enjoyable task, while participants previously in the easy math condition will select an interesting task. Previous research has focused on feelings of boredom throughout tasks completed individually, though relatively few have examined satisfaction and happiness. Extending this research, the present study examines the role of task difficulty on boredom, satisfaction, and happiness.

Presenter(s): Abilene Roberts
Authors: Abilene Roberts, Adrienne Widener, Jorge Santini, Edward Phelps
Faculty: Edward Phelps

ECM Functionalized Microporous-annealed PEG Particles as a Platform to Study Cell Migration in Type 1 Diabetes

Hydrogels have recently been used as an in vitro platform to study T cell interactions with insulin-secreting β-cells as seen in Type 1 Diabetes. However, synthetic hydrogels such as Polyethylene Glycol (PEG) lack a natural extracellular matrix (ECM) which relay signals for cell behavior and have a nanoscale crosslinking network that forces cells to enzymatically degrade the crosslinks, inhibiting movement. Here, we use ECM functionalized microporous annealed PEG particles (ECM-MAP-PEG) as a scaffold for cell migration. The ECM-MAP-PEG was made by functionalizing ECM-binding proteins AG-73 and BMB to PEG-MAL, and made into microgels through an emulsion. We found that ECM-MAP-PEG had an average pore size of 266.1 μm2 and microgel size of 266.8 μm2. We compared these results to histological images of pancreatic tissue stained for Collagen IV and found that the spaces in between the pancreatic exocrine cells were significantly different to the pore spaces in ECM-MAP-PEG. We observed the binding of ECM proteins, specifically laminin, to ECM-MAP-PEG scaffolds with or without ECM-binding proteins. Future studies include cytocompatibility studies, tuning of ECM-proteins, and rapid cell migration of immune cells within the ECM-MAP-PEG scaffold.

Presenter(s): Michael Roberts
Authors: Michael Roberts, Charles D'Ambra, Aroba Saleem
Faculty: Aroba Saleem

Online Learning: Analyzing Course Modalities' Impact on Student Performance and Satisfaction

Engineering education aims to establish effective instructional strategies to enhance student learning. With COVID-19 pandemic, students have had to transition to online learning, presenting new challenges in terms of teaching and learning styles. Given students' diverse learning styles, it is crucial to identify a model that promotes success. Investigating the impact of instructional techniques on student achievement and satisfaction in online education is key to identifying the optimal approach. This research aims to investigate the effects of course modality on student performance and satisfaction in online learning. This study involved evaluating two distinct instructional techniques, traditional and flipped, within an online learning environment. The study analyzed student performance and feedback from an introductory materials engineering course at a university in Southeastern United States. Initial findings indicated that the average exam scores between traditional and flipped setups did not differ significantly. This can be attributed to the fact that students may face difficulties adapting to the new format of online learning, regardless of the specific instructional technique being employed. Further examination of exam results was conducted to identify areas of difficulty and develop an enhanced approach for delivering course material.

Presenter(s): Racheal Rodriguez
Authors: Racheal Rodriguez
Faculty: Dr. Yulia Levites Strekalova

Gender Blindness and Biases in Artificial Intelligence: A Narrative Literature Review

In this paper, I will first establish the differences between sex and gender to lay the foundation for which I take such aspects into consideration in the usage of AI software in healthcare. Next, in conducting a narrative literature review, I will outline the grounds for which discriminatory practices and biased software impact healthcare outcomes, especially through as they relate to gender as a social construct. Lastly, I will discuss the lack of regard for the social aspect of an individual in the computational field which is the usage of machine learning to answer the question: “How can we rewrite gender biases in artificial intelligence software to foster more equitable healthcare outcomes?” Through such means, I would like to open a discussion intent on the ethics of such overarching issues to disseminate amongst students and individuals in the healthcare and research fields to formulate specific solutions and adaptations that hold patient care at the forefront.

Presenter(s): Claire Roffi
Authors: Claire Roffi, Marc Salute, Bikash Sahay, Alberto Riva, Yanping Zhang, Yasemin Can, Keijiro Shiomitsu, Rowan Milner
Faculty: Rowan Milner

Single-cell RNA sequencing and analysis of canine malignant melanoma heterogeneity

Canine malignant melanoma (CMM), a non-ultraviolet-induced melanoma, is potentially fatal in dogs and serves as a model for mucosal and acral human melanoma. The goal of my project is to examine the heterogeneity of cell populations in CMM by analyzing single-cell RNA sequencing (scRNA-seq) of four CMM cell lines. CMM is a genetically chaotic cancer and scRNA-seq offers the benefit of identifying novel pathways and biomarkers which could serve as prospective research interests in the future. Three cell lines readily went into single-cell suspension while one cell line (mSHADOW20) created clumps and a protocol was formulated that yielded high viability while also producing single cells. All cell lines showed high RNA integrity. Using 10x Genomics scRNA-seq protocol, barcoded cDNA was generated from RNA present in individual cells. Transcriptome reads were aligned to the ROS_Cfam_1.0 canine reference genome by Cell Ranger software, then input into Loupe Browser which clusters cells by globally distinguishing up or downregulated genes, producing a UMAP plot of cell clustering. Preliminary data from two cell lines (REMI and CML2) show clear evidence of multiple clusters and selective up and downregulation of genes between clusters, confirming CMM heterogeneity. Further analysis is pending scRNA-seq data from remaining cell lines.

Presenter(s): Brianna Rosner
Authors: Brianna Rosner, Elena Kalina, Abigail Masterson, Robert Leeman, Liana Hone
Faculty: Liana Hone

Effects of a Smartphone Intervention on Unprotected and Regretted Sex among Heavy Drinking Young Adults

Alcohol consumption is associated with negative sexual outcomes among heavy drinking young adults. Smartphone interventions are a promising approach to reducing alcohol consumption. This study aimed to determine if a smartphone app designed to reduce heavy drinking (via feedback on the cued go/no-go task) could reduce negative sexual outcomes, including unprotected sex and regretted sex. We hypothesized that app use would be associated with fewer negative sexual outcomes, especially among women. Participants were young adult heavy drinkers (N = 49) aged 21 to 25 years. Participants completed an in-person drinking session as well as a four-week app field use period during which they used the app in drinking situations. Participants reported on their drinking consequences via the Young Adult Alcohol Consequences Questionnaire (YAACQ) at baseline, two- and four-week follow-ups, and six- and twelve-month follow-ups. We did not find a significant association between app use and unprotected or regretted sex, but the results were in the predicted direction, especially among women. Given encouraging preliminary results, future studies with larger samples should test similar smartphone app interventions for heavy young adult drinking.

Presenter(s): Maddie Ross
Authors: Sofia Goodrich, Madison Ross, Brent Sumerlin
Faculty: Brent Sumerlin

Democratization of Sono-RAFT: utilizing low-frequency sonication to achieve controlled radical polymerization

Sonochemically initiated RAFT polymerization (Sono-RAFT) is achieved by low-frequency ultrasound (US) (40 kHz) in bulk monomer for the first time. Continuous sparging of argon, throughout sonication, generates transient cavitation events in which monomers can undergo pyrolysis to produce exogenous radicals suitable for initiating polymerization. Previous works report Sono-RAFT in organic solvents (DMF and DMAc) as well as aqueous solutions; utilizing high sonication frequencies (490 kHz) to generate solvent radicals for polymer initiation by pyrolysis. Our method allows for the synthesis of controlled polymers without the need for solvent or an exogenous initiator with easily accessible and inexpensive equipment. A variety of acrylate and acrylamide monomers were successfully polymerized and prepared with excellent control. The increase in solvent viscosity throughout bulk polymerization limited the final monomer conversions (15 – 20%) and the upper limit of molecular weight (10 - 20 kDa). MALDI-TOF chain-end analysis elucidated the monomer radical initiating species and confirmed the retention of the chain-transfer agent in the primary polymer populations.

Presenter(s): Morgan Rubin, Dara Gottlieb
Authors: Morgan Rubin, Dara Gottlieb
Faculty: Susan Nittrouer

Tactile Signals Can Deliver Linguistically Relevant Structure

While cochlear implants (CIs) are helpful for individuals who have severe-to-profound hearing loss, the signal they provide is extremely degraded, which leads to a diminishment in speech recognition for CI users. Previous research studies have reported that CI signals may be augmented with low-frequency signals provided by hearing aids, thus enhancing speech recognition for CI users with some amount of residual hearing. But this configuration is of no use to CI users with no residual hearing. This study presents that low-frequency signal tactically to normal-hearing adults listening to CI simulations to compare outcomes in both acoustic and tactile conditions. These listeners heard complex sentences through these CI simulations with either low-frequency acoustic or tactile signals. After testing about 25 participants, preliminary results show improvements in word recognition for both conditions, with the acoustic signal proving to be more effective. Results will be conclusive once there are equal participants in both acoustic and tactile conditions.

Presenter(s): Uriel Rubinovich
Authors: Uriel Rubinovich, Sakthivel Ravi, Daylin Barroso, Jose Francisco Abisambra
Faculty: Uriel Rubinovich

The Impact of Repetitive Mild Traumatic Brain Injury (rmTBI) On Glycogen Dynamics and its Consequences on Resting-State Functional MRI (rsfMRI)

Identifying mechanisms that drive brain dysfunction after a traumatic brain injury (TBI) is a challenge in head injury research. We measured glycogen and glycan intensity levels and functional connectivity after a repetitive mild traumatic brain injury (rmTBI). B6 mice received two rmTBI 24-hours apart by the closed head impact model of engineered rotational acceleration (CHIMERA). resting state functional MRI (rsfMRI) was used to measure functional connectivity. We measured changes in glycogen and glycans using Matrix-Assisted Laser Desorption/Ionization-Mass Spectrometry Imaging (MALDI-MSI), and gliosis changes using immunohistochemistry. Injured mice demonstrated increased levels of glycogen and glycans in optic tract, olfactory, amygdala, posterior parietal association, and primary somatosensory areas. White matter gliosis was shown in the optic tract and corpus callosum. rsfMRI data demonstrated node strength signatures in mediodorsal and paracentral thalamic nuclei. Node clustering coefficient and eigenvector centrality in areas that processes visual, auditory, and somatosensory information showed significant modifications. Our data suggests that while physical white matter changes, rmTBI significantly alters metabolomic pools, functional connectivity, and induces an inflammatory response. Changes in any area could help determine irregularities of outcomes after rmTBI.

Presenter(s): Nicolas Ruiz
Authors: Nicolas Ruiz1,4, Jan Ramos5, Flavia Leticia Martins Pecanha1, Chris Fraker 3, Ruy Andrade Louzada1, Ernesto Bernal-Mizrachi1.2
Faculty: Ernesto Bernal-Mizrachi

Development of a Neural Network for Analysis of Immunofluorescence-Stained Pancreatic Cells Using Python Programming Language

We are developing a Python program to automate the analysis of immunofluorescence-stained pancreatic cells, which is currently a time-consuming and tedious task for diabetes researchers. Our program uses image processing techniques to accurately segment the nuclei in microscopy images and draw contours around them. We are in the process of developing a database of annotated microscopy images to train and test a neural network, which will estimate the cell count. The neural network architecture will consist of convolutional and fully connected layers, and we expect it to provide a more efficient and accurate method for cell counting. Our approach has the potential to revolutionize the way researchers perform cell counting, accelerating the pace of scientific research. In the future, we plan to create a website to make our approach more accessible to other researchers, including calculating beta cell mass. We believe that our work has the potential to have a significant impact on the field of diabetes research.

Presenter(s): Najla Said
Authors: Najla Said, Huiqing Kuang
Faculty: Huiqing Kuang

Cultivated Wild: Algorithmic Plant Communities Design

“Urban wilderness” is a recent heightened attention to landscape design in urbanized areas. Many successful projects include The High Line, NYC; The Urban Glade, Miami; and Lurie Garden, Chicago; This “natural” design offers lush greenery and a dynamic environment for people and diverse habitats for wildlife. However, the design process was limited to the traditional “miniature landscape design”. A few experimental small projects deploy agent-based workflow planting designs when introducing “nature” into urban areas. For example, the successful application of the Seed Scattering system, an algorithmic design, and algorithmic botany method, for the Sony Forest project in Tokyo. OLIN Lab explores using algorithm tools, Rhino+Grasshopper, to support the design of living systems and to optimize the design workflow. Despite the increasing use of algorithmic design in professional practice, it remains fairly new in landscape architecture education, especially in the BLA program. Our department started introducing fundamental parametric/agent-based modeling recently, focusing mainly on paving design. This project aims to identify the current algorithmic planting design models, reconstruct them in Rhino+Grasshopper, for educational use, identify the workflow for a successful design, and apply algorithmic plant communities design model(s) specifically with South Florida native plants.

Presenter(s): Joseph Sanders
Authors: Joe Sanders, Hoda Akl, Stephen J. Hagen, BingKan Xue
Faculty: BingKan Xue

Rethinking the Role of Crosstalk: Mutual Activation in Coupled Quorum Sensing Pathways

Many bacterial species are able to coordinate population-wide responses by exchanging chemical signals,a behavior known as quorum sensing. A quorum sensing bacterium may employ multiple types of chemical signals and detect them using interconnected pathways that crosstalk with each other. While there are many hypotheses for the advantages of crosstalk, the prevalence of it between signaling pathways and its functional significance are much less understood. Our model of crosstalk captures key aspects of typical quorum sensing pathways, including detection of multiple signals that crosstalk at the receptor and promoter levels, positive feedback, and hierarchical positioning of sensing pathways. We find that behaviors can be tuned by modifying crosstalk and feedback strengths. These include activation or inhibition of one output by the non-cognate signal, broadening of dynamic range of the outputs, and the ability of either the upstream or downstream branch to regulate the feedback circuit of the other branch. Our findings suggest that crosstalk is not as much a detriment to the flow of information as it is a mechanism that enhances the range of the entire regulatory system, and an understanding of crosstalk as synergizing with feedback is readily applicable to a variety of quorum sensing pathways.

Presenter(s): Megan Sanford
Authors: Sanford, Megan
Faculty: Elise Morrison

Microbial Community Structure of Swedish Fjords with Varying Redox Conditions

Microbial communities are drivers of biogeochemical processes and carbon cycling within the ocean, especially in sediments. Understanding the fate of carbon within the ocean is vital in understanding climate feedbacks and alterations of the global carbon cycle in the Anthropocene. Fjords are deep, high-latitude estuaries that bury the greatest amount of organic carbon normalized for area compared to other marine systems. Many factors, including oxygen availability, redox conditions, and microbial community composition, may influence fjords' carbon burial. Evaluating fjords' ability to bury carbon in the face of climate change and increasing global temperatures can provide insight into tracking the efficiency of carbon sinks with increased atmospheric carbon. Three Swedish fjords, the By, Hake, and Gullmar, were chosen based on varying oxygen regimes and represent anoxic, oxic, and seasonally mixed anoxic to oxic conditions, respectively. These sites were selected to explain how redox conditions may influence microbial community composition and organic carbon burial. This study aims to describe differences within the microbial community structure of each fjord to identify the microorganisms that may drive elemental cycling within marine sediments and, therefore, understand what is influencing the fate of carbon within the ocean.

Presenter(s): Sierra Sanne
Authors: Sierra Sanne, Colin Littlefield
Faculty: Colin Littlefield

Low States in Intermediate Polars

Nearly half of all stars are found in binary star systems. Some of these binaries evolve into intermediate polars (IPs), in which a rapidly rotating, magnetized white dwarf accretes gas from the companion star. Several recent studies discovered, contrary to prior research, that intermediate polars can fade unpredictably for unknown reasons, creating what are known as low states. To investigate these low states, we analyze observations of 26 IPs obtained by Asteroid Terrestrial-impact Last Alert System (ATLAS) and Transiting Exoplanet Survey Satellite (TESS). We examined these data sets for low states and found six IPs to have very obvious low states, while others had none at all. One IP with an obvious low state that is of particular interest for study is MU Camelopardalis (MU Cam). We analyzed the ATLAS data for MU Cam and found a low state where it faded by ~47% for around 100 days. Such behavior has never been observed for MU Cam previously. We have also utilized ATLAS observations to confirm the presence of low states in a handful of other IPs and compare our findings against previous observations and studies of low states in IPs.

Presenter(s): Justin Santos
Authors: Justin Santos, Jess Nastasi, Nicole Gravina
Faculty: Nicole Gravina

Exposure to Nature Images During Work Breaks: An Exploratory Study

Previous research has shown that taking breaks at work and exposure to nature individually benefit employee productivity and affect, yet there is limited research studying the effects of exposure to nature during work breaks on behavior. A mixed design with counterbalanced exposure to the order of sessions was used to evaluate the impact of nature exposure during breaks on productivity, affect, and delay discounting among 30 undergraduate students. In each of the two, 2-hr sessions, participants were exposed to nature (experimental) or built structures (control) image, administered during 5-min work breaks for every 20 m of work on a check processing task. Results for productivity were calculated using a Wilcoxon Signed Rank analysis which yielded a p value of 0.67, indicating there were not significant differences in productivity between the two groups. Results regarding affect will be described at a later time. The implications of exposing employees to nature images during breaks will be discussed.

Presenter(s): Sage Schaefer
Authors: Sage E. Schaefer, Cristiana N. De Paula Araujo, Ph.D., & Ali M. Yurasek, Ph.D.
Faculty: Ali Yurasek

Parent Preferences on a Stress and Coping Skills Component of a Behavioral Economic Intervention

Anxiety, stress, and substance use are common among youth, yet few receive treatment. Parents' negative perceptions of mental health may be a barrier to treatment-seeking. This study explored parent and child characteristics and parent preferences for a stress component of a novel behavioral economic (BE) intervention. Parents (N=109; 67.9% female; 76.1% White) of at least one adolescent between 13-17 years old were recruited via Amazon Mechanical Turk. After viewing the intervention feedback, they provided ratings on the content. Parent and child demographic, descriptive, substance use, and attendance data were also collected. Parents indicated stress and coping information would be novel, interesting, relevant, and motivating for their child. Controlling for relevant covariates, ANCOVA analyses revealed that females were more likely to find this content motivating for their child compared to men. Substance-using parents rated this content as less interesting and less likely to decrease their child's substance use compared to non-substance-using parents. Child truancy and substance use were not related to parent attitudes. Results suggest that parents generally have positive attitudes towards stress and coping feedback, but preferences may differ based on parents' sex and substance-use. Future research should examine how these differences impact treatment outcomes.

Presenter(s): Kendall Schlitt, Garrett Jackson
Authors: Kendall Schlitt, Garrett Jackson, Payton Moore
Faculty: Dr. Ziynet Boz

Application of Hyperspectral Imaging to the Detection and Quantification of Microplastics in Simulant Shellfish

As the world becomes increasingly reliant on single-use plastic, plastic litter has increased exponentially, especially in marine ecosystems. One type of plastic litter affecting marine life is microplastics, or plastics under 5mm in diameter. Microplastics are consumed by marine animals, which are then consumed by people. This study aims to detect microplastics in shellfish by utilizing the nondestructive method of hyperspectral imaging as an indicator of both marine ecosystem health food quality. Gelatin models of shellfish were injected with a known concentration of microplastics (polyvinyl chloride and polystyrene, specifically). The hyperspectral camera then took 3-dimensional images of the models, with the wavelength dimension ranging from 400nm to 1000nm. Next, algorithms for Competitive Adaptive Reweighted Sampling and Partial Least Squares Analysis were developed to determine the optimal wavelengths for plastics and to analyze the relationship between the optimal wavelengths and the quantity of plastics in the sample. Preliminary results have shown slight variation in reflectance spectra between models spiked with microplastics and control models past the 950nm range. Therefore, hyperspectral imaging might be a viable tool to identify and quantify microplastics in shellfish, but the range of the camera used in this study is a limitation.

Presenter(s): Chloe Schwab
Authors: Chloe Schwab, Abby Uehling, Gustav Paulay
Faculty: Gustav Paulay

Three is One, One is Three: Upheaval of Toxopneustes Species

Rapid biodiversity assessments in under-researched areas have become urgent in the midst of a global biodiversity decline. Such efforts have already shown that marine invertebrate diversity is much higher than previously documented. By utilizing DNA barcoding, this project aims to reevaluate the known diversity of the sea urchin genus Toxopneustes. Commonly known as the flower urchin, this genus is found across the tropical Indo-Pacific Ocean. A total of 31 individuals, across eight locations, were sequenced in this study. Eight out of the 31 individuals were collected in Oman, an under-researched area defined by unique environmental parameters. These parameters, the geological history of this region, and the observation of distinct morphological features suggest that Oman may have undescribed endemic species. To test this hypothesis mitochondrial marker (COI) was sequenced and a phylogenetic tree was constructed. Phylogenetic analysis revealed that Toxopnuestes diversity is higher than previously thought: three recognized Toxopneustes species were revealed to be one, one species was split in two, and a possible endemic, Tethyan relict population was discovered in Oman. Overall, investigating the classification of the genus Toxopneustes creates an accurate biodiversity baseline for the genus, which will aid in conservation efforts in a time of intense environmental threats.

Presenter(s): Sabrina Scothorn, Joanna Jaramillo
Authors: Sabrina Scothorn, Joanna Jaramillo, Rachel Mallinger
Faculty: Rachel Mallinger

<u>Assessing the Effects of Floral Origin and Irrigation on Pollen Availability</u>

There is a global decline in pollinator populations, partly due to human impacts on the deterioration of floral resources. Floral resources such as pollen provide nutrients necessary for bee survival. Plants labeled as pollinator-friendly are a favorite for gardeners. However, these pollinator-friendly plants are not always sold to their native region. Ornamental plants, typically non-native or exotic, continue to grow in popularity in gardens. The quantities of available pollen in flowers can vary greatly depending on the floral origin (native vs. non-native) and the irrigation treatments received. In prior research, pollen quantity, viability, and protein content varied significantly among the ornamental plants evaluated. This poster aims to provide preliminary results that can lead to inferences on how irrigation and floral origin affect pollen availability and their implications on pollinator communities. To test these effects, we set up a field, at The University of Florida's PSREU, with ten Florida native and ten non-native angiosperms who received either complete or partial irrigation. The flowers of these plants were harvested, and we recorded the pollen quantities present for each plant species. The pollen quantities were then compared to their respective species' origin, irrigation treatment, and the interaction between the two variables.

Presenter(s): Elizabeth Sebastian
Authors: Elizabeth Sebastian, Arup Mondal, Alberto Perez
Faculty: Alberto Perez

BRD-ET Peptide Binding Structural Changes and Affinity Differences

Bromodomain containing proteins such as BRD3 and BRD4 are regulatory proteins that increase transcription of euchromatin through binding to lysine-acetylated histones and recruiting transcription factors to the transcription start site. The extra-terminal (ET) domain acts as a protein interaction hub to recruit these regulatory proteins. Proteins in some viruses also bind to the ET domain in order to associate close to the transcription start site. What is unique about the ET receptor is that it exhibits a large degree of plasticity, binding different proteins through different binding modes. BRD proteins are associated with multiple types of cancers and are possible targets for gene therapy – but the mechanism by which ET helps regulate the process is unknown. Through this project, I will determine whether there are differences in complex structure formation that occur when either viral or host regulatory proteins bind ET. I will address this issue through the study of the different peptide epitopes that bind ET. By determining the dynamical and structural changes during binding I will stablish the basis for design of novel peptides that can specifically inhibit ET domains as a powerful anticancer strategy.

Presenter(s): Franco Sempio
Authors: Franco Sempio, Amber Heemskerk, Didem Pehlivanoglu, Ziad Hakim, Natalie C. Ebner
Faculty: Natalie Ebner

The Effect of Social Network Size on Susceptibility to Phishing Among Older Adults

Phishing emails present a major problem for the growing aging population, who show reduced phishing detection compared to young adults (Grilli et al., 2020). Prior research has found that older adults with greater social support were less vulnerable to financial fraud (Spreng et al., 2016). However, the association between social networks and phishing email detection ability has not yet been explored. The present study investigated the relationship between social network size and susceptibility to phishing emails among a sample of 73 older adults (61 - 90 years). The social network size was determined based on the self-reported number of people that participants interact with on a regular basis. Phishing email susceptibility was assessed using a field test where participants unknowingly received simulated and non-malicious phishing emails over the course of 30 days. We conducted a linear regression model to determine the effect of social network size on phishing email susceptibility. Results showed that a larger social network was associated with lower phishing email susceptibility among older adults. By highlighting the social network size as one of the psychosocial factors associated with phishing vulnerability, our findings have the potential to inform the design of future interventions tailored toward such susceptible groups.

Presenter(s): Isabel sepanic, Nilkanth Patel, Sean Flaherty
Authors: Isabel Sepanic, Nilkanth Patel, Sean Flaherty, Frederick Kates
Faculty: Frederick Kates

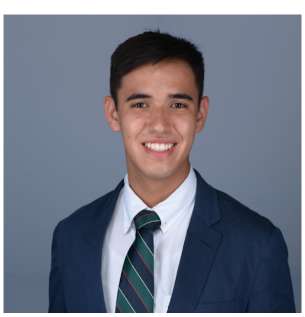
Using Virtual Reality in the Field of Cosmetic Surgery

The cosmetics industry is drastically growing as more people are becoming focused on their physical appearance; however, the field is not perfect. Many individuals are not satisfied with the outcome of their plastic surgery. Based on prior research and our findings, our team is proposing a new cutting-edge technological design which will work to decrease the number of patients who are unsatisfied with their cosmetic work. This technology will combine the field of cosmetic surgery with virtual reality. To summarize our design, the virtual reality device utilizes an imaging software which will allow users to view their desired cosmetic changes on a live, mirror reversed image of their body. This program will revolutionize the industry because it allows plastic surgeons to give their patients realistic expectations of what their results will look like post-surgery. It also gives consumers the validation they need to be confident in the procedure they want to have done and eliminates the anxiety of possibly regretting the cosmetic work.

Presenter(s): Maria Fernanda Serafim
Authors: Maria Fernanda Serafim, Zachary Greenberg, Mei He
Faculty: Mei He

Nanographene Engineered Magnetic Particles for pH-responsive Capture of Bone Marrow Stem Cell Derived Regenerative Extracellular Vesicles enabling Lung Cancer-Associated Fibrosis Treatment

Mesenchymal stem cell secreted extracellular vesicles (MSC-EVs) enable superior regenerative function for preventing and reducing pulmonary inflammation and fibrosis in animal models. However, understanding clinical biomolecular cues that drive its therapeutic modality is still challenging. EVs are 30-200 nm universally cell secreted diverse nanoparticles that mediate intercellular communication through internalization in recipient cells. Methods to isolate EVs produce high isolate variability and are often contaminated with lipoproteins and protein aggregates. Herein, we have developed a smart capture-and-release system (ExCy) using a pH-based on- demand transmembrane insertion peptide to a magnetic microparticle. We characterized ExCy's functionality for EV capture in terms of Zeta potential, SEM, and regenerated capture capacity to demonstrate its utilization potential. Further, we benchmark ExCy against conventional EV isolation methods, indicating its superior performance in terms of EV quality and reduced heterogeneity. Finally, we aimed to accelerate clinical discovery of relevant EV surface markers by isolating EVs from bone-marrow derived stem cells (BMSDCs) cultured under GMP requirements. We discovered 3 highly relevant regenerative markers, TGFB1, CD44, and CD73, warranting a deeper investigation on anti-fibrosis mechanism and their clinical utility.



Presenter(s): Spencer Serrano
Authors: Spencer Serrano, Mert Canatan, Ziynet Boz
Faculty: Ziynet Boz

Computer Vision Approaches to Condensation Detection on Fresh Produce and Packaging

While cold temperatures prolong chemical stability within fresh produce, temperatures below the dew point encourage condensation of droplets on packaging and fruit surfaces. Prolonged droplet retention has been shown to promote microbial activity and spoilage. Furthermore, low moisture storage conditions favor evapotranspiration processes and the dehydration of produce. Refrigeration operating regimes should be optimized to avoid trending towards extreme condensation states. Consequentially, water vapor condensation is an important psychometric state to monitor and can inform control decisions and provide packers with insight into the shelf life of their produce. Current approaches for this measurement involve adherence of electronic moisture sensors to fruit or packaging surfaces. This work introduces an alternative approach, leveraging open-source computer vision and deep learning tools for rapid, unobtrusive detection of condensation areas evolving on produce and packaging surfaces. In this system, a USB camera and a Raspberry Pi computer monitored apples for simulated condensation droplets. The live video processing pipeline first employs an edge detection algorithm to isolate individual apples and then applies a trained object detection model to identify the presence of droplets on the apple surface. This inexpensive and inconspicuous sensor and processing framework can supply apple purveyors with valuable condensation data in real-time.

Presenter(s): Akash Shah
Authors: Kartik Motwani, Akash Shah, Richard Musca, Abhishek Kulkarni, Melanie Shapiro, Puchong Thirawatananond, Thinzar Myint, Todd Brusko
Faculty: Todd Brusko

Modulation of Monocyte MHC Class II by HLA-DR4 in Type 1 Diabetes

Type 1 Diabetes (T1D) is an autoimmune disease characterized by destruction of pancreatic beta cells, with multifactorial etiology including genetic predisposition and environmental triggers. Genome wide linkage analysis and prior clinical studies implicate the human MHC gene locus in numerous autoimmune diseases, in which MHC Class II haplotypes HLA-DR4/DQ8 carry a majority of the genetic risk associated with T1D. CD74 (CLIP) is a peptide cleavage product of MHC Class II-associated invariant chain, essential for antigen presentation by mediating the assembly and transport of the peptide-MHC II complex to the cell membrane. Our prior studies suggest a gene dosage effect of HLA-DR4 haplotype on monocyte surface expression of MHC Class II. Using cryopreserved peripheral blood mononuclear cells (PBMCs), we examined differences in monocyte cell surface markers across DR4 genotypes after being exposed to stimulatory conditions via interferon-γ and LPS across multiple time points. In classical monocytes, a significant increase in CD74 (CLIP) expression was observed with IFNg stimulation in individuals with DR4/X haplotype compared to DRX/X, implicating antigen presentation in the mechanistic basis of genetic risk for autoimmunity. Additional replicates are in progress to confirm these results in each clinical status and in individuals with DR4/4 genotype.

Presenter(s): Aleezeh Shaikh
Authors: Aleezeh Shaikh, Anna Rushin, Matthew E. Merritt
Faculty: Matthew Merritt

Isotopic Tracing of Glycolytic Metabolism After Ketogenic Diet in Glioblastoma Cells

Glioblastoma (GBM) is the most frequently occurring brain tumor, affecting 5 in every 100,000 people. To support proliferation, GBM consumes tremendous amounts of glucose. Due to this reliance, there have been trials examining the ketogenic diet (KD), which is low in glucose, in the treatment for GBM. However, there is still little research on isotopic tracing of this metabolic process. In this work, we examined metabolic changes in CA7 human GBM cells using the stable isotope tracer [$^2H_7$]glucose. CA7 cells were grown in either standard stem cell media or a media containing 4 mM glucose and 4 mM β-hydroxybutyrate for three days to mimic a KD. After 72 hours, both groups were placed in stem cell media with [$^2H_7$]glucose for 6 hours. Media samples for ^2H Nuclear Magnetic Resonance (NMR) analysis were collected to assess glucose uptake. After administration of [$^2H_7$]glucose, oxygen consumption was measured and the cells were analyzed by gas chromatography-mass spectrometry and NMR. This work demonstrates how a KD affects overall metabolism in GBM cells as evidenced by differences in [$^2H_7$]glucose. Further studies will expand this approach to L2 and CA3 human GBM cells to confirm the detected metabolic phenotypes.

Presenter(s): Anna Sheehan, Kabir Khara, Pranay Raman
Authors: Anna Sheehan, Pranay Raman, Kabir Khara
Faculty: Adam Kahlifa Baibhab Chatterjee

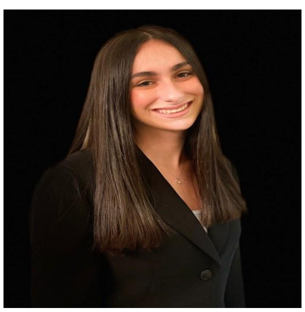
Brain Talk

Our project aims to advance technology for individuals with disabilities by creating a device that uses a pre-existing algorithm to predict speech and/or handwritten characters for people with speech impediments or movement limitations. This would provide increased access to communication for those who struggle with speech. We utilize a codebase designed by Willett et al. (Stanford University) to interpret brain signals recorded from a clinical participant, which results in decoded speech sentences. Our project takes this pre-trained model and transfers it onto a portable Jetson TX2 development board, which can display the output of the test data set to the user via an attached visible screen. This single-board computer has the capability to infer new datasets in a portable setting, making it possible to decode real-time EEG data with further development. The significance of a project with this foundation is immense. Upon further development, a portable real-time device that can interpret brain signals and output them as speech would have major applications in many areas, including medical and communication fields. Such a device could be a breakthrough for people with neurological disorders such as ALS, stroke, or paralysis. Additionally, it could revolutionize communication for people who are deaf or hard of hearing as well as for people who speak different languages.

Presenter(s): Cassidy Sheldon
Authors: Cassidy Sheldon, Chloe Baratta, Jennifer Nichols
Faculty: Jennifer Nichols

Examing How Limb Dominance Affects Muscle Activation During Yoga

In any style of yoga, practitioners aim to exercise both sides of their bodies evenly. Yet, inter-limb, muscle imbalances occur naturally, thereby altering postures and muscle activity between the dominant and non-dominant sides. This study aims to understand how limb dominance influences muscle activation and stability in yoga postures with the goal of informing effective training methods to account for muscle imbalances. We used surface electromyography to bilaterally record lower limb muscle activity during maximal contraction and during six static yoga postures. Yoga postures included single- and double-limb support. Motion capture to measure posture alignment and joint angles as well as questionnaires on yoga experience, physical activity, and injury history were also collected. Ongoing analysis examines differences in muscle activation between dominant and non-dominant limbs as well as experienced versus inexperienced yoga practitioners. We expect dominant limbs and experienced yogis to demonstrate more efficient muscle activation, including lower amplitudes during co-contraction and faster activation during preparatory phases of movement. Overall, this research is important because it can influence training regimens in future yoga classes or rehabilitation protocols. For example, if the dominant side is more efficient, instructors can emphasize strengthening the non-dominant side to resolve imbalances and ultimately increase stability.



Presenter(s): Amanda Shelowitz
Authors: Amanda Shelowtiz, Thomas Everett, Sofia Stansbury, Barry Setlow, Jeremy C. McIntyre
Faculty: Jeremy McIntyre

<u>MCHR1 Receptor Knockout and Cilia Removal Alter Cocaine-Induced Locomotion and Reward</u>

Neuromodulatory peptides that regulate substance abuse-induced aberrant neural activate receptors enriched in neuronal primary cilia. Primary cilia are microtubule-based organelles that play a role in cellular signaling via G-protein coupled receptors. One receptor is the melanin-concentrating hormone receptor 1 (MCHR1). Melanin-concentrating hormone (MCH) and MCHR1 are critical to energy homeostasis and drug-seeking behavior. It is unclear how MCHR1+ primary cilia and MCH+ neurons modulate responses to psychostimulants. To test this, different strains of mice were used: one in which cilia are removed from MCHR1 neurons (MCHR1Ift88 KO) and one in which the receptor was deleted (MCHR1 KO). The final mouse model utilized DREADD (Designer Receptor Exclusively Activated by Designer Drugs) technology to chemogenetically activate MCH+ neurons in MCHcre mice. Mice were subjected to conditioned place preference (CPP) and locomotor activity tests. MCHR1 KO and MCHR1IFT88 KO strains exhibited increased acute locomotor responses and sensitization to cocaine. CPP testing showed that MCHR1 KO mice had a reduced preference to the cocaine-paired chamber. Locomotor tests with MCHcre mice showed that giving a 30-minute activation period resulted in a decreased acute locomotor response and sensitization. These findings support a role for MCH signaling in modulating response to psychostimulants.

Presenter(s): Sierra Shepherd
Authors: Sierra Shepherd, Jiri Hulcr
Faculty: Jiri Hulcr

<u>Effects of elevation on the species diversity of bark beetles in a tropical forest</u>

A gap in current knowledge exists on how bark beetles disperse across elevational gradients, particularly in tropical environments. In this project, we sought to determine the distribution of bark beetles along a tropical elevational gradient and assess areas of highest and lowest species richness, abundance, and diversity. A selection of nine different elevation bands was made along a mountain range in Madang, Papua New Guinea, to serve as our gradient. The target taxon of this study were weevils of the subfamily Scolytinae, commonly known as bark beetles. Despite a collection of over 12,000 specimens, our sample did not fully exhaust the diversity within our study region. Our findings indicate that species richness of bark beetles appears to follow a unimodal curve that peaks at a low-middle elevation of 700m. Abundance, in contrast, peaks at 200m and 1700m, with dips at 700m. Distributions of two hyper diverse genera—Coccotrypes and Cryphalus—follow unique patterns within the overall diversity gradient. These results support the findings of previous studies that conclude disparities between species richness and species evenness while presenting additional data on the elevational spread of specific bark beetles in tropical environments.

Presenter(s): Benjamin Sherwin
Authors: Benjamin Sherwin, Zachary Slepian
Faculty: Zachary Slepian

Searching for Parity Violation with Topological Data Analysis (TDA) on the Galaxy 4-Point Correlation Function (4PCF)

Breaking mirror symmetry, also known as parity, relates to a key puzzle in our Universe: why is there more matter than antimatter? In this project, I build on previous work by the Slepian group that computed thousands of coefficients to describe the 4-Point Correlation Function (4PCF). This is the lowest-order statistic sensitive to parity breaking. The 4PCF describes the number of tetrahedra formed by quadruplets of galaxies in 3D within a sky survey. The 4PCF is high-dimensional: there are on the order of 10,000 different coefficients capturing it. To detect parity violation, we combine the coefficients weighted by the inverse covariance, which measures how independent each measured coefficient is from the others. Unfortunately, the covariance matrix is then enormous. To address this issue, we are developing a compression scheme that captures the impact of parity-violating in the 4PCF yet reduces the dimensionality significantly. We are applying different Topological Data Analysis (TDA) techniques on HiPerGator 3.0 to identify the key invariants in the space of 4PCF coefficients. To do so, we are identifying topological invariants to reveal subtle anomalies in a signal which would help us better understand inflationary cosmology.

Presenter(s): Nicholas Sherwin
Authors: Nicholas Sherwin
Faculty: Eric Wang

Decoding the Associations of Kinesins, RNA-Binding Proteins (RBPs), and mRNA

As the population continues to age, neurodegenerative and repeat expansion diseases pose major challenges to society. These diseases disrupt cellular trafficking, which is necessary for functional synapses in neurons. RNA localization is a crucial component of cellular trafficking in neurons, which is regulated by kinesins and RNA-binding proteins (RBPs). However, there is a lack of understanding regarding how these components interact and how they are affected by neurodegenerative diseases. This study aims to investigate the kinesin-RBP-RNA specificity code by screening kinesin-RBP interactions using a proximity labeling via biotinylation technique. This will provide a comprehensive list of kinesin-RBP interactions, which will advance our understanding of cellular trafficking and RNA localization. Additionally, this research may lead to identifying specific interactions responsible for RNA mislocalization associated disorders, such as myotonic dystrophy. By providing valuable information in the field of therapeutics, this study will connect the mechanisms of cellular trafficking defects to therapeutic targets, ultimately aiding in the treatment of neurological diseases.

Presenter(s): Nicholas Sherwin, Norman Zvenyika
Authors: Nicholas Sherwin, Norman Zvenyika
Faculty: Yulia Strekalova

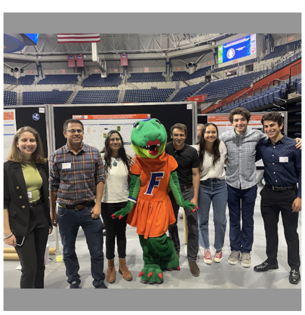
Computational Image Analysis Platform (CIMAP): An AI-Powered Platform for Analysis of Pathological Specimens

The Human Biomolecular Atlas Project (HuBMAP) aims to create a comprehensive map of the human body at the cellular level. To achieve this goal, the project has developed the Computational Image Analysis Platform (CIMAP) using a combination of artificial intelligence and transcriptomics. CIMAP is automating the field of pathology by providing multiple tools to analyze whole slide images uploaded by users. This includes plug-ins for nuclei counting, cell segmentation, differentiation among distinct cell types using genomic and morphological data, and the generation of digital stains on whole slide images.
Ultimately, CIMAP has the potential to revolutionize our understanding of cellular biology and pathology by providing highly accurate and detailed analysis of histological specimens. As the project continues to develop, CIMAP is set to become a vital instrument for pathology researchers by facilitating novel pathological discoveries and fostering an enhanced understanding of cellular biology.

Presenter(s): Jessica Shubin
Authors: Jessica Shubin [1], Daniel Ryu [2], Duc Duong [3], Qi Guo [3], Nicholas Seyfried [3], Todd Golde [2], Karen McFarland [4]
Faculty: Karen McFarland

Modifying Tau Aggregation in Neurons

Accumulation of Tau into neuronal tangles is a pathological hallmark of Alzheimer's disease and related dementias (ADRD). Mutations in the MAPT gene, which encodes for Tau protein, can cause frontotemporal dementia, Pick disease, Progressive Supranuclear Palsy, and Alzheimer's disease. Collectively, these "tauopathies" have common pathological features of neurofibrillary tangles and neurodegeneration. Our past studies demonstrate that a mutant form of Tau harboring two familial mutations (P301L/S320F) forms insoluble tangles displaying rapid turnover of Tau. Recent gene expression analysis shows that over-expression of mutant Tau appears to blunt gene expression changes in primary neuronal cultures suggesting a loss-of-function mechanism. Proteomic analyses highlighted the involvement of three members of the ubiquitin proteosomal pathway: TRIM44, PJA1, and PJA2. To understand the role of these in Tau biology, we co-expressed these transgenes with wild-type and mutant Tau in culture models. We find that overexpressing these genes has a profound effect on the accumulation of Tau and alters the physical characteristics of mutant Tau aggregates in culture models. TRIM44 may regulate Tau degradation under normal conditions but be sequestered into Tau aggregates when Tau is overexpressed.



Presenter(s): Aryeh Silver, Diana Feier
Authors: Aryeh Silver, Diana Feier, Avrirup Chakraborty, Miruna Anica, Guimei Tian, Michael Andrews, Mariana Dajac, Changlin Yang, Tanya Ghosh, Dongtao A Fu, Maryam Rahman, Jianping Huang, Elias J. Sayour, Jeffrey Harrison, Duane A. Mitchell, Loic P. Deleyrolle
Faculty: Loic Deleyrolle

Characterization and spatial analysis of metabolic enrichment of cancer stem cells mediated by the immune compartment in GBM

Glioblastoma (GBM) contains cell populations with distinct metabolic requirements. Fast-cycling cells (FCCs) harness glycolysis, and treatment-resistant slow-cycling cells (SCCs) engage in lipid metabolism, enhancing their metabolic fitness. However, the interactions between tumor cells and immune cells and how they shape the microenvironment is yet to be understood. Our primary objective is to spatially decode the GBM microenvironment heterogeneity with a focus on the metabolic links between SCCs and the immune compartment. Murine glioma cell lines were studied using geospatial profiling to understand metabolic heterogeneity and communications within and between different cell populations and immune infiltrates. We determined that SCCs exhibit distinct metabolic dependencies, involving preferential lipid metabolism supported by enhanced fatty acid uptake. Their proliferation is regulated by their interactions with immune suppressive cells. SCCs shape an immune microenvironment that enhances lipid exchange between immune cells and SCCs, thereby supporting SCC survival. Our results reveal that metabolic interactions between SCCs and immune suppressive cells play a critical role in the development of drug and immune resistant tumors. This study delineates these metabolic communications and assesses the potential therapeutic effect of disrupting these interactions to treat GBM.

Presenter(s): Emma Silverman
Authors: Emma Silverman, Robert Grosdidier, Phil Hahn
Faculty: Phil Hahn

Plants and insect herbivores are functionally linked based on nitrogen content

The competitive exclusion principle is a proposition in ecology that predicts that, for species with similar niches (i.e., food or habitat requirements), one species will outcompete another. Certain grasshopper species consume the same food sources while inhabiting the same areas, proposing a question as to how they partition the niche between the many species. Functional traits can be used to quantify the niche and determine how similar species can coexist. We hypothesized that the nitrogen content of plants would be related to the nitrogen content of their insect herbivores. We tested this by collecting samples of 11 species of grasshoppers and 16 species of plants that all occur in longleaf pine savannahs. Feeding trials were conducted where a single grasshopper was placed in a cage containing all 16 of the plant species and allowed to feed for 48 hours. This was repeated twelve times for each grasshopper species (n = 13288 total trials). Grasshoppers and plant samples were dried, homogenized, and tested for their carbon and nitrogen content and then analyzed for correlations. We expect to find a positive correlation between the carbon-to-nitrogen ratios of plants and the grasshopper species which feed on them.

Presenter(s): Emma Silverman
Authors: Emma Silverman, Johanna Engström
Faculty: Johanna Engström

Analyzing Drought Vulnerability in South America

Severe droughts are a significant concern of society, causing environmental damage and large economic costs. In South America, a continent with ample water resources, this concern has grown in recent decades as the occurrence of droughts on the continent has been increasing, with many of the worst droughts ever recorded in the region taking place in the last 20 years. This paper seeks to examine the vulnerability of South American nations to drought to provide insight on the relative preparedness and risk that each country faces regarding future droughts. Our assessment on drought vulnerability is separated into three main aspects of vulnerability: exposure, sensitivity, and adaptive capacity, each of which is evaluated using a variety of indicators. Using statistical analysis, we will be determining which indices correlate closet with drought severity and risk. Analyses will be conducted to assess the reliability of the results and account for the similarities that may exist between indicators. Results show which countries in South America are the most vulnerable (resilient) to drought, and what factors contribute to their vulnerability (resilience).

Key words: drought, vulnerability, South America, water resources

Presenter(s): Cassidy Simas
Authors: Cassidy Simas, Gabrielle Wood, Erika Monte, Spencer Serrano, Carl A. Denard
Faculty: Carl Denard

Directed Evolution of an Alpha-Synuclein Degrading Enzyme

Synucleinopathies are neurodegenerative disorders characterized by the abnormal aggregation of the neuronal protein alpha-synuclein in the brain, leading to synaptic dysregulation and neuronal death. Currently, there are no effective targeted treatments for these degenerative diseases, including Parkinson's Disease (PD) and Lewy Body Dementia (LBD). Here, we are investigating evolving proteases as a modality for degrading the distinctive alpha-synuclein plaques associated with PD and LBD. One such protease that can degrade alpha-synuclein is the serine protease Kallikrein 6, also known as neurosin. However, alpha-synuclein is a poor substrate for neurosin due to its preference to cleave after arginines as opposed to the lysine cleavage site of alpha-synuclein. This proclivity presents an issue, as protease activated receptors (PARs) in neurons and endothelial cells are subject to undesirable cleavage by neurosin. From prior research performed by the PI, we have identified 6 neurosin variants of interest from high-throughput yeast screens. Our current objective is thus to continue evolving neurosin to fine-tune its preference for alpha-synuclein cleavage and improve its catalytic activity. To accomplish this task, we will use our current yeast-based high-throughput screen followed by an in vitro fluorescence assay for biochemical characterization of evolved variants.

Presenter(s): Derek Simon
Authors: Derek Simon, Elsa Jiang, Erin Westgate
Faculty: Erin Westgate

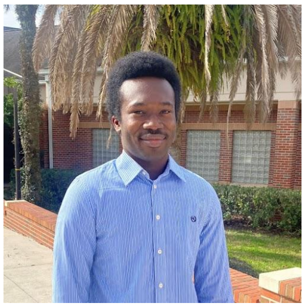
A life worth living: General ethic of life in decision-making

What kinds of lives are worth living? Across two studies, undergraduates were presented with a thought experiment in which they chose between 1) living 30 years in a community with everything necessary to live a good life, and then be painlessly slaughtered for consumption by space aliens, and 2) declining to experience such a life, thus not being born at all. They then made the same choice for a close other. In Study 2, participants were randomly assigned to be presented with the scenario first (treatment group) or to answer our attitude measures first (control group). Across the studies, we found that people were significantly more likely to choose life for both themselves (76.4%) and a close other (66.4%). In Study 1, people were more likely to choose to be raised for slaughter if they thought such a life would be meaningful, happy, and psychologically rich. We found the same trend in Study 2, with slight differences emerging between groups. We also measured attitudes on abortion, physician-assisted euthanasia, and animal consumption. We suggest that people see lives as worth living when they perceive quality of life to be high, regardless of its ending, and that this extends beyond personal decision-making.

Presenter(s): Ethan Slaton
Authors: Ethan W. Slaton, Samantha G. Martinusen, Julia Besu, Cassidy Simas, & Carl A. Denard
Faculty: Carl Denard

<u>Enhancement of Biochemical Studies in the Yeast ER through Modular and Integrative Activity Reporters</u>

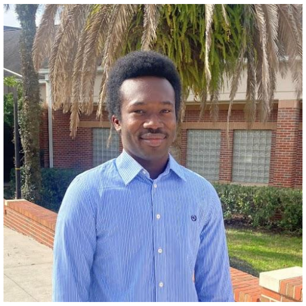
The ability to engineer and study enzymes that catalyze post-translational modifications (PTMs) is a cornerstone of biotechnological and biomedical breakthroughs. We have previously developed a yeast-based high-throughput screening platform to control, profile, and engineer the activity of protein-modifying enzymes, particularly proteases, via yeast surface display. Here, we report significant optimizations and improvements to our yeast platform. This was done by creating a Suite of Integrative Vectors (SIVs). SIVs allow us to integrate components of our platform partially or fully into the chromosome of S. cerevisiae. Chromosomal integrations improve upon plasmid-based integration systems, which are often hindered due to reproducibility issues that arise from inconsistent plasmid copy numbers and nonuniform induction. We used TEV protease to validate the performance metrics of SIVs. We observe a significant increase in signal-to-noise ratio when running flow cytometry. Furthermore, integration of specific modules in the chromosome decreases the size and stability of movable components. In the future, we will use this approach in various biochemical assays, including isolating protease modulatory nanobodies and protein binders, screening and isolating small molecule protease inhibitors, and profiling the substrate specificity of various enzymes.



Presenter(s): Olusegun Sobanjo
Authors: Olusegun Sobanjo, Dr. Alexandra Calinescu
Faculty: Alexandra Calinescu

Regulatory transcriptional networks of mesenchymal transformation in malignant glioma

Glioblastoma (GBM) is the most aggressive and lethal primary brain tumor in adults. One treatment being developed for GBM is the use of normal neural stem cells (nNSCs) to deliver therapeutic agents within brain tumors. Despite showing promise, these therapeutic cells have been shown to spontaneously transform into malignant cells that form tumors. These transformed neural stem cells (tNSCs) resemble mesenchymal GBM, which has the worst prognosis amongst the three different molecular subtypes of GBM. To gain a better understanding about the mechanism responsible for this malignant transformation, gene set enrichment analysis (GSEA) was performed to identify enriched biological processes and pathways in tNSCs from mice using data from RNA-seq and ATAC-seq analyses. The results from the GSEA analysis were used to create string networks that were modified using Cytoscape to simultaneously compare the directions of differential gene expression and chromatin accessibility for various genes within the enriched pathways and processes. These networks also highlighted upstream regulatory transcription factors and cofactors which included GMNN and BRCA1 among others which likely play important roles in driving the malignant transformation of normal neural stem cells. Targeting these transcriptional regulators in GBM may have promising therapeutic potential.



Presenter(s): Olusegun Sobanjo
Authors: Olusegun Sobanjo1, Zain Sultan2, McKenzie Kauss3, Alexandra Calinescu4
Faculty: Alexandra Calinescu

Regulatory transcriptional networks of mesenchymal transformation in malignant glioma

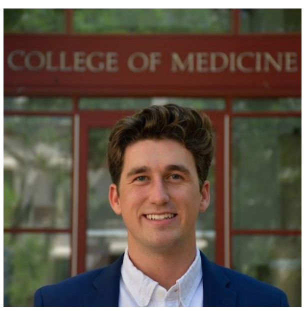
The current molecular classification of Glioblastoma (GBM), the most common and lethal primary brain tumor in adults, includes 3 subtypes: classical, proneural and mesenchymal. Mesenchymal GBM is the most prevalent molecular subtype found in recurrent GBM, characterized by high frequency of Glioma Stem Cells (GSCs) and an invasive, inflammatory, hypoxic phenotype resistant to therapy. We have devised an in vitro culture system to transform normal Neural Stem Cells (nNSCs), derived from embryonic mice, into GSCs, without relying on genetic alterations. Transformed NSCs (tNSCs) are highly mitotic, therapy-resistant and, when implanted into the brains of mice, generate aggressive, deadly tumors. RNA-Seq and ATAC-Seq analyses identified significant changes between nNSCs and tNSCs centered on critical transcription factors (TFs). tNSCs adopt the molecular signature of mesenchymal GBM. Gene set enrichment analyses identify common biological pathways enriched in tNSCs by RNA-Seq and ATACSeq, including DNA replication and repair, inflammatory responses and chromatin modification pathways. Network analysis of the

highest ranked transcriptional regulators identifies 4 functional clusters of TFs known to regulate immune function, mesenchymal transformation, chromatin remodeling and CNS development. We propose that therapeutic targeting of these transcriptional regulators in GBM will hinder progression and recurrence of GBM.

Presenter(s): Igor Sokolov
Authors: Jason Cory Brunson, Luis Sordo Vieira, Igor Sokolov
Faculty: Jason Brunson

The Modulus as a Tool for Analysis of Signal Transduction Networks

Every organism relies on complex biological processes to govern even the simplest of tasks. These processes transpire over a range of components which must effectively communicate. Molecular signals are not always simple activations but may be co-dependent with other signals or may inhibit components downstream rather than activate them. Mathematical representations of such signaling pathways are called signal transduction networks (STNs). We analyze these STNs with tools from two python packages intended to expand the network and compute minimal functional routes, which are analogues to shortest paths that take synergy and inhibition into account. We then compute the graph modulus for these functional routes, which is a quantity characterized by a norm that unifies many useful notions of richness of the family of routes. This leads to an analysis using the graph modulus, comparing values obtained from families of different objects such as walks and functional routes. Finally, we provide a probabilistic interpretation of the 2-modulus on a family of functional routes as it relates to the most likely paths a stochastic signal will take through the network.



Presenter(s): John Sommerville
Authors: Frederick Ashby, John Sommerville, Jake Boles, Nadia Kabbej, Natalia Andraka, Jesse Hall, Stephanie Merfeld-Clauss, Dimitri Traktuev, Keith L. March, Brent A. Reynolds, Coy D. Heldermon
Faculty: Coy Heldermon

Neural Stem Cell Biodistribution Visualization by 3D Immunolabeling in Sanfilippo Syndrome Disease Models

Neural stem cell (NSC) treatment for Sanfilippo Syndrome (MPS III) holds promise as a means to possibly restore central nervous system (CNS) function, with preliminary data in MPS IIIB mice demonstrating partial disease correction. We previously injected newborn immunocompetent MPS IIIB mice with murine NSC's that constitutively express RFP reporter gene using multiple injection methods targeting the cerebrospinal fluid (CSF) space or the brain parenchyma. We also compared biodistribution within MPS IIIB mice compared to phenotypic controls. While traditional immunofluorescence (IF) or immunohistochemistry (IHC) methods demonstrated parenchymal injections to be superior to CSF-based injection methods, we found these methods prone to sectioning bias, and poorly characterized stem cell engraftment. Here, we establish 3D IF labeling (iDISCO) as consistent and reproducible method for characterizing stem cell biodistribution and molecular processes within the brain. Using iDISCO methods allows whole brain to be scanned and virtually sectioned, thus eliminating potential for sectioning bias in stem cell research and allowing transparent immunofluorescent analyses. Overall, we demonstrate the potential role of iDISCO, and similar 3D IF methods, in progressing the field of regenerative therapies in lysosomal storage diseases within the CNS, and simultaneously confirm the superiority of intraparenchymal delivery of stem cells in the CNS compared to intracerebroventricular and intracisternal methods.

Presenter(s): Barbara Sousa
Authors: Sousa Barbara, Stark Heather
Faculty: Heather Stark

Developing a Data Assessment System for Communicable Diseases in South Sudan

This project aims to develop a reliable method for capturing data regarding communicable diseases treated in internally displaced refugee camps in South Sudan. We will be conducting health assessments to provide a uniform method of data collection through the use of electronic tablets. This data can be analyzed to provide insight into communicable diseases and allocate resources for the Southern Sudan Health Care Organization (SSHCO), an internally displaced refugee camp in South Sudan. Statistical analysis of the survey data will identify the prevalence of communicable diseases and determine if there has been an increase in communicable diseases due to the heavy flooding that has taken place in recent years.

CENTER FOR UF UNDERGRADUATE RESEARCH WEEK UNDERGRADUATE RESEARCH

Presenter(s): Zoe Spielman
Authors: Zoe Spielman, Samuel Smidt, John Flores, Kevin Easton, and Kyle Williams
Faculty: Samuel Smidt

Estimating Maximum Streamflow Impacts by Land Cover Change in Florida Watersheds

As Florida’s population continues to grow, many natural land cover types are being converted to support this population (e.g., forest to urban). As these natural land covers are converted, changes in surface imperviousness can lead to changes in downstream water flow. This has direct implications on human and environmental systems like increased flood risk. This study looks to develop a back-of-the-envelope calculation to determine how changes in land cover influence Florida streamflow. Precipitation, land cover, streamflow, and impervious datasets spanning from 2001-2016 are used to validate the calculation using multivariate linear and nonlinear regression. The results of this study found a back-of-the-envelope calculation with an R2 of 0.78, demonstrating that there is a statistically significant relationship. This model will help identify hydrological changes throughout Florida watersheds that can lead to a variety of future research impacts like investigating impacts to flooding, nutrient loading, and outcomes of urban planning strategies.

Presenter(s): Vahini Srikakulapu
Authors: Vahini Srikakulapu, Yoon Jin Choi, Basma Yacoubi, Evangelos A. Christou
Faculty: Evangelos Christou

<u>Slow rate of force development decreases force variability and the effect is similar for low and high-gain visual feedback in young adults</u>

We aimed to examine the effect of rate of force development (RFD) and visual feedback (VF) on force variability during a continuous increase of force contraction (ramp).

Eight young adults (20.5±1.51; 4 females) traced a ramp target with their ankle to 50% maximum. Participants performed the task with two RFDs (16.6% vs. 2% MVC/s) and two VF gains (5° vs. 1°). We used the 3 most accurate trials and quantified the coefficient of variation (CV) of force from the middle of the ramp (25-75%). We also quantified the force structure with the normalized power in force from 0.5 to 4.5 Hz for every 0.5 Hz.

The CV of force was significantly lower in the 2% MVC/s ramp ($F(1,7)=14.1$, $p<0.01$). There was a significant interaction between RFD and frequency bands for the power spectra of force. Power from 0.5-1.0 Hz was lower in the 2%MVC/s ramp, and power from 2.5-4.0 Hz was greater in the 2%MVC/s ramp relative to 16.6%MVC/s ramp (p<0.05). The VF main effect and the RFD x VF interaction were not significant.

We provide novel evidence that in young adults, force variability is significantly lower when the RFD is slower and VF gain does not affect this finding.

Presenter(s): Alana Starr
Authors: Alana Starr, Kelly DeMars, Ph.D., Sofia Stansbury, Tom Everett, Amanda Shelowitz, Kalene Jasso, Ph.D., Jeremy McIntyre, Ph.D.
Faculty: Jeremy McIntyre

Physiological Modulators of the Melanin Concentrating Hormone (MCH) System

Hunger and circadian rhythm are known to influence the sense of smell. This dynamic interaction is regulated by the hypothalamus. The lateral hypothalamus releases a neuropeptide hormone Melanin Concentrating Hormone (MCH) that regulates energy homeostasis through sleep and hunger through activation of its receptor MCHR1, a G-protein coupled receptor. Our group has shown that MCH+ processes originating from the lateral hypothalamus project to the olfactory bulb, indicating that MCH could also modulate olfactory processing. To test the hypothesis that MCH regulates olfactory signaling, tissue was collected every 4 hours from both the hypothalamus and the olfactory bulbs of male and female mice with either ad libitum access to food or from food-restricted mice over the course of 24 hours. We measured expression of genes that regulate the MCH system including Pmch, Mchr1, and Adyc3, the gene for adenylyl cyclase 3, a downstream effector of its receptor MCHR1. Results indicate circadian rhythm drives translation of Pmch, Mchr1, and Adcy3 in the olfactory bulb in addition to the hypothalamus. This project supports the idea that the olfactory system is intimately linked with metabolic processing through the MCH signaling.

Presenter(s): Savannah Still
Authors: Savannah Still, Hansel Montalvo-Castro, and David Hibbitts
Faculty: David Hibbitts

Exploring Zeolite Catalysts for Regioselective Toluene Methylation to para-Xylene

During methanol-to-olefins (MTO) chemistry, aromatic species cocatalyze the formation of olefins and subsequently form polyaromatic species that cause catalyst deactivation. The mechanisms for aromatics formation during MTO processes thus are key to understanding reaction rates and catalyst deactivation. Here, we elucidate aromatic-formation mechanisms using density functional theory (DFT) calculations in the MFI framework. Aromatic formation broadly takes place by the formation of cyclic compounds, followed by their dehydrogenation. The formation of cyclic compounds can occur via the direct cyclization of unsaturated olefins, the cycloaddition of dienes and alkenes, or formaldehyde-mediated dehydration reactions via dienic-alcohol intermediates. Here, we contrast direct cyclization pathways that involve ring closure of C5 and C6 intermediates. Preliminary calculations suggest that cyclization precursors are generally more stable when present as surface-bound species (i.e., as opposed to H-bound alkenes and their carbocation derivatives). While the relative stability of cyclization precursors governs the available intermediates toward cyclization, the relative rates are governed by transition state energies. We are currently searching for these transition states that contrast 1,6 and 1,5 ring closure of C6 intermediates toward cyclohexene and methyl-cyclopentene, respectively.

Presenter(s): Elizabeth Stocker
Authors: Elizabeth Stocker, Courtney Valerio, Adam W. Stern
Faculty: Adam Stern

Comparison of Two Immunochromatographic Tests Ability to Detect Barbiturates in Dog and Cat Urine

Determining whether an animal was humanely euthanized is a crucial part of the animal autopsy in veterinary medicine. The drug most frequently used for humane euthanasia in veterinary medicine is pentobarbital (barbiturate drug class). Use of immunochromatographic test strips can help to screen for barbiturates in the body of deceased animals and these tests have been shown to be effective at detecting barbiturates in postmortem urine and multiple alternative matrices. This study focused on comparing the accuracy of two different brands (Alere, Healgen) of immunochromatographic test kits for the detection of barbiturates in postmortem urine samples collected from dogs and cats. Twenty dog and twenty cat urine specimens were analyzed using both test kits and there was 100% agreement of the results from the two different test strips and 100% agreement of the tests results with the euthanasia status of the animals. Our results support the use of either immunochromatographic test strip for the detection of barbiturates (pentobarbital) in postmortem urine collected from dogs and cats.

Presenter(s): Kathryn Stroud, Neha Vitttal, Nick Sherwin
Authors: Kathryn Stroud, Neha Vittal, Nick Sherwin
Faculty: Frederick Kates

Utilization of AI in Improving the Quality and Delivery of Healthcare via Electronic Health Records

The growing popularity and use of artificial intelligence (AI) has had major impacts on many industries, and healthcare is no exception. AI is already being used in countless ways within healthcare, and this trend is expected to continue. The authors of this project describe a multi-step approach to using AI throughout a patient's experience, from an initial doctor's visit to eventual diagnosis and treatment. The first step of this process uses AI to interpret and transcribe conversations between a physician and a patient. The information gathered by the AI is then implemented into the patient's electronic health record (EHR). The next step is to use AI systems to organize information within EHRs, both for individual patients and to process large sets of data from many patients. Using this organized data, AI models can be used to create decision support systems in which the AI is able to make evidence-based suggestions for diagnosis and treatment. The final step of the process uses this model to generate diagnosis and care suggestions for individual patients. This project describes the way AI is used in each of these steps in detail.

Presenter(s): Paola J. Sullivan
Authors: Paola Sullivan, Anna Puig
Faculty: Anna Puig

An Overview of the Research Literature on Children's Spirituality, Happiness, and Psychological Well-Being

Despite the pressure on educators to concentrate on children's cognitive development (Eaude, 2016; Peng & Kievit, 2020), research has demonstrated that a more holistic and integrated approach to learning, inclusive of spiritual development, is crucial (Cameron, 2009). Nurturing children's spiritual development is a complex matter, including ambiguity about defining spirituality. Thus, to provide holistic education and expand the view of young children's development to include spirituality, this research will explore the efficacy of a sensory development intervention on the self-reported spirituality, happiness, and psychological well-being of children. The study is grounded in Fisher's (1998) children's spiritual health model comprised of four domains: 1) personal; 2) communal; 3) environmental; and 4) transcendental. This poster provides an overview of the research literature on children's spirituality, happiness, and psychological well-being. We identify gaps in the research to propose a study asking the following research questions: 1. does a spiritual intervention tool, part of an educational enrichment program focused on sensory development of children, help increase students' spirituality, happiness, and/or overall psychological well-being? 2. What is the relationship between children's spirituality, happiness, and psychological well-being?

Presenter(s): Zion Szot
Authors: Zion Szot, Kathryn Sieving
Faculty: Kathryn Sieving

Artificial Night Lighting and Aggression of Urban Northern Cardinals

Birds (including Cardinalis cardinalis) require sleep for daily functions. In spring, birds sing to protect territory and attract mates. Scant evidence suggests that artificial lighting increases avian nighttime activity which contributes to sleep loss. This study investigates how artificial night lighting affects the aggressiveness of C. cardinalis responses to conspecific song playbacks. We hypothesize that increased artificial lighting near C. cardinalis roosting spots prompts less aggressive responses owing to decreased energy budgets. We measured nighttime light at dark and bright urban roosting locations and returned in the morning to play cardinal calls for three minutes and observe individual bird behavior for five minutes. Standard aggressive measures included latency to respond, distance from bird to speaker, number of songs, hops, and flip flops. An aggression index was obtained using principal component analysis which confirmed that aggressive responses featured short latency and approach distance, few chips, and many songs, flip flops, and hops. Analysis of variance revealed the opposite response as expected: cardinals sleeping in high levels of nighttime light engaged in more aggressive morning responses. We will adjust our design to confirm whether birds in well-lit areas are (1) more active at night and (2) have less stamina in territorial defense.

Presenter(s): Sara Tahir
Authors: Sara Tahir, Michael B. Reid
Faculty: Michael Reid

Age and heat stress promote cardiac-related death during race car driving

Introduction: Auto racing exposes drivers to physiological stressors: environmental heat, increased muscular work, and gravitational (g) loading. Heat stress is related to ambient temperature and type of car (open vs. closed cockpit), whereas muscular work and g-loading are influenced by the type of race track (oval vs. road course). All of these stressors increase heart rate and cardiac output, promoting cardiovascular strain which could be fatal.
Hypothesis: Driver athletes may experience cardiac-related deaths while racing.
Methods: We searched five online databases (Google, PubMed, Scopus, ScienceDirect, Web of Science) using twelve medical terms: myocardial infarction, heart attack, stroke, angina, arrhythmia, cardiac arrest, chest pain, heat stroke, fainting, dehydration, passing out, and cardiac death. We cross-referenced these terms with ‘race car driver,’ ‘auto racer,’ ‘auto racing,’ and ‘racing driver.’ Preliminary

Conclusion: Age and heat stress promote cardiac-related death during race car driving.

Presenter(s): Katherine Tansky
Authors: Katherine Tansky, Nesmine Maptue, Phillipe C. Fernandes, Tatiana E. Alvarez, Ashlyn T. Hu, Qingyang Shen, J, Joshua A. Pegoraro, Chalermchai Khemtong
Faculty: Chalermchai Khemtong

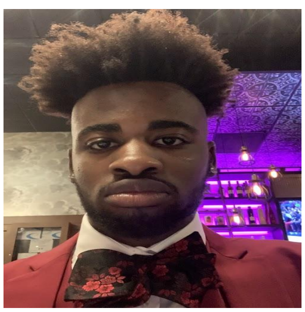
<u>Myocardial Ketogenesis in Isolated Perfused Rat Hearts</u>

Ketogenesis, a process in which acetyl-coA is converted to acetoacetate (AcAc) and β-hydroxybutyrate (β-HB), has been evidenced to occur in the heart though has not yet been widely studied. In this study, we used stable isotope carbon-13 tracers to investigate ketogenesis in isolated perfused rat hearts. Hearts were perfused with perfusion medium containing long chain fatty acids uniformly labeled with 13C (0.2 mM) and non 13C-enriched glucose (5.5 mM). Four groups of hearts were studied: fed or fasted rats perfused at normal perfusion pressure (80 mm Hg), and fed or fasted rats subjected to low-flow ischemia (40 mm Hg). Heart tissues were freeze-clamped after 35 minutes of perfusion and extracted for metabolite analysis by gas chromatography mass spectrometry (GC-MS). Hearts in all groups had similar steady-state flow rates, heart rates, and oxygen consumption rates, all of which decreased upon inducing low-flow ischemia. All isotopes of ketones were detected, and low-flow ischemia induced a change in β-HB:AcAc ratios. The results of this study suggest that myocardial ketogenesis can be measured in perfused hearts. Our findings also suggest that ketone body ratios could potentially be used to determine changes in mitochondrial redox state, which may have diagnostic applications in the clinical setting.

Presenter(s): Max Taylor
Authors: Max Taylor, Lucas Jennings, Donald Behringer
Faculty: Donald Behringer

Effects of the Nemertean Egg Predator Carcinonemertes carcinophila imminuta on the Atlantic Blue Crab

The blue crab, Callinectes sapidus, is one of Florida's most valuable crab fisheries, valued at around 14 million dollars in 2022. Female blue crabs are host to a nemertean worm Carcinonemertes carcinophila imminuta, which preys upon its eggs. Nemertean worms have been linked to the collapse of fisheries, such as the Dungeness crab fishery in the 1960s and 1970s and the red king crab fishery in the 1980s. In 2017, the newly-discovered nemertean Carcinonemertes conanobrieni was found to parasitize the egg masses of female Caribbean spiny lobsters, Panulirus argus, potentially impacting reproductive output and fecundity. We hypothesized that nemertean egg parasites might have similar impacts on blue crabs. To investigate this, we collected 20 ovigerous female blue crabs from Jacksonville and Ormond Beach. There was a 55% parasite prevalence rate overall, with 67% in Ormond Beach and 44% in Jacksonville. Female blue crabs with positive signs of nemertean infection (worms, worm eggs, eaten embryos) had lower fecundity than crabs with no signs of infection. Nemertean parasite prevalence could pose a threat to the Florida blue crab fishery via reduced fecundity and reproductive output, so it is important that we gain a more complete understanding of this parasite and its effects.



Presenter(s): Joseph Tebou
Authors: Joseph Tebou, Dominick Lemas PhD
Faculty: Dominick Lemas

Maternal Obesity and Perinatal Cancer: Mapping the Mechanistic Impact Using OMOP

Maternal obesity is linked to adverse perinatal health outcomes, including an increased risk of certain cancers in both the mother and offspring and other negative effects to fetal growth and development. Ontology-driven phenotypes derived from electronic health record (EHR) data and OpenMRS-OMOP (OMOP) can provide a powerful tool for mapping the relationship between maternal obesity and perinatal cancer outcomes. The objective of this study is to apply ontology-driven phenotypes derived from EHR data and map the data using OMOP to understand the mechanistic impact of maternal obesity on perinatal cancer outcomes. UFHealth EHR data spanning ten years were analyzed using logistic regression to examine the relationship between maternal obesity and cancer outcomes. A total of 713 individuals with cancer were identified, but there was no significant relationship between maternal obesity and cancer diagnosis. The results of this study have the potential to improve cancer outcomes, early diagnosis, and treatment in perinatal populations with obesity. Ultimately, the development of advanced data analytics methods for health research can help to advance the field of biomedical informatics and improve public health outcomes.

Presenter(s): Joshua Thomas
Authors: Joshua Thomas
Faculty: Eric Schwartz

Development of Autonomous Robots

Presenter(s): Samuel Thomas
Authors: Samuel Thomas, Bikram Karmakar
Faculty: Bikram Karmakar

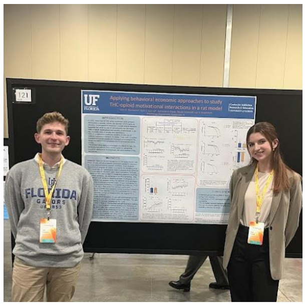
Understanding the Effect of the Supplemental Nutritional Assistance Program through Quasi-Experimental Methods

The Supplemental Nutritional Assistance Program, or SNAP, is a food assistance program funded by the US federal government whose primary goal is to aid low-income households with the purchase of food. Recently, SNAP has come under pressure due to a lack of strong scientific evidence of its effectiveness. However, difficulties arise assessing the effectiveness of SNAP due to a strong confounding by indication problem; the program is available only to the poor who are most at risk of food insecurity. In this analysis, the instrumental variable (IV) method and the regression discontinuity (RD) method are used to quantify non-overlapping evidence for the effectiveness of SNAP. In our study, the IV is an individual's state of residence since states have different regulations for when one must re-register their SNAP eligibility. The RD method uses the fact that the program is available to individuals just below the federally mandated income threshold, and those slightly above this threshold miss out. Data is from the FoodAPS National Household Food Acquisition and Purchase Survey by the US Department of Agriculture of 4,826 American households on household food purchase and acquisition data.

Presenter(s): Lindsey Thompson
Authors: Lindsey Thompson, Rebecca Kimball
Faculty: Rebecca Kimball

Analyzing the Recombination of Sex Chromosomes Among Bird species

Sex chromosomes include large regions of genes that have stopped recombining. There is not much information about bird's sex chromosomes and information about recombination requires sampling females (which have a Z and W chromosome similar to the XY sex chromosomes in mammals). Bird species vary in how much they recombine, and when they might have stopped recombining. So far, we have examined sex chromosome genes from published genomes of 44 species of birds that have both the Z and W from to see where they have stopped recombining and better understand their evolution. Phylogenetic trees were created in order to show their recombination patterns. Four different genes have been studied. (RPL 17, ST8IA3, VCP, and UBAP2), though some of the species only have Z, W which can make comparing species difficult. From this we can determine which species stopped recombining or are continuing to recombine. One gene shows a single stop to recombination, though others show multiple cases in different bird groups. In one gene, all species in one group only appear to have a Z version. We will also determine how the position of the gene on the chromosome contributes to whether or not it is recombining.



Presenter(s): Tyler Thompson, Rylie Conrad
Authors: Tyler Thompson, Rylie Conrad, Katherine Driver, Marek Schwendt, and Lori Knackstedt
Faculty: Marek Schwendt

<u>Applying behavioral economic approaches to study THC-opioid motivational interactions in a rat model</u>

Opioid use disorder lacks an effective, broad-spectrum treatment. Clinical evidence suggests that co-use of cannabinoids can reduce opioid dependence rates and severity of withdrawal, though at the cost of elevated anxiety and depression. Thus, well-controlled, translational animal models are necessary to investigate consequences of cannabinoid-opioid co-use. The current study investigated the effects of D9-tetrahydrocannabinol (THC) consumption on behavioral economic demand for intravenously self-administered (IVSA) oxycodone in male and female Sprague-Dawley rats. Rats self-administered oxycodone or sucrose under the fixed-ratio (FR) 1 and 3 schedule for 6 days each. Somatic signs of withdrawal and anxiety-like behaviors were assessed at 22hr withdrawal. After FR-3, rats entered the demand self-administration paradigm, where FR increased in quarter log increments. Throughout this paradigm, rats received access to gelatin containing either THC or ethanol for 1hr following operant sessions. The rats advanced to the next FR after meeting the criteria for two consecutive days, or exited if zero infusions were attained. Upon exit, two FR-3 IVSA sessions were completed to restabilize oxycodone-seeking behavior. THC had no effect on sucrose self-administration. The findings of this study will provide first-ever evidence regarding the effects of THC on motivation to seek oxycodone.

Presenter(s): Taylor Thomson
Authors: Katherine M. Gonzalez, Taylor Thomson, Madison Halcomb, Linda B. Cottler, Lori Knackstedt, Barry Setlow
Faculty: Barry Setlow

<u>Effects of concurrent cannabis on cocaine use and relapse in Sprague Dawley rats</u>

Polysubstance use (PSU), or the ingestion of multiple drugs of abuse simultaneously, is commonplace, with cannabis and cocaine being among the most prevalent combinations. Together with UF epidemiologists, we developed a rat model of cannabis-cocaine PSU to better understand this phenomenon. Rats were implanted with intravenous catheters and assigned to three smoke conditions (cannabis smoke, placebo smoke, clean air) before undergoing cocaine self-administration (SA) sessions in operant chambers, in which a response delivered an intravenous cocaine infusion accompanied by audiovisual cues. Once a week following smoke exposure, rats completed SA sessions. Rats in the cannabis smoke group self-administered less cocaine compared to the control groups during these sessions. They then underwent a 30-day abstinence period and no longer received either drug, followed by a relapse test in which they were placed in operant chambers; a response triggered the audiovisual cues but no cocaine delivery. During this session, the cannabis group exhibited elevated cocaine-seeking compared to the controls. The results show that although cannabis co-use attenuates cocaine intake, it produces heightened cocaine-seeking in abstinence in the presence of cocaine-paired cues. These findings emphasize the importance of working with animal models that reflect real-world patterns of drug intake.

Presenter(s): Sebastian Tirado-Vélez
Authors: Sebastian Tirado-Vélez, Brandon Parks, Aysegul Gunduz
Faculty: Aysegul Gunduz

<ins>Structural Connectivity of Motor Brain Regions in Essential Tremor Over Time</ins>

It has been previously established that evoked potentials (EPs) resulting from single-pulse stimulation are effective measures for determining structural connectivity between subcortical and cortical regions. Deep brain stimulation (DBS) has been implemented for the treatment of patients with essential tremor (ET) and can target either the ventral intermediate nucleus of the thalamus (VIM) and the posterior subthalamic area (PSA). This study made use of LFP and electromyographic (EMG) data from patients (n=4) with medication-resistant ET that underwent DBS. Data was recorded during stimulation of two targets, both the PSA and the VIM, across multiple visits. Subcortical and cortical signals were simultaneously recorded during stimulation. MATLAB® was used to identify peaks of stimulation artifacts, allowing for alignment of the EPs. EPs from single-pulses over time had varying results. Both within and between patients, analysis of cortical evoked potentials generally revealed decreases in the magnitude of their polarizations and depolarizations over time following stimulation. These results indicate that there may be potential changes to connectivity over time, and a more comprehensive study is needed to determine the exact interaction between DBS and structural connectivity.

Presenter(s): Megan Tirrell
Authors: Megan Tirrell, Joseph Katz, DMD, Nosha Farhadfar, MD
Faculty: Joseph Katz

Oropharyngeal Squamous Cell Carcinoma Following Allogeneic Stem Cell Transplants- Characteristics and Risk Factors- a Pilot Study

Allogeneic hematopoietic stem cell transplants for hematological malignancies are correlated with health concerns including immunosuppression, graft- versus- host- disease (GVHD), and greater susceptibility to secondary malignancies. The present study examines risk factors among patients who underwent allogeneic stem cell transplants and later developed oropharyngeal cancer. This was a retrospective cross- sectional chart review of 285 stem cell recipients treated at UF Health Shands Hospital. Data was collected on presence of GVHD, smoking habits, chemotherapy/TBI regimen, initial hematological diagnosis, age, and gender. Statistical analysis used logistical regression with a significant P value of < 0.05. 285 charts were reviewed with a mean follow- up time of 5 years. 3 patients developed secondary oropharyngeal cancer, resulting in a prevalence rate of 1.053%. Of the non- oral cancer control population, GVHD occurred in 77.1%, and 48.8% were smokers. Within the oral cancer group, 100% were diagnosed with GVHD, and 66.6% were smokers. The results indicate a 100- fold increased prevalence of oropharyngeal cancer in allogeneic stem cell recipients compared to the general population. These findings agree with existing literature, with a recommendation for increased follow- up time and close monitoring of hematopoietic stem cell transplant recipients for secondary malignancies.

Presenter(s): Eric Torres
Authors: Eric Torres, Gerard Sapes, Dylan Clark, Cross Heintzelman, Yanyang Song, Marcio Resende, William M. Hammond
Faculty: William Hammond

Beyond Arid Thermal Limits (BATL) Box: A New Tool to Measure Plant Thermotolerance

Understanding plant thermotolerance is crucial with rising global temperature extremes. Our study compared the standard water-bath method to a dry air application (BATL-box) for measuring plant thermal tolerance and its interaction with drought stress. We grew 80 maize plants of four cultivars, applying four drought stress durations: 0, 2, 4, and 6 days. Thermotolerance was assessed via chlorophyll fluorescence. We found that the conventional water-bath method underestimated thermal tolerance of intact plants under irrigated and mild drought stress conditions (by 32.5% after 0 days, $p<.001$; 49.4% after 2 days, $p<.001$; and 17.0% after 4 days, $p<.01$). However, the two methods did not significantly differ under severe drought stress conditions ($p=.26$). We observed a large increase in transpiration of irrigated maize as temperatures approached 40°C, coinciding with the leaf thermal limits determined using the water-bath method. The water-bath method appears to significantly underestimate thermotolerance in well-watered to mildly droughted maize, and relatively underestimate it under severe drought stress, when plants cannot thermoregulate. On our warming planet, we propose that methods to determine plant thermal limits in dry air will be critical to predicting plant performance during and after increasingly frequent hotter-drought events.

Presenter(s): Noah Towbin
Authors: Noah Towbin, T. Isaac White, Lauren Nieder, Meredith S. Berry, Danielle E. Jake-Schoffman
Faculty: Danielle Jake-Schoffman

Barriers And Facilitators to Exercise for Adults with Opioid Use Disorder: A Qualitative Analysis

Aerobic exercise is a promising supplementary treatment for opioid use disorder (OUD), but little research has been conducted on effective promotion strategies. As a preliminary step, we conducted a 12-week structured walking program for patients with OUD. Post-program interviews were conducted with participants to explore their views on the program and exercise in general (e.g., enjoyment). This project explored perceptions of the benefits, importance, and barriers associated with exercise as participants looked ahead at being active after the program. Eligible participants were 21-64 years old, presented with at least mild OUD or were enrolled in opioid maintenance treatment (OMT), were insufficiently physically active, and had a body mass index between 18.5-40 kg/m2. Interviews were conducted via Zoom and transcribed verbatim. Analysis followed an emerging themes approach. The study is ongoing; participants (n=2) with interview data are included. Participants were 38 years old, non-Latinx White, and in OMT. Initial coding revealed that participants believe physical activity gives them energy, makes them feel healthier, and helps them establish routines. Barriers to exercise reported included family and work commitments, low motivation, and health problems. As exercise in this population is beneficial and resources are limited, future research could improve these programs.

Presenter(s): Natasha Tracy
Authors: Joshua Gertler, Lourdes Dale, Natasha Tracy, Joelle Dorset, Nicola Sambuco, Andrea Guastello, Brandon Allen, Steven Cuffe, Carol Mathews
Faculty: Carol Mathews

<u>Resilient, but for how long? The relationships among temperament, burnout, and mental health in healthcare workers during the Covid-19 pandemic.</u>

Dispositional traits of positive and negative emotionality are strong predictors of mood symptoms following stressful life events, and the COVID-19 pandemic introduced many life stressors, especially for healthcare workers. We longitudinally investigated the relationships among temperament, burnout, COVID concern, and moral injury as predictors of generalized anxiety, depression, and post-traumatic stress symptoms in 435 healthcare workers. Participants were employees in healthcare settings in North Central Florida. Multidimensional Personality Questionnaire subscale scores for stress-reaction and well-being were subjected to K-means cluster analyses that identified two groups of individuals, those with high stress-reaction and low wellbeing and those with the opposite pattern defined as resilient. A repeated measures ANOVA revealed that vulnerable participants reported greater mood symptoms, burnout, covid concern, and moral injury than resilient participants overall, and that there was a significant interaction between group status and time for mood symptom scales such that vulnerable participants' scores decreased over time while resilient participants' scores increased over time. Overall, results suggest that individuals with higher stress-reactions and more negative outlooks on life were at risk for anxiety, depression, and PTSD early in the COVID-19 pandemic, whereas individuals with more resilient temperament traits became more exhausted and thus more symptomatic over time.

Presenter(s): Angela Tran, Halle Kurit, Grace Baker, Alexa Haas
Authors: Angela Tran, Halle Kurit, Grace Baker, Alexa Haas,
Faculty: Susan Nittrouer

Effects of Chronic Otitis Media with Effusion on Spectral Modulation Depth Detection and Language Acquisition

Chronic otitis media with effusion (chronic OME) is a prevalent ailment of early childhood that has been shown to delay normal language development. Despite reports of a decline in the incidence of OME over the past decade, attributed to early medical intervention, OME continues to be a leading cause for medical consultation, antibiotic prescription, and surgery in pediatric patients. We hypothesize that prevalent OME contributes to a delay in the development of mature spectral processing abilities and potential deficits in vocabulary or phonological sensitivity. This ongoing study compares otherwise healthy children ages 5 through 7 with histories of OME to age-matched peers with negative OME histories. The child completes measures of (1) sensitivity to spectral structure in non-speech acoustic signals, using spectrally modulated signals at three modulation rates (0.5 cycles per octave (cpo), 1.0 cpo, and 2.0 cpo). (2) speech articulation. (3) vocabulary knowledge. (4) sensitivity to phonemes at the beginning of words. (5) sensitivity to phonemes at the ends of words. Thus far, results are demonstrating significant effects of OME histories on all measures, particularly elevated spectral modulation depth detection thresholds at lower modulation rate and poorer phonological sensitivity.

Presenter(s): Ethan Trapold
Authors: Ethan Trapold, Karla Saldaña Ochoa
Faculty: Karla Saldaña Ochoa

Deriving Architectural Inspiration from Big Data

It is often said that one of the most defining features of the 21st century so far has been the impact of social media. Trillions of data points exist in the digital realm, all charged with some sort of significance depending on what we are looking for.. The proposition of this paper is to explore how this data can be used as a driver for architectural design, and how other digital tools along with artificial intelligence can work symbiotically with our own design intentions and tendencies. The methodology of this paper reviews and analyzes multiple studies and journal articles that utilize big data, social media, and artificial intelligence to address issues in the realm of architectural and urban design. From these studies we will summarize the findings and synthesize the commonalities in their methods to speculate on how we could aggregate data to derive inspiration for an architectural design. Overall, this paper asserts that the methods for collecting and utilizing data across the field of design and urban planning can be adopted and utilized to collect data for the purpose of informing or inspiring an architectural design.

Presenter(s): Ethan Tucker
Authors: Ethan E. Tucker, Keun Ho Cho, Doosan Shin, Jeongim Kim
Faculty: Jeongim Kim

C-S Lyases Functioning in Glucosinolate Biosynthesis Pathway in Arabidopsis thaliana

Glucosinolates (GSL) are defense compounds found in Brassicales. For GSL biosynthesis, C-S lyase activity is necessary. SUPERROOT1 (SUR1/HLS3/ALF1/RTY1, At2g20610) is the only characterized GSL C-S lyase encoding gene in Arabidopsis.

Disruption of SUR1 leads to severe dwarfism, resulting from the redirection of indole-3-acetaldoxime (IAOx), a precursor of indole GSL, to indole-3-acetic acid (IAA) the potent auxin. As sur1 mutants do not develop any reproductive organs, it has been challenging to evaluate its function in seeds - the GSL-enriched organ. To evaluate SUR1 function in GSL biosynthesis in seeds, we generated sur1 mutants in Arabidopsis IAOx-deficient mutant background. In Arabidopsis, CYP79B2 and CYP79B3 convert tryptophan to IAOx. As the double mutant of CYP79B2 and CYP79B3, cyp79b2 cyp79b3 (b2b3) is IAOx-free, we expected that b2b3sur1 triple mutants would be fertile and suitable to study C-S lyases functioning in GSL biosynthesis. Using the CRISPR system, we generated four distinct triple mutant genotypes to study SUR1 function in Arabidopsis. b2b3sur1 showed abnormal growth and development compared to b2b3, which was indistinguishable from wild type. Metabolite analysis indicated that other C-S lyases play a role in the GSL biosynthesis in Arabidopsis seeds and a crosstalk between the GSL biosynthesis and phenylpropanoid pathway.

Presenter(s): Faith Twinamaani
Authors: Faith Twinamaani, Dylan Kovach, Gerardo Nunez
Faculty: Gerardo Nunez

Examining the Relationship Between Leaf Age, Chlorophyll Fluorescence, and Photosynthetic Function in Blueberry

Photosynthetic function changes dynamically as leaves grow and gain function, and measuring fluorescence can provide key insights into plant photosynthetic machinery. Seasonal changes in photosynthesis are known for wild blueberry, but not the commercial varieties used today. Our objective was to use fluorescence to evaluate how photosynthetic characteristics change as leaves age. We hypothesized photosynthetic function increases as leaves grow from young to mature, then drops off as mature leaves transition into senescence. We collected leaf area, fluorescence, and photosynthesis measurements in 'Emerald' and 'Farthing' southern highbush blueberry (Vaccinium corymbosum). Image scans to capture general leaf color and size were also collected. Measurements were collected across several dates between June 2021 and April 2022 to capture different leaf developmental stages (young leaves, mature leaves, and senescing leaves). Statistical analysis was performed using one-way ANOVA tests. Our results for chlorophyll fluorescence showed senescing leaves still have function as leaves reach the end of their lifespan. Our photosynthesis measurements corroborated this trend. We anticipate these findings to develop a mechanistic understanding of how leaf function changes at different plant developmental stages, and to inform crop management decisions for blueberry growers in the southeast.

Presenter(s): Catherine Tyler
Authors: Catherine Tyler, Sidhu Gurgit, Gary Wang
Faculty: Sidhu Gurgit

Impact of Gavage Preparation on Clostridioides Difficile Infections

Clostridioides difficile is an opportunistic pathogen that commonly affects people who have been treated with antibiotics which compromises the normal gut flora. Clostridioides difficile is one of the most common healthcare-acquired infections and is a frequent cause of mortality and morbidity. The research project I will be conducting will collect quantitative data to find the variation in the bacteria load between a 10% centrifuged suspension gavage and a 1% settled suspension gavage between a variety of human donors. The goal of this project is to determine if important bacteria to protect against Clostridioides difficile infections is pelleted in the centrifugation step of gavage preparation. The overall goal is to understand how variations in the microbiome are related to infectious diseases and how the variations in the microbiome impact patients' resistance to certain infectious diseases.

Presenter(s): Olivia Tyler
Authors: Olivia Tyler
Faculty: Jessica Harland-Jacobs

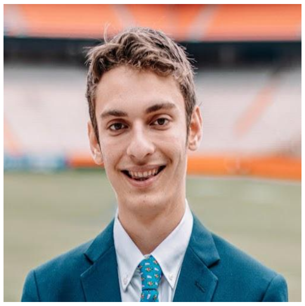
Gender, Power, and Marriage in British Colonial Florida: A Historical Analysis

What did it mean to be a colonist in the British East and West Florida? This question inspired an investigation into the society and inner workings of an often overlooked, and certainly under-researched, area in United States History. Florida's colonial history has a strong emphasis on its status as a Spanish colony and largely ignores its transformative British years. The topic of my research is similarly under-researched yet important: how gender affected the lives of the colonists living in British Florida. Florida was traded from the Spanish to the British after the Seven Years' War in the Treaty of Paris (1763) and was held by the British until 1783. It was a frontier land: scarcely settled by Europeans, with a harsh climate and rough terrain, and home to many native tribes. This created a unique blend of settlers in the Florida colonies and created a social dynamic unlike the colonial stereotype of other British settlements. Due to the recent discovery of two extremely rare primary sources written by women, The Memoir of Mary Port Macklin and a Memoir of an Officers Wife, I attempt to examine the lives of two different families who lived in British East Florida.

Presenter(s): Buse Utkan
Authors: Buse Utkan, Dr. Sharon DiFino, Dr. Charles Ellis
Faculty: Sharon DiFino

<u>The Health Transformation Program's Impact on the Decline in Infant Mortality in Turkey</u>

This project explores the impacts of the recent healthcare reforms implemented in Turkey. It asks the question; how do these reforms relate to the fall in infant mortality and the rise in patient satisfaction? In 2003, Turkey began to create changes to their healthcare services, these major changes were implemented under a plan called the Health Transformation Program (HTP). Before these changes were implemented (in 2003), Turkey's infant mortality rate was 24.697 per 1000 live births and there was a 39.5% satisfaction rate among Turkish citizens with their healthcare services. By 2020, the infant mortality rate had dropped to 8.249 per 1000 live births and their satisfaction with healthcare services had improved to 72.1%. These numbers are impressive and show high effectiveness of the HTP. My poster presents many of the reforms implemented in a timeline and shows their direct link to the fall in infant mortality. My review method consisted of data collection via traditional search engines such as Google and country specific data repositories such as the Turkey Minister of Health's published data files. This research provides a comprehensive view of the successful reforms that are very influential to learn about in the healthcare domain.



Presenter(s): Zachery Utt
Authors: Zachery Utt, Daniel Volya, and Prabhat Mishra
Faculty: Prabhat Mishra

Mitigation of Quantum Measurement Errors with Distribution based Learning

Quantum computing can efficiently solve many hard problems significantly faster than its classical counterpart. Quantum measurement is one of the critical steps in quantum computing that determines the probabilities associated with qubit states after conducting several circuit executions and measurements. As a mesoscopic quantum system, real quantum computers are prone to noise. Therefore, a major challenge in quantum measurement is how to correctly interpret the noisy results of a quantum computer. While there are promising classification based solutions, they either produce incorrect results (misclassify) or require many measurements (expensive). In this paper, we present an efficient technique to estimate a qubit's state through analysis of probability distributions of post-measurement data. Specifically, we estimate the state of a qubit using cumulative distribution functions to compare the measured distribution of a sample with the distributions of basis states 0 and1. Our experimental results demonstrate a drastic reduction (78\%) in single qubit readout error. It also provides significant reduction (12\%) when used to boost multi-qubit discriminator models.

Presenter(s): Victoria Marie Vailoces
Authors: Victoria Marie Vailoces, Mark Segal, MD
Faculty: Mark Segal

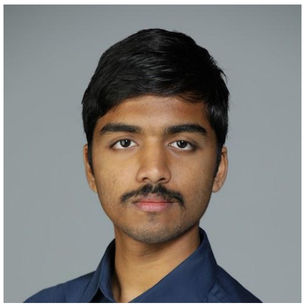
How May Socioeconomic Factors Affect the Adoption of Mobile Health (mHealth) Applications Amongst Cardiovascular Patients?

With the efficiency of obtaining health information, mobile health (mHealth) platforms are becoming popular as they provide efficient and affordable forms of healthcare services. mHealth technologies are becoming especially prevalent in cardiovascular care for their utility in blood pressure control, physical activity monitoring, and arrhythmia screening. A total of 15 patients were recruited from the UF Health cardiology clinic at Springhill. Participation in the study was completely voluntary and subjects could participate by scanning a QR-code on flyers posted around the clinic waiting room that connected individuals to the survey. The survey consisted of 19 questions, gathering information on the sociodemographic background of the subjects, their usage of mHealth, and their attitudes on the integration of mHealth in clinical settings. Results were analyzed through a combination of descriptive statistics, multiple logistic regression tests, and Fisher's exact tests. No significant associations were found between sociodemographic factors and the usage of mHealth in cardiovascular health. Despite inconclusive results from this study, future studies should further investigate the existing attitudes towards mHealth in cardiovascular care in order to address specific concerns that may discourage individuals from using mHealth technologies.

Presenter(s): Chloe Van Horn, Hannah Quintal, Morgan Luff, Joseph Tebou
Authors: Joseph Tebou, Hannah Quintal, Morgan Luff, Chloe Van Horn, Magda Francois, Dominick Lemas
Faculty: Dominick Lemas

The Breastfeeding and EArly Child Health (BEACH) Study

Pediatric obesity affects 1 in 3 children in the US and represents a public health crisis. Accumulating data suggests maternal obesity may seed an "obesogenic" microbiome responsible for transmitting obesity risk from mother to child. Exclusive breastfeeding is associated with protection against pediatric obesity; however, the association between human milk components and the microbiome that account for these observations is poorly characterized. The BEACH study is focused on understanding how bioactive components in human milk contribute to the maternal-infant microbiome and long-term risk of obesity. The over-arching hypothesis of this proposal is that the human milk metabolome will be associated with changes in the early infant microbiome that alter risk for obesity and weight gain in the first year of life. We have recruited 83 mom-baby pairs and all data collection and biological samples (stool and human milk) are available for the project. Specifically, we collected breast milk, stool, urine, diet, and vaginal swab samples to examine this association between the human milk metabolome and child health outcomes. The research is focused on the pathophysiology of infant growth and adiposity during early life and will inform subsequent studies that seek to reduce the risk of pediatric obesity.



Presenter(s): Sreeram Vasudevan
Authors: Sreeram Vasudevan, Neil Sullivan
Faculty: Neil Sullivan

Optimizing Tunnel Diode Susceptibility Measurements

Tunnel diode oscillators can be used to detect small changes in magnetic susceptibility of quantum magnets. These devices are very sensitive and work optimally at cryogenic temperatures. The current interest is in measuring electric field-induced magnet-electric responses. The current-voltage characteristics of the tunnel diode has a negative resistance region which can be used to create a stable radio frequency oscillator. The resonant frequency of the circuit was increased incrementally from an original frequency of 40MHz to a final frequency on the order of 200MHz. Once at this higher frequency, many stability tests were performed at room temperature, as well as at liquid nitrogen temperatures. We observed a noise of about 5ppm at 200MHz. Tests with possible cavity resonators were also tested, although with unsuccessful results. We were able to successfully push the tunnel diode to higher frequencies without losing much precision. Furthermore, since a sample will eventually be placed within the inductor coil, different inductor geometries are being tested to improve the filling factor of the magnetic field to the coil itself.

Presenter(s): Thabasya Veeramani
Authors: Thabasya Veeramani, Sylvain Doré
Faculty: Sylvain Doré

Therapeutic Potential of Iron Chelators Mitigating Oxidative Stress and Iron Homeostasis Dysregulation Following Ischemic Stroke

Ischemic stroke occurs when a cerebral vessel blockage causes limited blood and oxygen flow throughout the brain. Strokes are one of the leading causes of death and disability, yet there are limited treatment options for this condition. A major cause of damage associated with ischemic stroke is oxidative damage due to supraphysiological levels of iron in the brain. Iron chelators are being investigated as putative treatment for ischemic stroke due to their ability to bind excess iron and prevent it from participating in harmful mechanisms, particularly ferroptosis. Additionally, iron chelators have shown evidence of increasing activation of the hypoxia-inducible factor 1α pathway, which can help repair damage caused by ischemic stroke. The data derived from the pre-clinical and clinical trials does indicate that iron chelators, such as deferoxamine, can improve anatomical and functional outcomes after ischemic stroke; however, due to small sample sizes, variations in method of administration, and a relatively low number of trials, this data is not fully reliable. More clinical and preclinical trials need to be conducted to understand the full effects and viability of iron chelator treatment in ischemic stroke patients.

Presenter(s): Dawson Veghte, Shreya Mathur
Authors: Dawson Veghte, Shreya Mathur, Travis Koenig, Kevin Avaiya
Faculty: Cole Dooley

<u>Pediatric Single-Location MRI: Immersive Therapeutic Play Preparation Using an Interactive Model MRI Scanner as a Low-Cost Replacement for Sedation</u>

We attempt to understand the benefit of immersive therapeutic play preparation using an interactive model MRI scanner as a low-cost replacement for sedation or anesthesia to improve quality of care in pediatric single-location MRI. Specifically, we aim to better understand the benefits of Certified Child Life Specialist (CCLS) facilitated therapeutic play preparation involving an interactive model MRI scanner, with and without the effects of an immersive, themed environment to the MRI suite via an undersea-themed paint skin to the walls and scanner. Our approach centers around combining established preparation methods, such as preparatory books and an interactive model MRI scanner, with a newer, immersive approach within the imaging department at Shands. We hypothesize that patients who undergo this preparation strategy will be able to undergo MRI without sedation or anesthesia and yield clinically-viable scans at a success rate of > 90%. Our ultimate goal is to use these methods to reduce anxiety and anesthesia/sedation rates in children undergoing a single-location MRI at UF Health Shands Children's Hospital to improve quality of care and patient safety outcomes.

Presenter(s): Sophia Vellozzi
Authors: Sophia Vellozzi, Fenqi Wang, Ratree Wayland, Kevin Tang
Faculty: Kevin Ratree, Tang Wayland

<u>Comparing Degree of Lenition in Parkinson's Disease (PD) Patients Versus Healthy Control Subjects</u>

Speech can be used as a non-invasive biomarker to capture fine changes in speech articulation patterns associated with linguistic phenomena in normal populations and individuals diagnosed with neuromotor disorders, such as Parkinson's Disease (PD). One common linguistic process known as lenition describes the weakening of consonant articulation when uttered in a particular context (e.g., between two vowels in Spanish). PD patients also exhibit reduced precision in consonant production consistent with lenition. This study uses a deep learning, bi-directional recurrent neural network model known as Phonet to measure and compare the degree of lenition among PD patients and healthy control subjects who are native speakers of Spanish. It also explores if lenition degree varies as a function of place of articulation of the consonants, syllable stress, and surrounding vowel height. Understanding the relative reliability of these biomarkers will contribute to the development of speech as biomarkers for clinical diagnoses of Parkinsonism and other neurodegenerative disorders, including Amyotrophic Lateral Sclerosis (ALS) and Alzheimer's disease.

Presenter(s): Karen Villancio-Wolter
Authors: Karen Villancio-Wolter, Rachel Hybart, Daniel P. Ferris
Faculty: Daniel Ferris

Evaluating Statistical Correlations between Physiological Markers and Metabolic Energy Expenditure in Powered Ankle Exoskeleton Trials

Steady-state energy expenditure is an important physiological indicator used to quantify the effectiveness of assistive exoskeletons. However, collecting metabolic data requires bulky equipment and indirect measurements like breath-by-breath gas exchange. In this study, we investigated the correlations between various physiological markers (heart rate, electromyography (EMG), minute ventilation) and metabolic energy cost during powered ankle exoskeleton trials to determine whether these are accurate predictors of energy expenditure. We collected data from 8 participants during a standing trial followed by 3 indoor treadmill walking conditions: no exoskeleton, unpowered exoskeleton, and powered exoskeleton. We measured data with various wearable sensors and a portable metabolic system. Afterwards, we performed time-series analyses to compare each physiological marker against the calculated energy cost. We concatenated the 3 walking conditions to measure the Pearson's correlation coefficients for the duration of the collection. Our preliminary findings show no significant correlations ($r < 0.7$) between metabolic energy expenditure and heart rate or muscle EMG (Soleus and Tibialis anterior) during the indoor exoskeleton trials.

Presenter(s): Harry Villanueva
Authors: Harry Villanueva, Sylvain Doré
Faculty: Sylvain Doré

Potential Implications of the Mutant Heme Oxygenase 1 Gene in Sickle Cell Disease Pathology

Sickle cell disease (SCD) is a remarkably common monogenic disorder affecting millions of people world-wide. SCD causes production of sickle-shaped erythrocytes from mutant hemoglobin polymerization. This mechanism consequently manifests complex symptoms that may lead to severe organ damage, pain crises, and premature death. Vaso-occlusive pain crises are distinctively associated with SCD and are the result of interactions between sickle red blood cells and the vascular endothelium, promoting inflammation. SCD also propagates increased hemolysis which upregulates inflammation by releasing free heme into the vasculature which then binds to toll-like receptor 4. HO-1 is an inducible, rate limiting enzyme involved in the heme catabolic pathway, distinguished from its constitutive isoform, HO-2. HO-1 reduces the inflammatory response of vascular cells by breaking down free heme into antioxidant bile pigments. The following scoping review associates the genetic variations of HO-1 to the pathology of SCD. Current data suggests that the (GT)n length polymorphism of the HO-1 gene may directly influence the severity of SCD symptoms, with the genotype for long length promoter region decreasing the inducibility of the enzyme. Moving forward, we propose the investigation of gene therapy treatment options involving potential removal of excess HO-1 promoter region nucleotides.

Presenter(s): Anjali Visvalingam
Authors: Anjali Visvalingam
Faculty: Dr. Joesph Larkin Lauren Stafford

SBT-100 Administration in Rabbit Eyes

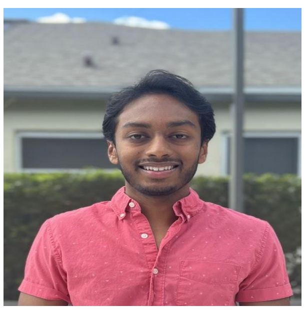
Uveitis is an autoimmune disease that occurs in the middle layer of the eyeball, known as the uvea. The ophthalmic condition results in intraocular inflammation of the eye, which causes pain, blurred vision, and, in more severe cases, permanent vision loss. Based on previous experimentation, the protein STAT3 was recorded to increase the regulation of innate and adaptive immunity. In collaboration with Singh Biotechnology, this study will administer an anti-signal transducer that activates 3 (STAT3), known as SBT-100, to evaluate its effect on ocular ultrastructure. The aim of this study focused on conducting introductory evaluations of the ocular localization of SBT-100 through topical and intravitreal administration in rabbits. Three rabbits were provided with a topical application of the drug twice a day for fourteen days, while another three rabbits received a single intravitreal injection of the drug. After the fourteen-day period, the rabbits were euthanized and received enucleations. Using the tissues and ocular fluids collected, immunofluorescent showed detection of SBT-100. The study is still in progress and is currently observing the detection of SBT-100 in the vitreous and aqueous regions of the rabbit eyes.

Presenter(s): Elizabeth Vo
Authors: J. N. Thomas , E. Vo, T. H. Mareci
Faculty: Thomas Mareci

Study of Glucose Metabolism In Vivo with Deuterium Magnetic Resonance

Glucose and creatine play key roles in physiological function of the body, so knowledge gained from analyzing metabolism in the brain will be translatable to other body areas. Deuterium (2H) have low natural abundance, but 2H magnetic resonance (MR) imaging and spectroscopy can provide a unique method of detecting downstream metabolism of substrates enriched with 2H (e.g., [2H7]-glucose). Brain metabolism can be studied in vivo using 2H MR by measuring metabolites of injected deuterated glucose and creatine and 2H MR imaging and spectroscopy has future clinical diagnostic potential. However, the application of 2H MR is limited by low detection sensitivity.

To overcome this limitation, we designed a coil system which includes receive-only (Rx-only) cryo-cooled 2H surface coils with high sensitivity to detection. First, we constructed an in-magnet system for study subject support and alignment of MR coils. Then we constructed a series of room temperature Rx-only 2H surface coils to quantify sensitivity gains provided by cryo-cooled 2H Rx-only coils. In total, five Rx-only 2H coils were developed. Cryo-cooled 2H Rx-only coil bench tests demonstrated a 300% gain in sensitivity. Final sensitivity analysis will be performed on the completed system using in-house MR imaging and spectroscopy software.



Presenter(s): Anirudh Vustepalli
Authors: Anirudh Vustepalli, Eric Nelson, Emilee Cato, Emma Freeman, Md Abu Sayeed
Faculty: Eric Nelson

Development and evaluation of a qPCR method to detect common virulent bacteriophages in cholera patients.

Multiple virulent vibriophages, known as ICP1, ICP2, and ICP3, specifically target Vibrio cholerae. The objective of this study was to develop a quantitative method to detect vibriophages and evaluate the relationship between vibriophages and V. cholerae collected from cholera patients. Total nucleic acid (tNA) was extracted from stool samples collected from cholera patients (n=2574) admitted to hospitals in Bangladesh. Quantitative polymerase chain reaction (qPCR) was utilized to determine the copy number per rxn volume of ICP1 (gp58.2), ICP2 (gp24), ICP3 (gp5), and V. cholerae (tcpA). To validate the qPCR assays, the positivity rates by qPCR (cT<29) were compared to positivity rates for the gold-standard diagnostic of culture (Cx). A total of 2574 samples were extracted and analyzed by qPCR. A total of 8.9% were qPCR+/Cx+, 2.1% were qPCR-/Cx+, 22.8% were qPCR+/Cx-, and 74.4% were qPCR-/Cx. Regarding the impact of phage on V. detection, 198 samples had V. Cholerae+/ICP1+, 79 samples had V. Cholerae-/ICP1+, 8 samples had V.

Cholerae+/ICP2+, 9 samples had V. Cholerae-/ICP2+, 107 samples had V. Cholerae+/ICP3+, 171had V. Cholerae-/ICP3+. There is a similar amount of V. cholerae+/phage+ and V. cholerae-/phage+ samples for all vibriophages. These detection levels suggest the existance of a relationship between vibriophage and V. cholerae.

Presenter(s): Preston Wagner, Anika Heuberger, Allison Comite, Elisabeth Martin Castosa, Dominic Hall, Stephanie Barsoum, Douglas Nabert
Authors: Preston Wagner, Anika Heuberger, Allison Comite, Elisabeth Martin Castosa, Dominic Hall, Stephanie Barsoum, Douglas Nabert, Nicole Chambers, Michael Millett, and Mark Moehle
Faculty: Mark Moehle

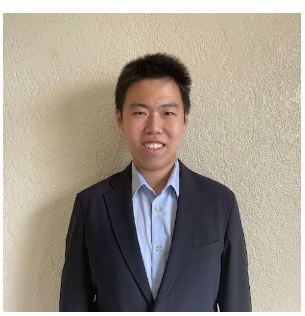
Cognitive and Motor Deficits in a Mouse Model of Parkinson's disease

Parkinson's disease (PD) is a neurodegenerative disorder associated with motor deficits such as bradykinesia akinesia, and tremor and non-motor symptoms such as cognitive disturbances. While the mechanisms behind these motor and non-motor symptoms are complex, and not fully elucidated, they correlate to the aggregation of alpha-synuclein into insoluble aggregates. These inclusions form when alpha-synuclein misfolds becomes hyperphosphorylated, ubiquitinated, and insoluble, eventually forming into Lewy bodies and Lewy neurites. Beyond cell death, the physiological consequences of aggregation of alpha-synuclein are poorly understood.. Using the pre-formed fibril model of alpha-synuclienopathies, we injected pre-formed fibrils or monomeric alpha synuclein into the striatum to cause widespread Parkinson's disease like pathology.. We observed a short-term working memory deficit in a short latency 2-trial Y-maze task. We also observed that mice with the preformed fibrils were less anxious than monomer mice in several assays including the light-dark box, elevated plus maze, and marble burying. Furthermore we ran these mice through the Erasmus ladder at 3 months of age and observed motor deficits. Postmortem analysis revealed that the mice injected with preformed fibrils formed Lewy bodies in regions associated with these behavioral deficits. We used expansion microscopy to image these Lewy bodies and surprisingly, we found that Lewy bodies go through the nucleus of affected cells and that they form specific shapes. Overall our investigation supports the idea that Lewy bodies are linked to cognitive impairment and motor impairment, and suggest Lewy bodies interacting with the nucleus of cells may provide a novel mechanism by which neuronal death and deficits occur in Parkinson's Disease.

Presenter(s): Johanna Walker
Authors: Johanna Walker, Basil Iannone
Faculty: Basil Iannone

Estimating nitrogen and phosphorus loads in stormwater ponds from nutrient-rich grass-clippings

Urbanization increases impervious surfaces, inhibiting water infiltration and exacerbating stormwater runoff. Stormwater runoff carries harmful pollutants that infiltrate surrounding waterbodies, posing an extreme environmental threat. Pollutants of concern include nitrogen (N) and phosphorus (P) that are essential nutrients for life, but an overabundance in waterbodies leads to devastating algal blooms. A key mitigation strategy is implementation of stormwater ponds, which are engineered water basins that reduce flooding and filter pollutants. Conventional stormwater ponds consist of a permanent pool of water with frequently mowed turfgrass planted along the perimeter. While these ponds may be aesthetically pleasing, they can exacerbate nutrient pollution when nutrient-rich grass-clippings reach the water. The objectives of this study are to (1) estimate the magnitude of nutrients that grass-clippings add to pond water and (2) compare the range of N and P values from grass clippings to other sources of nutrient pollution identified in the literature. We collected grass-clippings after mowing events from a sample of stormwater ponds around Gainesville and analyzed them to determine the quantity of N and P. With this information, we extrapolated the magnitude of N and P loads from grass-clippings in stormwater ponds annually and compared this to other nutrient sources.



Presenter(s): Heyang Wang
Authors: Miao Huang, Heyang Wang, Wenzhe Zhu, Danial Parra, Quang Vo
Faculty: Xin Tang

How Differing Matrix Mechanics Affects YAP Intensity in Drug-Resistant Non-Small Cell Lung Cancer Cells

Yes-associated protein (YAP) is a protein that regulates cell division and the cell cycle. This is especially important in regulating the proliferation and drug-resistance of cancer cells, specifically non-small cell lung cancer. PC9 cell lines are not typically mechanosensitive to mechanical stimuli, as indicated by a homogeneous distribution of YAP in the nucleus and cytoplasm. However, drug-resistant PC9 cells are proven mechanosensitive in this project. We observe the different expression of YAP in the nucleus versus the cytoplasm of drug-resistant cells, the YAP N/C ratio, across various types of substrate stiffnesses. In drug-resistant PC9 cells, the YAP N/C ratio is higher on stiffer substrates than that on softer substrates. YAP and its mechanosensitive characteristic have great potential in the regulation of cancer's drug-resistance. Thus, results in this project can provide a solid foundation for YAP's regulating effects in the future.

Presenter(s): Eloise Wein, Liza Thomas
Authors: Eloise Wein, Liza Thomas, Shruti Kolli, Frederick Kates, Rachel Liu-Galvin
Faculty: Frederick Kates

Revolutionizing Reproduction: How AI is Paving the Way for IVF

Infertility, defined as the inability to become pregnant after 12 months of unprotected intercourse, affects many women worldwide. Currently, the IVF success rate is around 30% and has not increased in nearly a decade. Our research investigates how artificial intelligence (AI) can improve the chances of improving in-vitro fertilization (IVF) for those seeking to have a baby. We will discuss two mechanisms in which AI can improve IVF success: displaying embryo stages through heat maps and performing preimplantation genetic testing (PGT). Heat maps display the embryos in their developmental stage to rank them based on an algorithm for selection. PGT will ensure that the embryo has the correct number of chromosomes to reduce the chances of miscarriage. Lastly, AI will consider individual patients' characteristics and determine the best course of treatment for them. Implementing AI in IVF clinics would benefit not only those seeking treatment but their partners and those around them as well by reducing the time span of pregnancy as well as lowering the cost for the patient.

Presenter(s): Danielle Weisenfeld
Authors: Danielle Weisenfeld
Faculty: Denise Simmons

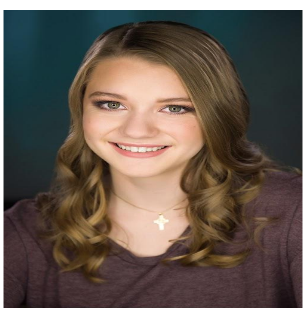
The 'Hard Hat' Journey: An Autoethnographic Account of a Black Woman Civil Engineering Intern

Though literature has begun to exhibit the numerous benefits Black women can offer to the engineering workforce, they still remain highly underrepresented in fields such as civil engineering. This research explores the career path and formative experiences of a Black woman's time in her civil engineering internship. Current literature demonstrates that internships provide benefits for students to persist in engineering. While these benefits are well documented, recent studies have shown how engineering workplace culture can marginalize and isolate interns of underrepresented backgrounds. This study focuses on supports and barriers of one student's internship experience that influenced her career decision making in the civil engineering field. Analysis of the data used autoethnographic journaling and peer debriefing among members of the lab. Findings indicate that support for Danielle's career path was centered around interpersonal relationships and positive aspects of workplace culture. Barriers to career decision making included lack of representation in the office, dealing with COVID, and negative aspects of the workplace culture. Overall, this research serves to illuminate Danielle's experience in efforts to transform the work environment, and promote recruitment and retention of more Black women in these spaces.

Presenter(s): Brendan Wernisch
Authors: Brendan Wernisch, Mohammed Al Otmi, Janani Sampath
Faculty: Janani Sampath

Investigating Void Evolution and Mechanical Stability in Amorphous Polymer Membranes Undergoing Deformation at Different Temperatures

Glassy polymers are a promising separation membrane material, due to their excellent transport properties and low fabrication costs. The separation performance of a membrane is quantified by its permeability, which defines its selectivity and diffusivity. These characteristics are strongly influenced by the morphology and distribution of void spaces, called free volume elements (FVEs), in the polymer matrix. In industrial membrane separation applications, membranes are routinely subjected to extreme temperatures and pressures, which can compromise membrane performance through deformation. With open-source computational techniques, this study considers three membranes (polystyrene, polymethylpentene, and HAB-6FDA thermally rearranged polymer), which represent a breadth of chemistries, microporosities, and rigidities. These membranes are subjected to non-equilibrium uniaxial deformation at three temperatures (100K, 300K, and 500K), providing insights into the temperature effect on both FVE evolution and a membrane's mechanical stability under deformation. FVE analysis is accomplished qualitatively through snapshots as well as quantitatively with plots of evolving void diameters through the deformations. Our findings show that rigid structures demonstrate reduced sensitivity to changes in FVE morphology when deformed, including at high temperatures. The findings of this study can guide the rational design of high-performance, mechanically robust polymer membranes for improved separation applications.



Presenter(s): Kendra Westmoreland
Authors: Kendra Westmoreland. Ashley Krause, Erin Westgate
Faculty: Erin Westgate

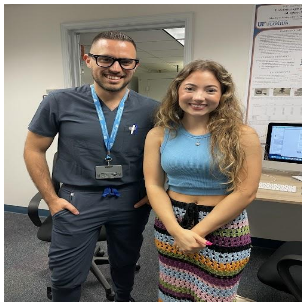
Does the Upkeep of a Daily Routine Affect Well-being?

Previous research has shown that a routine schedule has a direct impact on their perception of the meaning within their life (Heintzelman & King, 2018). Our goal is to examine how perceptions of meaning in life and psychological richness are altered when daily activities no longer follow a structured routine. This study will investigate whether the changing of daily routines influences meaning and psychological richness. Participants will be asked to describe what they do on a typical day(that is, "what do you do on a normal Tuesday?"). During the following week, half of the participants in the study will be reminded to scramble their routine (e.g., go to class a different way). While the other half of the participants will be asked to complete their routine as normal. Participants will complete pre and post measures regarding the three dimensions of meaning, meaning in life, and psychological richness. We hypothesize that participants who have their routines scrambled will have increased psychological richness and decreased meaning due to previous findings of the effects of coherence on external stimuli.

Presenter(s): Mary Mason White
Authors: Mary Mason White, Edward Braun
Faculty: Edward Braun

Models of Transmembrane Protein Evolution

Selective pressures on amino acids located in different parts of protein structures are expected to differ. With transmembrane proteins, we expect the amino acids located in the transmembrane helices to be dominated by hydrophobic amino acids whereas those amino acids located outside of the membrane will be dominated by polar amino acids. One way to examine the selective pressures on proteins is to fit models of sequence evolution to homologous proteins from different species. These models should be able to predict patterns evident in observed protein sequences. Many studies have examined protein evolution by applying a single model of sequence evolution to a set of aligned proteins, but this results in model misspecification and yields inaccurate estimates of other parameters. To address this question, we obtained aligned transmembrane proteins and categorized amino acid sites (as transmembrane sites or sites inside or outside of the membrane-bound surface). We used the IQ-TREE program to estimate models for each group and compared amino acid exchange values for each set. These models indicated that transmembrane and extra-membrane sites have different amino acid compositions, however we were unable to find significant differences between amino acids found inside a cell membrane and outside of the membrane.



Presenter(s): Olivia White
Authors: Olivia White, Matthew Masapollo, Linda Polka, and Lucie Menard
Faculty: Matthew Masapollo

<u>On the relation between articulator positions and formants during speech production</u>

A fundamental issue in the field of speech production is to explicate the intricate way in which the acoustic signal of speech is structured by articulatory movements of the vocal tract. The present study focuses on vowel gestures and examines the relationship between articulator positions and the formant frequencies of the vocal tract, using state-of-the-art electromagnetic articulography (EMA). EMA recordings of the lips, tongue, and jaw were captured for 20 speakers of Canadian French (sampled at 250 Hz) while producing the ten French oral vowels (/i y u e ø o œ ɔ a/). We quantified how lingual constriction location and degree and lip rounding (i.e., lip compression and protrusion) structure formant parameters (measured at acoustic midpoints of the vowels). With these measurements, we discuss how changes in articulator position alter the resulting acoustics, which offer key insights into the speech production mechanism.

Presenter(s): Jarrod Williams
Authors: Paige Talhelm, Jarrod Williams, Iser DeLeon
Faculty: Paige Talhelm , Iser DeLeon

<u>A Translational Evaluation on the Effects of Multiple-Context Training on Renewal</u>

Renewal is reemergence of a previously extinguished response following a change in context from the context in which the response contacted extinction (Bouton, Winterbauer, & Todd, 2012). Some researchers have attempted to evaluate potential interventions that may help mitigate renewal. One solution might be to evaluate the effects of renewal by incorporating multiple implementers across different settings before implementing treatment in contexts in which the target behavior was initially reinforced (Kimball et al., 2023). The current study evaluated single vs. multiple context training with individuals with disabilities to determine the extent to which multiple context training will mitigate renewal in a translational arrangement.

Presenter(s): John Williams, Co-
Authors: John Williams, Dr. Andrea Lucky, Dr. Jason Williams
Faculty: Andrea Lucky

Taxonomic Revisions of the Nylanderia austroccidua Species Complex

The ant genus Nylanderia (Emery) includes 125 described species and likely hundreds more undescribed. Nylanderia taxonomy is difficult because morphological differences between species are often subtle . This has led to problems where invasive Nylanderia species have been difficult to distinguish from native species and from each other . The goal of this project is to document biodiversity in this genus by revising the taxonomy of a Central American clade known as the Nylanderia austroccidua (Trager) species complex. Nylanderia austroccidua is currently described as a single species. However, this species is morphologically variable and has a vast geographic range spanning from Utah to Panama, indicating this taxon includes multiple undescribed species. In total, we anticipate at least three new species, which we will describe. 240 specimens from this complex will be imaged and qualitative and quantitative morphological data will be collected from them, including 24 standardized measurements. The morphological data will be used to delimit species boundaries, maps of the native range for each species will be provided, and a dichotomous key to the species complex will be constructed.

Presenter(s): Elyse Winne
Authors: Elyse Winne, Madalen Robert, Cătălin Voiniciuc
Faculty: Cătălin Voiniciuc

Uncovering the Functions of CSL Protein Variants in Hemicellulose Biosynthesis

Hemicelluloses are one of the main structural polysaccharides of the plant cell wall and make up approximately one-third of the total cell wall biomass. Despite this, the genes and processes involved in its formation are not well understood. My research focuses on Cellulose Synthase-Like (CSL) genes, which encode putative glycosyltransferases involved in the elongation of multiple hemicelluloses, although the functions of most members are still unclear.

To explore the functions of CSL genes, native and mutated forms of the enzymes were expressed in Pichia pastoris, a yeast species that can be genetically engineered to produce plant-like polysaccharides. By growing these bioengineered yeast strains, analyzing the recombinant proteins and performing carbohydrate analysis I aim to identify amino acid changes that influence hemicellulose production. My synthetic biology approach involves the utilization of engineered carbohydrate-binding fluorescent proteins as non-invasive reporters for certain polysaccharides. This fluorescence-based screen is currently applied to screen a large CSLA mutation library to identify novel glucomannan synthase enzyme variants. My results could have promising implications in multiple industries including pharmaceuticals, food, cosmetics and even biofuels.

Presenter(s): Chase Wrenn
Authors: Chase Wrenn, Pedro Huillermo Feijoo-Garcia, Jacob Stuart, Dr. Benjamin Lok
Faculty: Pedro Feijoo-Garcia

Scaling Academic Mentorship for Undergraduate Computer Science Students: A Framework for Intelligent Virtual Agent Support

This work uses virtual humans to address the absence of scalable academic mentorship for undergraduate computer science students. Mentoring is an effective way to improve the academic performance, reduce drop-out rates, and increase satisfaction of undergraduate students. While some mentoring resources exist, often as mentorship programs, many barriers exist in higher education that reduce the accessibility and implementation of these mentorship programs. We propose the use of intelligent virtual agents (i.e., virtual humans) as an alternative for accessible mentorship, as they have been shown to be effective in educational contexts and for mental health support. Currently, frameworks for determining the content of virtual humans based on students' mentorship needs have not been widely explored. To address this issue, we developed a framework that uses feedback loops and machine learning tools to enable rapid and relevant content generation based on weekly student feedback surveyed in the Fall of 2022. We propose this framework can act as a blueprint for other academic institutions to provide learner-centered mentorship content, leading to more confident and better prepared students in the future.

Presenter(s): Dahlia Wrubluski
Authors: Dahlia Wrubluski, Sushain Kaul, Dr. Kyle Allen, Dr. Shahab Vahdat
Faculty: Kyle Allen

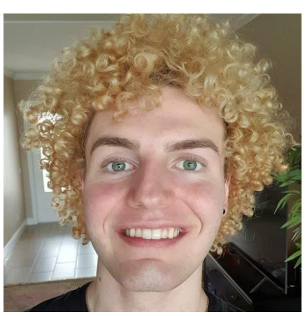
<u>Kinematic and Dynamic Analysis of Longitudinal Gait Deficits in Rodent MCAo Model</u>

Stroke is the third most common cause of disability worldwide, and the proportion of young people suffering from stroke continues to rise. Cerebral infarctions cause chronic gait asymmetry and decreases in gait speed. These deficits increase fall risk and are indicators of poor cognitive and musculoskeletal health. It is essential to understand these gait changes in preclinical models so therapeutic strategies can be developed. This project analyzes longitudinal changes in spatiotemporal and dynamic gait variables in mice using the middle cerebral artery occlusion (MCAo) model of ischemic stroke. Baseline gait data was collected on mice (n=15) using the GAITOR suite, an open gait arena with force plates and a high-speed camera that records lateral and ventral views of the rodents. Mice either received a transient surgical occlusion (tMCAo) for 45 minutes (ntMCAo=12) or remained naive (nnaive=3). Gait data was collected on the rodents at days 3, 14, 21, and 28. After day 28, the animals were euthanized via perfusion and their brains dissected. Histology and staining with cresyl violet were performed on the samples followed by volumetric analysis. This project is still in the data processing stage, and as of this submission no data has been statistically analyzed.

Presenter(s): Amy Wu
Authors: Amy Wu, Audrey DeHoog, Jeremiah Blanchard
Faculty: Jeremiah Blanchard

Analysis on Fundamental Programming Classes for Non-STEM Computing Majors

Rising demand of non-STEM majors to gain a fundamental computing background supported the growing need for more academic resources and studies. Therefore, we aim to find how non-STEM computing majors study programming fundamental classes by looking at the fundamental programming courses of the top largest 50 universities. Based on statistics from NCES, we excluded community colleges and private universities due to lack of population representation and limited curriculum access. Furthermore, we selected classes according to a keyword search on programming languages. From the sample size, researchers collect survey responses from the instructors of beginning programming classes based on their programming languages, collaboration methods, and departmental affiliations. Our results emphasize that many of the beginning programming classes came from a STEM background; others mainly came from Natural or Informational Sciences. Moreover, undergraduates in majority of fundamental coding courses learned Python, C, C#, MatLab, Python, Java, R, SQL, PHP, or JavaScript. Their assignments either had collaboration or none. In future works, we will send out another survey to understand how collaboration influences non-STEM majors with their beginning programming classes as a follow-up study. Based on what we learned, we aim to gather real-time feedback in a controlled environment as well.



Presenter(s): Nathaniel Wydra
Authors: Nathaniel Wydra, Shimei Nelapati, Joy Gabrielli
Faculty: Joy Gabrielli

Development of TECH Parenting: A Web-Based Intervention to Prevent Youth Substance Use

As technology and media saturate the lives of youth, parents must continuously evaluate how they manage children's media consumption and exposure. Effective home media management by parents is critical given mounting evidence that pre-teen and adolescent media exposure to health risk behaviors (e.g., substance use) is associated with an increased likelihood of engagement in similar health risk behaviors. TECH Parenting is a collaborative home media management framework that emphasizes: Talking to children about media use, Educating children about media-related risks, actively Co-viewing/Co-using media with children, and establishing clear House rules regarding media use. To promote adoption of this evidence-informed framework by parents, we developed an initial build of the TECH Parenting website that supports parents in application of its behavioral and communication strategies with interactive activities and homework tasks. We also conducted three focus groups to elicit quantitative and qualitative feedback about the TECH Parenting website from parents of 10 to 14-year-olds. Focus group prompts elicited parent perceptions of website usability, design, program structure, content usefulness, etc. This presentation will describe the TECH Parenting framework and associated evidence base, provide examples of activities across modules, and provide preliminary focus group feedback.

Presenter(s): Chloe Wykle
Authors: Chloe Wykle, Xzaviar Solone, Finn Rimay, Xin Zhou, Mu Yu, Dietmar Siemann, Juan Guan, Frederic Kaye, Robert Mckenna, Lizi Wu
Faculty: Lizi Wu

<u>Role of SIK2 in Regulating TNFα-Induced Cytotoxicity in Lung Cancer</u>

Lung cancer is the deadliest cancer with limited treatment options. Salt-inducible kinases (SIK1,2,3) regulate metabolism and tumorigenesis. While SIK1/SIK3 are known to suppress lung cancer onset and progression in mouse models, the role of SIK2 in lung cancer remains unclear. This study aimed to investigate the significance of SIK2 in lung cancer. We observed high SIK2 expression was associated with better overall survival in a cohort of lung adenocarcinoma (LUAD) patients. Additionally, a panel of lung cancer cell lines expressed high levels of SIK2, suggesting a potential role of SIK2 in lung cancer. Further analysis revealed a positive correlation between expression of SIK2 and the NF- kB subunits RELA and NFKB1 in LUAD. As NF- kB reduces TNFa cytotoxicity through activation of pro-survival genes, we hypothesized that SIK2 is functionally linked with NF-kB signaling, and inhibiting SIK2 could influence cytotoxic TNFa responses. Our results showed that lung cancer cells with genetic knockout (KO) of SIK2, or treated with the SIK2 inhibitor ARN-3236, increased cell death in response to TNFa compared to control cells. These preliminary findings suggest a role of SIK2 in TNFa -induced cell death. In future studies, we plan to test SIK2 inhibitors in vivo for therapeutic response to TNFa.

Presenter(s): Kiara Xhindi
Authors: Kiara Xhindi, Juan Claudio Nino, Marcelo Febo
Faculty: Juan Claudio Nino

A Comparative Study of Graph Theory Community Clustering and Functional Connectivity Clustering for Brain Parcellation.

The identification and characterization of modules in functional brain networks can be approached through two methodologies: community-finding algorithms and parcellation from fMRI analysis. Both methodologies seek to uncover the organization of the brain, yet they differ in their utilization of methods and models. Community algorithms are founded on graph theory principles and aim to identify clusters of highly interconnected brain regions within a graph. The quality of the partition is evaluated using mathematical measures such as modularity, and the optimal number of communities is determined. Parcellation from fMRI analysis, on the other hand, employs statistical methods to identify brain regions exhibiting similar patterns of activation in response to a specific task. This approach often involves clustering or partitioning the brain into regions based on functional connectivity, with the ultimate goal of defining biologically meaningful regions. Both parcellation and algorithms can reveal the functional organization of the brain, providing insight into how distinct brain areas work together to perform different tasks. This analysis will concentrate on comparing the results obtained from brain network partitioning through algorithms such as Louvain and Spectral Community Detection with those derived from the original parcellation methodology of the data (Yeo et al.).

Presenter(s): Jennifer Yanes
Authors: Kyle A. Riding, Jennifer Yanes
Faculty: Kyle Riding

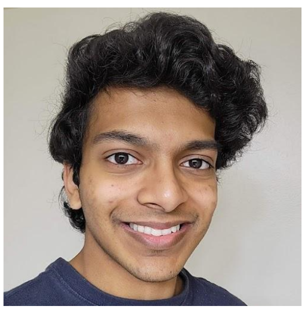
Development of a Test to Measure Concrete Permeability Admixture Effectiveness

The University of Florida has been conducting research regarding the permeability of admixtures in concrete. These chemicals are touted to reduce water and accompanying harmful ions into concrete, however no test method is accepted to determine its performance. This work focuses on measuring the transport of chlorides through concrete in field samples and in laboratory test methods to determine which ones will perform best. We are narrowing the admixtures being tested to hydrophobic pore blockers and crystalline products. As of now, this research is still ongoing and samples are being made and tested. Field samples have been at Seahorse Key in the marine environment since 2019. These samples will continue to be tested and data will be collected when they reach the right conditions. We hope to see new and old tests bringing forth new information to the concrete industry. This would greatly help the selection process of admixtures and see how it affects the permeability of concrete.

Presenter(s): Jenna Yungmann
Authors: Jenna Annalise Yungmann, Shifeng Wang, Roy Curtis III
Faculty: Shifeng Wang

O-Antigen Mutations Affect the Tumor Targeting Ability of Salmonella

As a gram-negative bacterium, Salmonella has been proven to be an effective immunotherapy agent that induces tumor regression against cancers through multiple mechanisms in mice. However, clinical trials showed that the targeting efficiency of the live bacterium needs to be increased. A strain that displays an OmpA fused with PLZ4 peptide on the surface of Salmonella was developed to increase the targeting ability of bladder cancer cells. This research focuses on further surface modification and mutations to potentially increase Salmonella tumor targeting via tissue culture cell assay and compares the ompA3Ωplz4 strain with various core and O-antigen mutations to test for increased efficiency. The mutations introduced into the Salmonella ompA3Ωplz4 strain included ΔwaaL, ΔwaaC, and ΔwaaG and were compared to the parent strain. The attachment to and invasion of human carcinoma urinary bladder cells (5637), mouse bladder tumor cells with different genetic complexities (BBN963), and urothelial carcinoma bladder fibroblast cells (MB49) in culture were also observed to further determine the tumor targeting efficiency. As a result, some mutations and surface modifications resulted in a more significant effect on cell attachment and invasion than others and an increase in tumor targeting efficiency was seen. Future animal studies will be performed to further this research.



Presenter(s): Alen Zacharia
Authors: Michael Chung, Alen Zacharia, Juan Guan
Faculty: Juan Guan

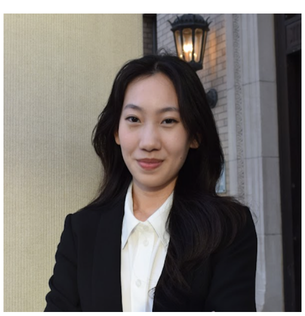
Noise-Robust Data Driven Model Discovery with Parameterized Basis Terms

Data-driven model discovery (DDMD) has emerged as a powerful approach for extracting equations that describe physical systems directly from data, requiring a user to only input possible basis terms and returning the correct coefficients. In many systems, governing equations feature terms with additional parameters, such as the phase of sinusoidal terms or the exponent in power law terms. There is limited research conducted into efficient DDMD techniques when such parameters are unknown. In this work, we employ an optimization procedure to determine these parameters in between iterations of the Sparse Identification of Nonlinear Dynamics (SINDy) algorithm. Additionally, to address the increased sensitivity to noise coming from the unknown parameters, we developed a novel noise reduction technique using an optimization procedure with Savitzky-Golay filters. The performance of our algorithm is evaluated using simulated data with known governing equations. We demonstrated the success of our approach in recovering the dynamics of a driven Duffing oscillator with an unknown driving force, as well as determining the functional form of a kernel with fractional exponents in the Smoluchowski equation. These promising results prompt further testing using experimental data, setting the stage for DDMD to become an invaluable tool in understanding complex physical systems.

Presenter(s): Eli Zemach
Authors: Eli Zemach, Kaitlin Arnold, Isabella Dewhurst, Benjamin Vollmer, Chelsea Hampton, Sophia Mueller, Susanna Lee, Benjamin Johnson
Faculty: Benjamin Johnson

Personalities, Posts, and Products on Instagram and TikTok

This consumer psychology-based study investigates the relationship between content production techniques and consumer perceptions of authenticity for brand-related posts on Instagram (IG) and TikTok. This study attempts to understand how authentic consumers believe brands to be in their advertising, influencer content, or organic word-of-mouth. By sampling and comparing participant perceptions of posts from IG, IG reels, and TikTok, this study will assess relationships between specific post components (e.g., like number, comment number, sponsorship disclosure) and consumer perceptions of post factors such as authenticity, expertise, trustworthiness, production quality, and production intent. This study has two data collection phases: a content analysis and online survey. Our content analysis records post features for sixteen brands across IG, IG reels, and TikTok. Next, a large-scale survey of MTurk workers assesses audience perceptions and how they correlate to post features. Potential implications of our findings include the potential for differentiating brand abilities to appear authentic on different platforms, as well as how each platform and type of post affects brand authenticity in the eyes of consumers. Ultimately, this study has the ability to indicate the importance of perceptually authentic or inauthentic posts on consumer behavior.



Presenter(s): Mengyang Zhang
Authors: Mengyang Zhang, Catherine Kishel, Timothy Vollmer
Faculty: Catherine Kishel

Assessment of Blocking as a Response to Dangerous Problem Behavior in Children with ASD

Some children with Autism Spectrum Disorder (ASD) exhibit problem behavior. These behaviors can sometimes be dangerous, and thus often result in adults blocking those responses for safety purposes in community and clinical settings. Clinicians often assume that blocking will function to reduce behavior, but the functional effects of this consequence are not always known (Smith, Russo, & Le, 1999). It is important to investigate how blocking affects behavior for three key reasons. First, if blocking reduces the occurrence of behavior, it may be used by therapists as a potential treatment. Second, if blocking has no effect, it may remain in place as a safety measure. Third, if blocking acts as a reinforcer, it should be modified and another consequence or safety measure must be considered. This study sought to evaluate the effects of blocking using an arbitrary response task (e.g., Fiske et al., 2020) and then to validate those findings via a pairwise functional analysis of problem behavior. Data from three participants with ASD and dangerous behaviors are presented; blocking resulted in no functional effect on problem behavior for these children.

Presenter(s): Xinyi Zhang
Authors: Xinyi Zhang, Calistus Ngonghala
Faculty: Calistus Ngonghala

Mathematical Assessment of the Impact Insecticide-Treated Nets on Malaria Dynamics

We develop and use a novel dynamic model to assess the impact of ITNs and human behavior on malaria prevalence and control. The model differs from other published models in that it accounts for 1) human choice to use ITNs properly (for protection) or improperly (for other purposes) through a game theory approach and 2) the decay in ITN-efficacy due to natural and human-induced wear. Additionally, the model is structured in terms of individuals who own and use ITNs properly and individuals who do not own or own but use ITNs improperly. The model will be extended to other vector-borne diseases, e.g., Zika virus. Well-formulated and parametrized models can provide useful insights to disease dynamics and are useful for public health decision-making.

Presenter(s): Jialong Zhen
Authors: Jialong Zhen, Didem Pehlivanoglu, Mengdi Zhu, Brian S. Cahill, Damon L. Woodard, Natalie C. Ebner
Faculty: Dr. Didem Pehlivanoglu, Dr. Natalie C. Ebner

Effects of Analytical Reasoning and Interoceptive Awareness on the Ability to Detect Deepfake Faces

Deepfakes, which are images and videos created with artificial intelligence technology to fake someone's entire audio-visual representation are one of the novel deception tactics to spread false information and manipulate public opinion. A recent survey indicates that people had "a great deal of confusion" in the face of deepfake images with the ability to distinguish between real and fake images was only slightly above chance. Crucially, to date, no studies have systematically investigated the psychological mechanisms underlying the detection of deepfakes. To fill this research gap, this study examined whether people with higher (i) analytical reasoning and (ii) interoceptive awareness (the ability of reading bodily signals about physical and emotional states) would perform better at detecting deepfake images. Preliminary findings showed that while detection of real faces was not influenced by analytical reasoning ability, greater analytical reasoning was related to better detection of deepfake faces. Additionally, while detection of deepfake faces was not influenced by interoceptive awareness, greater interoceptive awareness was related to better detection of real faces. Findings from this study have potential to provide insights on applications of the growing field of artificial intelligence on human behavior and decision making.

Presenter(s): Qi Zheng
Authors: Qi Zheng, Phuong Ton, Dake Liu, Jeongim Kim, Gustavo Seabra, Yousong Ding
Faculty: Yousong Ding

Flavonoid hydroxylation by a Rieske-type oxygenase in Scutellaria

Flavonoids are a large family of polyphenolic plant secondary metabolites that demonstrate human health benefits and critical roles in plant physiological functions. Flavonoid hydroxylation is an essential reaction that contributes to different biological properties of plant flavonoids, hence the characterization of hydroxylases aids in novel analog synthesis and fundamental plant sciences. Herein, we characterized a Rieske-type oxygenase (SbRTO) from S. baicalensis that produces a rare 8-hydroxylated 4’-hydroxyflavone from apigenin through the 8-hydroxylation reaction. We further observed the broad substrate specificity of SbRTO by performing the enzyme reaction with different flavonoids. The predicted SbRTO structure and its cofactor binding sites showed the highest similarities with another Rieske-type oxygenase GxtA despite differences in the active site, the significant structural variations conclude probable contributions to flavonoid recognition and orientation during selective hydroxylation. Molecular-docking of flavonoids into the active site of predicted SbRTo structure allowed the identification of significant enzyme-ligand interaction residues, while endorsed by site-directed mutagenesis. Collectively, this work uncovers new functions of Rieske-type oxygenases in plant flavonoid biosynthesis and provides a basis for biocatalysis and synthetic biology approaches to generate novel flavonoid compounds.

Undergraduate Research Faculty Mentors

College of Agricultural and Life Sciences	
Adam Wong	Alison Adams
Anthony Auletta	Andrea Lucky
Cătălin Voiniciuc	Ann Wilkie
Daniel Hahn	Anne Mathews
Daniel Czyż	Bala Rathinasabapathi
Donald Behringer	Basil Iannone
Erica Goss	Bradford Daigneault
Felix Enciso Rodriguez	Cameron Jack
Jason Williams	Candice Prince
Jeanette Andrade	Christine Miller
Jeffrey Jones	Daniel Czyz
Jennifer Drew	Debbie Miller
Jorge Ruiz-Menjivar	Esteban Rios
Juan Andrade	Gerardo Nunez
Julie Maupin	Gustav Paulay
Kathryn Sieving	Jeongim Kim
Kathryn Stofer	Jiri Hulcr
Larry Forthun	Joesph Larkin
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