# 26th Annual

## SPRING UNDERGRADUATE RESEARCH SYMPOSIUM

**April 8, 2025 | Stepen C. O'Connell Center**

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# Welcome

This year we are celebrating the 15th Anniversary of the Center for Undergraduate Research. We started with one program, USP, with 200 students. We now directly support 1327 students annually. Since 2010, 1087 faculty representing 162 departments in 16 colleges have mentored UR students. All of you who have students presenting today are among this very supportive faculty who take the time to help these new researchers learn and grow and we appreciate your efforts. Faculty mentors are listed following the abstracts.

Once again, we have exceeded previous numbers of poster presented, making this the largest celebration of undergraduate research at UF yet, with a record number of posters (645). We are celebrating the undergraduate research that has been conducted this year in 14 Colleges, the Cancer Center, and the Florida Museum of Natural History, and UF Online, and AI. These students have conducted research in 27 departments.

This large number of presenters reflects the team research conducted by many of our students. Of note are the first-year University Research Scholars who will be presenting 44 posters about the research they have conducted in their Course Based Undergraduate Research Courses (CUREs). CUR strongly supports students research presentation efforts. We also helped support 30 students to present at 20 national professional meetings. 96 UF students presented their research at the Florida Undergraduate Research Conference, held this year at the University of South Florida.

This year we have added an international research opportunity, collaborating with the University of Newcastle to provide 15 students with a 6-week international research experience.

Also, we are delighted to announce that the new CUR Assistant Director is Olivia Tyler. Olivia is a former CUR student assistant and is working on her PhD in Higher Education and is already making an impact in the CUR office.

We encourage you to visit the presentations, talk with the students about their research, and read the collection of abstracts. Faculty, we welcome you to the VIP room in the Center Court Club.

Enjoy,

Anne E. Donnelly

Director
Center for Undergraduate Research

# 26th Annual
# Spring Undergraduate Research Symposium

April 8th, 2025

Stephen C. O'Connell Center

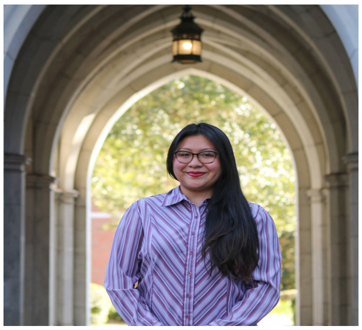
## Program in Brief

| | |
|---|---|
| **11:00 am – 12:45 pm** | **Poster Set Up** |
| **1:00 pm – 1:05 pm** | **Welcome Remarks**<br>**Dr. Anne Donnelly**<br>Director, Center for Undergraduate Research |
| **1:05 pm – 1:20 pm** | **Keynote Speaker**<br>**Angelos Barmpoutis**<br>Professor, Digital Worlds Institute |
| **1:20 pm – 1:25 pm** | **Logistics**<br>**Olivia Tyler**<br>Assistant Director, Center for Undergraduate Research |
| **1:25 pm – 2:25 pm** | **Poster Session A** |
| **2:30 pm – 2:40 pm** | **Best Paper Contest Winners**<br>**Dr. Anne Donnelly** |
| **2:40 pm – 3:00 pm** | **Poster Swap Intermission** |
| **3:00 pm – 4:00 pm** | **Poster Session B** |
| **4:00 pm** | **Poster Take Down** |

# Keynote Speaker: Dr. Angelos Barmpoutis

We are delighted that Dr. Angelos Barmpoutis is joining us today to celebrate the 15th anniversary of the Center for Undergraduate Research at the University of Florida. Dr. Barmpoutis is a Professor of Digital Arts and Sciences and the coordinator of research and technology in the Digital Worlds Institute at the University of Florida. He is also an affiliate faculty of the Computer and Information Science and Engineering Department and the Biomedical Engineering Department at UF and has been a supporter and advocate for the Center for Undergraduate Research for years. His current research projects focus on automated analysis of human motion, 3D reconstruction and dissemination of digital cultural heritage, applications of virtual and augmented reality, and medical image analysis. For his contribution to the aforementioned areas, he received in 2014 the Merit Award from the IEEE International Conference on Connected Vehicles, in 2016 he was finalist for the Rome Prize for Historic Preservation and Conservation and was named UF Research Foundation Professor for 2020-2023. Dr. Barmpoutis has authored numerous highly cited publications in the aforementioned topics, and his work has led to patented and copyrighted inventions registered in the US, and been funded by several awards and grants from various funding agencies including the National Institutes of Health, the National Science Foundation, the National Endowment for the Humanities, the US Department of Transportation, the Andrew W. Mellon Foundation, and the Robert Wood Johnson Foundation. In the international community he is also known for the Digital Epigraphy and Archaeology project that he is directing since 2011 and the highly cited Java-For-Kinect open-source library, which has been continuously used since 2013 in more than 50 countries around the world.

# UNDERGRADUATE BEST PAPER AWARD WINNERS



## Angie Cordova

**Faculty Mentor: Dr. Andreas Keil**
**Medicine Best Paper Winner**

*Assessing Individual Differences in Emotional Reactivity Using Electrophysiology and Self-Reported Affect*

Characteristics of emotion, such as valence and arousal can be evaluated using self-reported affective ratings and electroencephalogram (EEG) to gain a better understanding of individual differences in diversified populations. The International Affective Picture System (IAPS) and AI-generated counterparts
were used to elicit emotional responses that were collected from the self-assessment manakin (SAM) rating scale for valence and arousal. EEG data were used to observe biomarkers of emotional processes related to the presentation of these stimuli. These methods were correlated to individual differences such
as sex and depression and anxiety related questionaries. The study showed significant sex differences in the self-reported affective ratings, where females showed greater aversive affect compared to males. EEG data showed that there was less alpha reduction relative to baseline in percent for individuals who scored high on the BDI-II, which suggests biomarkers of emotional dysregulation, such as anhedonia. Overall, the study highlights the differences in emotional processes for variable populations, which has implications for intervention and targeted treatment efforts.

# UNDERGRADUATE BEST PAPAER AWARD WINNERS

## Serena Huberty

**Faculty Mentor: Dr. Vanessa Hull**
**STEM Best Paper Winner**

*Nutritional sustainiblity of California (Zalophus californinaus )and Steller Sea Lion Diets under future climate condition.*

Marine species ’distributions are predicted to shift due to rising ocean temperatures under climate change. The bottom-up control of prey species on sea lions under future climate conditions is an important factor to consider when evaluating their populations and the entire Pacific oceanic ecosystem. This study utilized the program AquaMaps to develop species distribution models of California and Steller sea lions (Zalophus californianus and Eumetopias jubatus, respectively) and their common prey items under the predicted climate scenario for 2050 to determine how their diets may be affected by changing prey distribution. Additionally, the nutritional compositions of commercially available prey were analyzed to understand the impacts that a dietary shift may have on meeting the sea lions ’nutritional needs. Results suggest that while common prey items may remain available in the future, more energetically dense options such as Pacific jack mackerel, Pacific salmon, and Pacific sardine could increase in importance in the diet of both sea lion species, especially as currently predominant prey becomes less available at the furthest extents of their ranges. The results inform not only actions that may need to be taken in their native habitats to maintain steady populations, but also in the zoos that maintain these animals as species ambassadors.

# CURE CLASS ABSTRACTS

**Presenter(s): Eli Groothuis, Chloe Caven, Branden Frishman**
**Faculty: Michael Harris**

## ***Investigating Small Molecule Inhibitors Targeting the RNase P Enzyme from Pathogenic Bacteria***

Targeting RNA for antibiotics has advantages that include an expanded range of druggable sites, less opportunity for antibiotic resistance mutations, and enabling new forms of inhibition. ESKAPE pathogens (*Enterococcus faecium*, methicillin-resistant *Staphylococcus aureus*, *Klebsiella pneumoniae*, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, and *Enterobacter* sp.) are universally important human pathogens and have been declared by the WHO as critical pathogens for targeted drug research and development.

Our goal is to discover small molecule inhibitors of an essential non-coding RNA in ESKAPE pathogens as an approach to antibiotic development and to create a pipeline for the discovery of small molecules targeting essential bacterial RNAs. One such RNA target of interest is RNase P, a holoenzyme made of RNA and protein components used in tRNA modification. Previously, the Harris Lab discovered several promising inhibitors using in-vitro high-throughput screening that targeted the essential RNA subunit of *S. aureus* RNase P. Now, we are tasked with understanding where and how these small molecules bind to the RNA subunit of RNase P and determining mechanisms by which they inhibit activity.

In our CURE, we are designing a series of chemical modifications for an inhibitor of RNase P and determining the effects of changing its chemical structure on binding and inhibition.

**Presenter(s): Kate Bass**
**Faculty: Dr. Anthony Auletta**

## ***Taxonomic Revision of Ant Genus Nylanderia in Mesoamerica through Morphological Characteristics***

This research project focuses on ant taxonomy within the genus *Nylanderia* to better classify a sample requiring further taxonomic analysis. This study aims to enhance ecological and agricultural knowledge of these ants while highlighting their conservation importance. Examining their morphological, behavioral, and biological traits provides insight into their evolutionary history and relationships.

The research team analyzed 50–55 specimens, replicated four times, collected from South and Central America to identify new species within the genus. Using the digital analysis tool ImageJ, measurements and morphological comparisons were conducted on detailed specimen images to distinguish potential new species. The collected data contribute to a larger-scale project aimed at refining *Nylanderia* taxonomy alongside multiple research teams, while also assessing the effectiveness of the CURE model of research learning.

Currently, this study has identified four new species within the *Nylanderia* genus, with publication pending. This work will clarify *Nylanderia* taxonomy and facilitate future research to better differentiate species within the genus.

**Presenter(s): Owen Suzmanski, Bayan Mahmoodi, Haoran Shi**
**Faculty: Dr. Walter Leite**

## ***Project FUNLIT - Fun Literacy Integration for Thriving Readers: Gamification of Reading Practice to Increase Engagement and Motivation***

The education system faces a growing literacy crisis. FUNLIT—a gamification framework built on top of the existing Storiza reading app—aims to address this issue by enhancing reading practice through gamification. This research investigates whether generalizable gaming mechanics in a learning environment can boost engagement and improve overall literacy.

Previous studies have demonstrated the success of gamification in student engagement; however, many existing educational games rely on complex simulations, deep progression-based adventures, or costly systems. FUNLIT seeks to develop a generalizable framework for gamifying intelligent tutoring systems to foster long-term student engagement.

FUNLIT employs a narrative-based approach, linking multiple AI-generated stories into sagas. Each story includes comprehension exercises such as multiple-choice questions, dropdown selections, and fill-in-the-blank activities. To encourage participation, students earn points and badges upon completing these exercises. This approach has the potential to empower schools and educational content developers to integrate gamification more effectively into literacy education.

**Presenter(s): Steve Sajeev, Kiran Rao, Agnivesh Kaundinya, Illia Yi**
**Faculty: Walter Leite**

## ***Project InSPIRE***

Project InSPIRE (Intelligent Support for Personalized Individual Reading Experiences) aims to enhance reading fluency support within Storiza, a reading app designed for literacy development. While schools offer some reading assistance, resource limitations often prevent them from providing one-on-one tutoring for children who need additional support.

This project integrates virtual Elkonin boxes—an educational tool proven to improve children's phonemic awareness, letter-sound correspondence, and spelling skills. Although prior research confirms the effectiveness of Elkonin boxes, only one study has explored their application in a digital format, highlighting the need for further investigation.

InSPIRE seeks to innovate by expanding the use of digital Elkonin boxes in a way that has not been previously explored. By digitizing this instructional tool in a multi-sensory format, the project aims to support children with dyslexia, ADHD, and autism, who have been shown to benefit from multi-sensory learning approaches.

**Presenter(s): Victoria Foster, Neha Senthilkumar, Margaret Sadlo, Chloe Hill, Gabriel Ribay, Arya Patel**
**Faculty: Dr. Wendy Dahl**

## ***Exploring the Relationship between MIND Diet Adherence and Skin Carotenoid Levels***

Recent research has increasingly linked diet to brain health, leading to the development of dietary patterns aimed at promoting cognitive function. One such pattern is the Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diet, which emphasizes nutrient-dense foods like leafy vegetables that are rich in carotenoids. Carotenoids are antioxidants and serve as biomarkers for fruit and vegetable intake.

This study investigates the correlation between adherence to the MIND diet and skin carotenoid levels. Skin carotenoid levels will be measured using the Veggie Meter, a device that utilizes reflectance spectroscopy, while MIND diet adherence will be assessed through a 14-item MIND diet screener, which provides a score ranging from 1 to 14. The study aims to test 250 participants (ages 18-27) and anticipates finding a positive correlation between MIND diet adherence and skin carotenoid levels, establishing a baseline for young adults.

The broader implications of this research include future investigations into how carotenoid levels and MIND diet adherence may contribute to a reduced risk of neurodegenerative diseases.

**Presenter(s): Imogen Migliorasse, Loren Blumenfeld**
**Faculty: Craig Smith**

## ***How depression changes the way psilocybin interacts with the brain***

Psilocybin, a serotonergic psychedelic, has shown potential as a treatment for depression, but its neural effects on individuals with treatment-resistant depression (TRD) are not fully understood. This review examines existing neuroimaging studies to determine whether psilocybin-induced brain changes differ between individuals with TRD and healthy controls.

By analyzing findings from functional MRI (fMRI) studies, we assess alterations in functional connectivity within key brain regions, including the amygdala and medial prefrontal cortex (mPFC), which are involved in emotional processing and regulation, and the default mode network (DMN), which plays a role in cognitive integration.

This review synthesizes recent research on psilocybin's impact on neural plasticity and connectivity, exploring whether its antidepressant effects are mediated by distinct neurobiological mechanisms in TRD patients. Understanding these differences could lead to personalized approaches to psychedelic-assisted therapy, optimizing treatment strategies for individuals with TRD and expanding the clinical use of psychedelics in psychiatry.

**Presenter(s): Kaylie Verkon**
**Faculty: Whitney Stoppel**

## ***Examining Methods to Decellularize Axolotl Tissues***

Decellularization is an essential step in tissue engineering, where cellular components are removed to preserve the extracellular matrix (ECM) structure. The decellularization method chosen affects the residual DNA content, ECM integrity, and tissue architecture. This study aims to compare the structural differences in axolotl heart, lung, dermis, and connective tissue after using three distinct decellularization methods: CHAPS, SDS, and Triton X-100. Each method targets cellular removal through different mechanisms, potentially influencing the final ECM composition and tissue structure.

To assess the effectiveness of decellularization and structural preservation, we used scanning electron microscopy (SEM) to evaluate pore sizes and overall structure, DAPI staining to confirm DNA removal, and histological analysis with hematoxylin and eosin (H&E) and Masson's Trichrome staining to examine tissue architecture.

These techniques allowed for a comprehensive comparison of decellularization efficiency and ECM preservation. Our findings highlight the different effects of each decellularization reagent on residual DNA content and tissue microstructure. By analyzing histological staining and SEM images, we identified the method that best retains the native tissue structure and ECM organization. These insights are critical for optimizing decellularization strategies to improve the use of ECM materials for tissue engineering applications.

**Presenter(s): Solange DeLaVegaMulet, Rodrigo Medinilla, Spencer Maillot**
**Faculty: Aida Miro-Herrans**

## ***Parallel Evolution Between the Human Head Louse and Its Host: A Comparative Analysis of Pediculus Humanus Mini-Chromosomes***

Human head lice are parasites that rely on their human host for survival. Since lice are closely tied to human movement, their evolutionary processes are shaped by human activity. Previous research on two mitochondrial DNA (mtDNA) genes revealed six evolutionary louse clades. However, human head louse mtDNA contains 37 genes split across 20 mini-chromosomes. It remains unclear whether mini-chromosome genes are inherited together or exhibit different evolutionary histories.

In this study, we analyze mtDNA from 420 lice collected worldwide. We processed genomic sequence data from each louse to identify single nucleotide polymorphisms and sequenced 10 mtDNA genes found across various mini-chromosomes. Using this clean data, we built phylogenetic trees for these genes and compared their structures.

The phylogenetic trees reveal differences between lice with distinct evolutionary histories. Our goal is to determine whether the genes exhibit phylogenetic trees consistent with the six louse clades identified earlier. If the trees are significantly similar, this would suggest that the mini-chromosomes are inherited together. Conversely, trees showing different numbers of clades may indicate alternative explanations for why these genes are not inherited collectively.

Our findings also provide valuable insights into past human migrations, highlighting potential regions where different human groups may have interacted.

**Presenter(s): Prithika Bose, Arissa Latif**
**Faculty: Dr. Craig Smith**

## ***The Differences in the Effects of Psilocybin-Assisted Treatment in Major Depressive Disorder and Treatment-Resistant Depression***

**Background:**
Psilocybin, a serotonergic psychedelic, has emerged as a promising treatment for Major Depressive Disorder (MDD) and Treatment-Resistant Depression (TRD). Although both share core symptoms, their treatment challenges differ, necessitating an evaluation of how psilocybin's effects vary between the two.

**Methods:**
A comparative analysis was conducted using recent clinical trials and neuroimaging studies on psilocybin's safety, efficacy, and neural mechanisms in MDD and TRD. The studies included fMRI-based and dose-response investigations.

**Results:**
Psilocybin proved to be efficacious in both MDD and TRD, significantly reducing depressive symptoms in both cases and maintaining relief for several weeks. However, patients with TRD exhibited more variability in their response rates; while some experienced sustained symptom reduction, others relapsed. Neurobiological evidence and varying doses suggest that TRD patients require repeated dosing for ongoing symptom relief, compared to MDD patients. Side effects, including headache, nausea, and anxiety, were common, with suicidal ideation reported more frequently in TRD cases.

**Conclusion:**
Psilocybin shows efficacy in both MDD and TRD, but response rates, treatment durability, and side effects vary greatly. It is assumed that MDD patients may benefit from sustained treatment, while TRD patients may require more specialized and repetitive treatment plans.

**Presenter: Anna Poacelli**
**Faculty: Dr. Peterson**

## ***The American Promised Land***

In this paper, I will examine the relationship between the Bible and early American settlement in New England, specifically by the Puritans and the Pilgrims in the 1600s. I will use primary sources from settlers and significant figures within settlements like Cotton Mather and John Winthrop, comparing the language in those documents to that of the Bible. My purpose in comparing the language in primary sources to Biblical language is to determine the ways in which Biblical concepts such as the Exodus narrative and the promised land both inspired and justified American colonialism and the formation of a national identity.

I will also incorporate commentary from scholarly literature that addresses the topic of Christianity's effects on American settlement. I will organize my paper by beginning with a history of this argument made by scholars. I will then specifically examine some concepts that they introduce, such as typology, connecting them to primary sources that display examples of their arguments. Within my analyses of primary sources, I will also incorporate quotations from the Bible that act as the inspiration for the allusions made in primary sources.

**Presenters: Samikshaa Prabhu**
**Faculty: Dr. Craig Smith**

## ***Evaluating Racial & Socioeconomic Barriers to Psychedelic-Assisted Therapy for Depression & Trauma***

Psychedelic-assisted therapy (PAT) is gaining recognition as a promising intervention for depression and trauma, yet its accessibility remains limited due to racial and socioeconomic disparities. While clinical trials in resource-intensive settings demonstrate success, they primarily benefit White, higher-income individuals. In contrast, marginalized communities, particularly Black, Indigenous, and People of Color (BIPOC) and low-income populations, face significant barriers such as legal risks, high costs, and culturally insensitive care.

National survey data indicate that psychedelics like psilocybin are linked to reduced psychological distress among White individuals, but these benefits are less pronounced in BIPOC communities—likely due to structural inequities, healthcare discrimination, and limited access to culturally competent treatment. This study uses a health equity framework to examine systemic barriers, including exclusion from clinical trials, financial inaccessibility, and provider bias, which impede PAT's accessibility and effectiveness for underserved populations.

Findings emphasize the urgent need for policy reforms, inclusive clinical research, and culturally responsive treatment models. Without targeted interventions, PAT may perpetuate existing mental health disparities instead of serving as an inclusive and transformative therapy.

**Presenter: Jack Penn, Richard Yang, Vignesh Saravanan**
**Faculty: Dr. Jack Judy**

## ***Investigating the Tissue Response of Strawberry Plants to Needle Insertions of Varying Diameters***

Flexible probes, commonly used in neuroscience, have emerged as promising tools for precision agriculture by enabling sensitive electrochemical measurements in plants. Recent advancements in microneedle-based bioimpedance sensors have shown enhanced sensitivity compared to traditional planar sensors (Bukhamsin et al., 2021). By penetrating the electrically insulating cuticle, these sensors enable real-time assessments of crop health through direct sampling and analysis of electrical fields within plant tissue (Bukhamsin et al., 2021). However, their invasive insertion can trigger thigmomorphogenetic responses that compromise measurement accuracy.

In this study, we investigate the biological response of strawberry (Fragaria × ananassa Duch) stems to rigid microneedle insertions of varying diameters—a critical step toward developing minimally invasive, microfabricated probes for plant health monitoring. Microneedles were manually inserted into branching stems (penetrating approximately halfway through the stem diameter) and subsequently removed to simulate flexible probe implantation. Histological analysis performed four days post-insertion, using multiple staining techniques, analyzed tissue recovery marked by occlusion of the puncture site and cell death.

**Presenters: Bryce Ownby, Keely Moody, Max Livingston, Karin Farag**
**Faculty: Alexander Angerhofer**

## ***Nanoencapsulation of Oxalate Decarboxylase for Redox Characterization***

Oxalate Decarboxylase (OxDC), an enzyme from the soil bacterium *Bacillus subtilis*, catalyzes the breakdown of oxalate into carbon dioxide and formate. With optimal activity at pH 4, OxDC holds potential applications as a diagnostic tool for calcium oxalate kidney stones and as a descaler in the paper industry. Although its overall reaction is redox neutral, understanding electron transfer between its N- and C-terminal manganese metal centers is crucial for further applications.

This study employs electrochemical techniques such as protein film voltammetry to investigate OxDC's redox properties. By utilizing nanoencapsulation—an approach successfully implemented in glucose oxidase for commercial blood sugar sensors—we aim to enhance protein stability and longevity under standard storage conditions. Additionally, encapsulation will allow for precise electrical measurements and identification of the reduction potentials of the enzyme's manganese centers. These findings will contribute to a deeper understanding of OxDC's role in redox reactions and its potential for broader biochemical applications.

**Presenters: Alec Beylus, Edward Collins, Gabriel Wright**
**Faculty: Craig Smith**

## ***Integrating Psilocybin with Alternative Medicine: A New Pathway to Treating Mental Health***

Mental health disorders, including depression and PTSD, affect millions worldwide, from cancer patients to war veterans to those impacted by global pandemics. Conventional treatments, such as pharmaceuticals and traditional therapy, often yield mixed results, leaving many individuals without effective solutions.

This study explores the therapeutic potential of psychedelic drugs—primarily psilocybin—in combination with alternative therapies such as psychotherapy, yoga, mindfulness meditation, and cryotherapy. By reviewing a body of primary research, we analyze how integrating these non-traditional approaches enhances clinical outcomes for depression and PTSD. Findings suggest that hallucinogens, when paired with complementary therapies, lead to greater reductions in mental health symptoms compared to traditional therapy or placebo groups.

The research underscores the need for further clinical trials and investigations to better understand the efficacy of these modern approaches. As the field evolves, the integration of psychedelics with alternative medicine may redefine mental health treatment, offering new hope for individuals resistant to conventional therapies.

**Presenters**: **Andrew Chuang**, **Saladin Holly**, **DeMarcay Johnathan**, **Garcia Ali**, **Hilal Yuwei**, **Huang Lilly**, **Liu Samiyyah**, **Rucker Aron**, **Prakash Hans**, **Tang Shunmuka Valsa**
**Faculty**: **Angelos Barmpoutis**

## ***Immersive 3D Games for Disseminating Osteology Knowledge to K-12 Students: Design, Development, and Usability Evaluation***

This project explores the gamification of primate bone scans to enhance osteology education for middle and high school students. By transforming CT scans of primate bones into interactive digital content, the platform aims to foster engagement and curiosity about anatomy and developmental biology. The study focuses on species such as Aotus nancymaae (Night Monkey), Cebuella pygmaea (Pygmy Marmoset), Callithrix jacchus (Common Marmoset), and Propithecus (Sifaka).

The educational platform under development integrates a 3D viewer for exploring detailed bone structures, matching games to reinforce pattern recognition, and quiz modules for knowledge assessment. Additionally, a dedicated mascot and cohesive branding elements are being designed to enhance user engagement. Using technologies like Unity, C#, JavaScript, and HTML, the project combines high-resolution imaging with interactive design to create an immersive learning tool.

Current development efforts focus on refining user interfaces, ensuring scientific accuracy, and optimizing game mechanics to maximize educational value. A usability survey will be conducted to evaluate perceived usefulness and ease of use. Data collected from experts at the University of Florida DeLeon Osteology Lab will undergo statistical analysis to assess the effectiveness of the platform in enhancing student learning.

**Presenters**: **Tyler Radtke**
**Faculty**: **Pam Soltis**, **Doug Soltis**, **Edgardo Ortiz**, **Shengchen Shan**

## ***A chromosome-scale assembly and annotation for pignut hickory, Carya glabra***

Carya glabra (Juglandaceae) is an important tree in hardwood forests of the eastern United States, with a distribution spanning from Canada to central Florida, and provides critical ecosystem services that support a wide diversity of wildlife. In the McCarty Woods Conservation Area on the University of Florida campus, C. glabra is a major component of the canopy, along with other hardwood species like oaks (Quercus sp.), sweetgum (Liquidambar styraciflua), and hornbeam (Carpinus caroliniana). The goal of this project is to sequence the first C. glabra chloroplast and nuclear genome, both to increase our understanding of the natural history of this species, and to promote the McCarty Woods restoration effort. By sequencing the genome of a tree found on the UF campus, our hope is to emphasize the importance of protecting biodiversity in urban environments and, in turn, strengthen ongoing preservation efforts.

In collaboration with the American Campus Tree Genomes (ACTG) project, we have successfully generated Hi-C short reads and PacBio HiFi long reads, yielding 79 Gbp of data and an estimated 28x coverage. Further work will continue to assemble the full genome and begin the annotation process in order to produce a high-quality reference genome for C. glabra.

**Presenters: Rubina Torkzadeh**
**Faculty: Pam Soltis, Doug Soltis, Edgardo Ortiz, Shengchen Shan**

## ***Assembly and Annotation of the Carya Glabra Genome***

Carya glabra, or pignut hickory, is a species of hickory tree belonging to Juglandaceae, commonly known as the walnut family. Native to eastern North America, the southernmost distribution of the species occurs in northern central Florida. Due to Gainesville's distinctive position as the southernmost point of this distribution, Carya glabra plays a notable role in enhancing the wildlife diversity on the University of Florida campus. The species has become integral to the McCarty Woods Restoration Project, which aims to promote conservation and restoration of the species-diverse woodland at the heart of the University's central campus.

The goal of this study is to perform a de novo assembly and annotation of the chloroplast and nuclear genome of Carya glabra, the first genome of this species. This will be accomplished through analyses of generated PacBio HiFi data, with a coverage depth of 30X, and Hi-C data, covering an estimated genome length of 2.8 gigabases. In collaboration with the American Campus Tree Genomes project, this study intends to better understand the biodiversity of McCarty Woods and support its ongoing conservation.

**Presenters: Benjamin Pringle**
**Faculty: Pam Soltis, Doug Soltis, Edgardo Ortiz, Shengchen Shan**

## ***Assembly and Annotation of Carya glabra Genome***

Carya glabra, also known as pignut hickory, covers nearly all of the eastern United States. It is part of the family Juglandaceae and is closely related to many species of walnut, pecan, and hickory trees. This research is being done as part of the McCarty Woods Restoration Project, a project intended to conserve and restore a highly diverse area of woods on the University of Florida campus, which, among many other plants, has one of the southernmost pignut hickory trees in the entire United States.

For the first time, we will be assembling this particular pignut hickory tree's chloroplast and nuclear genomes, using PacBio HiFi data (79 Gb; ~30x coverage), as well as Illumina Hi-C data. Furthermore, our work can also help with better understanding the pecan, given the close relationship between it and Carya glabra, which may hold economic value.

**Presenters: Gia Serrano**
**Faculty: Pam Soltis, Doug Soltis, Edgardo Ortiz, Shengchen Shan**

## ***Assembly and Annotation of Carya glabra Genome***

The McCarty Woods Conservation Area at the University of Florida is a region of diverse flora. The Woods lie in a specific area where the geographical distribution boundaries of many northern and southern plant species overlap, allowing for an interesting mix of vegetation. Due to the ecological status of the Woods, the McCarty Woods Restoration Project was enacted to restore native species and protect the woods from damage or elimination.

As a part of the project, we are sequencing the genome of Carya glabra, a species of tree that is a part of the walnut family (Juglandaceae) and is closely related to hickories and pecans. McCarty Woods is one of the southernmost regions where Carya glabra natively occurs; furthermore, the genome of this tree has yet to be sequenced. Thus, the goal of this project is to sequence both its chloroplast genome and its nuclear genome. By doing so, we hope to emphasize the botanical significance of McCarty Woods and gain a better understanding of its native species.

To date, we have generated HiFi data with an average coverage of 30x and will use Hi-C data to further improve the assembly of the genomes.

**Presenters: Ezra Linnan**
**Faculty: Pam Soltis, Doug Soltis, Edgardo Ortiz, Shengchen Shan**

## ***Genomic Exploration of Carya glabra: Unlocking the Secrets of the Pignut Hickory***

The McCarty Woods Conservation Area is a 2.9-acre plot of woodland in the heart of the University of Florida campus. Boasting an enormous array of wildlife and biodiversity due to its unique geographical location, recent efforts to restore, maintain, and preserve this sanctuary are underway. One of these tasks is to sequence the first genomes of five native species of trees, with this study focusing on Carya glabra. Commonly known as the pignut hickory, this deciduous tree grows in nearly all of the eastern United States, with the University of Florida being on its southern boundary.

Carya glabra belongs to the Juglandaceae (walnut) family and has close genetic ties to the common walnut and pecan trees. Using the HiPerGator supercomputer, the goal of this study is to assemble and annotate both chloroplast and nuclear genomic sequences using PacBio HiFi (with ~30x coverage) and Hi-C data. This research will not only help further our understanding of the biodiversity of plant life but also aid in the restoration and preservation processes of these renowned species.

Once full genomes have been attained and studied, further exploration can provide key insight into the fields of botany, ecology, agriculture, and biomechanics.

**Presenters: Audrey Tucker**
**Faculty: Pam Soltis, Doug Soltis, Edgardo Ortiz, Shengchen Shan**

## ***Carya glabra (Pignut Hickory) Genome Assembly and Annotation***

The eastern United States and Canada are home to the deciduous tree *Carya glabra* (pignut hickory; Juglandaceae). Pignut hickory reaches heights of 50-80 feet and thrives in upland habitats, with a characteristic narrow crown appearance. It is also found in close proximity to *Quercus michauxi* and *Liquidambar styraciflua*. *Carya glabra* is closely related to both the scrub hickory (*C. floridana*) and the sand hickory (*C. pallida*). *Carya glabra* produces pear-shaped nuts that appeal to many wild animals and very durable wood that is important for home use. The southernmost distribution of *C. glabra* reaches the University of Florida's McCarty Woods Conservation Area, and genomic data from species in McCarty Woods will contribute to the site's importance as a resource.

We have the privilege of assembling, for the first time, the chloroplast and nuclear genomes of a tree from *C. glabra* in McCarty Woods, with the goal of creating a complete sequence of this organism's DNA. We will use our samples to obtain and generate both PacBio HiFi data with around 30x coverage and Hi-C data. In doing so, we will begin analyzing the reads and assembling the genomes to better understand this species, its evolutionary history, and necessary conservation efforts.

**Presenters: Logan Burns, Rohan Bisht**
**Faculty: Dr. Wayne Giang**

## ***ChatGPT in Higher Education: Learning its Limits or Limiting Learning?***

The rise of Large Language Models (LLMs) has presented opportunities for their use in higher education. However, misperceptions about these tools' limitations and capabilities may lead to inappropriate use by students that impair the pedagogical goals of classroom assessments. This study examines whether a training module focused on human factors concepts such as task analysis, human-automation design, and background knowledge about LLMs can improve students 'understanding of the limitations and capabilities of LLMs.

Seventeen upper-year engineering students completed entrance and exit surveys assessing their knowledge, perceptions, and usage of ChatGPT 3.5. These surveys included true/false questions on its capabilities, Likert-scale items measuring trust and usage, and free-response questions exploring personal experiences. To evaluate the training's effect, we performed continuity-corrected McNemar tests on the true/false section and Wilcoxon Signed-Rank Tests on the Likert-scale sections.

Our analysis revealed no significant change in capability knowledge ($\Delta M = .24$, $z(17) = 0.49$, $p > .05$) or in trust and usage ($\Delta M = -0.01$ and $\Delta M = 0$, $ps > .05$). Thus, our current intervention appears ineffective in improving students' comfort and appropriate usage of LLMs. However, statistically significant changes in understanding ChatGPT's limitations and capabilities were observed ($p = 0.02$), warranting further investigation.

**Presenters: Baylee Klein**
**Faculty: Dr. Pamela Soltis, Dr. Douglas Soltis, Dr. Shengchen Shan**

## ***Carya glabra Genome Assembly and Annotation***

Carya glabra is the scientific name of the pignut hickory tree, which is distributed throughout much of Eastern America and Canada, with northern Florida representing its southernmost distribution. This tree belongs to the Juglandaceae family, also known as the walnut family, which includes around ten genera and fifty species. Carya glabra was one of the fourteen tree species planted for the McCarty Woods restoration project, a campus movement to preserve and improve the plant diversity of the woods.

The goal of this study is to assemble the chloroplast and nuclear genome of Carya glabra for the first time. To assemble the plant genome, this class is using advanced PacBio HiFi data and Hi-C data. PacBio HiFi data helps achieve accurate DNA configuration, and the current coverage of the Carya glabra genome using HiFi data is 30x. Meanwhile, Hi-C data will provide information about the structure of the genome, assisting with chromosome arrangement.

Sequencing this plant will aid in conservation efforts. A better understanding of the Carya glabra genome also has agricultural implications, given its close relationship to pecans.

**Presenters: Brayden Smith, Kaitlynn Casiano**
**Faculty: Dr. Walter Lee Murfee**

## ***The Impact of Metabolic Syndrome on Lymphatic Network Structures***

Metabolic syndrome, or insulin resistance syndrome, increases the risk of heart disease, diabetes, stroke, and other conditions, affecting many individuals. Lymphatic vessels, which transport lipids and waste, are crucial for tissue healing but show impaired function under metabolic syndrome. Lymphatic network variables may predict diseased states, yet gaps remain in understanding how metabolic syndrome causes dysfunction and whether rat models reflect human systems.

This study aims to determine whether lymphatic network structures differ in rats with metabolic syndrome compared to lean-control rats. Tissue samples from 12-month-old Zucker Diabetic Fatty rats were analyzed in obese and lean groups five days post-stimulation. Images were captured at 4x FOV using LYVE-1 staining, ensuring an adequate presence of lymphatic vessels. Two metrics were quantified: gaps and length/area. Gaps were defined as discontinuities where a previous connection between vessels could be inferred, while length was measured as LYVE-1 stained vessels, excluding gaps.

Preliminary data show 8.67 $\pm$1.09 and 18 $\pm$2.16 lymphatic gaps and 2.53 $\pm$ 0.15 vs. 1.57 $\pm$0.12 mm/mm$^2$ vessel length/area in stimulated lean and obese tissues, respectively. These findings support the idea that metabolic syndrome alters lymphatic network structures, contributing to dysfunction.

**Presenters: Abby Bunk, Sophia Ziede**
**Faculty: Dr. Walter Lee Murfee**

## ***Lymphatic Network Alterations in Obese Rats with Metabolic Syndrome***

Despite efforts to prevent metabolic syndrome, diabetes, and obesity remain prevalent. New approaches are needed to address this burden. Research suggests lymphatic network variables may predict diseased states, as lymphatic vessels transport dietary lipids and liquid waste, yet how metabolic syndrome causes lymphatic dysfunction remains unclear. Our goal is to develop therapies that enhance lymphatic function by identifying molecular changes in lymphatic vessels as potential targets.

As a first step, we aim to determine whether lymphatic network structures differ between obese rats with metabolic syndrome and lean-control rats. To assess this, 4x images of mesenteric tissues from 12-month-old Zucker Diabetic Fatty rats were analyzed using ImageJ. Groups included lean (n=6) and obese (n=6) rats, with tissues collected 0 days post-harvest. Lymphatic vessel structures were evaluated by measuring vessel length per area and identifying isolated lymphatic vessel segments (islands) with two discontinuities per segment. Lyve-1 labeling was used to visualize lymphatic vessels in both groups.

The preliminary data includes 1.83 ±0.38 and 3.5 ±1.26 lymphatic islands in the region of interest for the group of lean and obese tissues, respectively. The results of this study will support the potential influence of metabolic syndrome on lymphatic network morphology and remodeling.

**Presenter: Jacob Cohen**
**Faculty: Dr. Anna Peterson**

## ***Religious Empathy: What Quaker Action in Criminal Justice Reform Reveals About Religion's Role in Social Progress***

The Quaker sect of Protestant Christianity has actively contributed to social change since its founding. A key piece of that history is a commitment to reforming the criminal justice system. Beginning with William Penn and the Pennsylvania Prison Society, they have fought for more humane conditions, specifically focusing on reintegration. The Quaker work in prison reform is deeply tied to their belief system, in particular, the doctrine of inner light described by founder George Fox. Inner light and the ideals derived from it can be fused into the concept of religious empathy. It is this empathy that has kept the faith in the longstanding tradition of social progress.

Beyond Quakers, scholars can apply this concept to religion as a whole, with religious empathy being a tool to understand why members care for the well-being of those outside their religious group. However, a look at modern Quakers reveals a more nuanced view of religion's role in social change, with a balance between religion influencing personal values and preexisting secular values aligning with religious beliefs. Broadly, this study aims to explore the extent of religion's role in reform by investigating the reasons behind Quaker thought and action in criminal justice.

**Presenter(s): Heer Patel, Ankit Ambatipudi, Max Azzariti, Ashlin Cannella, Samantha Herrera, Mary Huang, Ashir Idrees, Miaohan Lin, Vivek Panse, Keya Patel, Saathviksai Reddy, Shreya Sreekanth**
**Faculty: Peggy Borum, PhD; Parrish Winesett, MD; Maria Bruzzone, MD; Melissa L. Moreno, MS; Zoe Craig; AnnMarie Muñecas; Hanyu Luo; Samatha Waterman**

## ***Ketogenic/Anti-ketogenic Potential of Food in Precision Medicine***

A century ago, the use of the ketogenic diet was introduced to the medical literature for the treatment of seizures. Since then, different versions have been used: 1) grams of carbohydrates consumed per day, 2) a keto ratio of foods consumed per day (grams of dietary fat divided by the sum of grams of protein plus grams of carbohydrate), or 3) food with a low glycemic index. Medical literature supports the use of the therapy for many chronic illnesses but concludes that the therapy must be defined in greater detail before the questions addressed can be answered for precision medicine.

We chose 20 recipes from a ketogenic website frequently recommended by medical providers, made a grocery list of foods listed in recipes, collected nutrient composition data for several products of each food that might be purchased by a patient, compared the nutrient content of the products for each food, and calculated several ketogenic and anti-ketogenic parameters for each recipe. We conclude that the product of the food chosen, and the parameter used for dosing are major controllable factors in the resulting therapy and should be documented. We are proposing the parameter Ketogenic/Antiketogenic Potential Percent (KAP%) as the next step in reaching a better-defined ketogenic therapy.

**Presenter(s): Manas Vudugula, Ishaan Desai, Logan Scott, Roshan Shah**
**Faculty: Walter Leite**

## ***Project READS - Reading Error Analysis and Detection System: Automatic Identification and Classification of Reading Errors of Early Readers to a Reading Curriculum***

Project READS (Reading Error Analysis and Detection System) is a project designed to enhance oral reading fluency (ORF) in elementary school students, particularly those with learning differences. ORF is a useful predictor of reading comprehension and academic success, yet traditional methods for learning English often lack the individualized support that many struggling readers require. To address this gap, Project READS is being developed to improve Storiza, a reading app that uses generative AI to create personalized stories for young readers, by adding automated error detection and pronunciation assessment.

For this, we have utilized Azure's Pronunciation Assessment API to detect and classify reading errors in student speech. This API provides detailed feedback at the word, phoneme, and syllable levels, evaluating pronunciation accuracy, fluency, completeness, and prosody. Our research builds on prior work in automated speech evaluation, surpassing binary correctness models by incorporating a more nuanced pronunciation scoring system. Through iterative model validation and cross-validation techniques, we have developed a system that not only identifies errors but also adapts future reading content to reinforce phonemes and words where students struggle.

Initial findings indicate a strong correlation between fluency and pronunciation accuracy, suggesting that fluency scores may serve as reliable predictors of ORF proficiency. Furthermore, adaptive storytelling within Project READS personalizes reading materials based on individual student needs, ensuring engagement while systematically improving literacy skills. Future directions include integrating machine learning models like XGBoost for enhanced error classification, expanding our dataset with real classroom recordings, and refining real-time feedback mechanisms within Storiza to provide a seamless, interactive reading experience.

By using AI speech analysis, Project READS aims to give access to high-quality reading interventions and provide scalable, cost-effective support for students in diverse educational settings. Our research contributes to the advancement of AI-based reading assessments and the development of adaptive learning technologies that teach lifelong literacy skills.

**Presenter(s): Pranav Gunjala, Nikhil Sangamkar, Elsa Mathew, Sahara Butler**
**Faculty: Walter Leite**

## *Aligning AI-Generated Children's Stories with Reading Curricula*

Artificial intelligence is reshaping educational technology, yet ensuring AI-generated content aligns with structured reading curricula remains a challenge. Misalignment can lead to cognitive overload for students and reduce instructional coherence for teachers, limiting the effectiveness of AI-powered tools. When educational technology is carefully aligned with curriculum objectives, it enhances student learning and supports more targeted instruction.

Project ALIGN evaluates the alignment of AI-generated children's stories with the UFLI Foundations curriculum using machine learning (ML) and natural language processing (NLP). By applying semantic similarity analysis, topic modeling, and text complexity measurement, this research systematically assesses how well stories created with OpenAI's GPT-4.0 match lesson objectives. Additionally, ensuring the validity and reliability of this alignment is crucial for maintaining instructional integrity.

Scalable ML and NLP techniques provide an efficient alternative to manual curriculum alignment, allowing for large-scale evaluations across diverse educational settings. Establishing a data-driven framework for evaluating AI-generated content ensures that AI-driven learning tools are not only pedagogically sound but also instructionally coherent. Project ALIGN advances the integration of AI in education by developing reliable methods for generating and evaluating curriculum-aligned literacy materials, ultimately improving student outcomes and supporting teachers in delivering effective, structured instruction.

**Presenter(s): Jacob Urbina**
**Faculty: Whitney Stoppel**
## ***Magnetic Particle Imaging of Silk Fibroin Nanoparticles for Bioactive Components***

Silk fibroin nanoparticles (SFNPs) offer a promising platform for encapsulating bioactive components such as proteins due to their ability to form stable β-sheet crystalline structures. While SFNPs have demonstrated efficient encapsulation and stability of biomolecules like hemoglobin, in vivo studies remain a challenge, such as nanoparticle distribution and their accumulation in specific organs. This study explores the incorporation of superparamagnetic iron oxide nanoparticles (SPIONs) into SFNPs to enable imaging via Magnetic Particle Imaging (MPI). We aim to optimize SPION encapsulation efficiency, assess physicochemical properties through Fourier Transform Infrared Spectroscopy (FTIR) and Transmission Electron Microscopy (TEM), and determine detection limits in MPI by varying the SPION-silk ratio and SFMP concentration. Before any in vivo studies can be performed, we will design 3D printed phantoms and parameterize volumes, flow rate, and accumulation points. Establishing these parameters will facilitate future applications of SFNPs in biomedical imaging and therapeutic delivery.

**Presenter(s): Gabriela Matzen**
**Faculty: Anna Peterson**

## ***Christian Missionaries & the Indo-Chinese Opium Trade***

Much of the existing literature concerning Christian missionaries examines their activity as intertwined with the empires that they originate from and frequently depicts their activities as tools of those empires. However, this analysis represents a fundamentally secular viewpoint that tends to describe proselytization as an advancing of one's own religious interests instead of something done with the interests of others in mind. The activities of missionaries were not only commonly detached from the interests of imperial forces but could even work in opposition to them when it seemed their faith demanded it. A critical example of this occurrence was the relationship between the British Christian missionaries and the Indo-Chinese opium trade. These missionaries were at the forefront of protesting the opium trade in Britain, especially after the Opium Wars, as they believed that forcing opium upon the Chinese was a great evil. The fact that this position put them in direct conflict with their own government did not cause them to waver in their resolve to see the trade ended. This paper will challenge notions that view missionaries as perpetuators of imperialism by illustrating how these Christian groups advocated for the Chinese people in a manner exceptional for their time.

**Presenter(s): Christopher Dougherty, Jude Parker, Richard McCreary**
**Faculty: Dr. Rebecca Butcher**

## ***Effects of Length on KS Domain and Monomer Subunit Binding in C. Elegans***

Nemamides are hybrid polyketide-nonribosomal peptides produced in the neurons of *Caenorhabditis elegans* (C. elegans). These natural products increase the worm's chance of survival during starvation-induced larval arrest. The various domains in polyketide synthase (PKS) and non-ribosomal peptide synthase (NRPS) in C. elegans assemble the monomer units that make up the nemamides. Ketosynthase (KS) domains catalyze the Claisen condensation reaction in the production of nemamides and select misnomer units with coenzyme A condensation. KS domains activate and amplify certain genes within C. elegans, a small nematode with DNA sequences we seek to observe. We plan to make our KS domains water-soluble and add coenzyme A to observe the function of the substrate after protein expression. If successful, we will express the genes in the KS domain and add a substrate to identify the function of the enzyme in C. elegans. We aim to determine if the KS domains have preferences for the length of the substrate by creating mimics of the monomer subunits of varying lengths to see if the KS domains will attach to the substrate.

**Presenter(s): Samantha Herrera, Shiman Huang, Juliana Tu**
**Faculty: Dr. Peggy Borum**

***Food as Precision Medicine, Ketogenic Diets in Epileptic Patients***

This study examines the impact of food brand variations on macronutrient composition and their implications for ketogenic dietary management in epileptic patients. While similar food products may appear nutritionally equivalent, data analysis reveals significant differences in carbohydrate, fat, and protein content across brands. These variations are particularly critical in maintaining ketosis, a key factor in the effectiveness of ketogenic therapy for epilepsy.

A comparative analysis of high-carbohydrate (HC) and low-carbohydrate (LC) versions of common ingredients highlights the importance of brand selection in recipe formulation. For instance, fresh baby spinach shows a carbohydrate difference of 1.2 g per 100 g between HC and LC versions, and cream cheese exhibits variations in both carbohydrate and fat content. These discrepancies, though seemingly minor, accumulate over daily intake, influencing ketosis maintenance. Recipe-level analysis further underscores this impact, with HC versions reaching up to 6.33 g net carbs per serving, while LC alternatives reduce this to 0.9 g.

These findings emphasize the necessity of careful ingredient selection, label scrutiny, and individualized dietary planning for ketogenic therapy. Understanding brand-specific differences enables optimized nutritional strategies, ensuring that patients maintain a metabolic state conducive to seizure control and overall dietary success.

**Presenter(s): Joel Gritmon, Richard Li, Caleigh Patterson, Tirth Shah**
**Faculty: Ana Martin-Ryals**

## ***Anaerobic Co-Digestion of Food Waste and Wastewater Biosolids***

Gainesville Regional Utility is investigating the feasibility of an anaerobic digestion facility to reduce organic waste accumulation, mitigate greenhouse gas emissions, and produce biogas as a renewable energy source. Since biogas generation from food waste can be unpredictable due to its variable composition, the objective of this study was to see how co-digestion, which is digesting the food waste with another feedstock, at different ratios of food waste to wastewater biosolids would impact biomethane production and digestate quality.

A biomethane potential test was carried out on four conditions with varying food waste to wastewater biosolids ratios, 0:100, 10:90, 30:70, and 50:50. The inoculum was collected from a bench scale digester from the UF Agricultural and Biological Engineering department and the wastewater biosolids were collected from three wastewater treatment plants in Gainesville, Florida. Food waste was a prepared mixture. After 11 days of digestion, the biogas production of each condition (0%, 10%, 30%, and 50% food waste) was 197, 236, 330, and 432 mL/g VS added, respectively. The highest biogas production was observed at the 50:50 ratio, indicating that increasing amounts of food waste improved anaerobic digestion performance.

**Presenter(s): Dania Tarabishy**
**Faculty: Anna Peterson**

## ***Women's Ethical Agency and Syrian Islamic Revivalism: Transnationalizing the Qubaysiat***

The widespread impact of the Qubaysiat movement is reflected in the cultural landscape of Damascus today. Little work, however, has been done in assessing the motivations and impacts of this women's Islamic revivalist movement relative to those run by male counterparts. Nonetheless, the influence of Munira Al-Qubaysi and her Jama'ah, translated directly to "group," is abundant, not simply in the more religious echelons of Syrian society, but internationally.

Through analyzing the organizational structure of the Qubaysiat along with the influences on its teachings, this research examines how the generally traditionalist values taught by the organization are reflected in ways that create proactive agents for social change. The study will also look at Qubaysi operations on an international scale to understand how these ideals and modes of conveying them are reflected outside of the place of origin by looking at specific case studies, particularly within the United States. The paper posits that traditional Islamic values can be utilized across several spheres to promote women's ethical agency and put them at odds with the traditional dictates of society in both majority Muslim countries and international minority communities, while exploring the continuities and differences in the demonstration of said values.

**Presenter(s): Selena Mullore**
**Faculty: Anna Peterson**

## ***Religion and Reproductive Health Legislation***

For my research, I will be investigating the relationship between religion and reproductive health legislation. This paper will explore specific topics such as IVF and abortion and how legislation regarding these procedures is often influenced by religious beliefs and practices. I believe that I will find legislators and their constituents to be more influenced by their religious beliefs and upbringings than they thought. This topic is important to explore because it can highlight the influence that religion has on government. In countries such as the United States, where there is an intention to separate church and state, this recognition can lead to a more effective application of that structure.

When researching religious theories, I came across the work of Émile Durkheim who asserted that religion reinforces group interests that clash very often with individual interests. It will be interesting to see if this concept can be applied to my research.

**Presenter(s): Avery Gauthier, Ava McCarthy, Eva Pendleton**
**Faculty: Steven Bruner**

## ***Investigating O-Methyltransferases in the Biosynthesis of Dolastatin for Cancer Therapy***

Dolastatin, a potent anti-cancer compound derived from cyanobacteria, has demonstrated significant therapeutic potential, particularly in inhibiting tumor vascularization. While its biosynthesis is well-documented, the role of O-methyltransferases (OMTs) in modifying dolastatin remains unclear. OMTs catalyze the methylation of hydroxyl or amine groups, influencing the stability, bioactivity, and pharmacological properties of dolastatin derivatives. Understanding the structural and functional characteristics of these enzymes is essential for optimizing dolastatin-based therapeutics.

This study employs a genome mining approach to identify and characterize OMTs involved in dolastatin biosynthesis. Using PCR amplification, target genes encoding OMTs will be cloned into E. coli via plasmid transformation. The resulting recombinant enzymes will be purified and subjected to X-ray crystallography to elucidate structural features critical to their function. By analyzing key active site interactions and substrate specificity, we aim to determine how OMT modifications impact dolastatin's therapeutic efficacy.

Our findings will provide insight into OMT-driven biosynthetic pathways, facilitating the design of synthetic dolastatin derivatives with enhanced anti-cancer properties. This research contributes to the broader effort of leveraging marine natural products for novel drug development, bridging enzymology, structural biology, and cancer pharmacology.

**Presenter(s): Patrick Gawienczuk**
**Faculty: Dr. Jane Southworth**
**Program: AI Scholars & CLAS Scholars Program**

## ***Mapping Shrubland Encroachment: Using Machine Learning to Analyze Rainfall Trends***

Bush encroachment is an endemic threat to Namibia's savannas, impacting biodiversity, agriculture, and livelihoods. This phenomenon, driven by unchecked growth of invasive bush species during wet seasons, is closely linked to changing precipitation patterns. Understanding the relationship between precipitation trends and bush growth is critical to developing targeted management strategies.

This study employs the Random Forest (RF) classification algorithm to analyze the correlation between wet-season precipitation patterns and shrubland expansion in the Otjozondjupa region from 2015 to 2022. Using Landsat 8 satellite imagery and CHIRPS precipitation data within Google Earth Engine, the research identifies precipitation thresholds that promote bush encroachment.

Preliminary findings indicate that precipitation thresholds of newly established shrubland were inconsistent year-over-year; however, higher rainfall was positively correlated with increased shrubland expansion. This suggests that while precipitation is a key driver of bush encroachment, additional unstudied environmental factors significantly influence shrub growth.

Despite this variability, the clear link between increased rainfall and shrubland expansion provides valuable insight for land management strategies. By integrating this research into policy planning, decision-makers can develop data-driven bush control measures that account for shifting precipitation trends. These findings lay the groundwork for proactive action to mitigate bush encroachment and support Namibia's savannas

**Presenter(s): Nicholas Moyer**
**Faculty: Dr. Jennifer Dungan**
**Program: Laboratory-Based Frailty Assessment Using Electronic Health Record Data**

## ***Laboratory-Based Frailty Assessment Using Electronic Health Record Data: Association Between Frailty and 90-day Ischemic Heart Disease Outcomes Among Women***

**Significance:** There is an established correlation between physical frailty and the development of ischemic heart disease (IHD) in adults. Research illustrates a sex-frailty paradox, demonstrating a higher incidence of frailty in women but a decreased mortality rate when compared to men. The Laboratory-Frailty Index (FI-LAB) uses labs from electronic health records (EHR) to determine frailty levels but has not been evaluated for the context of IHD among women.

**Purpose:** This study aims to phenotype frailty using FI-LAB and test the relationship between frailty and 90-day IHD outcomes among women who presented to an Emergency Room (ER) setting for suspected coronary ischemia.

**Methods:** FI-LAB values were extracted from EHRs of 51 female participants being evaluated for suspected coronary ischemia. EHR LOINC codes for 23 FI-LAB parameters were utilized to calculate FI-LAB scores. Descriptive t-tests, chi-square tests, and mean differences in frailty levels between IHD diagnosis and event prevalence will be analyzed.

**Findings:** Among the 51 women recruited, one withdrew; 50% (n=25) self-reported Black/African American ancestry, with 5.9% (n=3) reporting Hispanic ethnicity. Five participants had a prior history of IHD (9.8%). Complete findings will be available at the time of the presentation.

**Discussion:** This research highlights the need for broader efforts to routinely assess frailty among women and understand its relation to IHD. A more comprehensive understanding of frailty could lead to better risk assessment and targeted interventions for at-risk female populations.

**Presenter(s): Cristina Barrios**
**Faculty: Dr. Eleni Bozia**
**Program: The Digital Epigraphy and Archaeology Project**

## ***The Digital Epigraphy and Archaeology Project***

The Digital Epigraphy and Archaeology project pioneers a transformative approach to preserving and revitalizing ancient inscriptions, unlocking new possibilities for scholarly exploration and public engagement. In this presentation, the DEA team will demonstrate the methodologies employed, showcase preliminary results from ongoing efforts, and discuss future implications for epigraphy.

Currently, the DEA is working on digitizing inscriptions from Thasos in collaboration with the University of Lyon and the Athenian Agora through the Krateros Project. These inscriptions, rich with historical narratives, offer profound insights into the dynamics of ancient societies, emphasizing the urgent need for their preservation against physical degradation.

Through imaging technology and digital archiving, the project significantly enhances the preservation, accessibility, legibility, and analytical potential of these ancient texts. Digitization not only safeguards these irreplaceable cultural assets from loss but also democratizes access, fosters global participation and interdisciplinary collaboration, fuels innovative research methodologies, and promotes a wider public understanding of archaeological heritage. The growing interest in classical archaeology continues to enrich the field and inspire a new generation of scholars, ensuring its enduring relevance in academia. Through digital technology, the project redefines the boundaries of archaeological scholarship, ensuring the lasting impact of these inscriptions for future generations

# Presenter(s): Yansheng Luo
# Faculty: Dr. Malcolm Maden
# Program: Sciatic Nerve Regeneration and Recovery in African Spiny Mouse (Acomys)

## ***Sciatic Nerve Regeneration and Recovery in African Spiny Mouse (Acomys)***

**Introduction:**

Regenerative medicine explores mechanisms enabling tissue repair after nerve injuries. The African spiny mouse (*Acomys cahirinus*) presents a unique model for scarless nerve regeneration, unlike *Mus musculus* (Maden & Varholick, 2020).

**Background:**

*Acomys* exhibits exceptional regenerative abilities, including functional recovery of peripheral nerves and the spinal cord (Maden, 2020). Enhanced axonal regeneration and Schwann cell activity characterize early recovery (weeks 1–5 post-injury) (Nogueira-Rodrigues et al., 2022). However, fibroblast and macrophage roles remain unclear despite their potential significance in nerve repair (Streeter et al., 2020).

**Methodology:**

This study examines sciatic nerve regeneration in *Acomys* and *Mus musculus*, focusing on axon signaling, Schwann cells, fibroblasts, and macrophages. Sciatic nerve crush surgeries and immunohistochemical analyses will assess cellular responses. Spinal cord tissue cultures will evaluate regenerative potential (Wehner & Becker, 2022). Functional recovery will be measured via behavioral and gait analyses (Dias et al., 2021).

**Results:**

*Acomys* exhibited enhanced Schwann cell proliferation, reduced fibrosis, and increased macrophage-mediated clearance compared to *Mus musculus* (Nogueira-Rodrigues et al., 2022). The absence of glial scar formation in spinal cord cultures highlights its distinct regenerative response (Streeter et al., 2020).

**Conclusion:**

**Identifying regenerative mechanisms in *Acomys* may lead to novel therapies for nerve injuries (Jain et al., 2015).**

**Presenter(s): Melody Marino**
**Faculty: Dr. Leslie Parker**
**Program: Perceptions of Mothers' Experiences Regarding the Use of "Personalized Pumping Pathways"**

## ***Perceptions of Mothers' Experiences Regarding the Use of "Personalized Pumping Pathways"***

The consumption of Mother's Own Milk (MOM) by critically ill infants decreases complications. Due to prematurity and critical illness, infants in the Neonatal Intensive Care Unit (NICU) often cannot breastfeed, requiring mothers to use a breast pump to provide MOM. However, mothers of critically ill infants often struggle to produce sufficient amounts of MOM due to mother/infant separation, the high rate of comorbidities, and the stress of having an infant in the NICU.

The Personalized Pumping Pathway (PPP) tool offers a personalized approach to help mothers optimize lactation and MOM volumes through to NICU discharge. This qualitative study explores the experiences of pump-dependent mothers using the PPP tool.

Participants included mothers ≥18 years old who intended to supply MOM to their infant, whose infant was admitted to the NICU for ≥14 days, and who received lactation support using PPP at two time points (prior to the onset of secretory activation and at 6-8 days postpartum). After each session, mothers completed a survey with nine open-ended questions about their experiences with PPP. A thematic approach was used to analyze the responses and identify themes

**Presenter(s): Srinidhi Pinni**
**Faculty: Dr. Aaron Costin**

***Program: IoT-Based Microbiological Risk Monitoring System for Construction Workers***

## ***IoT-Based Microbiological Risk Monitoring System for Construction Workers***

Construction workers face significant occupational health risks from microbiological hazards such as bacteria, fungi, and viruses. Traditional monitoring methods rely on periodic sampling and laboratory analysis, leading to delayed responses and increased exposure risks. The Internet of Things (IoT) offers a real-time solution by integrating environmental sensors, wireless networks, and cloud-based data analytics for continuous monitoring and rapid alerts.

Despite its growing use in workplace safety, no dedicated IoT-based microbiological risk detection system exists for construction sites. This research aims to develop an IoT-enabled system that continuously detects airborne and surface pathogens using sensor networks, transmits data via existing wireless infrastructure, and applies real-time analytics to assess risk levels. The system will provide automated alerts to workers and site managers, enabling immediate intervention.

This study will identify high-risk pathogens in construction environments, assess the feasibility of IoT-based biosensors, and evaluate data transmission and processing capabilities for real-time hazard detection. The expected outcome is a scalable framework that enhances occupational health by reducing pathogen exposure. By leveraging IoT for real-time pathogen surveillance, this research addresses a critical gap in workplace safety, providing a proactive and data-driven approach to risk mitigation on construction sites.

**Presenter(s): Mary Rowe**
**Faculty: Dr. Anil Rao**
**Program: Control of Laminar-Turbulent Transition**

## ***Control of Laminar-Turbulent Transition***

The objective of this study is to characterize mean flows over a hypersonic flat plate and predict where transition will occur using computational fluid dynamics (CFD). A passive control scheme will be developed to delay transition, thus reducing drag to improve aerodynamic efficiency.

"Transition" refers to the process by which laminar flow becomes turbulent and is characterized by small, unstable mean flow disturbances amplifying uncontrollably until the flow exhibits unpredictable behavior. Delaying transition is important to reduce the negative effects of turbulence on aerodynamic performance. One of these negative effects is drag, particularly skin friction and parasitic drag, which is a critical consideration in aircraft design.

This study aims to provide a method of reducing skin friction and parasitic drag via passive control in the form of heating. To approximate the mean flows over the flat plate and to predict where on the flat plate transition will occur and inform the passive heating, NASA's Langley Aerothermodynamic Upwind Relaxation Algorithm (LAURA) and Langley Stability and Transition Analysis Code (LASTRAC) will be employed

**Presenter(s): Mallorie Watson**
**Faculty: Dr. Mateus Rocha**
**Program: Spectrophotometric Analysis of Spherical and Prismatic Silver Nanoparticles stabilized with different L-Arginine Polymers used for dental caries prevention**

## ***Spectrophotometric Analysis of Spherical and Prismatic Silver Nanoparticles Stabilized with Different L-Arginine Polymers Used for Dental Caries Prevention***

**Objective:** To evaluate the UV-Vis spectra of spherical and triangular silver nanoparticles (AgNPs) stabilized with L-arginine and Poly-L-Arginine.

**Materials and Methods:** AgNPs were synthesized using silver nitrate, trisodium citrate, and sodium borohydride. Spherical AgNPs turned yellow within 2 minutes, while triangular AgNPs changed from clear to yellow to blue over 30 minutes. After 24 hours, L-Arginine (0.1 wt%) and Poly-L-Arginine (0.1 wt%, 5-15 Kmol%, 15-70 Kmol%, >70 Kmol%) solutions were mixed with AgNPs along with 0.033 wt% PVP to prevent aggregation. Purification was achieved via centrifugation (6708 g, 20 min, three cycles).

**Results:** Spherical and Triangular AgNPs with PVP displayed peak absorptions at 394 nm and 800 nm, respectively. Spherical AgNPs with Poly-L-Arginine exhibited redshifts (+5 nm to +14 nm), while Triangular AgNPs showed significant blueshifts (-319 nm to -420 nm). These spectral shifts, influenced by L-Arginine polymer molecular weight, suggest their role in tuning nanoparticle optical properties.

**Conclusions:** The observed UV-Vis absorption shifts indicate that L-Arginine polymers can modify AgNP surface plasmon resonance. This tunability has potential applications in tailoring dental materials to enhance biofilm-targeting reactions

**Presenter(s): Jaden Smith**
**Faculty: Dr. Gabriel Pundrich**
**Program: Analysis of Local Sales Taxes in Response to Economic and Demographic Trends**

## *Analysis of Local Sales Taxes in Response to Economic and Demographic Trends*

**Introduction:** Local sales taxes are a crucial source of revenue for municipalities and an important aspect of fiscal policy. The variation in state laws regarding the ability of counties and cities to levy and utilize sales taxes complicates understanding their economic impact. Furthermore, the lack of accessible and standardized local sales tax data has hindered research in this area.

**Methodology:** Using diverse web scraping techniques across individual state government websites, I have developed an original national panel dataset on local sales tax rates from 2000 to 2024. The availability of this data depends on state publication practices. Descriptive analysis reveals an upward trend in total sales tax rates over time, with significant variation in the contribution from state, county, and city-level taxes.

**Findings:** Substantial differences were identified in how each tax component responds to shifting economic and demographic trends. This analysis uncovers important insights into how local sales taxes are influenced by changing economic conditions and population shifts.

**Conclusion:** The findings of this study offer valuable insights for researchers and policymakers seeking to understand the complexities of local sales tax systems. This work serves as a strong foundation for further investigation into the broader economic and societal impacts of municipal tax policies

**Presenter(s): Zoe Struk**
**Faculty: Dr. Kerry Costello**
**Program: Balancing Data Reduction and Signal Integrity Through Downsampling in Wearable Accelerometry for Osteoarthritis Analysis**

## ***Balancing Data Reduction and Signal Integrity Through Downsampling in Wearable Accelerometry for Osteoarthritis Analysis***

**Introduction:** Machine learning applied to high-resolution wearable accelerometer data has the potential to offer valuable insights into how human movement impacts knee osteoarthritis progression. However, these analyses are computationally expensive. This study uses power spectra analysis to inform filter design and decimation-based downsampling to explore data reduction while retaining essential signal components.

**Methodology:** Accelerometer data were collected from 2436 participants in the Multicenter Osteoarthritis Study at a frequency of 100 Hz over 7 days, resulting in approximately 180 million data points per person. Dominant frequency components were identified using Welch's method of spectral estimation prior to filter design. Signal information was quantified by calculating the percentage of area under the curve preserved after downsampling.

**Findings:** The results showed that on average, 99.77% of the area was retained at 50 Hz, 92.87% at 25 Hz, and 77.36% at 12.5 Hz. Processing time for feature extraction from the original and downsampled data decreased with lower sampling rates (47.53% reduction at 25 Hz and 86.18% reduction at 12.5 Hz).

**Conclusion:** Decimation to 25 Hz preserves signal information while significantly reducing data volume. By maintaining signal integrity while improving computational efficiency, these techniques could enhance the development of predictive models and support more effective clinical interventions for osteoarthritis patients. Future work will explore the predictive power of features extracted from decimated data.

**Presenter(s): Erika Mattar**
**Faculty: Dr. Ramzi Salloum**
**Program: Promote Up: Comparative Effectiveness of Mobile Health Smoking Cessation Approaches**

## ***Promote Up: Comparative Effectiveness of Mobile Health Smoking Cessation Approaches***

**Introduction:** Promote UP is a 5-year research project funded by the Patient-Centered Outcomes Research Institute (PCORI), which explores the comparative effectiveness of mobile health (mHealth) smoking cessation aids and the Florida Quitline referral system. Tobacco smoking is the leading cause of preventable disease and death in the U.S. Recent advances in digital technology and behavioral science have led to two significant breakthroughs in mobile health treatments for smoking cessation.

**Methods:** Two mHealth treatments are being compared in this study. The first, iCanQuit, is a cognitive-behavioral approach shown effective in a large phase 3 clinical trial. It helps users quit by recognizing triggers for smoking and committing to personal values. The second, Motiv8, offers financial rewards based on verified smoking abstinence, promoting smoking cessation through a technology-enabled, health incentive-based model.

**Objective:** This research aims to evaluate the comparative effectiveness of iCanQuit alone, iCanQuit+Motiv8, and the Florida Quitline referral system in primary care patients. The study will examine how and for whom these interventions are effective in achieving smoking abstinence, while also identifying barriers and facilitators in implementing these interventions in clinical settings

**Presenter(s): Kristian O'Connor**
**Faculty: Dr. Stephen Wormald**
**Program: Causal Clusters: Representing Explainable Feature Learned by Deep Neural Networks as Causal Graphs**

## ***Causal Clusters: Representing Explainable Features Learned by Deep Neural Networks as Causal Graphs***

**Introduction:** This study aims to visualize the inner workings of deep neural networks (DNNs) by investigating the clustering patterns that emerge within the latent space at each layer. The goal is to represent the relationships between these learned patterns using a causal graph to explain the decision-making process of the DNN.

**Methodology:** The research focuses on identifying clusters at every layer during training. Traditional explainable AI (XAI) methods, such as SHAP, are used to analyze and interpret the behavior of each cluster. This analysis allows the construction of a causal diagram that explains how certain clusters (and their associated patterns) influence or predict the activation of downstream clusters across the network.

**Objective:** By employing causal graphs, this method sheds light on how information is transformed and propagated through the layers of a DNN. The study also evaluates the performance and interpretability of this approach by showing how these explanations can assist model inspectors in predicting false positive and negative cases in a neural network

# Presenter(s): Sadia Barua
# Faculty: Dr. Roberto Abreu
# Program: “I took that part of myself because I was so ashamed and put it so far down that I almost made it non-existent”: South Asian Immigrants ’Experience with Appropriated Oppression and Ethnic Identity

## ***South Asian Immigrants ’Experience with Appropriated Oppression and Ethnic Identity***

**Introduction:** Despite the increasing population of first-generation South Asian immigrants to the US, there has been little focus on their identity development, especially in relation to appropriated oppression (internalized racism) and ethnic identity. This study examines the complex experiences of South Asian immigrants in navigating the pressure to assimilate into the dominant culture while maintaining strong ethnic identity ties.

**Methodology:** This qualitative study involved 13 participants who completed semi-structured interviews reflecting on their ethnic identity and experiences with discrimination related to both their ethnic and immigrant backgrounds. Using frameworks such as internalized oppression and ethnic-racial socialization, the study investigates how these factors intersect in shaping ethnic identity.

**Results:** The study identifies three main themes and 9 subthemes:

1. **Appropriated Oppression** (e.g., Messaging, Coping, Age)
2. **Retention and Importance of Ethnic Identity** (e.g., Motivations, Practices, Communities)
3. **Emergence of Biculturalism and Critical Consciousness** (e.g., Unlearning, Biculturalism, Critical Consciousness)

**Conclusion:** The findings emphasize that practitioners working with first-generation South Asian immigrants should focus on fostering ethnic identity while addressing the challenges of appropriated oppression. This study contributes to a deeper understanding of how ethnic identity and the experience of internalized oppression shape the immigrant experience

**Presenter(s): Özlem Polat**
**Faculty: Dr. Cheryl Resch**
**Program: CyGator: A Resilience Assessment Framework for Adaptive Cyber Defense against Advanced Persistent Threats**

## ***CyGator: A Resilience Assessment Framework for Adaptive Cyber Defense against Advanced Persistent Threats***

**Introduction:** As cyber threats, particularly Advanced Persistent Threats (APTs), grow in sophistication, there is an increasing demand for resilient systems that can adapt and respond to these complex attacks. CyGator addresses this challenge by developing a comprehensive framework to assess and enhance the resilience of critical infrastructure systems under cyberattacks.

**Methodology:** The CyGator framework integrates various components of system architecture, including hardware, software, known vulnerabilities, and environmental factors. This integration is combined with Bayesian networks, Finite State Machines (FSMs), and other mathematical models to simulate the impact of cyberattacks. The framework calculates resilience scores and evaluates recovery pathways to provide actionable insights, prioritizing defensive actions and quantifying operational risks.

**Advancements:** The next phase of the research introduces machine learning (ML) algorithms to predict resilience degradation patterns and optimize recovery strategies. By training AI models on simulated attack scenarios, CyGator adapts in real time to evolving threats, making it a dynamic and scalable solution for diverse systems.

**Conclusion:** CyGator aims to automate the resilience assessment process, informing acquisition decisions, and enabling system operators to deploy the most effective cybersecurity measures. Its ultimate goal is to contribute to the development of autonomous systems capable of not only withstanding adversarial attacks but also evolving in response to emerging cyber threats, advancing resilient cyber defense architectures and automated security interventions

## Presenter(s): Zhengxiao Wang, Alper Ungor, Özlem Polat, Jessica Lourenco

## Program: Evaluating Nearest Neighbor Search Algorithms for Cyber Resilience Assessment & Mitigation

# ***Evaluating Nearest Neighbor Search Algorithms for Cyber Resilience Assessment & Mitigation***

**Introduction:** With the increasing frequency and sophistication of cyber threats, organizations are realizing that preventing attacks alone is insufficient. The focus is shifting towards developing strategies that detect threats early, respond efficiently, and recover swiftly from cyber incidents, all while minimizing operational disruption and protecting sensitive data. This study evaluates the applicability of various Nearest Neighbor Search (NNS) algorithms in the context of cyber resilience modeling.

**Methodology:** The research examines several NNS algorithms, including:

- **Hierarchical Navigable Small-World Graphs (HNSW)**
- **Random Walk-based k-NN Search**
- **Cosine Similarity k-NN (Vectorized Search, MinHash + LSH)**
- **Graph Embedding-Based NNS (Node2Vec, GraphSAGE)**

These algorithms are evaluated against structured network datasets, considering key data components such as system architecture, asset inventory, known vulnerabilities, and critical function mapping.

**Objective:** The goal of this study is to determine which of these NNS algorithms is best suited for supporting cyber resilience analysis, threat modeling, attack path inference, automated risk assessment, structural risk clustering, and resilience scoring. By identifying the most effective approach, the study aims to enhance proactive risk mitigation and resilience strategies for organizations.

**Conclusion:** This research will provide valuable insights into the most effective NNS algorithm for use in cyber resilience, enabling better threat detection, risk assessment, and decision-making. It ultimately aims to bolster organizational preparedness against emerging cyber threats by fostering proactive system hardening and risk mitigation techniques.

## Presenter(s): Paulina Decker, Frederick Kates

## Program: Artificial Intelligence in Diabetic Retinopathy Diagnosis: A Narrative Review of Accuracy, Clinical Integration, and Public Health Impact

## ***Artificial Intelligence in Diabetic Retinopathy Diagnosis: A Narrative Review of Accuracy, Clinical Integration, and Public Health Impact***


**Background:**
Diabetic retinopathy (DR) is one of the leading causes of preventable blindness, with early detection being crucial for effective treatment. Traditional screening methods depend on ophthalmologists analyzing retinal images, which can be a time-consuming process. Artificial Intelligence (AI) offers a promising alternative by utilizing deep learning algorithms to automate and improve DR detection. This study reviews the efficacy, accuracy, and broader public health impact of AI-driven diabetic retinopathy screening.

**Methods:**
A review of studies indexed on PubMed between 2020 and 2025 was conducted, focusing on AI-based DR diagnosis. The study analyzed key performance metrics such as sensitivity, specificity, and AUC-ROC. FDA-approved AI models like IDx-DR and EyeArt were specifically evaluated for their clinical effectiveness. The study excluded non-English articles and those with small sample sizes to ensure data quality and generalizability.

**Results:**
The AI models demonstrated diagnostic accuracy comparable to ophthalmologists, with both sensitivity and specificity rates exceeding 90%. AI-assisted screening also alleviated the workload on clinicians, expanding access to care, especially in underserved regions through telemedicine. Despite these advancements, challenges such as model bias, data privacy issues, and regulatory hurdles remain.

**Conclusion:**
AI-driven diabetic retinopathy diagnosis has made significant strides in ophthalmology by enhancing early detection and improving patient outcomes. Integrating AI into clinical practice reduces the burden on healthcare providers and increases access to care in underserved populations. Future research should focus on refining AI models, diversifying datasets, and establishing standardized guidelines to ensure clinical reliability and equitable care for all patients

## Presenter(s): Logan Hoskins, De Hoe, Ethan Mottas

## ***Polyethylene Furanoate (PEF) as a Sustainable Alternative to Polyethylene Terephthalate (PET)***

Polyethylene furanoate (PEF) is gaining attention as a promising bio-based polymer that can replace polyethylene terephthalate (PET) due to its superior environmental and performance characteristics. PEF is derived from renewable plant sugars, positioning it as a more sustainable alternative to PET, which is derived from petroleum.

**Key Advantages of PEF:**

- **Barrier Properties:** PEF offers excellent protection against gases like oxygen and carbon dioxide, extending the shelf life of packaged products.
- **Thermal Stability and Mechanical Strength:** PEF demonstrates higher thermal stability and mechanical strength, making it suitable for a variety of applications including packaging, textiles, and automotive components.
- **Recyclability:** PEF is recyclable and can be incorporated into existing PET recycling streams, supporting a circular economy.

These features make PEF a compelling material to explore further as a sustainable and high-performance alternative to PET in a variety of industries

**Presenter(s): Florencia Merlino, Brent Sumerlin**
**Authors: Megan E. Lott, Lucas Aburaya, Florencia Merlino, Brent S. Sumerlin**

## ***Polymers of Dynamic Sequence through Depolymerization***

This study explores the use of depolymerization methods as tools to transform synthetic vinyl polymers into evolving materials rather than static entities. The research highlights how the depolymerization process, typically used to address plastic waste, can also be leveraged for broader synthetic applications, enabling polymers to undergo transformation and evolve in response to external conditions.

**Key Concepts:**

- **Reversible-Deactivation Radical Polymerization (RDRP):** This method facilitates the synthesis of polymers with controlled architectures and sequences, offering high end-group fidelity essential for block copolymer preparation and depolymerization of polymethacrylates.
- **Depolymerization and Circular Economy:** Depolymerization regenerates the starting monomer in high purity, which can be repolymerized into the initial polymers, creating a circular economy by reducing waste.
- **Dynamic Polymers:** This study proposes expanding depolymerization methods to create dynamic polymers. By leveraging depolymerization, the study demonstrates how materials can be reprocessed and reformed into new structures with random sequences.

**Experimental Approach:**

- **Polymer Used:** Poly((benzyl methacrylate)-b-(methyl methacrylate)) (P(BnMA-b-MMA)) was chosen for depolymerization under both solution and bulk conditions.
- **One-Pot Repolymerization:** After depolymerization, the regenerated monomers were used in a one-pot fashion to repolymerize the material into a random sequence, enabling continuous reprocessing and transformation.

This work expands the potential applications of depolymerization methods, demonstrating that synthetic polymers can evolve over time, offering new possibilities for adaptive materials in various fields

## Presenter(s): Amanda Smith, Ashish Aggarwal

# ***On the Applicability and Validity of Obtaining a Rashomon Set to Interpret Predictive Models in Education***

**Background:** As machine learning models become more prevalent in educational data mining (EDM) for predicting outcomes like dropout rates and academic performance, one of the critical challenges is interpretability. Many machine learning models, especially "black-box" systems, lack transparency and actionable insights for educators. While current methods like SHAP, LIME, and Neural-Symbolic AI aim to make models more interpretable, they don't fully meet the specific needs of educators.

**Research Aim:** This study explores the use of the Rashomon set—a collection of predictive models with similar performance—for improving the interpretability of educational prediction models. The goal is to provide educators with actionable insights into student performance predictions, enabling them to make data-driven interventions that are fair and transparent.

**Key Approach:**

- **TreeFARMS (Trees Fast Rashomon Sets):** The study used TreeFARMS, a technique for generating sparse decision trees from educational data. A dataset of over 800 student records was analyzed, considering variables like GPA, prior programming experience, and demographics.
- **TimberTrek Tool:** To enhance the usability of the Rashomon set, the study integrated **TimberTrek**, an interactive visualization tool that allows educators to explore and curate models from the Rashomon set. This enables them to identify decision paths that align with educational goals and priorities.

**Findings:**

- **Interpretability in Education:** The study demonstrated that educators can use the Rashomon set of models to make informed decisions, identifying patterns and decision paths that lead to similar outcomes. This empowers educators to intervene effectively in a way that balances fairness and transparency while improving student outcomes.
- **Balancing Accuracy and Simplicity:** By using a collection of models instead of a single one, the approach helps balance the accuracy of predictions with the simplicity of understanding, thus fostering trust and enabling more informed decision-making in educational settings.

**Presenter(s): Dania Tarabishy**
**Faculty: Anna Peterson**

## ***Women's Ethical Agency and Syrian Islamic Revivalism: Transnationalizing the Qubaysiat***

The Qubaysiat movement has had a significant cultural impact in Damascus, but little research has been done on the motivations and effects of this women's Islamic revivalist movement compared to similar movements led by men. Despite this, the influence of Munira Al-Qubaysi and her Jama'ah ("group") is widespread, both within the religious sectors of Syrian society and internationally.

This research examines the organizational structure of the Qubaysiat and how its teachings have fostered proactive agents for social change despite its generally traditionalist values. It also explores the movement's international operations, particularly in the United States, to understand how its principles have been adapted outside of Syria.

The study argues that traditional Islamic values, when reframed within the Qubaysiat framework, can empower women ethically, challenging societal norms in both majority Muslim countries and international minority communities. It also highlights the continuities and differences in how these values are expressed across various cultural contexts.

# INDIVIDUAL STUDENT ABSTRACTS

**Presenter(s): Rohun Gargya**
**Faculty: Luis Sordo Vieira**

## ***Control Methods for Dynamic Cellular Simulations of Fibrosis***

Agent-based modeling (ABM) is commonly used in simulating biological systems, particularly in areas like mathematical oncology and systems immunology. However, the computational intensity of these simulations, especially in dynamic, high-dimensional environments, limits their practical use. This paper introduces a software-based approach designed to efficiently approximate these complex simulations, enabling faster and more feasible analysis of biological models.

The methodology combines sensitivity analysis techniques, including Random Forest Regressor, Sobol Analysis, SHAP (Shapley Additive Explanations), and Monte Carlo simulations, to identify the key parameters influencing model behavior. By integrating machine learning with mathematical analysis, the approach reduces data requirements and enhances interpretability.

The method is applied to an existing ABM coupled with Ordinary Differential Equations (ODEs), focusing on modeling fibrosis progression and intracellular processes. This multi-scale framework serves as a test case for the sensitivity analysis. Initial results suggest that the hybrid methodology effectively identifies the critical parameters governing biological behaviors (e.g., collagen production in fibrosis) while minimizing simulation runs and cutting computational costs. Further testing is needed to evaluate the broader applicability and robustness of the method in more complex biological systems.

**Presenter(s): Paris Daniels**
**Faculty: Gerlyn Murrell**

## ***Undergraduate Women and Femmes of Color at University of Florida: Social Life, Academic Obligations, and Anxiety and Depression***

Undergraduate women of color and femmes in higher education, particularly at predominantly white institutions (PWIs), face unique challenges tied to academic performance, social belonging, and mental health. These students often navigate racial and gender-based stressors, which lead to higher rates of anxiety and depression. This study examines how undergraduate women of color and femmes at the University of Florida balance academic pressures and social lives while managing anxiety and/or depression, regardless of formal diagnosis. The study is framed using an intersectional theoretical approach, and a qualitative survey was distributed digitally via Qualtrics to 57 students who report experiencing anxiety and/or depression.

Findings indicate that while extracurricular activities serve as a key support system, academic and financial stress contribute significantly to mental health challenges. Participants reported experiencing impostor syndrome, isolation in classrooms, and challenges accessing mental health resources due to stigma and inadequate institutional support. Social support networks, such as friends, family, and cultural organizations, were vital for coping, with many students relying on peer communities instead of university-provided mental health services.

This study contributes to the conversation on equity in higher education, emphasizing the structural barriers and the need for culturally responsive policies to support the academic success and mental well-being of women of color and femmes at PWIs

**Presenter(s): Molly Wagner**
**Faculty: Erin Westgate, Jackie Davis**

## ***Scripture and Spiritual Experience: A Qualitative Study of Religious Narratives in Anglo-Catholic and Evangelical Anglican Seminarians***

Religious experience is both personal and socially influenced, shaping individual identity and the wider religious community. While much research has been done on religious experience, fewer studies have looked at how theological traditions within Anglicanism shape these experiences. This study addresses that gap by analyzing 25 participants from two distinct Anglican seminaries: Nashotah House (Anglo-Catholic) and Trinity (Evangelical Anglican). The study examines significant moments in their Christian journeys, their spiritual experiences tied to specific themes, and the role of objects in their religious lives. Additionally, the research investigates participants' views on high and low church traditions.

The data were analyzed using thematic coding, with a particular focus on how scripture references were integrated into their responses. Rooted in phenomenology and narrative theology, the study reveals that denominational context heavily influences how seminarians interpret and describe their religious experiences. The findings offer a deeper understanding of how theological traditions shape spiritual formation, providing valuable insights for pastoral care, seminary education, and ecumenical dialogue

**Presenter(s): Daniel Leverette**
**Faculty: Benjamin Johnson**

## ***REMEMBER IT, AS IT WAS ON SCREEN: FILM AND REIMAGINED HISTORIES***

The translation of historical events or figures onto the screen involves compressing time, creative liberties to engage audiences, and the perspectives of filmmakers. These reconstructions of the past serve as dominant means by which societies and individuals remember, learn, and reflect on events that occurred years, decades, or even centuries ago. How history is depicted, altered, or fictionalized on screen has significant implications for audiences ’ understanding of historical events. Additionally, nostalgia for past people, places, and events can foster "restorative nostalgia" for an idealized time that may never have existed, which influences how people make sense of their present lives.

This project will use a survey method to explore how exposure to historical films influences beliefs about the histories they represent. The survey will assess respondents ’reactions to recent films set in historical contexts, their perceptions of historical accuracy, and audience responses such as immersion and enjoyment.

**Keywords:** film, history, enjoyment, accuracy, knowledge

**Presenter(s): Diego Medina-Jimenez**
**Faculty: Ramon Sun**

## ***Cutting Costs and Maintaining Reproducibility in Quantitative Metabolomics Using a Custom Nitrogen Blowdown Apparatus***

High costs and complex equipment present significant challenges in scientific fields. This research aims to reduce the cost while improving the reproducibility of liquid chromatography-mass spectrometry (LC-MS) metabolomics experiments by comparing a custom in-house designed nitrogen drying apparatus to commercial alternatives. The design utilizes a single nitrogen line feeding a manifold that evenly distributes gas through replaceable stainless steel luer lock needles, efficiently removing solvent from 2 mL HPLC tubes.

The apparatus is modular and adaptable, making it suitable for various sample containers across different scientific disciplines. We compare the performance of our device with commercial vacuum centrifugation and lyophilization equipment, specifically in preparing biological samples for quantitative metabolomics by LC-MS. The custom apparatus offers reduced equipment and maintenance costs, with the potential to lower barriers for entry into these analyses. The design is open-source and 3D printable, and the research shares assembly instructions and files to promote scientific collaboration.

Beyond metabolomics and LC-MS experiments, this nitrogen blowdown apparatus can be applied to other protocols requiring directed gas flow for sample preparation, including proteomics, analytical chemistry, and chemical engineering

**Presenter(s): Ansley Johnson**
**Faculty: Edith Kaan**
**Co-Author: Denise Suarez**

## ***Can Attention Modulate Predictive Eye-Movements in Sentence Processing?***

Efficient and accurate language processing is both incremental and predictive (e.g., Ferreira & Chantavarin, 2018). Listeners rely on contextual cues—grammatical and semantic—to anticipate upcoming words in both first (L1) and second languages (L2) (e.g., Kaan & Grüter, 2021). However, research on how attentional demands influence predictive processing in L1 remains limited.

This study investigates whether attention modulates predictive eye movements using an eye-tracking visual world paradigm. L1 English speakers (N = 121) listened to sentences while focusing on either male or female actors. Sentences contained either predictive verbs ("After Peter answered his phone...") or non-predictive verbs ("After Peter lost his phone..."), with displays showing a phone, wallet, and glasses. Predictive verbs were task-relevant for participants attending to male actors. While both groups exhibited increased fixations on the target image in predictive conditions, the onset of the prediction effect remained unchanged, indicating that attention manipulation had no significant impact.

To further explore whether predictive processing can be influenced by attentional instructions, a follow-up study (N = 60) is underway, where participants receive explicit guidance to anticipate upcoming nouns.

**Presenter(s): Jack Kuzmicki**
**Faculty: Saeed Moghaddam**

## ***Development of a Microfluidic Dialyzer for Wearable Artificial Kidney***

A wearable artificial kidney (WAK) offers a transformative solution for patients with end-stage renal disease (ESRD), enabling continuous or more frequent dialysis outside clinical settings. Unlike traditional dialysis, which requires frequent healthcare visits and limits patient independence, a WAK enhances flexibility, improves quality of life, and reduces healthcare costs.

Current WAK designs rely on bulky hollow fiber and outdated membrane modules, preventing truly wearable systems. This study addresses these challenges by developing a microfluidic dialyzer (MD) that is significantly smaller and operates solely on arterial pressure, mimicking the kidney's glomerular basement membrane.

Numerical and experimental studies guided the MD's design, achieving a pressure drop of 0.73 kPa (5.5 mmHg)—substantially lower than the 4 kPa (30 mmHg) drop in conventional dialyzers. This reduction eliminates the need for an external pump, simplifying the system. Although the MD's urea clearance rate of 60 mL/min is lower than conventional dialyzers, it shows promise for low-flow applications like home hemodialysis. Future research will focus on membrane improvements to enhance clearance. The MD's optimized design minimizes pressure drop and footprint while striving for dialysis outcomes comparable to existing systems.

**Presenter(s): Zaed Christie**
**Faculty: Masanori Fujimoto**

## ***Analyzing the Heavy Metal Accumulation Potential of Sagittaria lancifolia from a Constructed Wetland***

Phytoremediation is a sustainable method for extracting pollutants from the environment. This study evaluates the effectiveness of *Sagittaria lancifolia* (Lanceleaf Arrowhead) as a hyperaccumulator of heavy metals by analyzing plant and soil samples from the SEEP constructed wetland. The concentrations of lead (Pb), nickel (Ni), and cadmium (Cd) were measured, and the Bioaccumulation Factor (BAF) was calculated to determine the plant's ability to absorb and store these metals.

Results showed that the mean BAF value for Ni was 4.64, which is comparable to known phytoremediation plants. Statistical analysis (ANOVA, $p < 0.05$) revealed that the BAF for Ni was significantly higher than for Pb and Cd, suggesting that *S. lancifolia* preferentially accumulates Ni. A correlation test indicated a negative relationship between BAF and soil concentrations of Pb (-0.8156) and Ni (-0.4818), while Cd showed no significant trend (0.0182).

Overall, the high BAF values for Ni suggest that *S. lancifolia* can be classified as a Ni hyperaccumulator, demonstrating potential for use in phytoremediation strategies to reduce Ni contamination in wetland environments

**Presenter(s): Rebecca "Becca" Walters**
**Faculty: Ann Wilkie**

## ***Mulching Soil with Dried Marigolds for Pest Control***

Marigolds (*Tagetes* spp.) have been valued for centuries for their vibrant blooms and, more recently, for their natural pest-repelling properties. These flowers emit chemical compounds that deter parasitic nematodes and certain hemipteran insects, making them useful as intercrops for vegetables like lettuce and tomatoes. However, once wilted, marigolds are typically discarded, and little research has examined their pest-repelling effectiveness when dried and mixed into soil.

This study investigates whether dried marigolds, when incorporated into mulch, can enhance soil conditions and suppress pests. A triplicate experiment will be conducted both inside and outside of a greenhouse, testing three conditions: dried marigolds alone, mulch alone, and a combination of dried marigolds with mulch. Tomato plants, which are susceptible to aphids and beetles, will serve as test subjects.

If dried marigolds retain their insect-repelling compounds after drying and incorporation into mulch, this treatment could offer a practical, eco-friendly alternative to chemical pesticides, potentially outperforming traditional mulch applications in pest suppression.

**Presenter(s): Ashley Correa**
**Faculty: Ryan Mears**
**Additional Authors: Emily Nordarse, Logan Dapp, Joey Puell, Chloe Lockwood, Victoria Manzatto**

## ***Rhythmic Dissociative Movements After Acute Ketamine: Kinematic annotation & Semi-supervised classification***

Sub-anesthetic doses of ketamine have emerged as a rapid and effective treatment for depression, often accompanied by dissociative side effects that may contribute to its therapeutic effects. This study focuses on a distinct upper body and head movement observed in four ketamine-treated Sprague Dawley rats, referred to as the "wag" or "head-bob"—a stereotypic movement associated with ketamine-induced dissociation. Our primary objective is to develop a structured approach for detecting and analyzing these WAGs in freely moving animals using a semi-supervised machine learning framework.

To achieve this, we recorded and annotated video footage of ketamine-administered rats, labeling frames with a binary classification: "1" for WAG presence and "0" for absence. Using DeepLabCut, we tracked 10 body points, iteratively refining the model to correct tracking inaccuracies. A balanced dataset was then constructed, ensuring consistent labeling of frames and sequences as feature-present or feature-absent. Following pose tracking, SimBA was employed to extract custom movement features—including angles, velocities, and distances—which served as input for machine learning classifiers. Each video frame yielded hundreds of features, enabling the training of supervised classifiers or the application of pre-trained models to generate frame-by-frame probability predictions of WAG occurrence.

The classifier's performance was assessed using accuracy, precision, recall, and F1-score, demonstrating high reliability in validation tests. In the final analysis stage, SHAP interpretation revealed key movement features that significantly contributed to accurate WAG predictions, enhancing the model's interpretability.

**Presenter(s): Lucja Stawikowska**
**Faculty: S. Balachandar**

## ***A Machine Learning Approach to Modeling Particle Flocculation Dynamics***

Flocculation, the aggregation of suspended particles into clusters, is a pivotal process in engineering applications, such as in the dispersion of soot after combustion events. Presently, the interaction between the flocs and the surrounding fluid can be accurately calculated using the Stokes and potential flow theories. However, these computations are highly expensive and impractical for large-scale simulations.

This project introduces a digital twin framework leveraging machine learning to overcome these limitations. The approach employs a double graph convolutional network (GCN) to predict forces acting on each particle by considering both unary forces, as well as binary force contributions resulting from interaction with neighboring particles. A diverse set of cases, encompassing variations in acceleration and global volume fraction, was generated to provide the network with comprehensive insights into different possible physical scenarios.

The network must learn complex interactions between particle positions, accelerations and local volume fractions to predict the resulting force on each particle. Preliminary results indicate a network accuracy of 99.73%, demonstrating the model’s potential for capturing complex flocculation dynamics. By integrating Stokes and potential flow theories with artificial intelligence, the created model offers a computationally efficient alternative for understanding large-scale particle interaction.

**Presenter(s): Reem Abdelghany**
**Faculty: Rene Opavsky**

## ***Lentiviral Knockdown of C17ORF58 on PTCL-NOS Lymphomas and Other Hematological Malignancies***

Lymphomas, malignancies arising from lymphocytes, are driven by oncogenes. Among them, Nodal Peripheral T-cell Lymphoma, Not Otherwise Specified (PTCL-NOS) is the most common T-cell lymphoma (TCL) subtype, comprising one-third of all cases. These aggressive cancers exhibit significant resistance to chemotherapy, necessitating alternative therapeutic strategies.

To identify essential genes for PTCL-NOS survival, we analyzed RNA sequencing data from patient tumors, identifying 400 genes overexpressed relative to controls. After excluding genes essential for normal function, we performed shRNA knockdowns in the PTCL-NOS cell line T8ML-1, revealing multiple candidates whose suppression induced cell death, including TRIP13 and C17ORF58. Notably, C17ORF58 knockdown had no impact on non-tumorigenic human fibroblasts (HEK293T) and normal T-cells, suggesting a selective role in malignant survival. Further studies in Jurkat T-cells demonstrated C17ORF58 downregulation triggered cell cycle arrest and apoptosis, reinforcing the gene's oncogenic potential.

To expand beyond T-cell malignancies, we examined C17ORF58 in B-cell and myeloid malignancies. Knockdown in B-cell Lymphoma (RAJI) and Chronic Myeloid Leukemia (CML) (K562) cell lines induced significant cell death and G2/M phase arrest, implicating C17ORF58 in cell proliferation. Our findings establish C17ORF58 as critical for lymphoma and leukemia survival, highlighting it as a promising therapeutic target in hematologic cancers.

**Presenter(s): Isabella Abouhana**
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## ***Let Her Cook: Content Creators, Recipes, and Home Meals***

Home cooking repertoires are important for healthy eating. Mediated depictions of food preparation, such as celebrity chef programs, have long influenced home cooking behaviors. In recent years, social media influencers have become a major source of information and entertainment around food, including recipes and preparation. Influencers, also known as content creators, have become prominent voices across a wide range of lifestyle and informative topics, as audiences spend more of their leisure time with short-form content on social media platforms and less time with traditional media. Previous research indicates that people are persuaded by content creators ' posts about food (Alwafi et al., 2022), followers learn from cooking creators and are likely to imitate their cooking (Sokolova, Perez, & Rezaee, 2024), and that entertainment and self-efficacy were predictive of intentions to imitate the creator's cooking (Sokolova, Rezaee, & Perez, 2024). We build on these findings to with a survey that considers how the intentionality in exposure plays a role: whether cooking creators are sought out or stumbled upon. We also extend existing findings by considering the role of sponsorship, and we examine a wider range of ultimate cooking outcomes than just imitation of the influencer.

**Presenter(s): Thrisha Acharya**
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## ***Essential Role of Hepcidin in Host Resistance to Disseminated Candidiasis***

Background
Candida albicans (C. albicans) is a commensal fungus, and its transition from commensalism to pathogenicity remains the predominant cause of invasive candidiasis. Patients with chronic liver diseases are vulnerable to invasive fungal infections. One consequence of chronic liver disease is attenuated ability to produce hepcidin and maintain organismal control of iron homeostasis. Given the importance of iron in microbial pathogenesis, we have investigated the role of hepcidin in fungal defense.
Methods
Genetic and inducible hepcidin-deficient mice were infected with C. albicans and the fungal burden, immune response and kidney pathology were evaluated. The therapeutic efficacy of PR-73 (hepcidin analog) was evaluated in infected inducible hepcidin-deficient mice.
Results
Genetic and inducible hepcidin deficiency resulted in inexorable fungal growth, invasive hyphal transformation, beta-1,3-glucan exposure that worsened kidney pathology independent of candidalysin, a known fungal toxin. Treating with PR-73 attenuated the fungal burden, hyphal transformation, and lowered renal injury.
Conclusion
This study establishes hepcidin deficiency as a susceptibility factor in invasive candidiasis. Loss of hepcidin and associated iron overload promotes fungal virulence and hyperimmune response. The findings suggest that hepcidin mimetics, such as PR-73, represents a promising therapeutic strategy to improve infection outcomes in at-risk patients.

**Presenter(s): Ana S. Acosta**
**Faculty: Gerardo H. Nunez**

## ***Assessing Cuticular Conductance in Southern Highbush Blueberry Leaves***

Plants control water loss using their stomata, closing them in the presence of hot and windy conditions to prevent drying out. However, plants also lose water from their epidermal cells through their cuticle (cuticular conductance), a process which plants cannot control. Cuticular conductance is an important factor in the growth of blueberry plants in Florida, where environmental conditions exacerbate water loss. However, cuticular conductance rates in blueberry leaves are unknown. We hypothesized that cuticular conductance rates vary among young and mature leaves and among blueberry varieties with contrasting stomatal traits. Four varieties of southern highbush blueberry plants with contrasting stomatal densities and sizes were selected (Vaccinium corymbosum interspecific hybrids varieties 'Colossus', 'Meadowlark', 'Albus 'and 'Sentinel'). We placed 14 mature leaves from each variety in a dark dehydration chamber to measure water loss when stomata remain closed. We periodically weighed the leaves as they lost water through their cuticle. We then measured the cuticle thickness of each variety using light microscopy. Rates of cuticular conductance and cuticle thickness varied among varieties. Understanding the role cuticular conductance plays in plant success can inform current and future blueberry cultivation practices.

**Presenter(s): Rowan Afiat**
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## ***Determining the Parentage of Putative Polyploid Tragopogon mirus × miscellus Hybrids and Other Morphologically Unusual Goat-Beard Plants Found Near Pullman, Washington***

In 1950, American botanist Francis Ownbey discovered two new species of Tragopogon (Asteraceae) (goat-beard) had evolved naturally through allopolyploidy in Washington and Idaho. He described hybrid tetraploid species Tragopogon mirus ($2n = 24$) (diploid parents T. dubius ($2n = 12$) x T. porrifolius ($2n = 12$)), and T. miscellus ($2n = 24$) (T. dubius ($2n = 12$) x T. pratensis ($2n = 12$)). The three parental diploid species, native to Eurasia, were introduced to the Palouse region of Washington and Idaho in the early 1900s. Extensive subsequent work has shown that the two allotetraploids had formed repeatedly. Ownbey's Tragopogons are one of few well-established models for studying recent polyploid evolution in angiosperms. We investigated potential natural T. mirus x miscellus hybrids and morphologically unusual plants recently collected in the Palouse using two molecular markers: nuclear (ITS) and plastid (rpL16). Following amplification of these loci, Sanger sequencing, and comparative analyses of sequence data we tested the hypothesis that the plants represented crosses between the polyploids or backcrosses. We found that some investigated individuals are hybrids between the polyploids or morphologically modified individuals of the named species. Overall, the complexity of the obtained molecular results is congruent with previously observed morphological complexity of the studied morphologically unusual populations.

**Presenter(s): Alexandra Aguila**
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## ***Significance of Lysine Acetylation on the Electron Transport Protein, 2Fe-2S Ferredoxin, in Haloferax volcanii via Site-Directed Mutagenesis***

Haloferax volcanii, a model halophilic archaeon, faces extreme conditions, including extreme temperature and pH, varying in osmolarity, and exposure to reactive oxygen species (ROS) that can damage the organism's macromolecules and disrupt redox reactions. To mitigate these stressors, H. volcanii has adapted by developing a range of regulatory mechanisms that aid to maintain cellular homeostasis. Among these mechanisms, the post-translational modification (PTM), lysine acetylation (KAc) is proposed to regulate protein function and metabolic pathways, particularly in response to oxidative stress. The 2Fe-2S ferredoxin (ferA5; HVO_2995), an electron transfer protein, has been identified as a KAc target at K97, K113, and K119. The proximity of ferA5 KAc sites to the protein's Fe-S cluster suggests an impact on redox and protein interaction. The overall aim of this study is to identify the functional significance of ferA5 acetylation within its structure and function to transfer electrons. To investigate the impact of acetylation at these sites, site-directed mutagenesis was performed, with lysine-to-glutamine (Q) mutations mimicking acetylation at KAc sites and lysine-to-arginine (R) mutations mimicking deacetylation. By anti-acetyllysine immunoblotting, we demonstrate K119 is a major acetylation site, as signal decreases when substituted to Q and R. Additionally the two characterized lysine acetyltransferase, Pat1 and Pat2, have not been seen to acetylate ferA5 under. Current work is aimed to determine the lysine acetyltransferase responsible for ferA5 acetylation. By analyzing the effects of these mutations, this study aims to determine the regulatory role of lysine acetylation in ferredoxin function, structure, and interactions with its putative protein partner, ferredoxin reductase (FdR; HVO_2345).

**Presenter(s): Joseph Alberto**
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## ***Leveraging the ExoQuality Index to Remove Extracellular Vesicle Isolate Bias from Breast Cancer Biomarker Detection***

Extracellular vesicle (EV) liquid biopsy is a non-invasive, highly specific method to assess breast cancer recurrence by probing isolated EV mRNAs. However, major technical bias associated with EV isolation and heterogeneity has confounded EV biomarker screening. Currently, no statistical methods exist to correct biomarker screening bias from EV isolation. Therefore, we propose to develop a statistical method to mitigate EV heterogeneity from isolated EV mRNAs to determine the most important breast cancer biomarkers indicating breast cancer recurrence. Herein, we will integrate the ExoQuality Index (EQI), a statistic defining EV heterogeneity based on isolated EV yield, size, protein, and RNA, into DESeq2 and edgeR to verify existing EV-discovered breast cancer biomarkers. First, we curated EV breast cancer transcriptomic datasets from NCBI's Gene Expression Omnibus (GEO) to generate the EQI per EV isolation method. Next, we modified the biological coefficient of variation (BCV) estimated by DESeq2 and edgeR to verify the dataset's breast cancer markers. Results showed determined biomarker differences between our method and the dataset, indicating the significant impact of EV heterogeneity in EV liquid biopsy. Thus, our method will strengthen rigor in determining effective breast cancer biomarkers from EV liquid biopsy.

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## ***Evaluating the Functionality of Gene-Edited Antigen-Specific Tregs for the Treatment of T1D***

Type 1 diabetes (T1D) pathogenesis involves a functional imbalance of unrestrained autoreactive T cells over the suppressive capacity of regulatory T cells (Tregs), which induces pancreatic beta-cell death. Studies using the Non-Obese Diabetic (NOD) mouse model indicate that adoptive Treg therapy can arrest T1D onset with adequate engraftment. However, human trials have demonstrated limited therapeutic efficacy with mechanistic data supporting the need for substantial numbers of antigen-directed Tregs with stringent tissue specificity and activation parameters optimized for activity and stability. Herein, we evaluated the function of human Tregs possessing native (WT, low-affinity) or affinity-enhanced (B6, intermediate-affinity; B1, high-affinity) T cell receptors (TCRs) that recognize a salient pre-proinsulin antigenic peptide (PPI15-24). We confirmed equivalent TCR transgene expression in the three PPI-reactive Treg "avatars," but noted increased MHC-multimer binding affinities, antigen-dependent proliferation, and expression of surface activation markers in cells expressing affinity-enhanced versus WT TCRs. Notably, intermediate-affinity B6 avatars outperformed high-affinity B1 avatars, exhibiting augmented proliferative and suppressive capacities. These data indicate that enhanced Treg function may follow increased TCR affinity to a certain extent and suggest that any redirected Treg avatar should be scrutinized to ensure optimal activation and suppressive function prior to adoptive cell therapy.

**Presenter(s): Amira Alkoriji**
**Faculty: Sharon DiFino**

## ***Menstrual (Period) Poverty: A Public Health Crisis Impacting Underserved Communities***

Period poverty refers to the lack of access to menstrual products, menstrual hygiene education, and sanitation services. This global issue significantly impacts education, employment, and overall well-being. One in five individuals experience period poverty in the U.S. (Casola et al., 2023). In a 2019 survey, 64% of women among the lower socioeconomic populations in St. Louis, Missouri reported period poverty (Kuhlmann et al., 2023). Menstrual poverty particularly affects school-aged girls resulting in missed school and extracurricular activities, impacting academic progress and social development. Moreover, the difficulty to access proper menstrual products can lead to unsafe hygiene practices, increasing the risk of other health implications.

The purpose of this study is to explore the policies and stigmas surrounding the menstrual cycle focusing on minority groups and those with lower socioeconomic backgrounds. By analyzing these cultural and social barriers through a comprehensive literature review, this research seeks to uncover the broader issue of menstrual inequity and identify steps to mitigate their effects. Data will be collected via UF databases and traditional search engines, such as Google Scholar and PubMed. Furthermore, this project will include a Qualtrics survey to investigate attitudes towards the menstrual cycle in the U.S..

**Presenter(s): Emilio Allan**
**Faculty: Stephen Elardo**

## ***Trace Element Partition Coefficients Between Major Minerals in Lunar Magma Ocean Liquids and Magnesian Suite Parental Melts***

The Luanr Magma Ocean (LMO) is the widely accepted model for the Moon's formation and differentiation, creating a mineralogically and geochemically heterogeneous crust and mantle. The Magnesian suite (Mg-suite) intruded the lunar crust during or shortly after LMO crystallization and is thus important for understanding and modeling this and subsequent stages of lunar evolution. Recent research has found discrepancies between calculated and measured abundances of trace elements in LMO and Mg-suite derived lithologies. We conducted two sets of high temperature experiments to determine mineral-melt partition coefficients for 1) LMO liquid compositions throughout magmatic evolution and 2) parental melts of Mg-suite lithologies. Developing a full set of major, minor, and trace elements is a necessary and essential step for future research in answering unsolved questions about the early history of the Moon.

**Presenter(s): Benjamin Allen**
**Faculty: Angelika Neitzel**

## ***Examination of Low Degree Quaternization of Poly(4-vinylpyridine)***

The assembly of oppositely charged polymers into nanoscale structures in solution, blends, and at interfaces is of great fundamental interest and provides avenues to advanced solid-state materials. Polymers with a wide range of charge fractions are desirable for the study of these systems. We present the synthesis of well-defined poly(4-vinylpyridine) via reversible-addition fragmentation chain transfer (RAFT) polymerization and the post-polymerization modification of these polymers to afford polymers containing a controlled fraction of variable ionic comonomers. Macromolecular characterizations was carried out using a combination of size exclusion chromatography with UV-Vis, multi-angle laser light scattering (MALLS), and refractive index (RI) detection as well as proton nuclear magnetic resonance (1H NMR) spectroscopy.

**Presenter(s): Connor Ambrose**
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## ***Atomic Precision Nanoparticle Synthesis Forecaster***

Cadmium telluride (CdTe) semiconductor magic-sized clusters (MSCs)—with their reproducible synthesis, distinct excitonic absorption peaks, and bandgap around 1.5eV— are promising materials for optoelectronic applications, such as solar cells and light-emitting diodes (LEDs). Recent work has demonstrated that CdTe MSCs with different first excitonic transitions (E1) can be selectively synthesized by adjusting reagent amounts, temperature, and reaction time. However, the large parameter space involved in these syntheses makes systematic exploration challenging. This study employs machine learning (ML) to model CdTe MSC synthesis, treating each E1 transition as a classification problem. ML algorithms were trained to map reagent parameters to specific transitions. Using SHapley Additive exPlanations Feature Importance (SHAP-FI), four critical parameters were identified: diphenylphosphine (DPP) amount, oleylamine (OAM) amount, temperature, and time. Twenty-six ML algorithms were evaluated, with the best model for each classification achieving high accuracy and strong discriminatory power on test data. An active learning loop further refined the models by selecting experiments in uncertain regions of the parameter space. This work provides a predictive framework to support the efficient synthesis of CdTe MSCs with tailored properties and may be generalized to other nanoparticle systems.

**Presenter(s): Paige Anderson**
**Faculty: Kyle Hartig**

## ***IMPLEMENTATION OF STACKED ENSEMBLE MACHINE LEARNING FOR DETECTION OF PLUTONIUM SURROGATE CONTAMINATION IN SOIL***

This study implements laser induced breakdown spectroscopy (LIBS) for the identification of plutonium surrogate material (Cerium oxide) in soil matrices by training supervised machine learning methods on the recorded spectral data. A bagged ensemble using Random Forest yields the highest sensitivity predictions with a detection limit of 0.015 wt%. However, high precision in Ce content prediction required the use of a stacked ensemble regression which provided the superlative Ce quantification model with error 0.107% and a detection limit of 0.022 wt%. This underscores the utility in applying tiered machine learning methods like stacking to solve complex spectral analysis problems.

**Presenter(s): Siya Aparanji**
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## ***Investigating the Antimicrobial Resistance Profile of Salmonella Isolated from Dairy***

Salmonella is a leading cause of foodborne illness and a significant public health concern due to its high morbidity and mortality rates, further compounded by the increasing prevalence of antimicrobial resistance (AMR). The rising incidence of antimicrobial resistance reduces available treatment options by undermining the effectiveness of antibiotics. This study aimed to investigate the antimicrobial resistance profile of Salmonella isolated from dairy cows to assess the prevalence of resistant strains.
In this study, Salmonella strains were isolated from healthy and diarrheic cows. Ultimately, the 18 strains selected for analysis were from diarrheic cows. The 18 isolates were tested for susceptibility to 12 different antimicrobial compounds, such as amoxicillin, tetracycline, colistin, and others by disc diffusion method. Most of the Salmonella strains exhibited susceptible against antibiotics, however, they showed resistant or intermediate susceptible profile to streptomycin and ceftiofur, which are used for treating bovine respiratory disease and mastitis.
The findings of this study provide insights into the presence and distribution of antimicrobial-resistant Salmonella in dairy cows, highlighting potential challenges in effectively treating mastitis in cows. Understanding these resistance patterns will guide strategies for improving food safety, strengthening public health, and mitigating the spread of resistant Salmonella strains in the dairy industry.

**Presenter(s): Rey Audrel Zeth Arcenas**
**Faculty: Seth Bernstein**

## ***Artificial Intelligence and The Florida Alligator: Representational Bias as a Historical Tool***

With the breakthrough of the transformer infrastructure, explosion of artificial intelligence (AI) development, and growth of datasets employed to train AI models, critical AI studies have increasingly scrutinized bias embedded within AI training data and subsequent output. Although representational bias remains a problem for other applications of generative AI, this project explores how such bias provides a useful tool for historians. Working with over ten thousand issues of the University of Florida's over century-long student newspaper, The Florida Alligator and The Independent Florida Alligator, this project divided the dataset into decades, incorporated them within a large language model (LLM), and requested the LLM to produce one hundred profiles of a UF alumni. Examining the profiles decade-by-decade and connecting it to the broader literature on social change at the University of Florida, this project's findings highlight the ability of LLMs to provide historical insight into broader demographic and rhetorical changes within a vast dataset. The project also discusses limitations of LLMs for historical work, including hallucinations and the opaqueness of the underlying architecture. This project contributes to the growing field of the digital humanities by providing an exploratory intervention into the benefits and limitations of LLMs for historians.

**Presenter(s): Yoan Argote**
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## ***Prevotella corporis prevents and reverses protein aggregation in Caenorhabditis elegans through activation of a protective stress response***

The sporadic onset of 90% of neurodegenerative Protein Conformational Disease (PCD) cases underscores the need to identify factors involved in disease pathogenesis. A growing body of literature has established a correlation between gut dysbiosis and PCDs. Recent work in our laboratory has identified the impact of 229 human bacterial isolates on PCD-associated proteins using Caenorhabditis elegans expressing polyglutamine, Aβ1-42, tau, and α-synuclein. We have determined that toxic protein aggregation is robustly suppressed by Prevotella corporis, regardless of the disease-associated protein in the host, suggesting an upstream bacterial effect on host proteostasis. These findings are consistent with literature that associates a depletion in the Prevotella genus with increased PCD occurrence and severity. Here, we elucidate the mechanistic basis of the observed proteoprotective effect that P. corporis has a on the host, specifically the effects this bacterium uniquely exerts on the heat shock response (HSR) and oxidative stress response (OSR), the interactions between these pathways, and their resulting effects on toxic protein aggregation in the host. Using C. elegans expressing hsp70p::GFP as a readout for the HSR and DAF-16::GFP for the OSR, we found that P. corporis not only induces the HSR but also the disaggregation of polyglutamine aggregates, providing mechanistic insights into how this proteoprotective bacterium affects host proteostasis. Our findings suggest a role for bacteria in the sporadic development of PCDs by affecting host stress responses and altering the host's transcriptome, galvanizing a novel microbial approach for managing neurodegenerative disease.

**Presenter(s): Malaica Ashley**
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## ***The Estrous Cycle Phase Influences Exercise Capacity Without Altering Dehydration in Mice During an Exertional Heat Stroke Protocol***

Exertional heat stroke (EHS) involves central nervous system dysfunction due to hypothermia from physical exertion in hot environments. In females, hormonal fluctuations during the estrous cycle (EC), estradiol predominating in estrus and progesterone in diestrus, potentially affecting EHS susceptibility. We evaluated whether mice EC phase influences BM during an EHS protocol, and the relationship between BM changes, total time of exercise (TTE), and core temperature (Tc).

Adult female mice (estrus:n=35, diestrus:n=22) were implanted with telemetry sensors for Tc. Thirty days post-implantation, mice underwent an EHS protocol with running wheel exercise in a 37.5°C, 40% humidity chamber, starting at 2.5 m/min and increasing by 0.3 m/min every 10 minutes until loss of consciousness.

TTE was higher in estrus (3.22±0.57h) than diestrus, (2.82±0.75h, p=0.02). BM decreased after EHS for mice in estrus (-2.75 ±0.66g, p<0.0001) and diestrus (-2.48±0.54g, p<0.0001), but was not different between phases (p=0.17). The BM percent reduction was not different between estrus (11.0±2.7%) or diestrus (9.8±2.1%, p=0.11). BM variation (r=0.65, p<0.0001) and percentage reduction (r=0.64, p<0.0001) positively correlated with TTE.

EC phases influence EHS susceptibility in female mice, with longer exercise tolerance during estrus than diestrus. Body mass reductions were not phase-dependent.

**Presenter(s): Jean Augustin Jr**
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**Additional Authors: Jena Brooks**

## ***Healing Across Cultures: Navigating Haitian Healthcare by Addressing Cultural Beliefs and Health Impacts***

To provide equitable and effective care, it is essential to recognize that healthcare goes beyond diagnosing medical conditions; it requires understanding the cultural backgrounds and beliefs that shape a patient's healthcare experience. Every individual is unique, and it is essential for healthcare providers to be well-versed in the diverse needs of various populations. While cultural competency is widely acknowledged in healthcare, certain marginalized groups, including the Haitian population, continue to face significant barriers in accessing quality care. These challenges stem from linguistic differences, cultural beliefs about health and illness, and systemic healthcare disparities.

This literature review aims to identify and evaluate the cultural determinants of health within the Haitian community, specifically exploring how cultural beliefs may hinder access to proper healthcare. By analyzing methodological factors such as target demographics, healthcare outcomes, and cultural practices, the purpose of this study is to provide a comprehensive understanding of Haitian culture and language. This study will also use traditional search engines such as Google Scholar and the University of Florida databases. Our findings seek to enhance healthcare delivery for Haitians while providing insights that can be applied to other culturally diverse populations.

**Presenter(s): Katie Austin**
**Faculty: Sungyoon Jung**

## ***Evaluating the Impact of Water Reclamation on Microplastic Concentration and Composition in a Local Creek***

An uprising issue in environmental topics has been the presence of microplastics, which are plastics ranging in size from one micrometer to five millimeters. Regarding freshwater environments, there are many sources of microplastics including stormwater runoff and discharge from water treatment facilities. Although it is known that microplastics are prevalent in many places in the environment, there is limited knowledge of the influence sources have on microplastics, especially in smaller freshwater environments. In this study, we will investigate a water reclamation facility that discharges effluent into a small local freshwater stream. Our approach includes water sampling before and after the treatment facility, as well as a sample of the effluent from the facility. Samples will be prepared by filtering and digesting using 30% hydrogen peroxide. The analysis first involves using stereomicroscopy to analyze the physical properties of microplastics. Then, we will identify chemical composition using a method called pyrolysis gas chromatography mass spectrometry (Py-GC/MS). In this study, we expect the water reclamation facility will influence microplastic physiochemical properties and quantity within the stream. This data will help us understand the impact that microplastic sources have on freshwater environments and can help bridge the knowledge gap of microplastics in local streams.

**Presenter(s): Giovanna Avellar Figueredo**
**Faculty: Philip Hahn**
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## ***Bend or Break: Nutrition affects the mechanical response of a sexually selected weapon***

Many species have evolved sexually selected weapons in male-male competition. Much remains unknown about how nutrition impacts weapon construction and structural integrity. In the insect Narnia femorata (Hemiptera: Coreidae), males use their spiny hindlegs as weapons to grab and squeeze male opponents in competition over mating opportunities. Previous studies have established in this species that high-quality juvenile nutrition improves injury resistance of the hind leg weapons. Yet, the effects of adult nutrition on injury resistance are largely unknown. Further, we do not know the effects of nutrition on an essential offensive component of the insect's weapon: its spines. For this purpose, adult N. femorata were reared on natural diets varying in quality. Hind legs were removed 28 days post-eclosion. We tested the structural integrity of the terminal femur spine by pressing a force transducer against the spine tip with increasing normal force. A spectrum of responses was observed: some fractured, while others bent strongly without breaking. Strong bending of the spines was also dependent on the flexible cuticle supporting the spine. Insects reared on low-quality diets showed a trend of lower bending and breaking forces. These differences suggest that despite their similar size, shape, and appearance, spines can differ strikingly in their mechanical response. Future studies in this area will examine the degree to which spine bending or breaking affects performance in male-male competition.

**Presenter(s): Philip Babbi**
**Faculty: Julie Maupin**

## ***Proteasome assembly chaperone homolog PbaB and its role in Archaea***

The ubiquitin proteasome system (UPS) is central to protein degradation and is important in maintaining homeostasis and recycling of nutrients in all eukaryotes, thereby becoming a major target for chemotherapy and other drugs to facilitate human health. In eukaryotes, proteasome assembly chaperones (PACs) appear integral to assembly of the 20S core particle (CP) of the UPS. Human disorders are associated with alterations to the PACs. The complexity of this system has made it difficult to draw conclusions regarding PAC function with proteasomes. Archaea synthesize proteasomal CPs and PACs that share close evolutionary histories with eukaryotes, providing ideal opportunities to advance knowledge of this system. Archaeal PAC homologs are distinguished by the presence or absence of a C-terminal Hb-Y-X motif (hydrophobic amino acid-tyrosine-any amino acid). We seek to understand the roles of these motifs in archaeal PACs, whether they are associated in regulation or assembly of the CP of the archaeal UPS. Recent work in the Maupin-Furlow lab has revealed that the PAC homolog, PbaA, co-purifies with CPs from the halophilic archaeon Haloferax volcanii. Examination of PbaA and the paralog, PbaB, which respectively do and do not have a C-terminal Hb-Y-X motif, will be paramount to advance knowledge of archaeal UPSs.

**Presenter(s): Maya Baker**
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## ***Alpha-1 Antitrypsin Enhances Humoral Immunity in Response to Vaccines***

Alpha-1 Antitrypsin (AAT) is a critical protease inhibitor that regulates extracellular proteases to maintain tissue homeostasis. Patients with deficiency in AAT show increased susceptibility to pathogens for which vaccines are available. The role of AAT in modulating protective immunity, particularly in antibody responses following vaccination, remains poorly understood. This study aims to explore the role of AAT in the stability of vaccine antigens in lymphoid tissue and its impact on humoral immunity after vaccination. Using AAT knockout (KO) mice, we found that AAT-deficient mice had significantly lower antigen-specific antibody titers after immunization, suggesting AAT's role in enhancing antibody responses. To further understand how AAT is prolongs protein antigen stability in lymph nodes, we tracked antigen accumulation and half-life in lymph nodes following immunization with fluorescent protein antigens. Our findings demonstrated that protein antigens degrade more rapidly in lymph nodes of AAT KO mice compared to wild-type, indicating that AAT is essential for preserving antigen stability. This research sheds light on how AAT modulates antibody responses to protein vaccines and its broader implications for vaccine efficacy in AAT-deficient individuals. Understanding AAT's role in antigen stability could lead to new strategies for optimizing vaccine responses in AAT-deficient patients.

**Presenter(s): Leah Baker**
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## ***Tuning Material Properties Through Depolymerization***

Plastic waste is a growing problem due to linear polymer economy, meaning plastics aren’t designed to be reprocessed. Polymers synthesized with circular polymer economy can be chemically recycled to monomer through depolymerization. This is applicable to upcycling post-consumer polyolefin waste by installing dynamic bonds into cross-linked networks, creating covalent adaptable networks (CANs) that allow for recyclability without diminishing the material properties.

Polymethacrylates efficiently depolymerize (>90%) with the inclusion of low (<5) mol% thermally labile phthalimide ester groups as pendent moieties. We synthesized a copolymer from 2-hydroxyethyl acrylate (HEA), butyl methacrylate (BMA), and phthalimide methacrylate (PhthMA) by conventional radical polymerization. We then synthesized a siloxane ether as a crosslinker by reacting with pendent hydroxyl groups. It has been shown that silyl ethers are capable of dynamic exchange to form CANs. We leveraged this approach to combine benefits of depolymerization and dynamic crosslink exchange to prepare chemically recyclable materials susceptible to selective depolymerization. By comprising the networks with acrylate and methacrylate functionality, we exploited the depolymerizability of the latter to generate materials that could undergo rigidification and strengthening while maintaining a constant number of crosslinks. We characterized network flow behavior before and after depolymerization via shear rheology to demonstrate improved thermomechanical properties.

**Presenter(s): Mahika Balaraju**
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## ***Novel DNA-guided CRISPR/AsCas12a System for RNA Targeting***

As more ways to manipulate the different parts of the CRISPR-Cas complex are discovered, the scope of what is possible in genome editing, RNA editing, and diagnostics is rapidly expanding. The original CRISPR/Cas systems used RNA guides for DNA targets and previous literature was limited by this aspect, however, this study presents the idea of ψDNA, which presents a novel way to do specific and efficient RNA targeting using a reversed orientation of traditional RNA guides and AsCas12a. ψDNA had remarkable accuracy and efficiency in the in vitro portion of the study and continued to do so in the recent in vivo portion as well. When used with patient samples, ψDNA was able to effectively guide AsCas12a enzymes to target HCV RNA with 100% accuracy in just 30 minutes. Moreover, the ψDNA CRISPR-Cas complex continued to display its functionality when tested within living cells and was able to accurately bind to the target RNA and induce a significant amount of RNA level knockdown. Upon further experimentation, it was even able to perform multiplex RNA regulation measured through trans-cleavage activity. Additional exploration of DNA could be harnessed for more diagnostic and therapeutic applications.

**Presenter(s): Sanjana Balkaran**
**Faculty: Jennifer Nichols**

## ***Evaluating the Reliability and Accuracy of Goniometer Measurements for Thumb Range of Motion***

Goniometers are commonly used to assess joint mobility by measuring range of motion (ROM). While manual goniometers are generally considered reliable, there are inconsistencies when evaluating the thumb due to challenges with joint identification, the parallax effect, and inability to control for out-of-plane motion. To understand the impact of these inconsistencies, this study assessed inter-rater and intra-rater reliability when reporting thumb joint angles measured via goniometer. Goniometer measurements from five data collectors were compared across four different thumb ROM tasks [radial adduction (RADD), radial abduction (RABD), palmar adduction (PADD), and palmar abduction (PABD)]. The average standard deviation was 3.7 degrees for RADD, 3.1 degrees for RABD, 3.0 degrees for PADD, and 3.8 degrees for PABD. However, the average variance across trials ranged from 12.9-21.3 for RADD, 13.3-26.4 for RABD, 30.6-43.5 for PADD, and 20.3-73.4 for PABD. These results indicate relative consistency amongst data collectors when measuring ROM along the thumb's radial plane. However, large inconsistencies were seen for joint angles reported along the thumb's palmar plane. This work elucidates the need to report reliability when multiple data collectors are measuring thumb ROM using a goniometer. Future work will analyze the goniometer measurements relative to ground truth data from motion capture.

**Presenter(s): Julia Ball**
**Faculty: Jeongim Kim**
**Additional Authors: Keun Ho Cho, Maximillian Munro, Ethan E. Tucker, Yoo-Shin Koh, Joo Young Kim, Thomas A. Colquhoun, Jeongim Kim**

## *Genetic Modification of Scutellaria barbata via Agrobacterium-Mediated Transformation*

Scutellaria, commonly known as skullcap, are herbaceous perennials in the mint family Lamiaceae. The Scutellaria genus contains over 400 species and has been used in East Asia for centuries as an herbal remedy for human health conditions including hepatitis, appendicitis, and pulmonary abscesses. The medicinal qualities of Scutellaria are largely due to the presence of bioactive secondary metabolites called deoxyflavones that primarily accumulate in the roots of species belonging to the genus Scutellaria. Deoxyflavones such as baicalin, wogonoside, wogonin, baicalein, and luteolin have numerous health benefits including anti-cancer, anti-inflammatory, antioxidant, and anti-viral properties. To improve the therapeutic properties of Scutellaria, it is necessary to engineer Scutellaria genetically. However, no established transformation method exists to generate stable transgenic lines with Scutellaria. We aim to establish an Agrobacterium-mediated transformation method in Scutellaria barbata using the RUBY reporter. We will then generate genetically engineered Scutellaria barbata by introducing flavone biosynthesis genes such as SbRTO or regulators cloned from Scutellaria baicalensis into the Scutellaria barbata genome. We seek to establish stable Scutellaria barbata transgenic plants and analyze the changes in secondary metabolites of transgenic Scutellaria barbata. By achieving these objectives, we aim to contribute to the improvement of the medicinal properties of Scutellaria barbata.

**Presenter(s): Valentina Baredes**
**Faculty: Rebecca Butcher**
**Additional Authors: Hannah Connell**

## ***Characterization of Mutants of Caenorhabditis elegans Acyl-CoA Oxidase***

The nematode C. elegans secretes pheromones known as ascarosides, which consist of an ascarylose core and a fatty acid-derived side chain. These side chains are shortened by peroxisomal β-oxidation cycles, during which a double bond is installed at the α-β position of ascaroside-CoA. Previously, the crystal structure of C. elegans Acyl-CoA Oxidase 1.1 (ACOX-1.1) revealed the catalytic mutant was bound to FAD and ATP, and ATP regulates the activity of ACOX-1.1. We hypothesized that ATP acts as an allosteric regulator, impacting enzyme conformation and FAD affinity. Computational prediction suggests that R295, Y581, E436, N437, R343, and K391 may be critical for allosteric communication between FAD and ATP binding sites. We are studying the effect of mutations on ACOX-1.1 using mutagenesis and an HRP-coupled kinetic assay. R295A and R295Q had extremely low activities and no ATP effect, indicating no involvement in ATP regulation. Y581F responds to ATP but loses cofactors during protein purification, suggesting its potential role as a gatekeeper in the ATP entry/exit tunnel. Other mutants showed varied effects on $EC_{50}$ values. These findings deepen our understanding of ATP regulation in C. elegans acyl-CoA oxidases, potentially aiding targeted therapy development in higher organisms.

**Presenter(s): Katelyn Barkman**
**Faculty: Dr. Sharon DiFino**
**Additional Authors: Brooke Reed**

## *"Bridging the Sound Gap: The Impact of Hearing Loops on the Deaf and Hard of Hearing (DHH) Communities and the Barriers to Their Implementation in the U.S."*

Universal Design (UD) aims to create public spaces that are accessible to all. Despite approximately 30 million Americans aged 12 and older experiencing bilateral hearing loss (U.S. Department of Health and Human Services, 2024), many public spaces lack auditory accommodations.

Hearing loops are devices that transmit sound directly to telecoil-equipped hearing aids and cochlear implants amplifying sound and improving accessibility in public venues lacking UD (transportation, places of worship, museums, ect.) (Hearing Loss Association of America, 2025). The purpose of this study is to evaluate the design of hearing loops and how this impacts the Deaf and Hard of Hearing (DHH) communities. The project will focus on why there is a lack of these services in the US compared to other countries. The study will include a comprehensive literature review conducted using traditional search engines such as Google Scholar, University of Florida databases, and hand searching. The information will be condensed in tables/graphs to draw conclusions and assess limitations. Based on this information, social, economic, health, and educational implications will be discussed as well as possible solutions to inspire change.

**Presenter(s): Grace Barney**
**Faculty: Aleksey Novikov**
**Additional Authors: Rotana Radwan, Serena Jingchuan Guo, Wenxi Huang, Amy Joy Sheer**

## ***Access to Endoscopic Ultrasound in the State of Florida and Its Impact on Pancreatic Cancer Outcomes***

Pancreatic ductal adenocarcinoma (PDAC) is projected to be the second leading cause of cancer deaths in the United States by 2030 and has a 10-year survival rate of less than 5%. Endoscopic ultrasound (EUS) with fine needle biopsy (FNB) is often chosen as an effective method for diagnosing pancreatic malignant lesions and has recently shown improved diagnostic yield reaching upwards of 90%. Therefore, access to this diagnostic modality is important in treatment of PDAC. This study aimed to find disparities in the access to EUS and a geographic correlation between these disparities and PDAC mortality rates across Florida. We reviewed data of patients with a malignant neoplasm of the pancreas (defined by ICD codes C25.0-C25.9) who have undergone an EUS procedure (defined by CPT codes 43238 and 43242) from a 15% random sample of national Medicare beneficiaries from January 1, 2011, to December 31, 2020. We measured the time to EUS following the identification of a concern for a pancreatic lesion and its impact on clinical outcomes, defined by pancreatic surgery, cancer metastasis, and mortality. The results of this study are currently awaiting processing of the large dataset, and are anticipated within the next few weeks.

**Presenter(s): Phoebe Barron**
**Faculty: Chamateut Oh**

## ***Elevated Risk of Algal Blooms in Gainesville Residential Ponds***

Algal blooms in small water bodies can degrade water quality and harm ecosystems. In areas accessible to the public, toxins from these blooms can cause health issues in both humans and wildlife. Shallow water bodies, which are more prone to blooms due to increased sunlight and temperature, are often located in residential areas, making them more hazardous to human health. Eutrophication and the decomposition of algae can significantly harm other organisms in the ecosystem. This study analyzed chlorophyll content, a proxy for algal blooms, in a small Gainesville, Florida pond over five months (July–November). Water samples (20 mL) were collected weekly, and dissolved oxygen, pH, ORP, and temperature were measured on-site. Chlorophyll a, b, and c levels were analyzed using a modified EPA Method 446.0. Results showed consistently high chlorophyll levels (>40 µg/L), with concentrations in the final quarter of the year nearly ten times the unsafe threshold. These findings highlight the need for better management of local water sources, as well as further research to identify nutrient sources contributing to harmful algal blooms.

**Presenter(s): Kate Bass, Athena Conde**
**Faculty: Anthony Auletta**
**Additional Authors: Raaida Saiyara, Gabriela Gonzales**

## *Taxonomic Revision of Ant Genus Nylanderia in Mesoamerica through Morphological Characteristics*

This research project focuses on classifying a sample from the ant genus Nylanderia that required further taxonomic analysis. It enhances ecological knowledge, highlights species diversity, and emphasizes conservation of the genus. By examining morphological characteristics, behavioral practices, and other biological traits, researchers gain insight into the genus's evolutionary history and relationships. This study specifically analyzed 50–55 specimens, replicated four times, collected from South and Central America to hypothesize and identify new species. Using the digital analysis tool ImageJ, researchers measured and compared morphological traits from detailed specimen photos to distinguish potential species. The collected data contribute to a larger project refining Nylanderia taxonomy alongside other research teams. Additionally, this project evaluates the effectiveness of the CURE research learning model. Thus far, it has helped clarify four new species, with findings currently under peer review. This work will improve taxonomic clarity, support future studies in distinguishing Nylanderia species, and affirm the CURE-based model of research learning.

**Presenter(s): Erin Beard**
**Faculty: Sharon DiFino**

## ***A Comprehensive Literature Review of Vowel and Consonant Differences in Irish-English and General American English Dialects***

The Irish-English dialect, also to be known as Hiberno-English, can be a complex dialect to study and understand due to its diversity. The historical development of Irish-English is notable in this review and how it has evolved to what the dialect is today. This literature review aims to explore and determine the main differences between the Irish-English dialect and General American English (GAE), with a special interest in comparing its vowels. This research explores existing literature on the Irish-English dialect and reviews speech samples from both Irish-English and General American English speakers. Research was gathered using data collections via PubMed, Google Scholar, and the University of Florida databases.

To explore these dialect differences, this review explored speech samples from various Irish-English speakers and GAE speakers. Articulation of all vowels and consonants are studied to compare similarities and differences between the two dialects. Results yielded that although Irish-English includes the same general vowel sounds as GAE, Irish-English speakers produce said vowels with a more open and rounded sound. This review established that there are minor differences in consonants, with a notable change in rhotic sounds between the two dialects. Future research should look at prosody related to different dialects. This review deepens our understanding of dialect differences in spoken language.

**Presenter(s): Anita Beijer**
**Faculty: Ben Lewis**
**Additional Authors: Iqbal N, Phalin B, Hunt J, Solomon L, Janner A, Mathias K, Teitelbaum SA, Lewis B**

## ***Elucidating the Impact of Comorbid Eating Disorders on Treatment Outcomes in Substance Use Disorder Patients***

BACKGROUND: Eating disorders (EDs) are characterized by disturbances in eating behaviors, poor nutrition, and persistent thoughts about weight/body image. EDs are commonly comorbid with substance use disorders (SUDs), but few studies have examined changes in ED symptomatology during SUD treatment or ED-contingent differences in SUD treatment outcomes. The current project addresses these questions, employing a quasi-experimental design to interrogate EDs as a causal factor.
METHODS: Data were collected from patients in SUD treatment (N=1,790) at treatment initiation, 30 days, and at discharge. Approximately 10% of the sample received an ED diagnosis (n=172). Group differences were interrogated across a number of treatment-relevant measures, including craving. The ED group was then matched to a similar non-ED sample using propensity scores and craving was re-examined.
RESULTS: EDDS symptomatology diminished across treatment. The ED group endorsed higher craving, more severe negative affect, and lower emotion regulation. When craving analyses were confined to the matched samples, the difference remained significant.
DISCUSSION: Results indicate that among patients in SUD treatment, comorbid EDs predict more severe symptomatologies, specifically including craving for drugs/alcohol. These data are consistent with observations that ED constitutes a significant challenge to SUD treatment. The matched sample results suggest a causal relationship.

**Presenter(s): Hailee Belcher**
**Faculty: Peter Adams**

## ***Quantifying Seasonal and Spatial Variability of Beach and Dune Sediment Grain Size Distributions Along Anastasia Island, Florida***

Coastal morphology is shaped by natural processes and human activity, with sediment grain size influencing shoreline stability and dune formation. This study identifies spatial and temporal trends in sediment grain size across St. Augustine Beach, Crescent Beach, Butler Beach, and Matanzas National Monument to assess variability that may provide insight into sediment transport processes.

Sediment samples were collected seasonally in November 2023, April 2024, and August 2024. from six transects at Coastal Range Monument sites and four beach zones—dune crest, dune toe, berm, and swash. Grain size distributions were analyzed using a Malvern Mastersizer 3000. Results reveal clear seasonal shifts: RM150 experienced a 48.54% reduction in average grain size from fall to spring and a 38.49% reduction from spring to summer. RM190 showed a 49.09% increase from fall to spring, followed by a 40.26% decrease from spring to summer.

These findings show seasonal variability in grain size across Anastasia Island, FL, and may be useful in future studies to better understand the timing of sediment transport processes. This research provides baseline data that can inform coastal management efforts and improve predictions of sediment movement in response to environmental changes.

**Presenter(s): Michael Bennie**
**Faculty: Alayo Tripp**
**Additional Authors: Jian Meng**

## ***Modeling Lexical Selection Response Times: A Probabilistic Explanation***

This study presents a probabilistic linear search model of lexical selection that accounts for three key factors in word reconstruction tasks: phonemic inventory size, answer space constraints, and feature-type-specific search strategies. Building on response time data from tonal and non-tonal languages, we propose that participants perform a permutation-driven search through phonemic possibilities, weighted by phoneme frequency (modeled via Plackett-Luce distributions), until finding a valid word. The model reveals that response times are primarily driven by: (1) the number of prompted feature evaluations (153 ms/item) requiring detailed analysis, (2) unprompted feature checks (67 ms/item) during search, and (3) baseline response execution. With 59% variance explained ($r^2$=0.59), this approach demonstrates that previously reported cross-linguistic differences in vowel/consonant/tone response times emerge from inventory sizes and answer space constraints rather than inherent feature-type processing differences. Our findings suggest fundamental methodological limitations in lexical selection research, where uncontrolled variation in possible answers per condition systematically biases response time comparisons.

**Presenter(s): Zeina Benton**
**Faculty: Elizabeth Lada**

## ***Investigating the Star Cluster NGC 2264***

NGC 2264, a star-forming region in the Monoceros constellation, features two well-known concentrated stellar regions in the North and South. Made of gas and dust, these stellar regions are sites of interest for their ongoing star formation. This research aims to investigate the physical properties of NGC 2264 with a focus on comparing the northern and southern star-forming regions. Using Gaia DR3, a spacecraft that monitors celestial movements, we can determine the distances to stars in the northern and southern regions of NGC 2264 based on parallax values. Parallax, the apparent shift in an object's position due to the observer's perspective, is measured using optically visible stars observed by Gaia. Additionally, 2MASS, an astronomical survey, provides near-infrared source data that will be used in this study. By cross-matching 2MASS and Gaia data, the distance distribution of sources within the star-forming regions are analyzed to assess whether the sources are clustered or widely distributed within space, helping to reveal the structure of these regions. Determining cluster physical properties are important for understanding the membership, structure, and brightness of the stars that will reveal the differences between the North and South regions and the evolution of NGC 2264.

**Presenter(s): Mia Bermudez**
**Faculty: Sung Min Han**
**Additional Authors: Erika Hathy**

## ***Investigating the Neurotoxic Effects of 6PPD Exposure in a C. elegans Model of Parkinson's Disease***

The antioxidant N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine (6PPD) is used in rubber tires to prevent breakdown. It has been detected in the human body, suggesting the need to evaluate its physiological impacts. While its toxicity in aquatic animals has been reported, its effects in non-aquatic animals remain poorly understood. According to a previous study, 6PPD exposure triggers reactive oxygen species (ROS), indicating abnormal oxidative stress. Moreover, its role in the nervous system remains unknown. Parkinson's disease (PD) is a neurodegenerative disease influenced by environmental and genetic factors. It is characterized by the aggregation of α-synuclein in brain cells and the loss of dopaminergic neurons. Caenorhabditis elegans (C. elegans) has a fully mapped nervous system and conserved genes. We conducted an in vivo study using the PD model system C. elegans. Transgenic strains expressing α-synuclein-YFP (NL5901) and dopaminergic neuron-specific GFP (BZ555) were used to investigate the neurotoxicity of 6PPD. These strains were treated with different doses of 6PPD for 48 hours from post-hatching to larval stage 4. We assessed the neuron area using ImageJ. Additionally, we investigated ROS production and mobility. Our findings are expected to determine whether 6PPD may exacerbate α-synuclein aggregation and contribute to dopaminergic neuron degeneration in a C. elegans PD model.

**Presenter(s): Cathrine Beshay**
**Faculty: Whitney Stoppel**
**Additional Authors: Marisa Pacheco**

## *Evaluating the Synthesis of Granular Silk Fibroin Scaffolds for Applications in Tissue Engineering*

Naturally derived silk fibroin materials from Bombyx mori cocoons have proven valuable in the study of biomaterials. This cytocompatible material has been formulated into particles, scaffolds, and hydrogels for applications in regenerative medicine and tissue engineering. In particular, silk fibroin micro-and nanoparticles have shown promising results in the encapsulation and controlled release of bioactive compounds. Work with other materials has synthesized granular scaffolds that maintain this controlled release behavior while allowing for cell infiltration and eventual degradation. In this work, we seek to engineer a two-phase silk fibroin system in which lyophilized silk forms a structural sponge containing silk nanoparticles for sustained release. The flexible mechanical properties of silk fibroin allow for adjustments in scaffold porosity and particle size and quantity. First, we quantified the rate of silk granular scaffold degradation in enzyme solution (Protease XIV) in an accelerated degradation experiment. The final dry mass of each scaffold was compared to its initial mass after remaining in the enzyme solution for a designated time point. The morphology of the scaffold post-degradation was evaluated through scanning electron microscopy. Next, particle-laden scaffolds were synthesized to encapsulate cytokines and direct macrophage phenotype to influence the inflammatory response and improve tissue integration.

**Presenter(s): Oluwatoni Betiku**
**Faculty: Jorg Bungert**
**Additional Authors: Asher Lee, Leonardo Perez, Matthew Petrides, Matthew Gibbons, Linda B. Bloom, Jörg Bungert**

## ***In Vitro Analysis of RNA Polymerase II Transcription Complex Recruitment to the Human ß-Globin Gene Associated Locus Control Region Super-Enhancer***

The human ß-type globin genes are expressed at extremely high levels in differentiating erythroid cells. A super-enhancer locus control region (LCR), located more than 10Kb upstream of the globin genes, mediates this high-level expression using five enhancer elements. Previous studies have shown that the LCR enhancer elements recruit RNA-polymerase II (Pol II) transcription complexes. We test the model that LCR-recruited Pol II transcription complexes are transferred to the globin gene promoters during transient looping interactions. We use the C-TRAP single-molecule imaging system and in vitro reconstitution of transcription complexes on immobilized LCR constructs. The C-TRAP experiments revealed sites of Pol II recruitment and residence times at the individual LCR enhancer elements. Further, we examined the recruitment of Pol II and general transcription factors on immobilized LCR and ß-globin gene templates. While the LCR and ß-globin gene recruit Pol II, the ß-globin gene recruits the transcription factor TFII-H more efficiently than LCR. This finding is consistent with high-level transcription at the gene and low-level enhancer RNA transcription at the LCR enhancer elements. The results are consistent with previous findings showing independent recruitment of Pol II transcription complexes to LCR enhancer elements and transfer of Pol II to high-affinity globin gene promoters.

**Presenter(s): Venkata Aditya Satvik Bhamidi**
**Faculty: Carl Denard**

## ***Development of a Yeast Model of α-Synuclein Toxicity for Continuous Evolution of α-Synuclein Cleaving Enzymes***

α-Synuclein (ASN) is crucial for synaptic vesicle regulation, but its misfolding and aggregation drive Synucleinopathies such as Parkinson's disease and Lewy body dementia (LBD). No current treatments exist for this class of human disease. This work aims to create a growth-based evolution platform for therapeutic protease engineering in S. cerevisiae. We aim to do this by coupling a genetic model of α-synuclein toxicity with the yeast-based continuous evolution platform, OrthoRep.

To accomplish this, we first benchmarked gene deletions that exacerbate α-synuclein toxicity (ENT3∆ and ARL3∆) in a TR3X strain background, as well as integrating 2 α-synuclein encoding genes for further toxicity. We then constructed an identical model in a W303-1a strain background, a stress-sensitive yeast strain, to improve its dynamic range. Next, a panel of candidate proteases, including KLK-6, PRSSV, and HTRA-1, will be screened in the model for their ability to restore cell growth by clearing endogenous α-synuclein.

Future work will involve applying this model to OrthoRep, a strain offering autonomous error-prone transcription-translation of a gene of interest (a candidate α-synuclein cleaving protease). Using OrthoRep we hope to identify protease variants with improved specificity and activity on α-synuclein and characterize their properties in a downstream pipeline.

**Presenter(s): Aanya Bhandari**
**Faculty: Aaron Costin**

## ***Development of an E-Skin Heart Rate Monitoring Device: A Breakthrough in Wearable Health Technology***

Heart rate monitoring technology has evolved significantly, transitioning from bulky clinical devices to compact, wearable sensors. Traditional heart rate monitors, including optical photoplethysmography (PPG)-based smartwatches and electrocardiogram (ECG) chest straps, face limitations such as motion artifacts, inconsistent skin contact, and discomfort over prolonged use. These shortcomings underscore the need for next-generation heart rate monitoring solutions that combine precision, flexibility, and user comfort.

This paper presents a comprehensive analysis of emerging heart rate monitoring technologies, with a focus on electronic skin (e-skin) sensors—ultrathin, stretchable devices that seamlessly conform to the human body. E-skin monitors leverage advanced nanomaterials, flexible substrates, and bioelectronic interfaces to achieve superior accuracy, real-time continuous monitoring, and enhanced biocompatibility compared to traditional methods. By integrating soft electronics, conductive polymers, and wireless signal processing, e-skin sensors overcome the limitations of rigid wearables, oKering improved signal fidelity and long-term wearability without compromising performance.

Furthermore, this research details the fabrication, implementation, and testing of a novel e-skin heart rate monitoring device. The proposed design incorporates graphene-based electrodes for high conductivity, low-power Bluetooth communication, and machine learning algorithms for adaptive filtering and noise reduction. Experimental results demonstrate the e-skin monitor’s ability to provide clinically accurate heart rate readings under dynamic conditions, outperforming conventional wearables in both comfort and data reliability.

By highlighting the competitive advantages of e-skin technology, this study underscores its

potential for revolutionizing digital health, remote patient monitoring, and personalized medicine. The findings pave the way for further advancements in bio-integrated electronics, ensuring more accessible and eKective cardiac monitoring solutions for diverse populations.

**Presenter(s): Niraj Bhavsar**
**Faculty: Sarah Doore**
**Additional Authors: Taylor Ladner, Archana Pannuri**

## ***Title: Investigating the Host-Pathogen Interactions of Bacteriophage Sf14 and S. flexneri***

Shigella flexneri is a Gram-negative pathogen of humans that causes almost 165 million cases of bacillary dysentery every year. Viruses that infect bacteria, known as bacteriophage or phage, recognize and infect specific strains or species. For example, Shigella phage Sf14 infects Shigella flexneri while not being able to infect other bacteria. The lipopolysaccharide (LPS) is a protective layer on Gram-negative bacteria that is also used as receptors by many phages. It is anchored to the membrane via lipid A, followed by oligosaccharide inner and outer cores, and finally a repeating oligosaccharide forming the O-antigen. We made knockouts of LPS synthesis genes to truncate the LPS and determine Sf14's ability to infect. Attachment and potassium efflux assays were performed to examine initial binding and genome ejection, respectively. We found that despite similar rates of attachment, the knockout of waaL gene, resulting in LPS without O-antigen, had a much higher rate of potassium efflux compared to the wildtype. We therefore hypothesize the presence of O-antigen masks receptor availability. Since these phages can potentially reduce the likelihood or severity of shigellosis, it is important to understand the complex process of phage-host interactions.

**Presenter(s): Harold Bishop**
**Faculty: Jennifer LeLaurin**
**Additional Authors: Sofia Anrecio, Melissa Bou Malham, MD, Cassandra O'Hara, Hailey Donohue, Kiah Kramer, Jomanda Webb, Nicole Davila, Magda Knight, MS, Ashley Dwarka, MPH, Ryan Theis, PhD, Jesse Dallery, PhD, Ramzi Salloum, PhD**

## ***Title: Perceived Relative Advantage of Mobile Health Smoking Cessation Treatments: An Analysis of Care Team Perspectives in a Comparative Effectiveness Trial***

Background
Tobacco smoking is the leading cause of preventable death, disability, and disease in the US. The 2020 Surgeon General's report on smoking cessation identified a gap in the effectiveness of mobile health (mHealth) treatments compared to traditional methods. Our aim was to determine the perceived relative advantage of mHealth smoking cessation interventions in primary care where relative advantage refers to interventions superior in effectiveness or cost-effectiveness
Care teams at 15 clinics were trained on the Ask-Advise-Connect method to connect patients to the comparative effectiveness trial. Treatment arms included the Tobacco Free Florida Quitline, one mHealth treatment based on acceptance and commitment therapy (ACT), and another combining ACT with contingency management. We conducted interviews structured using the Consolidated Framework for Implementation Research (CFIR) with 37 care team members. We summarized the transcripts followed by analysis using a respondent-by-domain matrix. Team-based coding was performed to identify central themes.

Findings
Three major themes were identified. First, mHealth treatments offer new approaches to smoking cessation that current programs lack. Second, mHealth apps offer an alternative option when traditional methods prove ineffective. Lastly, mHealth interventions had the potential to improve the reach of treatments via remote, immediate delivery.

**Presenter(s): Kristi Biswas**
**Faculty: Paramita Chakrabarty**
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## ***Title: Effect of Sepsis-Associated Peripheral Inflammation on Alzheimer's Disease Tau Pathology***

Sepsis is a life-threatening condition caused by an uncontrolled immune response to infection, leading to organ dysfunction. Research suggests that inflammation from sepsis can influence neuroinflammation in Alzheimer's disease (AD). However, whether chronic inflammation directly affects tau pathology, a characteristic of AD, remains unclear. Graduate students induced intra-abdominal sepsis using cecal ligation puncture (CLP) and daily chronic stress (DCS) on 6-month-old PS19-transgenic mice expressing human P301S mutant tau. The septic PS19 mice aged 9-12 months until they developed bilateral hindlimb paralysis due to neurofibrillary tangle accumulation in the brain and spinal cord. When harvesting, brain tissues were collected for histological analysis and compared with non-septic, sex-matched controls. Lifespan analyses suggested sepsis altered the time to paralysis differently in males and females. Septic males lived longer before paralysis, while septic females experienced paralysis sooner. Using immunohistochemistry with the AT8 antibody, we quantified hyperphosphorylated tau in the hippocampus, cortex, and brainstem. In septic males, AT8-ptau levels were lower in the hippocampus, while the cortex and brainstem had similar levels to controls. No significant differences were observed between sepsis and control groups in females. Future experiments are necessary to further understand the relationship between systemic inflammation and AD-type tau pathology in PS19 mice.


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**Presenter(s): Brian Blackwood**
**Faculty: Daiqing Liao**
**Additional Authors: Naomi John, Wenlin Yang**

## ***Title: Exploring the Role of DAXX and mTOR in Oncogenic Lipogenesis***

Death Domain Associated Protein (DAXX) is commonly overexpressed in many cancers and is involved in several cellular processes, including apoptosis and molecular chaperoning. DAXX regulates transcription of several genes via association with transcription factors, including sterol regulatory element-binding proteins (SREBP1 and SREBP2). SREBP1 and SREBP2 are essential for lipid synthesis in cancer. Cancer cells require increased levels of lipid synthesis for membrane formation and cell signaling. Previous work has shown that DAXX's SUMO-binding activity is vital for oncogenic lipogenesis, and SUMO-deficient DAXX mutants fail to activate SREBP1 and SREBP2. mTOR (molecular target of rapamycin) is a serine and threonine kinase commonly mutated in cancers involved in cellular metabolism, protein synthesis, and lipid metabolism. The mTORC1 complex promotes lipogenesis via Lipin1 and S6K1-dependent phosphorylation, activating SREBP1 and SREBP2. The mechanism by which DAXX and mTORC1 interact and their regulation remains poorly understood. Using Proximity Ligation Assay (PLA) and immunofluorescence microscopy to study DAXX and mTOR intracellular localization, this work is expected to provide insights into the interplay between DAXX and mTORC1 in oncogenic lipogenesis.

**Presenter(s): Alyssa Blood**
**Faculty: Alberto Perez**

## ***Title: Investigating the Relationship Between Dopamine-2/Dopamine-3 Binding Ratios and Extrapyramidal Symptom Incidence Using Computational Docking***

Schizophrenia treatment relies on antipsychotic medications that modulate dopamine receptors, yet the precise mechanisms underlying their side effects, particularly extrapyramidal symptoms (EPS), remain unclear. This study investigates whether the ratio of dopamine D2 to dopamine D3 receptor binding affinities correlates with the incidence of EPS in patients. Using computational docking methods via AutoDock, we analyzed the binding interactions of second-generation antipsychotic drugs, including Clozapine, Risperidone, Aripiprazole, Paliperidone, and Cariprazine, with D2 and D3 receptors. The docking simulations were standardized to ensure accurate ligand-receptor positioning and evaluated using genetic algorithms for optimal binding predictions. By examining receptor selectivity and binding patterns, this research aims to provide insights into the relationship between D2/D3 affinity ratios and EPS risk. These findings could contribute to a better understanding of antipsychotic mechanisms and aid us in modifying and developing medications for lower EPS percentages. Future work will integrate physics-based molecular dynamics simulations to further validate these interactions and refine predictive models.

**Presenter(s): Erik Bloomquist**
**Faculty: Damon Woodard**
**Additional Authors: Alexa Cole, Stephen Wormald**

## ***Title: From Black-Box to Glass-Box Models: Toward Explainability in Reinforcement Learning***

From autonomous real-time stock trading and traffic signal optimization to video game AI and robotic surgery, reinforcement learning (RL) is revolutionizing autonomous decision-making across a myriad of disciplines. However, despite significant advances, RL systems often act as black box models; it is very difficult, if not impossible, to understand why an agent makes its decisions- an issue that becomes critical in high-stakes applications like finance, healthcare, and autonomous vehicles. The purpose of this work is twofold: (1) to explore and quantify the relationship between the accuracy of RL algorithms and environment properties, and (2) to find interpretable policy representations that maintain agent performance. Using Deep Q Network (DQN) and Proximal Policy Optimization (PPO) RL agents, we analyze and compare state-to-action mappings for different agents on the same task, bringing some interpretability to the decision-making process for each agent. Our experiments find that while some RL agents learn interpretable and clear-cut policies of action, others do not, and a simple distillation of policy is not guaranteed. This work contributes towards the broader goal of explainable reinforcement learning (XRL), helping researchers and engineers understand how AI systems behave to build more trustworthy intelligent systems.

**Presenter(s): Devon Borg**
**Faculty: Habibeh Khoshbouei**
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## ***Title: αSynuclein Disrupts SNc Dopamine Neuron Activity and Network Connectivity Prior to Cell Death, Sparing the VTA***

Parkinson's disease (PD) is a neurodegenerative disorder that results in motor deficits caused by the death of dopaminergic neurons located in the substantia nigra compacta (SNc) and accumulation of α-synuclein (αSyn). It's known that SNc dopamine neurons are more vulnerable than those in the ventral tegmental area (VTA). Our study aims to determine how αSyn overexpression alters cell viability, dopamine firing activity, and network connectivity in the SNc compared to the VTA. We used two different models of Parkinson's, where we overexpressed αSyn in mice for four weeks. We labeled the SNc and VTA for αSyn, tyrosine hydroxylase (TH), FOX3, and TUNEL, and assessed the number of dopamine neurons positive for αSyn. Our findings showed no changes in the total number of general or dopamine neurons, confirming that αSyn overexpression occurs before cell death. Furthermore, we found αSyn overexpression increases SNc dopamine firing activity, hyperpolarized induced stress, and network activity more than VTA dopamine neurons. This study emphasizes the need to understand how αSyn impacts dopamine neurons in the SNc and VTA during early PD progression, as this knowledge could help slow, prevent, or treat the disease by addressing the greater vulnerability of SNc dopamine neurons.

**Presenter(s): Kruti Bosmia**
**Faculty: Michael Poulos**
**Additional Authors: Agatha Winiarski, Cody Carter**

## ***Title: Developing an ex vivo platform to examine alternative splicing within bone marrow endothelium***

Endothelial cells (ECs) form the innermost lining of blood vessels, providing a dynamic barrier between tissues and blood responsible for nutrient exchange, regulating flow, and mediating cellular trafficking. ECs also play a pivotal role in instructing tissue development and homeostasis through tissue-specific expression of angiocrine factors. In the bone marrow (BM), ECs are an essential component of the instructive microenvironment that regulates hematopoietic stem cell function. Dysregulation of the BM endothelial niche can promote inflammation, drive hematopoietic aging, and support hematological malignancies. While the factors that govern endothelial function have been well-studied, the protein isoforms generated by alternative splicing in endothelium remain poorly understood. Alternative splicing has been observed in >95% of mammalian mRNAs, significantly increasing the protein coding capacity of individual genes. SRSF1 is the founding member of the serine/arginine family of RNA-binding proteins that modulate alternative splicing. Aberrant localization of SRSF1 can promote senescence, while increased Srsf1 expression is pro-oncogenic. Our overarching goal aims to define endothelial-specific alternative splicing programs to understand their role in vascular barrier and instructive function. Herein, we describe the development of an ex vivo BM endothelial platform to define the SRSF1-dependent alternative splicing regulon and test the functional outcomes of individual splicing events.

**Presenter(s): Jacob Bousky**
**Faculty: David Brown**

## ***Title: The Implications of Private Equity Buyouts on Annuity and Life Insurance***

This paper is going to outline private equity's influence on annuity and life insurance companies over the past decade. Primarily focusing on the misalignment of incentives between private equity and the harmful unrealized consequences to policyholders. By analyzing financial disclosures, regulatory filings, and asset allocation trends, we were able to gather substantive data comparing private equity (PE) and non-PE backed insurance companies. Gathering conclusive evidence of PE-backed insurance companies holding opaque structured products to take advantage of overly reduced capital requirements for these assets. Customers seeking life insurance or annuities may initially be drawn to the more favorably priced products of the PE backed insurance companies. Although, in the long-term customers are exposed to higher levels of systematic risk from reductions in capital requirements of these uniquely structured assets. The implications of these buyouts have also been touching undesired policyholders through recent asset transfer capabilities like reinsurance and pension risk transfer, boosting the potential downside exposure to exponentially more people.

**Presenter(s): Lucas Bradshaw**
**Faculty: Lilianny Virgüez**

## ***Title: Integrating Industry Requirements into an Interdisciplinary Undergraduate Engineering Course***

This study describes the challenges undergraduate engineering programs face in maintaining relevancy with current industry expectations, and possible solutions to address the evolving demands of entry-level engineering positions. The engineering industry has experienced exponential growth in recent years due to technological advancements, yet the undergraduate engineering curriculum has remained largely the same. The increase in the number of annual graduating engineers has prompted a need for adaptations in traditional teaching methods to accommodate a larger volume of students. However, this influx of students poses a pertinent question: how can the undergraduate engineering curriculum be revised to make each course a valuable learning experience without compromising rigor and accessibility? This assessment involved scrutinizing professional skill requirements from a variety of mechanical engineering entry-level job postings sourced from a prominent online recruiting platform due to the broadness of this field. Furthermore, an undergraduate electrical engineering course was optimized through the implementation of optional course content and digitized participation quizzes with automatic feedback to address professional requirements. Aligning coursework with the evolving demands of the engineering industry allows future engineers to be equipped with the skills and knowledge necessary to tackle the complex challenges of our time.

**Presenter(s): Kyle Bragg**
**Faculty: Fatma Gunay**

## ***Title: Gambling on Policy: How Regulations and Demographics Influence Sports Betting***

This study investigates which characteristics are most influential in determining the amount of money wagered on sports in each state. After the Supreme Court struck down the federal ban on sports betting in 2018, some U.S. state governments implemented laws permitting citizens to bet on sporting events, both professional and collegiate. Depending on the amount of activity in states that choose to legalize the practice, local governments can raise considerable tax revenue.

A series of regressions are used to investigate what state-level factors impact the amount of local sports betting activity. Notable factors of interest include the use of anti-competitive agreements, excise tax rates, licensing rates, gambling attitudes, and the presence of favorable business regulations. These factors are regressed against the money wagered in each state in a variety of ways, including multiple linear regression, fixed effects, and differences-in-differences. The study finds evidence that both anti-competitive agreements and high excise taxes reduce the amount of sports betting activity in each state. Consequently, there is evidence that state-level policy decisions can impact local sports betting activity.

**Presenter(s): Eryn Brazlavsky**
**Faculty: Sharon DiFino**

## ***Title: Harmonizing Healing: Music and Cognitive Rehabilitation***

While music is widely recognized for its emotional and therapeutic benefits, its role in cognitive rehabilitation remains underutilized in patient care. Emerging research has demonstrated that musical engagement – such as singing, playing an instrument, or active listening – can enhance cognitive reserve (CR), potentially aiding in post-stroke recovery by strengthening neural pathways. CR refers to the brain's ability to adapt and maintain function, helping to prevent cognitive decline (Harvard Health, 2024). This study aims to examine the impact of music on accelerating neurological recovery in patients recovering from a cerebrovascular accident (CVA) using a comprehensive literature review and survey analysis.

The results suggest that music engages both sensory and motor systems, stimulating brain plasticity and fostering cognitive resilience. Musicians are 64% less likely to develop mild cognitive impairments, highlighting music's potential as a powerful mental aid (Walsh & Brayne, 2021). In post-stroke recovery, familiar music can evoke memories and emotions, potentially providing comfort and aiding in emotional regulation, though individual responses may vary (Xu et al., 2022). Both familiar and unfamiliar music stimulate different brain regions, enhancing mood and cognitive engagement—key for stroke rehabilitation. This study provides evidence suggesting that engaging in music—through singing, playing, and listening—enhances neural stimulation, promoting cognitive reserve in post-CVA patients.

**Presenter(s): Caitlin Brennan**
**Faculty: Erica Dale**
**Additional Authors: Caitlin Brennan, Alyssa Mickle, Jesús D. Peñaloza-Aponte, Erica A. Dale**

## ***Title: FOS Expression in Respiratory Motor Networks After Cervical Spinal Cord Stimulation and Injury***

Epidural stimulation (ES) of the spinal cord can restore volitional control of functions after spinal cord injury (SCI) but has not been clinically applied to breathing. Our lab uses closed-loop ES to restore breathing after cervical SCI, triggering short stimulation trains via diaphragm EMG activity. This restores some ipsilesional diaphragm EMG in rats with C2 hemisection (C2HS) (Mickle et al., 2024). However, the neural populations activated by ES remain unknown. This study examines stimulation and injury-induced changes in neuronal activity within respiratory motor networks using FOS expression in spinal diaphragm (C4) and intercostal (T4) motor pools. Urethane-anesthetized, mechanically ventilated male Sprague-Dawley rats (3–5 months old, n = 5-8/group) underwent C2HS or remained intact before sham or contralesional EMG-triggered ES. Rats were perfused 60 minutes post-stimulation, and T4/C4 tissue was analyzed for FOS mRNA. At C4, ES significantly increased FOS positivity in both groups, with FOS/CHAT copositivity only in C2HS rats. At T4, ES trended toward reduced FOS positivity in intact rats. These results indicate closed-loop ES interacts with injury to modulate respiratory motor networks, with distinct effects at C4 and T4. Ongoing work aims to identify specific neuronal and glial populations altered by injury and stimulation.

**Presenter(s): Benjamin Breuer**
**Faculty: Jeongim Kim**
**Additional Authors: Makou Lin**

## ***Title: Elucidating the Role of the 5′ UTR in the Translation Efficiency of MYB28***

The 5′ untranslated region (UTR), a segment upstream of the coding sequence of a gene is commonly found in mature mRNA and it functions in mRNA movement, stability, and translation. While investigating a metabolic crosstalk linking plant growth and stress resilience, we identified the significance of the 5′ UTR in translation regulation in Arabidopsis thaliana. Our preliminary study with two Arabidopsis mutants revealed that two single nucleotide polimorphism (SNP) in the 5′ UTR MYB28 activate MYB28 activity without affecting its transcription. MYB28 encodes a transcription factor regulating genes involved in aliphatic glucosinolate biosynthesis. Glucosinolates are specialized metabolites commonly produced by plants of the Brassicales order. These compounds affect the taste and nutrition of plants, and function in defense. As the mutations in the 5′ UTR of MYB28 showed similar transcript levels of MYB28 compared to wild type yet accumulated greater levels of aliphatic glucosinolates, we hypothesize that the 5'UTR of MYB28 is crucial for its translation. The aim of this study is to better understand how the 5′ UTR impacts the translation efficiency of MYB28. To address this question, various mutations were induced in the 5′ UTR using the CRISPR/Cas9 system. The CRISPR construct targeted a 77 base pair segment of the 5′ UTR of MYB28. Six CRISPR lines were made, 3 in wild-type background and the other 3 in ref5, a mutant that shows alterations in glucosinolate production. These CRISPR lines show greatly increasing levels of aliphatic glucosinolate content, indicating the 5′ UTR influence on MYB28 activity. Understanding how the 5′ UTR impacts the biosynthesis of glucosinolates can help regulate their concentrations in many horticultural plants.

**Presenter(s): Sarah Brock**
**Faculty: Sheila Bosch**
**Additional Authors: Ali Khashayar Mahmoudi**

## ***Title: Under Pressure: Identifying Environmental Design Strategies to Moderate the Risk of Workplace Violence in Healthcare Settings***

Healthcare workers in the US are more likely to experience workplace violence (WPV) than in any other industry. WPV prevention is crucial to ensuring not only the safety of hospital employees, but also the well-being of the patients they serve. Some published WPV prevention guidelines/tools acknowledge the important role that environmental design may play in reducing risks to staff. The purpose of this research was to identify and assess existing healthcare WPV prevention guidelines, extract recommended environmental design strategies, and develop a design checklist to assist healthcare designers in creating safe environments for healthcare workers. We identified 23 relevant WPV prevention tools/guidelines published between 2002 and 2024. These documents were uploaded into NVivo (V 15) where environmental design strategies were coded using a Situational Crime Prevention framework. The framework consists of five major categories focused on making it more difficult for would-be perpetrators to assault staff - increase effort, increase risk (to perpetrators), reduce provocations, reduce rewards, and remove excuses – as well as sub-categories to organize content. Strategies identified in the tools/guidelines were combined with those identified from the literature to develop a final set of design guidelines, vetted by several experienced healthcare designers, to inform healthcare workplace design.

**Presenter(s): Bryanna Broderick**
**Faculty: Michelle Gumz**

## ***Title: Circadian Clock Gene Expression in the 4 Core Genotype Model***

Circadian rhythms are 24-hour oscillations that are regulated by a molecular clock that exists in nearly every tissue and cell type in the body, coordinated by the central clock in the hypothalamus. The core proteins that comprise the molecular clock are BMAL1, CLOCK, CRY, and PER. In our lab, we study how these clock proteins impact renal function and how many genes are controlled by this mechanism. Our recent as yet unpublished study used RNAsequencing data from a circadian collection of male and female mouse kidneys to identify sex-specific rhythmic genes in the tissue over a 72h period. Data shows females had 3303 rhythmic genes (p<0.05), whereas males had 2201 with only 624 overlapping, meaning females had 1002 rhythmic genes more than males. The 4 Core Genotype model is being used to assess the sex-dependent circadian gene expression in the kidney. This model utilizes mice which have XY chromosomes with female gonads, and XX chromosomes with male gonads to differentiate sex differences between chromosomal and hormonal sources. This study utilizes qPCR to test whether the clock genes themselves are differentially regulated by gonadal hormones or sex chromosomes.

Future study will analyze the difference in rhythmicity between males and females in core clock genes and how it correlates with kidney disease and hypertension phenotypes through other data from the lab, and whether it plays a role in the known protection of females from these conditions.

**Presenter(s): Corey Broersma**
**Faculty: Eleonora Rossi**
**Additional Authors: Laury-Ann Francois**

## ***Title: New Language Training to Measure and Promote Neurocognitive Resilience in Healthy Aging***

The current literature suggests that long-term bilingualism may boost neurocognitive reserve and contribute to more effective memory, attention, and inhibitory control. However, little is known about the efficacy of novel, short-term language learning as an intervention to improve neurocognitive reserve in older adults. This longitudinal study consists of two sessions with one of two conditions between sessions. Preliminary data collection has included 14 English monolingual older adults. Participants completed a pre-test including neurocognitive, affective, and linguistic tasks and were then randomly assigned to the Spanish Language Training (LT) or Active Control (AC) condition. For 36 days, the LT group completed Rosetta Stone Spanish training, while the AC group completed English documentaries and review questions. The participants then returned for post-test. Results for the LT group from the Spanish Picture Naming Task show a significant reduction for the N400 for studied words compared to non-studied words, indicating rapid lexicalization of Spanish words. In the N-Back Task, the LT group had on average a more positive P200 and P300 at post-test relative to the AC group, suggesting more effective working memory and attention immediately after language training. These preliminary results indicate a positive neuromodulator effect of short-term language learning in older adults.

**Presenter(s): Jena Brooks**
**Faculty: Sharon DiFino**
**Additional Authors: Jean Augustin**

## ***Title: Healing Across Cultures: Navigating Haitian Healthcare by Addressing Cultural Beliefs and Health Impacts***

To provide equitable and effective care, it is essential to recognize that healthcare goes beyond diagnosing medical conditions; it requires understanding the cultural backgrounds and beliefs that shape a patient's healthcare experience. Every individual is unique, and it is essential for healthcare providers to be well-versed in the diverse needs of various populations. While cultural competency is widely acknowledged in healthcare, certain marginalized groups, including the Haitian population, continue to face significant barriers in accessing quality care. These challenges stem from linguistic differences, cultural beliefs about health and illness, and systemic healthcare disparities.

This literature review aims to identify and evaluate the cultural determinants of health within the Haitian community, specifically exploring how cultural beliefs may hinder access to proper healthcare. By analyzing methodological factors such as target demographics, healthcare outcomes, and cultural practices, the purpose of this study is to provide a comprehensive understanding of Haitian culture and language. This study will also use traditional search engines such as Google Scholar and the University of Florida databases. Our findings seek to enhance healthcare delivery for Haitians while providing insights that can be applied to other culturally diverse populations.

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

## ***Title: 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 it is not often that researchers consider that the measurement process may be compromised by fairness problems, which would then compromise the studies 'results. This study is a literature review project to examine and document the extent to which fairness in measurement is investigated when conducting educational effectiveness research studies.

**Presenter(s): Semaj Butler-Drinks**
**Faculty: Julie Maupin**
**Additional Authors: Alexandra Agulia**

***Title: Significance of lysine acetylation on the electron transport protein, 2Fe-2S ferredoxin, in Haloferax volcanii via site-directed mutagenesis***

Haloferax volcanii, a model halophilic archaeon, faces extreme conditions, including extreme temperature and pH, varying in osmolarity, and exposure to reactive oxygen species (ROS) that can damage the organism's macromolecules and disrupt redox reactions. To mitigate these stressors, H. volcanii has adapted by developing a range of regulatory mechanisms that aid to maintain cellular homeostasis. Among these mechanisms, the post-translational modification (PTM), lysine acetylation (KAc) is proposed to regulate protein function and metabolic pathways, particularly in response to oxidative stress. The 2Fe-2S ferredoxin (ferA5; HVO_2995), an electron transfer protein, has been identified as a KAc target at K97, K113, and K119. The proximity of ferA5 KAc sites to the protein's Fe-S cluster suggests an impact on redox and protein interaction. The overall aim of this study is to identify the functional significance of ferA5 acetylation within its structure and function to transfer electrons. To investigate the impact of acetylation at these sites, site-directed mutagenesis was performed, with lysine-to-glutamine (Q) mutations mimicking acetylation at KAc sites and lysine-to-arginine (R) mutations mimicking deacetylation. By anti-acetyllysine immunoblotting, we demonstrate K119 is a major acetylation site, as signal decreases when substituted to Q and R. Additionally the two characterized lysine acetyltransferase, Pat1 and Pat2, have not been seen to acetylate ferA5 under. Current work is aimed to determine the lysine acetyltransferase responsible for ferA5 acetylation. By analyzing the effects of these mutations, this study aims to determine the regulatory role of lysine acetylation in ferredoxin function, structure, and interactions with its putative protein partner, ferredoxin reductase (FdR; HVO_2345).

**Presenter(s): LLIA BYRON**
**Faculty: Dr. Whitney Stoppel**
**Additional Authors: Elizabeth L. Aikman**

## ***Title: Silk fibroin long-term mechanical performance as anisotropic sponges for engineered skeletal muscle tissue***

Engineered tissues made from biomaterials are explored as matrices and biomaterials for tissue engineering applications. Due to its degradation rate, ease of manipulation, and compatibility in vivo, silk fibroin serves as a candidate for an aligned scaffold mimicking muscle properties for muscular dystrophy research. During the processing of silk to produce anisotropic sponges, multiple parameters were manipulated to yield various scaffold physical and mechanical properties. These parameters included polymer concentration, freezing time, and post-lyophilization method. It was found that beta-sheet content had the largest impact on the mechanical properties, which is also the parameter that influenced silk sponge degradation. Young's modulus ranged from 600kPa to 2800 kPa, representing a wide range of tunability in scaffold elasticity and fatigue tests showed little change in the storage and loss modulus of 5% silk scaffolds over 6000 minutes at 10% strain. After evaluation of mechanical properties, human skeletal muscle myoblasts (HSMMs) were seeded into the scaffolds to evaluate migration and maturation. Sectioning and staining with hematoxylin and eosin were utilized to visualize cell migration and fluorescence staining was used to confirm cell maturation into multinucleated myotubes. Future work will look to mature cellularized scaffolds into contractile muscle tissue with a bioreactor.

**Presenter(s): Michelle Byrus**
**Faculty: Adam Veige**
**Additional Authors: Courtney Sever**

## ***Title: Improvement to Synthesis of Tungsten Catalysts for Cyclic Polymer Synthesis***

Utilizing a new approach for an easier synthesis of a trianionic pincer ligand, we report the synthesis of two new tungsten alkylidyne and alkylidiene complexes. By inserting a tert-butyl group para to the alcohol group also known as 2-bromo-4,6-di-tert-butylphenol, reduction in cost and safety hazards have been noted. As well as improved efficiency to the overall catalyst synthesis, further allowing for this reaction to be scaled up. Improvements have been made in the metalation of the tungsten precursor, cutting down reaction time from 2 weeks to 1 day. These complexes were tested for activity in the polymerization of phenylacetylene to produce cyclic polymer was done, showing negligible differences.

**Presenter(s): Sofia Cabanillas**
**Faculty: Matthew Schiefer**
**Additional Authors: Cameron Bradfield, Bianca Barroso, Nicholas Scarpa, Amanda Rodriguez, Abigail Deleon-Pena, Michael Fernandez**

## ***Title: A Tri-Diet Model to Enhance Weight Gain in Sprague Dawley Rats: A Comparative Analysis***

Obesity research often uses high-fat (HF) diets to induce weight gain in animal models, but this approach doesn't fully capture the complexity of human obesity, which results from various dietary patterns, including high-fat and high-carbohydrate intake. To enhance the external validity of preclinical obesity studies, we propose using a tri-diet (TRI) model that integrates HF, high-glucose (HG), and standard (ST) chow diets. This study analyzed weight gain and food consumption data from 37 Sprague Dawley rats across three prior studies, each examining different aspects of obesity and vagal nerve stimulation. Rats were maintained on either TRI, HF, or ST diets according to the dietary conditions of their respective studies, with daily food intake recorded and body weight measured routinely. Caloric intake was calculated based on food consumption and macronutrient composition. Statistical analyses, including confidence intervals and growth modeling, assessed differences in weight trajectories across diet groups. A 14–26-week timeframe was selected to maximize data overlap. Preliminary findings suggest the TRI model may better reflect human eating behaviors, potentially improving the translational relevance of obesity research. By providing more accurate animal models, the TRI approach could help develop heavier animal models more efficiently, reducing study duration and costs while enhancing the reliability of obesity-related research.

**Presenter(s): Katelyn Cabral**
**Faculty: David Fuller**
**Additional Authors: Sabhya Rana, Megan K. Pope, Manuela Corti, Ramon C. Sun, Matthew S. Gentry, Barry J. Byrne**

***Title: Morphological Changes of Phrenic Motoneurons in Pompe Disease***

Pompe disease is a neuromuscular disorder resulting from mutations in the gene encoding the enzyme responsible for lysosomal glycogen degradation. Intravenous enzyme replacement therapy is the current standard of care but cannot target the central nervous system (CNS). Respiratory failure is common in Pompe disease and research indicates that the neural regulation of breathing can be impaired. The purpose of our study was to evaluate phrenic motoneurons (PhrMNs) in a Gaa-/- rat model of Pompe disease. The retrograde marker cholera-toxin-β (CT-β) was delivered to the pleural space to label PhrMNs in 12-month and 3-month old Gaa-/- and Sprague-Dawley rats. Cervical spinal cord sections were cut (25 µm) with a longitudinal orientation. Immunochemistry using the IV58B6 antibody was used to identify glycogen. Tissues were imaged using a 20x objective on a Keyence microscope. The PhrMN morphology changes evident in Pompe rats were swollen and vacuolized neural soma. Glycogen accumulation was prominent in Pompe PhrMNs but was never observed in S-D PhrMNs. Our results confirm that PhrMNs in the Gaa-/- rat model have extensive glycogen accumulation and show the pathology expected in Pompe disease. The data supports the notion that therapies to preserve breathing function in Pompe disease should target the CNS.

**Presenter(s): Lara Caglayan**
**Faculty: Adriaan Bruijnzeel**
**Additional Authors: Guido Huisman, Ranjith Kumar Chellian, Tengfei Bian, Chengguo Xing**

## ***Title: Kava Supplementation Alleviates Anxiety-Like Behavior in Mice***

Kava is a plant consumed for its potential as a natural anxiolytic. We aimed to evaluate dietary kava supplementation effects on anxiety-like responses and locomotor activity in mice, with and without nicotine exposure.

C57BL/6 mice (32 males and 32 females) were randomly assigned to a group: standard diet with saline injections, standard diet with nicotine injections, kava-supplemented diet with saline injections, and kava-supplemented diet with nicotine injections. Mice received I.P. injections every other day for a total of five injections, and a challenge dose one week later. This injection sequence was repeated once more. Mice were evaluated with Small Open Field (SOF) tests immediately after injections to assess locomotor activity and anxiety-like behaviors over a 20-minute period.

Saline treated mice consuming the kava-supplemented diet had significantly higher center times and total distance traveled compared to standard diet mice, indicating reduced anxiety-like behavior. Nicotine treated mice did not display a significant difference in either measure with kava supplementation.

Kava supplementation significantly reduced anxiety-like behavior in C57BL/6 mice not treated with nicotine. Nicotine treated mice exhibited more anxiety-like behavior and decreased locomotor activity overall, and did not display a significant change in these behaviors with dietary kava supplementation.

**Presenter(s): Carolina Calonge**
**Faculty: Diego Guarin**
**Additional Authors: Gabriela Acevedo, Diego L. Guarin**

***Title: Comparison of finger tapping velocity features between groups of healthy control, iRBD, and Parkinson's Disease using video-based analysis***

Parkinson's disease (PD) is the second most common neurological disorder after Alzheimer's. Many individuals with PD were initially diagnosed with Idiopathic Rapid Eye Movement Sleep Behavior Disorder (iRBD), a condition where dreams are enacted during REM sleep, making iRBD a prodrome to PD. Identifying when iRBD converts to PD is challenging, as conversion may occur soon after diagnosis or never at all. This study compares movement velocity among healthy controls (CON), iRBD, and PD groups during finger tapping using video-based analysis. ANCOVA detected significant differences across groups and a Tukey HSD test compared PD vs. CON, PD vs. iRBD, and iRBD vs. CON. Results align with previous studies, showing significant differences between PD and CON but none for iRBD comparisons. However, video-based analysis shows promise in detecting iRBD conversion to PD and serving as a home-based tool. A hypothesis suggests that the iRBD population may be split, with some individuals closer to PD symptoms and others to CON. When combined, these subsets show no significant differences. Future research should consider disease duration and symptom severity as covariates.

**Presenter(s): Raul Camargo**
**Faculty: Eleonora Rossi**
**Additional Authors: Hannah Treadway, Dr. Diego Pascual y Cabo, Elijah Zarsadias**

## ***Title: Measuring the Dynamic Impact of Personal Social Networks on Language Learning Outcomes***

Recent socioecological frameworks of second language acquisition and bilingualism (i.e., Atkinson et al., 2016; Titone & Tiv, 2022) have attempted to describe variability in language learning outcomes beyond known individual factors (i.e., linguistic abilities, cognitive profiles, and social variables) by including indices from the speakers 'interlocutors, differences in interactional contexts, and different societies 'dynamics. Building on these recent developments, the main objective of this study is to measure the synergy between personal social network and language learning outcomes for learners of Spanish. Towards this goal, we capitalize on interdisciplinary methods from language science (corpus/computational, psycholinguistics), social network science, and cognitive science. We will study a cohort of Spanish Heritage Speakers (HS) enrolled in Spanish courses at UF, assessing their language background, personal social network, cognitive measures, and language proficiency at the start and end of the semester. We address two key research questions: (1) Do compositional and structural features of a speaker's personal social network predict language outcomes in HS beyond measures of individual variability in language use and cognitive abilities? (2) How does the correlation between compositional and structural features of the speaker's personal social network and language outcomes oscillate longitudinally?

**Presenter(s): Gabrielle Cannon**
**Faculty: Ben Lewis**
**Additional Authors: Cannon G, Farrior H, Phalin B, Solomon L, Janner A, Mathias K, Teitelbaum SA, Lewis B**

## ***Title: The Role of Peer Social Support in Substance Use Disorder Treatment and Readmission Outcomes***

The importance of strong social support for maintaining abstinence in individuals with substance use disorders (SUDs) is well-recognized. However, to date, much of this work has focused on familial social support following treatment. In contrast, social support from friends is less understood. Moreover, little is known regarding the degree to which friends ' support during treatment may predict long-term abstinence outcomes. This study characterized the change in social support from treatment initiation to discharge, and it examined the degree to which social support was associated with treatment readmission. Of particular interest was whether readmission was more strongly predicted by social support at treatment initiation vs. treatment completion.

**Presenter(s): Lauren Cardosi**
**Faculty: Graciela Lorca**
**Additional Authors: Reagan Beliakoff, Monica Lamberti**

## ***Title: Investigation of LysR2 Transcriptional Regulator Binding Sequence Onto the MarR Gene Promoter from Lactobacillus johnsonii N6.2***

Lactobacillus johnsonii N6.2 is a probiotic bacterium that when exposed to bile, hyperproduces extracellular vesicles that prevent beta cell death in pancreatic islets while increasing insulin secretion. To identify bacterial genes involved in the hypervesiculation phenotype, cells were grown in presence of bile, and whole transcriptomic analysis was performed. It was found that the transcriptional regulator LysR2 (LttR2) activates genes responsible for fatty acid utilization and cell wall homeostasis when cells are grown in presence of bile. In vitro experiments indicated that bile serves as a coactivator of LttR2. Given the unique effect that bile has on increasing the binding affinity of LttR2 to the MarR gene (fakT), DNAse I footprint analysis was performed to identify key bases involved in the interactions. Site directed mutagenesis was performed to identify specific binding sequence of LttR2, followed by PCR amplification and biotin labeling. Electron mobility shift assays (EMSA) were conducted in both the presence and absence of bile to determine how mutated residues in the promoters influenced LysR2s binding affinity. It was found that specific mutation on the binding sites as well as a decrease in the spacing between the two binding boxes identified by footprinting decrease the binding affinity of LttR2

**Presenter(s): Kasyn Carlton**
**Faculty: Sharon DiFino**
**Additional Authors: Julie Gonzalez**

## ***Title: Colonization, Carbs, and Cardiac Arrest: The Native American Health Crisis***

There are 5.2 million Indigenous peoples in America, representing about 2.2% of the population. Indigenous peoples are disproportionately affected by diabetes and heart disease. Indigenous refers to Native Americans and Indigenous and tribal communities. The traditional nutritious diet of many tribal communities changed with colonization, as Indigenous people were displaced from their homelands and often forced into a carb-heavy diet. Food insecurity within reservations in the United States limits access to nutritious food and contributes to diabetes, heart disease, strokes, and related health issues existing in Native American communities. One in four Native Americans experience food insecurity.

The burden of cardiovascular disease often induced by diabetes has motivated some government entities to begin federal initiatives such as the Indian Health Service (IHS). It is estimated that the IHS addresses only 48.6% of healthcare needs due to limited funding, impacting adequate staffing levels, as well as the quality and accessibility of care. This literature review will further examine the relationship between food insecurity within Native American communities and diabetes, highlighting the role of the IHS in these issues. Data for this literature review was collected through search engines such as Google Scholar, PubMed, and the Government Census.

**Presenter(s): Sabrina Carrillo**
**Faculty: Tracy Centanni**

## ***Title: Influence of Cerebellar Low Frequency Oscillations on Language Perception in Dyslexia***

Developmental dyslexia is a neurodevelopmental disorder associated with deficits in rapid automatized naming and phonological processing. The cerebellum has recently been implicated for its role in language and automaticity, which could explain a deficit in rapid automatized naming and language processing in individuals with dyslexia. The current study was designed to evaluate abnormalities in cerebellar long-range connectivity by quantifying power in theta, delta, and alpha frequency bands. Using a rapid speech task and magnetoencephalography (MEG), we analyzed language perception in adults with and without dyslexia. There was a significant, negative correlation between band power and accuracy at the three bands for typical readers and a positive correlation for those with dyslexia at theta and alpha. These data suggest a compensatory deficit in those with dyslexia, requiring more power at the cerebellum to succeed at language processing, marking a lack of efficiency for automaticity not present in typical readers. This compensation strategy may present differently among individuals with dyslexia, which can be explained by the genetic heterogeneity within the group. These findings highlight the need for future research on the different language deficits of those with developmental dyslexia in order to improve intervention outcomes.

**Presenter(s): Michael Casanueva**
**Faculty: Christopher McCurdy**
**Additional Authors: Sampa Gupta**

## ***Title: Synthesis and Evaluation of A-ring Substituted Compounds Inspired by Mitragynine with an Open D-ring Structure***

Mitragynine is an alkaloid compound found in Mitragyna speciosa (kratom) leaves, a plant native to Southeast Asia. Not only has kratom been used traditionally for its stimulant, analgesic, and soothing properties, but in recent years, mitragynine has gained attention for its potential therapeutic use as a safer alternative due to being a partial agonist at the μ-opioid receptor, lending itself as a potent tool to mitigate opioid overdose. Given the constant increase in opioid overdose deaths in the 2000s, the exploration of possible medications for addiction and withdrawal is imperative. The unique structure of mitragynine, which contains multiple rings, suggests that specific regions of its design play a critical role in receptor binding. The A ring's structure-activity relationship (SAR) with the receptors mentioned above will be studied by constructing the target molecule with different indole derivatives. Therefore, we aim to assess the impact of A ring substitution on mitragynine's therapeutic effects, binding affinity, and potency.

**Presenter(s): Christa Casey**
**Faculty: Rachael Seidler**
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## ***Title: Hypercania's Effect on Ocular Glymphatic Function***

The partial pressure of carbon dioxide (ppCO2) aboard the International Space Station (ISS) averages 12.7 times greater than Earth. This hypercapnic environment has been observed to impair glymphatic CSF-ISF exchange in rats (Goodman 2020). The "ocular glymphatic system" may play a key role in the development of ophthalmic abnormalities in astronauts, including Spaceflight Associated Neuro-ocular Syndrome (SANS). In this project, we studied how elevated CO2 impacts the brain and ocular glymphatic system by having participants breathe elevated CO2 and undergo delayed MRI following gadolinium contrast administration. We looked at whether changes in physiological responses were correlated with change in ocular signal intensity between the ambient and CO2 conditions. We found associations of R = 0.44 and 0.38 for diastolic blood pressure and respiration rate, respectively, compared against the changes in signal intensity in the vitreous chamber of the eye. These values were not statistically significant, given our small sample size (n=12); more participants might make these associations significant. This would suggest that the physiological responses typical with elevated CO2 levels may influence the ocular glymphatic system, potentially contributing to SANS. Our findings support the need for further studies on astronaut ocular health.

Goodman JR, Iliff JJ. Vasomotor influences on glymphatic-lymphatic coupling and solute trafficking in the central nervous system. J Cereb Blood Flow Metab. 2020 Aug;40(8):1724-1734. doi: 10.1177/0271678X19874134. Epub 2019 Sep 10. PMID: 31506012; PMCID: PMC7370362.

**Presenter(s): Alejandra Casillas**
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## ***Title: Identifying Features for Stealth Assessment of Oral Reading Fluency with AI***

Elementary school children often struggle to achieve oral reading fluency (ORF), a critical skill for successful reading. Schools provide tiered interventions to support these students, but limited resources hinder the availability of one-to-one tutoring. Reading apps could address this issue by incorporating strategies used by tutors, such as identifying reading errors, providing decoding training, and illustrating correct pronunciation. Recent research leveraging automatic speech recognition (ASR) technology to study children's speech production has focused on developing ASR for children with typical reading development and classifying mispronunciations. However, these studies have not examined the types of reading errors children make, limiting the effectiveness of current reading apps. Storiza, an AI-based reading app, aims to improve ORF by creating Stories for children and measuring Words Correct Per Minute (WCPM) and detecting reading errors. This research explores the use of speech modeling technology to detect various reading errors and identify features from authentic reading practice recordings that predict WCPM. We developed features based on distance measures between stories and their ASR transcriptions, as well as speech duration and pauses. Preliminary results indicate that these features are predictive of WCPM, demonstrating the potential of Storiza to enhance reading fluency assessment.

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## ***Title: Hyperbaric Oxygen Therapy in Pompe Disease***

Pompe disease (PD) is an autosomal recessive disorder caused by acid a-glucosidase gene mutations, leading to skeletal and cardiac muscle impairments, respiratory failure and neurodegeneration. Respiratory deficiency often necessitates mechanical ventilation, reducing life quality. Enzyme replacement therapy is the primary approach but doesn't target the central nervous system or prevent respiratory decline. Hyperbaric oxygen therapy (HBO) delivers 100% oxygen at increased pressure and reduces neuronal inflammation in spinal cord injured rats. This study examined HBO's effects on body mass and ventilation in a PD rat model. Female Sprague-Dawley rats were assigned to HBO (100% $O_2$, 2 ATA) or SHAM groups (21% $O_2$ , 1 ATA). Treatment began at different ages: 9 months , 7 months , 4 months and 3 months . HBO was administered daily, and body weights were recorded biweekly. Whole-body plethysmography assessed breathing patterns at baseline and mid-points. Data were analyzed using 2-way Repeated Measures Analysis of Variance. No adverse events were observed, and body mass changes were similar between groups. A trend toward increased tidal volume was noted in the 9-month group, but the small cohort precludes conclusions. These preliminary findings suggest HBO is safe, does not affect weight gain or loss, and may influence breathing patterns in PD rats.

**Presenter(s): Madison Cavanaugh**
**Faculty: Dr. Duane Mitchell**
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## ***Title: Enhancing mRNA-based immunotherapy exploring polyadenylation and silencing of mRNA nucleosides to evaluate the effects on expression (GFP mRNA) and immune response (gp100).***

mRNA-based immunotherapy has gained significant attention in medicine following the success of mRNA vaccines, such as, those developed for COVID-19. A particularly promising application of this approach is in the treatment of brain cancers. mRNA can be engineered to encode personalized tumor-associated antigens by activating the immune system to identify and destroy cancer cells providing a more durable response. This treatment strategy enables precise targeting of mutations unique to an individual's tumor while reducing harm to healthy tissues in concert with the current standard of care which is surgery, chemotherapy, and radiation. Studying mRNA-based immunotherapy through polyadenylation allows us to evaluate how these modifications impact mRNA translation and expression in antigen presenting cells, and in the overall immune response. In this study we expect to see how increasing the length of the poly A tail on mRNA constructs will enable the mRNA to be translated before breaking down into the cytoplasm. We will use this technique to first test the translation efficiency of GFP in DC2.4s, and we will apply this strategy to tumor-associated antigens, such as gp100 in future experiments.

**Presenter(s): Fabrizio Cavassa**
**Faculty: Jeffrey Rudolf**
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## ***Title: Discovery of bacterial diterpenoids by genome mining***

Terpenoids, also referred to as isoprenoids or terpenes, are the pinnacle of nature's structural diversity, and are widely used as pharmaceuticals, herbicides, and biofuels. They are often discovered and sourced from plants and fungi. Terpenoids from bacterial origin are also known, but rare, especially for diterpenoids. However, recent genomic sequencing data indicates that there are numerous putative terpene synthase (TS) genes in bacteria, such as in the Actinomycetes class. To unlock the new diterpenoids, bioinformatic techniques and genetic databases of bacteria were utilized to identify novel biosynthetic gene clusters (BCGs) that included TSs and other tailoring enzymes. After genome mining, the activity of the target TS was screened by engineered E. coli in vivo, and its metabolites were detected by high-performance liquid chromatography (HPLC) or gas chromatography-mass spectrometry (GCMS). Once we identified the positive hits for diterpenes, we isolated and characterized their structures by nuclear magnetic resonance (NMR) analysis. Five diterpenes from three TSs were discovered, which also included one new structure. Afterwards, with the new diterpene skeletons, we will use heterologous expression or other genetic manipulation methods, if we have the relative strains, to unlock the biosynthesis of new diterpenoids. These captivating structures possess important relevance to drug discovery.

**Presenter(s): Caitlyn Cavender**
**Faculty: Daniel Johnson**

## ***Title: Size-Class Mortality Trends in Longleaf Pine***

Once dominating the southeastern US, Longleaf pine (Pinus palustris) forests have been reduced to a fraction of their historical range because of land use change, fire suppression, and species conversion. Longleaf pine is a keystone species in the southeastern US, promoting biodiversity in fire- maintained ecosystems. Conservation efforts now focus on restoring longleaf ecosystems. Restoration requires the reestablishment and success of the keystone species. We investigate tree mortality by size class at Ordway-Swisher Forest Dynamic Plot from 2019 to 2024, by diameter class. In this five-year period health censuses were completed on an annual basis, based on survival status from these the mortality rates were calculated. We found that the smallest longleaf pines (5-10 cm) experienced the highest total mortality rate (23.8%), due to environmental stressors; fire sensitivity, or competition. Trees in the 5-10 cm class also experienced considerable mortality (16.6%), while the larger trees (10-20 cm & 20+ cm) had lower mortality rates (2.9% & 1.8%, respectively). These findings highlight the vulnerability of young pines. On a larger scale, the mortality rates of pines and oaks will shape the future forest composition. If fire disproportionately impacts pines while allowing oak recruitment, the system may shift towards oak dominance.

**Presenter(s): Thomas Cerniglia**
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## ***Title: Advancing AI in Classical Philology: Lemmatization, Sentence Modeling, and Chatbot Development***

The Data-Driven Humanities Research Group is at the forefront of integrating artificial intelligence with classical philology. Our project currently focuses on the development and refinement of Ancient Greek and Latin lemmatizers, enabling precise linguistic processing and enhanced textual analysis. These lemmatizers serve as the foundation for sentence modeling, allowing for deeper syntactic and semantic understanding of ancient texts.

By leveraging machine learning and computational linguistics, our work extends beyond traditional corpus analysis to construct structured, scalable models for processing historical languages. The implementation of advanced sentence modeling techniques enhances the accuracy of syntactic parsing and supports new approaches to the study of language evolution, textual transmission, and stylistic analysis.

Looking ahead, we are exploring the development of our own chatbot designed to interact with users in Ancient Greek and Latin. This initiative aims to bridge the gap between modern AI technologies and classical studies, fostering engagement with ancient languages in innovative ways. By incorporating natural language processing into the humanities, this project redefines how scholars, students, and enthusiasts access, interpret, and interact with the linguistic heritage of antiquity, pushing the boundaries of computational philology into new frontiers.

**Presenter(s): Emily Chacko**
**Faculty: Jason Brunson**
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## ***Title: Topological Feature Extraction for Machine Learning Classification and Texture Analysis of CT Scans: A Preliminary Study Toward an Application in Pulmonary Sarcoidosis***

Pulmonary sarcoidosis is a rare disease characterized by granulomatous inflammation. Given its heterogeneous presentation, sarcoidosis care may benefit from additional quantitative metrics for classifying, phenotyping, and forecasting progression. One promising texture-analytic approach is persistent homology, a multiscale quantification of connectivity and enclosure in images. We hypothesize that topological features will support machine learning classification of CT scans by disease subtype. In this preliminary work, we test our hypothesis in lung cancer, using publicly available CT scans collected from a research hospital in China. We used a support vector machine (SVM) to classify images by cancer type. Each 3D image array is subdivided into a cubical mesh on which persistent homology is computed. The feature averages across each training (2/3) image are used to train the SVM, and the trained SVM was evaluated on testing (1/3) images. The overall accuracy was 65.1%, with per-class accuracies of 74.3% for adenocarcinoma, 28.6% for squamous cell carcinoma, and 0% for small cell carcinoma. Our primary goal is to apply this approach to important problems in pulmonary sarcoidosis care: distinguishing stages, identifying phenotypes within a heterogeneous population, and predicting progression.

**Presenter(s): Rosenna Chan**
**Faculty: Zhe Ma**

## ***Title: Evaluating the effect of STING-targeting KSHV microRNAs in Primary Effusion Lymphoma cells***

Kaposi's Sarcoma Associated Herpes Virus (KSHV) is the etiological agent of several malignancies including Kaposi's Sarcoma (KS), Primary Effusion Lymphoma (PEL), and Multicentric Castleman's Disease (MCD). KSHV establishes lifelong infection by suppressing the host innate immune system. One component of this system is the cGAS-STING pathway, which is important for host innate immune response and cancer immunity. Recently, we identified four KSHV miRNAs that targeted STING, revealing a unique viral mechanism for repressing host innate immune responses. Blocking these KSHV miRNAs by miRNA inhibitors rescued STING expression and signaling in KSHV-positive adhesion cells, and disrupted KSHV lytic life cycle. To further evaluate the oncogenic potential and mechanisms, we inhibited these STING-targeting KSHV miRNAs in patient-derived PEL cells. Blocking each candidate miRNAs alone restored STING expression and caused cell growth inhibition in PEL cells, recapitulating the impact of STING overexpression in these cells. Moreover, when the cells were treated with miRNA inhibitor and diABZI, a STING agonist, we observed a greater reduction in cell viability and increased expression of downstream STING signaling targets. Our data suggests a possible additive/synergistic effect by the two treatments and reveals KSHV miRNAs as potential targets for PEL therapeutics.

**Presenter(s): Matthew Chao**
**Faculty: Habibeh Khoshbouei**
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## ***Title: Sex-specific impact of in utero methamphetamine exposure on the development of the dopaminergic system***

Prenatal methamphetamine (METH) use during pregnancy is linked to various developmental issues in children, such as impaired intellectual functioning, memory, language development, and emotional regulation. We hypothesize that dysfunction in neuroimmune communication between dopaminergic neurons and microglia during critical periods of development lead to altered dopamine transmission in offspring exposed to METH prenatally. On embryonic day 0.5, dams were administered 5 mg/kg (s.c.) of METH daily until parturition. Between PND20-25, pups were euthanized, and brains were collected for immunofluorescent staining of dopaminergic neurons and microglia, biochemical analysis, or ex vivo slice imaging experiments. Our data show that juvenile males, but not females, prenatally exposed to METH have increased tyrosine hydroxylase immunoreactivity in the striatum, indicative of altered dopamine transmission. Furthermore, prenatal exposure to METH may influence microglial activation state, reducing the overlap between microglia and TH+ axons, suggesting potential deficits in microglial responsiveness in dopaminergic circuit maturation. Ongoing experiments are evaluating dopamine release in response to pharmacological manipulation of DAT and/or dopamine receptors utilizing a virally-encoded fluorescent dopamine sensor, dLight1.3b, in ex vivo striatal slice preparations from pre-pubescent mice. Future studies will assess whether these effects persist through adolescence to adulthood and influence the sensitivity to psychostimulants in later life

**Presenter(s): Mariia Chasovskykh**
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## *Title: Synergistic Respiratory and Cardiovascular Impairments in Fentanyl-Xylazine Overdose*

The United States continues to grapple with a severe overdose crisis, with over 107,000 drug overdose deaths reported in 2022 (CDC, 2023). A concerning trend within this crisis is the escalating presence of xylazine, a non-opioid sedative, in the illicit drug supply. Fentanyl's activation of μ-opioid receptors suppresses respiratory function, while xylazine's action as an agonist of ∝2-adrenergic receptors exacerbates cardiovascular instability, likely increasing the probability of fatal outcomes in overdose scenarios. The increasing prevalence of xylazine underscores the urgency of understanding its impact, particularly its resistance to standard opioid overdose treatments like naloxone. This study aims to investigate how fentanyl and xylazine interact to impair respiratory function and cardiovascular stability in a mouse model.

We used an in-situ preparation of C57BL6/J mice (n = 10) to evaluate the cardiorespiratory effects of fentanyl, xylazine, and naloxone. This powerful decerebrate brainstem-spinal cord preparation is retrogradely perfused through the descending aorta with artificial cerebrospinal fluid (aCSF). The in-situ model demonstrates coordinated respiratory and cardiovascular activity, thus key physiological parameters, such as neural outputs of efferent respiratory nerves, cardiac activity, and vascular pressure can be continuously monitored.

Our preliminary findings reveal that the combination of fentanyl and xylazine leads to significant respiratory suppression, increased vascular pressure, and decreased cardiac rate. Consistent with observations in vivo, fentanyl (10 μM) initially slows and destabilizes breathing, decreases vascular pressure, and lowers cardiac rate. The addition of xylazine (10 μM), a veterinary sedative, further reduces heart rate, increases vascular pressure, and lowers respiratory rate and variability. The opioid receptor antagonist naloxone (1 μM) effectively reverses fentanyl's respiratory effects, but it does not mitigate the cardiovascular consequences of xylazine, leaving symptoms like high vascular pressure and slowed heart rate unresolved. These findings highlight the compounded physiological risks of fentanyl and xylazine co-administration, emphasizing the need for targeted interventions to address the unique challenges posed by this dangerous drug combination.

**Presenter(s): Rachel Chazotte**
**Faculty: Carolina Baruzzi**
**Additional Authors: Anna Maria Secci, Deanna Riente, Kim Sash, Marcus Lashley, Carolina Baruzzi**

## ***Title: Commensals at Gopher Tortoise Burrows in Different Habitats***

The Longleaf pine (LLP) savanna ecosystem has experienced a 97% decline from its historic range. This loss has driven wildlife to utilize alternative habitats such as old-fields, which have arisen from abandoned agricultural lands. The gopher tortoise (Gopherus polyphemus), a keystone species shared by LLP savannas and old-field ecosystems, supports a diverse commensal community of over 300 species that rely on its burrows for shelter. However, little research has compared the commensal communities between these habitats.
This research aims to compare commensal communities associated with gopher tortoise burrows in LLP savannas and old-fields. We placed 10 motion activated cameras at burrows in each ecosystem and recorded species presence over a five-month period. We analyzed differences in species richness and Shannon diversity using generalized linear models. We then compared differences in community composition conducting an analysis of similarities. Our results indicate that commensal communities were overall different between the two ecosystems, with higher species richness and diversity in the old-field. These findings demonstrate the ecological value of old-fields as a suitable habitat for gopher tortoise commensals. Nevertheless, LLP savannas remain critical for conservation, as protecting both ecosystems can ensure the survival of the diverse species that depend on gopher tortoise burrows

**Presenter(s): Jason Chen**
**Faculty: Ruogu Fang**
**Additional Authors: Dr. Aprinda Indahlastari Queen**

## ***Title: The Effects of MR Defacing Algorithms on TES Current Density***

Transcranial electrical stimulation (TES) is a non-invasive brain stimulation technique that relies on accurate head models derived from MRI scans and current density distribution estimates. To protect patient privacy, defacing algorithms are commonly applied to MRI data before sharing or analysis. However, these algorithms can alter anatomical structures, potentially affecting the accuracy of TES current density estimations. This study investigates the impact of different defacing algorithms on TES simulations by comparing current density distributions across head models generated from both defaced and non-defaced MRI scans. Using finite element modeling (FEM), we evaluated how defacing-induced modifications influence electric field magnitude and spatial distribution. Our findings highlight the need for careful selection of defacing techniques to ensure the integrity of TES modeling.

**Presenter(s): Rishika Cherukuru**
**Faculty: Richard Bennett**

## ***Title: Impact of a Histone H2A Mutation on Cell Biological Properties Related to Cancer***

Histones are proteins that play a critical role in DNA compaction, gene regulation, and access to DNA during replication and transcription. DNA wraps around complexes of histone proteins to form a nucleosome, which packs together to construct chromatin and, eventually, a chromosome. The octamer structure of histone proteins is essential for packaging DNA into the cell nucleus. By examining a database of cancer genomic profiles to analyze histone genes, statistical analysis found a significant number of genomic alterations in the H2A genes of lung cancer patients. Patients with these mutations were found to have lower survival rates compared to those without the mutation. In histone H2A, the most frequent mutation in cancer was a glutamate-to-lysine missense mutation at amino acid position 121 (H2A-E121K). My research is centered on investigating the impact of the H2A-E121K mutation on cell biological properties relevant to cancer. The core hypothesis of this study is that the H2A E121K mutation significantly alters cell biological properties, leading to the transformation of normal cells into a cancer-like state. To test this, we have compared the proliferation rate, apoptosis, and migration of the BEAS-2B lung epithelial cell line expressing mutant H2A-E121K to cells expressing wild-type H2A. The results of these studies are expected to provide valuable new insights into how chromatin architecture protects cells from tumorigenesis.

**Presenter(s): A'mya Chin**
**Faculty: Kelly C. Rice**
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## ***Title: Implication of Nitric Oxide (NO) Signaling in Staphylococcus aureus***

Staphylococcus aureus (S. aureus) poses a significant health threat due to its metabolic versatility and antibiotic resistance. S. aureus nitric oxide (NO) production modulates its respiration and contributes to virulence. To understand if this NO affects non-NO producing S. aureus cells, we are optimizing the use of green fluorescent protein (GFP) NO sensors. We will also engineer Escherichia coli (E. coli) to express GFP when exposed to NO, and will use this strain in co-culture to determine if S. aureus NO is sensed by E. coli. These studies will determine if S. aureus NO can travel intercellularly, and if it impacts non-NO producing cells.

**Presenter(s): Zoe Chu**
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## ***Title: Gene Expression Analysis of Urease and Carotenoid Biosynthesis Pathways in Haloferax volcanii***

The halophilic archaeon, Haloferax volcanii, is considered a model among extremophiles as the genome is sequenced and the organism displays robust growth. Among other traits, H. volcanii is of interest in biotechnology due to its unique resiliency to stress. H. volcanii encodes for urease, the enzyme that catalyzes the hydrolysis of urea into ammonia and carbon dioxide and is of interest for bio-concrete generation. This study aims to determine expression of the ureC and ureB genes encoding the urease subunits based on nitrogen source. Understanding potential differences will provide a broader understanding of how haloarchaea respond to fluctuations in nitrogen sources, including their metabolism of urea which is of interest in water reuse, pollution prevention and other applications. In this study, our qRT-PCR results display an increase in abundance of ureC transcripts when the parent strain, H26, is grown in glycerol minimal media containing urea, compared to ammonium chloride. During this investigation, we aimed to focus on urease activity; however, we found that H. volcanii grown with urea had a visibly darker color, suggesting an impact on carotenoid production. To further probe these findings, we examined expression a key gene of carotenoid biosynthesis by qRT-PCR and found it to be increased in transcript abundance during oxidative stress. As carotenoids are of interest for various biotechnology applications and H. volcanii prefers glycerol (an abundant waste product of biodiesel production), current research aims to evaluate the impact of biodiesel-derived glycerol on carotenoid production and to refine extraction protocols for improved efficiency.

**Presenter(s): Madison Chubb**
**Faculty: Hugh Fan**

## ***Title: Engineering Microfluidic Devices for Circulating Tumor Cells Isolation***

Pancreatic cancer is one of the most lethal cancers, with a 5-year survival rate of 5-10%. Low rate survival and cancer mortality are associated with metastasis. Circulating tumor cells (CTCs) are cancer cells that shed from primary tumor lesions and travel through the circulatory system, potentially leading to cancer metastasis. CTCs have been found to be effective biomarkers and shown significant utility with respect to tracking cancer progression and assessing patients ’responses to treatment. However, CTCs detection is limited by its extreme rarity among billions of normal blood cells. This study reports a microfluidic device that integrates both immunoaffinity-based isolation and size-based filtration to achieve high capture efficiency. Utilizing these microfluidic devices, we were able to monitor CTC count along the neoadjuvant treatment period in pancreatic cancer patients. This poster shows the design, functionality, and clinical application of our microfluidic devices in capturing CTCs and subsequent analysis.

**Presenter(s): Lydia Chung**
**Faculty: Prabhat Mishra**

## ***Title: Vulnerability Analysis and Mitigation of Hardware Cryptographic Modules for Implementation of Secure Silicon***

Hardware security is a critical aspect of modern cryptographic systems, as vulnerabilities in hardware cryptographic modules can expose sensitive data to various attacks. This research focuses on analyzing the security and design of hardware cryptographic modules by evaluating them against well-known threats and identifying potential weaknesses. Specifically, we investigate three key vulnerability types: malicious implants (hardware Trojans), information leakage, and finite-state machine vulnerabilities. Additionally, we explore and implement mitigation strategies to enhance the security of these modules. These cryptographic modules are integrated into a security engine firmware system to ensure their effective deployment in secure environments. This work contributes to the development of more resilient hardware cryptographic implementations, strengthening the foundation of secure computing systems.

**Presenter(s): Esse Ciego**
**Faculty: Amanpreet Kapoor**
**Additional Authors: Skyler Steiert**

## ***Title: Exploring Undergraduate Computing Tutors' Pedagogical Practices in Tutoring Sessions***

With the rapid increase in enrollment of CS majors, undergraduate teaching assistants (UTAs) have become a key resource for managing large courses and assisting students. As such, understanding the pedagogical practices UTAs employ is essential to improve tutoring quality. Our research aims to explore the pedagogical practices UTAs use during office hours through (1) what pedagogical practices UTAs use, and how do they implement these strategies? and (2) why UTAs use certain pedagogical approaches? We conducted an ethnographic study with seven UTAs, observing them for a total of 35 hours across 13 sessions during weekly office hours and documenting their interactions with students. We also interviewed the UTAs to understand their reasoning behind their strategies. Our study revealed UTAs use a wide range of pedagogical practices, such asking guiding questions, drawing diagrams, consulting other tutors, and editing students' code. These practices varied depending on how the UTA categorized the student's problem and their progress in the tutoring session. This research offers guidance to both novice and experienced tutors by offering insights into what tutoring strategies UTAs can use.

**Presenter(s): Pedro Cintrón Baerga**
**Faculty: Carl Denard**
**Additional Authors: Ziyue Dong, Dr. Kayla Sprenger**

## ***Title: A High-Throughput Computational Investigation of Protein-Polymer Bioconjugates with Molecular Dynamics Simulation***

Proteins are essential biomolecules whose function depends on their three-dimensional structures. However, many natural proteins have low stability and reduced enzymatic activity, limiting their industrial and therapeutic applications. Bioconjugation techniques, inspired by natural glycosylation, address these issues by covalently attaching synthetic polymers to proteins. PEGylation, the conjugation of polyethylene glycol (PEG), enhances solubility, reduces immunogenicity, and prolongs circulation time, making it crucial for therapeutic proteins.

This study investigates methoxyPEG conjugation on Hen Egg White Lysozyme (HEWL, PDB: 1LYZ), a model antimicrobial protein. Using high-throughput molecular dynamics (MD) simulations, we analyzed structural and dynamic changes induced by polymer attachment via modified cysteine residues. Extended 1000-nanosecond simulations revealed increased protein backbone rigidity, enhancing stability while introducing localized flexibility in surface residues due to polymer interactions.

These findings suggest that non-covalent hydrophobic interactions significantly influence protein function upon PEGylation, explaining reduced enzymatic activity. Understanding these effects will help refine bioconjugation strategies to optimize stability and function. This study provides insights into PEGylation's molecular mechanisms and informs the design of improved bioconjugates. Future research will explore factors like thermostability, pH sensitivity, and aggregation to enhance therapeutic applications.

**Presenter(s): Krysthel Cisneros**
**Faculty: Dr. Sharon DiFino**
**Additional Authors: Zoë Dupont, Emilia Przepiora, Brooke Leccese**

## ***Title: Disparities in Language Intervention Strategies for Bilinguals who Present Down Syndrome***

Access to language intervention is difficult for many families, and even more so for those in bi/multilingual households. Having a child with Down Syndrome may add another layer of difficulty in receiving adequate intervention. Only about 8.3% of ASHA-certified Speech-Language Pathologists self-identify as multilingual. This shortage means they cannot treat all children who are being raised bilingual and also struggle with their expressive and/or receptive language (American Speech-Language and Hearing Association, 2023). Research has found that with proper, individualized intervention that prioritizes a family-centered/based approach, a child with an intellectual disability can effectively develop language skills in multiple languages.
More research is needed on this topic, but researchers so far concluded that SLPs must "assess bilingual children with complex dual diagnoses with an individualistic approach" to optimize language interventions (Ward & Sanoudaki, 2020). The purpose of this literature review is to use data collected via Google Scholar and University of Florida databases to identify effective intervention techniques while also highlighting the positive effect of bilingualism on children with developmental disabilities such as Down Syndrome. With increased research, we can begin to develop a standard procedure for addressing language delays in individuals with intellectual disabilities.

**Presenter(s): Morgan Clemens**
**Faculty: Adam Stern**
**Additional Authors: Mary Yarborough**

## ***Title: How Reliable are Carboxyhemoglobin Levels in Animal Blood? A Precision Study***

Carboxyhemoglobin (COHb) is a complex that forms within erythrocytes when hemoglobin is exposed to carbon monoxide (CO). The concentration of COHb in blood can be used as a biomarker to support a diagnosis of CO poisoning and is used for this purpose in human forensic cases; however, there is limited research assessing the use of COHb in animal blood. The goal of this study was to determine the precision of the %COHb in animal blood using the AVOXimeter 4000. Peripheral blood from live animals (dogs, cats, horses) and heart blood from deceased animals (dogs, cats, horses) were analyzed using the AVOXimeter 4000. Descriptive statistics and the median absolute deviation (MAD) were determined for each analyte and a Kruskal-Wallis ANOVA followed by a Post-Hoc Dunn's test was performed to compare the COHb from the normal dogs to the smoke inhalation dog. Data collected from each animal antemortem and postmortem had a low MAD for COHb levels in blood. There was a significant difference between the %COHb in blood from normal dogs compared to the smoke inhalation dog. These results are supportive of future work evaluating the use of co-oximetry to assess for the vitality of an animal in a fire.

**Presenter(s): Madeleine Coalter**
**Faculty: Cora Best**
**Additional Authors: Elizabeth Eberley, Xinran Carol Hu, Julia Lancaster, Victoria Michalski, Giang Phan, Ehsan Safaei, Emily Schneider, Emma Shutters, and Cora Best**

## ***Title: Popular Diets and Musculoskeletal Health in Aging Study: Menu Design Project***

In animal and human studies examining the impact of very low carbohydrate ketogenic diets (KD) on musculoskeletal outcomes, failure to match the experimental and control diets on key nutrients, particularly protein, is a major source of potential confounding. The concern is that protein can influence muscle and bone independently of carbohydrate restriction. We are conducting a clinical trial comparing the effects of a well-formulated KD and Mediterranean diet (MD) on bone health and muscle function markers in older adults. The purpose of this menu design project was to produce menus for the test diets that (1) optimize nutritional quality, (2) minimize inadvertent differences in key nutrients, and (3) maximize sensory appeal. We identified candidate recipes using cookbooks and online resources. We conducted nutrition analysis, then optimized recipes with goal programming to achieve nutrition targets. Thirty recipes were prepared in an experimental foods lab and evaluated for sensory properties, and 28 met the nutrition and sensory evaluation criteria for inclusion. As intended, the final KD and MD menus significantly differed in carbohydrate and fat content but not in energy, protein, calcium, or sodium content. This project established a framework for menu design that can be used in future human feeding studies.

**Presenter(s): Isabella Colosimo**
**Faculty: Charles Ellis**
**Additional Authors: Elizabeth Evans, MS; Nicole J. Jones, MS**

## ***Title: Overlooked Aspects of Spinal Cord Injury Rehabilitation: Swallowing Impairments***

Individuals with Spinal Cord Injury (SCI) experience disruptions in daily life, requiring complex rehabilitation. Clinical guidelines emphasize comprehensive care, encompassing acute and long-term interventions. Acute care addresses critical medical concerns such as ulcers, thrombosis, gastrointestinal dysfunction, and respiratory complications. Long-term care includes multidisciplinary support, such as nutritional guidance and physical, occupational, and psychological therapies, to enhance recovery and quality of life. However, little attention is given to swallowing function after SCI, despite its importance for independence and health. This study explores swallowing issues in SCI and their mechanisms. It examines the role of Speech-Language Pathologists (SLPs) in treating post-injury swallowing impairments and identifies gaps in care by reviewing existing literature that investigates swallowing disorders in SCI as well as SLPs' roles, engagement, and management approaches. The research reveals a wide range of documented swallowing disorder prevalence among SCI patients, yet SLPs are frequently excluded from care protocols and insufficiently available in care centers. Future research must emphasize the importance of SLPs in SCI care plans and further explore swallowing disorders using consistent methodologies and assessment tools.

**Presenter(s): Mia & Selora Comas & Langston**
**Faculty: Kimberly Wiley**

## ***Title: "Only Stressful for Those Who Are Truly Doing the Work": Nonprofit Responses to Polarizing Politics***

Nonprofit organizations are faced with increasing legislation that targets the populations that they serve. Under recent political polarization, this problem has only worsened, leaving nonprofit organizations especially vulnerable. How do the dynamics between state actors and F.L.-based nonprofits serving clients subordinate to patriarchal control serve to challenge, maintain, or strengthen patriarchal systems? To better understand how nonprofits responded to these challenges, critical feminist theory was used by the lab's team of researchers. Data collection consisted of two parts: interviews and public policy observations. Nonprofit leaders were interviewed through zoom calls, and the data from these interviews was analyzed using a grounding theory coding schema. Additionally, state level public policy tracking and analysis was employed in order to pair the information with topics discussed in the interviews. The reactions of nonprofits could be categorized into fight, flight/freeze, or fawn to best understand their reactions to legislation impacting the groups that they serve. "Fawning" or attempting to reason with the legislation was found to be an ineffective method to deal with these changes, whereas fleeing and fighting were both found to be effective in the short term.

**Presenter(s): Allison Comite**
**Faculty: Mark Moehle**
**Additional Authors: Michael Millett, Elisabeth Martin Castosa, Anika Hueberger, Preston Wagner, Ignacio Galardo, Jessica Rheinhardt, Nicole Chambers, Dominic Hall, Douglas Nabert, James Heidings, Barbara Balsamo, Stefan Prokop**

## ***Title: Pathological α-Synuclein Perturbs Nuclear Integrity***

Alpha–synuclein (αSyn) is a predominant neuronal protein whose pathological form is a hallmark of various neurodegenerative disorders, collectively termed synucleinopathies. Historically, pathological αSyn aggregates have been considered cytoplasmic, but evidence is emerging that they also have nuclear localization. However, the degree of nuclear localization and its impact on the nucleus are still not well understood. Here, we employ murine models to elucidate the extent to which pathological αSyn localizes within the nuclear compartments and the downstream consequences of nuclear pathology. We observed pathological aggregation within the nucleus as a distinctive feature of murine synucleinopathy models via quantitative super resolution microscopy. Nuclear localization was confirmed in human Lewy Body Dementia tissue as well as an increase in abnormal nuclei. We confirmed elevated levels of abnormal neuronal nuclei morphology in murine tissue, which also correlated to increased levels of genotoxicity. Additionally, we demonstrate differential expression of nuclear envelope repair pathway proteins in Neuro 2a cells with nuclear Lewy-like pathology, suggesting an effect on envelope repair pathways. Lastly, we show that nuclear Lewy-like pathology leads to increased sensitivity to the DNA damaging reagent doxorubicin. In conjunction, these results supplement the previous report of nuclear Lewy pathology with super resolution methodology and provide novel insight into the ensuing impact on nuclear integrity and functionality.

**Presenter(s): Elizabeth Connor**
**Faculty: Elizabeth Johnson**

## ***Title: Are Dancers With A History of Eating Disorders More Susceptible to Nicotine Addiction?***

Eating disorders (ED) and nicotine usage both alter the neurotransmitter dopamine. Dopamine is associated with pleasure and the reward system of the brain. Having an ED or abusing nicotine changes dopamine levels, which is what makes these disorders so addicting. Due to the common link between dopamine, it was hypothesized that a correlation exists between eating disorders and nicotine addiction. This study looks at dancers at UF and whether having a history of eating disorders makes them more susceptible to nicotine addiction. Data was gathered through surveys of 42 participants. The results showed a weak correlation of 0.194. Using the data, a dance film was created as an artistic byproduct of the research. This film illustrates the dangers of ED/nicotine addiction and how dancers are at a higher risk for developing these issues. Future studies should focus on the relationship between ED and nicotine addiction within ballet schools and how the strength of this relationship may change based on geographical locations (United States vs. Europe).

Keywords: Eating Disorders (ED), nicotine addiction, dopamine

**Presenter(s): Victoria Consalvo**
**Faculty: Blanka Sharma**
**Additional Authors: Suzanne Lightsey, Esteban Bermudez, Blanca Ostmark, Carlos Rinaldi-Ramos, Ph.D., and Blanka Sharma, Ph.D.**

## ***Title: Optimizing Superparamagnetic Iron Oxide Nanoparticle Uptake by Natural Killer Cells***

Natural killer (NK) cell immunotherapy is a promising approach for cancer treatment. NK cells, like T cells, are white blood cells that destroy infected cells, including cancer cells. However, NK cells do not rely on antigens to induce cell death. Despite their potential, NK cell-based therapies face challenges, particularly in tracking their migration, growth, and proliferation within the tumor microenvironment. Magnetic nanoparticles offer a potential solution for non-invasive monitoring via magnetic particle imaging (MPI), which detects and quantifies the magnetic response of iron oxide nanoparticles (IONPs) to create real-time, three-dimensional images. The goal of this work is to determine the culture conditions necessary for measurable uptake of nanoparticles in NK92 cells, a clinically relevant NK cell line, while maintaining cell viability and function. Here, we evaluate the uptake of two nanoparticles, Perimag and VivoTrax+, by NK92 cells in three media conditions (serum-free, reduced serum, and serum-containing) at 4 hours and 24 hours.

NK92 cells were incubated with 100 ug/mL of either Perimag or VivoTrax+ nanoparticles for either 4 or 24 hours, followed by Prussian blue staining to visualize iron uptake. Relative to Perimag nanoparticles, conditions with VivoTrax+ particles showed significant nanoparticle aggregation across all media conditions, complicating accurate quantification of cellular uptake and highlighting the need for improved nanoparticle formulations. Future work will investigate the cell viability after incubation with these nanoparticles, screen additional commercially available magnetic nanoparticles, and measure signal strength via MPI.

**Presenter(s): Lucia Contento Cortes**
**Faculty: Eleonora Rossi**
**Additional Authors: Hannah Treadway, Zoe Ka Pui Cheung, Ester Navarro**

## ***Title: The Neural Bases of Theory of Mind; The Role of Bilingual Typology***

Theory of Mind (ToM), or the ability to felicitously assign mental states to others, has previously exhibited sensitivity to individual differences in verbal memory, working memory, executive control, and bilingual status. Recent studies reveal that bilinguals reliably outperform monolinguals on false-belief (FB) tasks (Rubio-Fernández & Glucksberg, 2012; Navarro & Conway, 2021), a signature of ToM proficiency. It remains unknown (1) which neural processes underlie the performance of bilingual adults on ToM tasks and (2) whether distinct bilingual profiles differentially modulate said processes. In the present study, Spanish-English heritage bilinguals (expected n=30) complete a belief reasoning task (Guan et al., 2018) with concurrent EEG recording. Event-related potentials and oscillations elicited during FB and true-belief (TB) trials will be comparatively analyzed. Results will be discussed considering individual differences of inhibitory control, resting-state EEG, metalinguistic awareness, language profiles, and personal social network. This study will shed light on how experiential and cognitive dimensions of bilingualism interact in the neural underpinnings of social competence and communication.

**Presenter(s): Kelsey Cook**
**Faculty: Adrienne Strong**

## ***Title: The Influence of Age within Pain Care Practices in Tanzanian Hospitals***

Pain management disparities in lower-income countries disproportionately affect older adults. In Tanzania, geriatric pain is often undertreated due to misconceptions that pain is a natural part of aging, communication barriers, side effect concerns, and patients underreporting pain. As the aging population grows, understanding these challenges is crucial for health, anthropology, and aging studies.

This medical anthropology research project, conducted in Iringa, Tanzania, as part of Dr. Adrienne Strong's NSF-funded project on pain care practices, took place at Tosamaganga District Hospital over nine weeks in the summer of 2025. Using ethnographic methods such as semi-structured interviews, free-listing, focus groups, and participant-observation, I explored how age influences pain treatment. Interviews with healthcare professionals, patients, and patients' family members revealed key themes: the normalization of pain in aging, structural and social barriers to seeking care, and the link between emotional distress and physical pain. Specifically, how loneliness shapes experiences within and outside of the hospital. These findings highlight age as a critical factor in the allocation of pain medication and in shaping patient experiences within biomedical health settings. By examining the intersection of aging and pain management in a low-resource healthcare system, this study contributes to a broader understanding of challenges in geriatrics.

**Presenter(s): Kelsey Cooper**
**Faculty: Julie Maupin-Furlow**
**Additional Authors: Daniel Gal, Julie Maupin-Furlow**

## ***Title: DNA Binding of Orc1 Homologs of Haloferax volcanii***

Haloferax volcanii is an obligate halophilic archaeon belonging to the family Haloferacaceae that originates from the Dead Sea. This archaeon has become a model organism for studying archaeal cell biology due to its relatively easy growth conditions, short generation time (2 hours) and facile genetics. Haloferax volcanii contains a higher number of Orc proteins compared to most organisms, and the precise functions of these additional Orc proteins remains unclear. This project aims to investigate these additional proteins in terms of Orc1 binding sites and affinity to these loci within the DNA of Haloferax volcanii. One of the techniques we are using to do this is microscale thermophoresis, which is a biophysical technique that measures the motions of molecules in response to temperature gradients to quantify biomolecular interactions and binding affinity. DNA footprinting will be used to examine Orc1 binding, specifically in terms of location rather than affinity. AlphaFold will be employed as well to predict the binding location of the protein of interest, before it is confirmed with DNA footprinting. Together, these 3 techniques will provide information regarding binding affinity and location of Orc proteins to ORB sites, allowing us to better understand how these Orc proteins influence DNA replication and ploidy of Haloferax volcanii.

**Presenter(s): Alexandra Cooper**
**Faculty: Samantha Brooks**
**Additional Authors: Cecelia Minner**

## ***Title: Examining the relationship between dressage performance and gait biomechanics in sport horses using machine learning***

In the equestrian sport of three-day eventing, a panel of professionals evaluates a sport horse's soundness of movement prior to and during the competition. The result of these evaluations, colloquially known as "jogs," determine whether or not a horse is fit enough to complete the upcoming phases of competition. However, this system lacks objectivity, and consequently, results are unreliable and difficult to reproduce. Our lab has developed a machine learning model that is able to identify and track certain points of a horse's body in videos, giving us a better picture of the individual's gait quality and how it might change throughout a competition. Using the model, we processed a total of 194 "jog videos" from 5 different competition venues. This study aims to examine the relationship between eight gait parameters, calculated using the data obtained from these videos, and the resulting performance of the horse. To assess performance, we collected publicly available records for each individual's dressage test results at the same competition, which are a score out of 100 reflecting the execution and quality of a predetermined set of movements completed by the horse and rider. The goal of this analysis is to better understand how competition affects gait quality and examine how gait quality affects dressage scoring, in the hope of introducing more objectivity to the soundness evaluation process.

**Presenter(s): Angie Cordova**
**Faculty: Dr. Andreas Keil**

## ***Title: Evaluating Individual Differences in Emotion Using Electrophysiology and Self-Reported Affect***

Introduction: Self-reported affect and electroencephalogram (EEG) are robust indexes of emotional dispositions towards media such as pictures. Prior research suggests there are strong effects of individual differences (sex and depression/anxiety questionnaires) in self-reported affect and EEG. However, what is the usefulness of self-reported ratings as a marker of an emotional state and how can EEG data be used to understand these markers. Methods: 59 participants were presented with 60 original images from the International Affective Picture Set (IAPS), and 60 AI-generated matching counterparts. Each image ranges in valence (20 pleasant, 20 neutral, 20 unpleasant) and arousal (intensity). After a break, the process is repeated, totaling to 240 trials/images. Of the 59, 45 were used for EEG analysis. Results: The findings showed a high retest reliability. There were strong effects of sex differences in self-reported affect, but no sex differences in alpha reduction. However, there was a significant correlation between alpha reduction and the BDI-II across all image category conditions. Conclusion: Regarding sex differences, females experienced greater negative affect compared to males. Less alpha reduction in individuals with greater BDI-II scores could suggest markers of anhedonia. Future studies could investigate a larger sample size and inclusion of clinical populations.

**Presenter(s): Marcus Costa**
**Faculty: Abdel Alli**
**Additional Authors: Niharika Bala**, **Lauren P. Liu**, and **Sihong Song**

***Title: Cullin-1, -2, and -3 are upregulated while protein kinase A is downregulated in the kidney of alpha-1 antitrypsin knockout mice***

It is known that human alpha-1 antitrypsin (hAAT) overexpressing mice have lower systolic blood pressure and less renal epithelial sodium channel (ENaC) protein expression and proteolysis compared to wild-type mice. Cullin ligases have been shown to play a key role in the regulation of ENaC through the ubiquitin-proteasome system. Various kinases including protein kinase A (PKA) have been shown to phosphorylate components associated with cullin complexes. In this study, we hypothesize that alpha-1 antitrypsin knockout (AAT KO) mice exhibit elevated blood pressure due to increased ENaC membrane protein expression in a cullin and PKA dependent manner. Proteomic analysis identified numerous proteins unique to AAT KO mice, with cullin-4A significantly downregulated among the differentially expressed proteins in their kidneys. Western blotting analysis showed that cullin 1, 2, and 3 proteins were upregulated, suggesting a potential compensation in response to cullin-4A attenuation. In addition, there was significantly less PKA activity in kidney lysates of AAT KO mice compared to wildtype mice. These data suggest the cullin-PKA axis contributes to increased ENaC and blood pressure in AAT KO mice. Future mechanistic studies will investigate how cullin-4A downregulation and the compensatory upregulation of cullins 1, 2, and 3 regulate ENaC expression and function.

**Presenter(s): Nicholas Cox**
**Faculty: Julie Maupin-Furlow**
**Additional Authors: Karol Sanchez-Sanchez**

***Title: Genetic and biochemical characterization of a urease from a hypersaline-adapted archaeon, Haloferax volcanii***

Haloferax volcanii, a halophilic archaeon first isolated from the Dead Sea in 1975, has emerged as a model organism for studying halophilic enzymes due to its diverse genetic toolbox. One such enzyme is urease – a predicted 90 kDa heterotrimer metalloenzyme that uses two $Ni2+$ cofactor ions to hydrolyze urea into ammonia. In H. volcanii, urease is predicted to be composed of the major subunit UreC and minors UreB and UreA. Despite being found in all domains of life, archaeal ureases are poorly understood, with previous research being focused on 'activity screenings 'rather than characterization. An H. volcanii parent strain (H1207) was used in this study, along with a ΔureC mutant, where a gene-knockout was performed. Both strains were grown in minimal media containing NH4Cl and urea, and while the parent strain could utilize either nitrogen source, the mutant was unable to grow in urea, demonstrating that ureC is vital for urea degradation. The ureC gene was then expressed in H. volcanii with a C-terminal His-tag and the encoded protein was isolated by chromatography-based purification. SDS-PAGE gels successfully confirmed the presence of UreC at 60 kDa. This research aimed to expand the understanding of the structure and function of archaeal ureases.

**Presenter(s): Emily Crespo**
**Faculty: Eleni Bozia**

## ***Title: Greco-Roman Influences in the Third Reich***

This paper examines how the Nazis utilized various elements of the Greco-Roman world to further their agenda, from idolizing Greek features and claiming descent from the Greek race to employing different aspects of the Roman Empire, including its traditions, architecture, and military prowess. This paper analyzes how the Nazis leveraged these elements and others in different forms to link the Third Reich to the revered civilizations of the past. It argues that this connection has been made repeatedly, particularly by the party itself, through both explicit and subtle means. More specifically, this study looks into the works of Tacitus' booklet Germania and Julius Caesar’s Gallic Wars and argues that the writings were used to redefine German nationalism. Additionally, it examines material evidence, such as the Discobolus sculpture that dates back to both Greek and Roman times and their influence on German society, and how the Nazi Party used them to promote their agenda. This approach provides further insights into why the Nazis considered it essential to promote such connections, enabling deeper exploration of a topic that is both fascinating and crucial for understanding the history of the Nazi party and the lasting influence of ancient civilizations on society long after their decline.

**Presenter(s): Madelyn Crist**
**Faculty: Dakota Lewis**
**Additional Authors: Andrew Altieri**

## ***Title: Assessing Shifts in Population Structure of the Great Barracuda Across South Florida***

Barracuda, Sphyraena barracuda, are the largest species in Sphyraenidae, acting as an important predator in coral reef and estuarine ecosystems. They are considered piscivores, predating on many fish species in tropical and subtropical regions. S. barracuda are also known to spend their juvenile life stage in mangrove and seagrass nursery habitat and, as they age, tend to transition offshore to deeper waters. Additionally, many biotic and abiotic factors likely play a role in S. barracuda abundance and distribution, such as: temperature, location, time, and trophic ecology. Due to their prevalence and ecological importance in the Florida Keys and Florida Bay ecosystems, studying S. barracuda population dynamics is crucial. However, S. barracuda population structure has not been assessed in the Florida Keys since 2020. Additionally, it is unknown how juvenile populations in Florida Bay nursery habitat may be influencing offshore adult populations across the Florida Keys Reef Tract. To address these knowledge gaps, we assessed S. barracuda population structure, distribution, and abundance trends across the Florida Keys Reef Tract and Florida Bay using two long-term ecological data sets. Ultimately, understanding the drivers of abundance and distribution can inform management and conservation strategies to protect this top predator.

**Presenter(s): Anna Cubito**
**Faculty: Zhiyong Cheng**
**Additional Authors: Jinying Yang, Limin Shi, James F Collins**

## ***Title: A Liver-Fat Crosstalk for Iron Flux During Healthy Beiging of Adipose Tissue***

Beiging of adipocytes is characteristic of a higher number of mitochondria, the central hub of metabolism in the cell. However, studies show that beiging can improve metabolic health or cause metabolic disorders. Here we discuss a liver-fat crosstalk for iron flux associated with healthy beiging of adipocytes. Deletion of the transcription factor, a protein that control gene activity, FoxO1 in adipocytes (adO1KO mice) induces a higher iron flux from the liver to white adipose tissue, concurrent with higher activity of mitochondrial biogenesis that increases iron demands. In addition, adO1KO mice adopt an alternate mechanism to sustain mitophagy, which enhances mitochondrial quality control, thereby improving mitochondrial respiratory capacity and metabolic health. However, the liver-fat crosstalk is not detectable in adipose Atg7 knockout (ad7KO) mice, which undergo beiging of adipocytes but have metabolic dysregulation. Autophagic clearance of mitochondria is blocked in ad7KO mice, which accumulates dysfunctional mitochondria and elevates mitochondrial content but lowers mitochondrial respiratory capacity. Mitochondrial biogenesis is comparable in the control and ad7KO mice, and the iron influx into adipocytes and iron efflux from the liver remain unchanged. Therefore, activation of the liver-fat crosstalk is critical for mitochondrial quality control that underlies healthy beiging of adipocytes.

**Presenter(s): Sam Curtis**
**Faculty: Emily Bartley**
**Additional Authors: Dr. Olga Ensz**

## ***Title: BRIDGE the Gap: Bolstering Resources for Inclusive Dental Growth and Equity in Gainesville, Florida***

Oral disease is a critical global public health issue, affecting approximately 3.5 billion people worldwide, with disadvantaged and underserved populations bearing a disproportionate burden. Among these populations, patients at the University of Florida (UF) Care One Clinic—an interdisciplinary transitional primary care clinic for frequent emergency department visitors— often face significant challenges in accessing dental care. These challenges contribute to unmet oral health needs that increase the risk of urgent dental crises, thereby underscoring the importance of addressing barriers to dental care in this population. Thus, this study aims to characterize dental care utilization, oral health-related quality of life (QoL), and barriers to oral health access among UF Health Care One Clinic patients. This study aims to enroll 120 patients from the UF Care One Clinic, aged 18 and older. During clinic visits, participants completed the Oral Health Impact Profile (OHIP-5) to assess oral health QoL, along with a series of study-developed items evaluating dental care utilization and access, orofacial pain, and barriers to care.

While data collection is ongoing (n=14), preliminary findings reveal significant gaps in dental care access. Approximately 79% of patients reported not having a dentist, and 71% had not visited a dentist in the past year for a routine checkup or cleaning. Additionally, 64% reported using medication in the past three months to manage oral pain or discomfort. The most commonly cited barriers to dental care were lack of insurance and high costs. Notably, greater reliance on medication for pain relief was significantly correlated with poorer oral health-related QoL (r = .70, p < .01). These preliminary findings highlight significant barriers to dental care among UF Care One Clinic patients, with cost and lack of insurance being primary obstacles, emphasizing the need to improve access to care in this population.

**Presenter(s): Paolo D'Alessandro**
**Faculty: Ant Ural**

## ***Title: Low Frequency Electronic Noise Characterization of Ni-Au/β-Ga2O3 Vertical Schottky Barrier Diodes***

Gallium oxide has recently attracted a tremendous amount of research interest for applications in high-power electronics and clean energy innovations due to its large bandgap, high breakdown electrical field, and large Baliga's figure of merit. Low frequency noise characterization is an important diagnostic tool for assessing the materials quality and reliability physics of wide-bandgap device technologies in extreme environments. In this work, we characterize the low-frequency noise of as-fabricated Ni-Au/β-Ga2O3 vertical Schottky barrier diodes at different forward bias voltages. We find that the current noise spectral density exhibits 1/f-type behavior for all forward bias voltages at low frequency indicating that the low frequency noise of these devices is dominated by excess (flicker) noise. We also investigate the dependence of the current noise spectral density on forward bias current, revealing that different noise sources dominate in different current transport regimes. Finally, using the noise figure of merit adapted for wide bandgap semiconductor devices, we compare the noise level of Ni-Au/β-Ga2O3 devices with well-established technologies such as GaN. These findings contribute to a better understanding of electronic noise in Ga2O3-based Schottky barrier diodes, serving as a valuable tool for assessing materials quality and device physics in extreme environments.

**Presenter(s): Angiolina Dall'Acqua**
**Faculty: Jennifer Nichols**
**Additional Authors: Jessica Molina**

## ***Title: A Biomechanical Analysis of Model Scaling: Examining How Specificity of Measurement Pairings Influence Simulations of the Hand***

Musculoskeletal simulations are essential in clinical research for evaluating variables that are difficult to measure, such as internal forces across the thumb joint. A key part of these simulations is developing a subject-specific model, which is often done by using experimental markers placed on bony landmarks to adjust the model to an individual's physical size. Previous studies on the lower limb have shown that errors in marker placement can significantly affect simulation outcomes, particularly for muscle forces. However, similar research on the upper limb is lacking. Therefore, in this study, three measurement sets, categorized by increasing specificity to anatomical landmarks of the thumb and hand, were compared to assess their impact on kinematic simulations. These sets (low, medium, and high specificity) represent increasing anatomical detail used for scaling. Scale factors, or ratios of distances between experimental and virtual markers, were analyzed to evaluate model accuracy. Preliminary findings suggest that scale factors decrease with higher specificity, reflecting anatomical variations such as differences in metacarpal size between men and women. Future research will focus on quantifying and visualizing the effects of subject-specific models on joint angles and the forces produced during specific daily tasks.

**Presenter(s): Zara Dalvi**
**Faculty: Gustavo Cortes**

## ***Title: Financial Crises and the Phillips Curve: A VAR Approach***

The Phillips curve, which depicts an inverse relationship between inflation and unemployment, has been cornerstone of macroeconomic theory and a guiding tool for monetary policy decisions. This study evaluates the validity of the Phillips curve in financial crises by examining critical periods including the 1973 oil crisis and the 2008 Global Financial Crisis (GFC). Using Structural Vector Autoregression (SVAR) time-series modeling with quarterly data spanning 1970-1985 and 2000-2015, this approach incorporates external macroeconomic variables such as the Federal Funds rate and M2 money supply for a more dynamic analysis.

The findings indicate that the traditional trade-off between inflation and unemployment is altered in periods of financial turmoil. During the GFC, inflation remained stable despite dramatic dips in unemployment demonstrating the "missing deflation puzzle" which characterized the Great Recession. Similarly, the 1973 oil crisis triggered stagflation or periods of high inflation and unemployment following an OPEC oil embargo. These anomalies suggest that the Phillips curve necessitates reconsideration of its application in economic modeling and policymaking frameworks. This research concludes that effective monetary policy formulation should incorporate a broader range of macroeconomic variables rather than relying on the simplified ceteris paribus approach of the Phillips curve.

**Presenter(s): Anna D'Ambrosio**
**Faculty: Amanda Elton**

## ***Title: Early-Life Enrichment Protects against the Development of Alcohol Use Disorder in Young Adulthood***

Rates of Alcohol Use Disorder (AUD) in individuals aged 18-25 are higher compared to other age groups in the United States. The early life environment has been previously shown to impact future health outcomes. We hypothesized that a more positive home environment would be associated with more positive AUD outcome. This research investigates the relationship between early home environment and alcohol use outcomes later in life, in addition to other mental health factors like depression and anxiety. Data was obtained from 164 undergraduate students (18-19 years of age at baseline, 107 females) and their substance use was measured over 3 years. The Home Observation Measurement of the Environment (HOME) survey was administered during the initial study visit. The HOME measures multiple aspects of the childhood home environment, including household responsibilities, parental involvement child's education, environmental enrichment, and extracurricular activities. Correlation and regression tests were conducted in SPSS to examine the relationship between the HOME total score and AUD, as well as other mental health measures. The HOME total score was created according to previously established scoring metrics for the HOME survey. HOME was negatively correlated with past year AUD symptom count, depression scores, and problems with self-concept. Additionally, HOME was found to have a positive correlation with state anxiety scores from the State-Trait Anxiety Inventory, suggesting that aspects of one's home life may also contribute to heightened anxiety later in life. These results may prompt further exploration on home life's role as a protective factor against AUD (and other stress-related mental health disorders) and home life's potential influence of an individual's anxiety levels after childhood.

**Presenter(s): Khanh Dang**
**Faculty: Anthony Middlebrooks**

***Title: A Tale of Two Cultures: Work-Life Balance in the East vs. the West***

This study examines the conceptualization and practice of work-life balance (WLB) across Eastern and Western work cultures, focusing on cultural and institutional factors that shape their differences. It analyzes macro-level influences such as cultural dynamics and global challenges, alongside micro-level factors like personal and job-related circumstances. The findings aim to provide actionable insights for multinational enterprises to adapt WLB practices, enhance employee performance, and support cross-cultural transitions, contributing to global workforce management.

**Presenter(s): Paris Daniels**
**Faculty: Ocqua Murrell**

## ***Title: Undergraduate Women and Femmes of Color at University of Florida***

Undergraduate women of color and femmes in higher education face unique challenges related to academic performance, social belonging, and mental health. At predominantly white institutions (PWIs), these students often navigate a compounded burden of racial and gender-based stressors, leading to increased experiences of anxiety and depression, which are characterized by persistent feelings of worry, stress, sadness, and difficulties in daily functioning (Pedrelli et al., 2015; Kodish, 2022). There is a significant gap in the literature that examines the intersection of race, gender, mental health, and institutional support systems for women of color and femmes in higher education. As such, this research project explores how undergraduate women of color and femmes at the University of Florida balance their academic and social lives while managing their anxiety and/or depression. The poster presentation will include the findings, data analysis, and implications of the qualitative survey that was digitally distributed via Qualtrics and concluded with 57 respondents. I utilize an intersectional framework to identify the structural barriers that contribute to mental health disparities and emphasizes the need for culturally responsive institutional policies.
Word count: 179/200

**Presenter(s): Abraham Daoud**
**Faculty: Stefanie Habenicht**

## ***Title: Synthesis and Characterization of Nucleobase-Terminated Star-Shaped Oligothiophenes***

The large-scale development of small molecule-based organic solar cells necessitates novel design choices. In pursuit of these, supramolecular assemblies have received significant attention in the investigation of candidates for organic photovoltaic cells (OPVs) over the years. As adaptable, reversible, and functionally accessible products, supramolecular structures are dictated by noncovalent forces (H-bonding, π-π stacking, etc.) that manifest between simpler monomers. As aromatic heterocycles capable of predictable hydrogen-bonding arrangements, the nucleobases in DNA are of special interest in supramolecular chemistry, exhibiting unique properties such as elevated charge transfer and strong π-delocalization. Likewise, thiophenes are aromatic heterocycles with powerful versatility and potential use in OPVs. An especially interesting thienyl-based derivative is the C3h-symmetric molecule benzotrithiophene (BTT), in which three thiophene rings are covalently fused to a central benzenic core. As a central unit, this structure provides access to highly planar, star-shaped systems.

The goal of this project is to synthesize and investigate a star-shaped, oligothienyl-substituted benzotrithiophene derivative triply capped with a nucleobase moiety. Analysis of the optical and electronic properties of the final compound will give key insight into its features within potential OPV active layers.

**Presenter(s): Kathryn Davis**
**Faculty: Sharon Difino**

## ***Title: "Sound Strategies: How Music Enhances Problem Solving, Memory, and Focus for College Students"***

Music is often called the universal language because of its ability to influence our emotions, support social connections, and touch people's lives in ways like no other medium can. It has been a vital part of human culture and enriches our experiences in a powerful way. As technology has advanced, music has become more widely accessible, through the use of streaming services such as Spotify and Apple Music. College students greatly utilize these platforms, as they can offer personalized playlists designed for pleasure, relaxation, and studying. Students may experience higher levels of perceived distraction and find concentrating hard without listening to music(Lehmann & Seufert, 2017). This comprehensive literature review will explore how the concentration levels, memory recall, and problem-solving skills of college students are affected by different musical genres, rhythms, and tempos. It will explore whether personalized study playlists act as a distraction or aid to college students. Research will be conducted using academic search engines such as Google Scholar and PubMed, as well as resources from the University of Florida databases. The findings will provide insight into the role of music in academic success and its potential as a tool for improving student performance in educational settings.

**Presenter(s): Cormac Davis**
**Faculty: Katelyn Bruno**

## ***Title: The Effect of Sex Hormones and Sex Chromosomes in Coxsackievirus B3 Myocarditis Utilizing Four Core Genotype Mice***

Myocarditis is a leading cause of sudden cardiac death in adults under 50, more common in men at a 3:1 ratio. Although there has been focus on sex hormones and chromosomes in myocarditis development, their full impact remains unclear. The sex-determining region Y gene (Sry) is crucial for testes development and testosterone production. The "Four Core Genotype" mouse model allows the study of independent and combined effects of sex hormones and sex chromosomes. We infected 8-week-old "Four Core Genotype" mice with heart-passaged coxsackievirus B3 and analyzed hearts via histology and RT-PCR.. WT female mice (XX Sry-) had significantly lower inflammation than other groups. No significant differences were seen between genotypic males with ovaries (XY Sry-), genotypic females with testes (XX Sry+), and WT Males (XY Sry+). WT males exhibited greater CD45 expression than WT females and XY Sry- mice. The absence of the Sry gene was linked to higher CD3 and CD8 expression, with no change in CD4. TLR2, NLRP3, and Casp1 expression were elevated in WT males compared to WT females. TLR4 expression in XY Sry- and XX Sry+ mice differed significantly from WT females. These findings suggest both sex hormones and chromosomes contribute to increased myocarditis in males.

**Presenter(s): Jannila Maxene De Asis**
**Faculty: JeeWon Cheong**

## ***Title: Trends in HIV Testing Among U.S. Youth: Associations with Risk-Taking Behaviors***

HIV testing is a critical component of prevention and early intervention in combating the HIV epidemic. Despite policy changes and social media campaigns promoting HIV testing, such as CDC's 2006 recommendation for routine opt-out HIV testing and the Act Against AIDS campaign by the CDC and the White House (2009-2014), testing rates remain low, particularly among U.S. youth. This study examines trends in HIV testing rates and explores associations with risk-taking behaviors that may influence testing decisions. Using CDC Youth Risk Behavior Survey (YRBS) data (2007–2023) from 9th–12th graders, we observed a decline in HIV testing rates from 12.9% to 7.1%. To assess the role of risk-taking behaviors (e.g., sexual behavior, substance use, and violent behavior) in these low testing rates, we conducted weighted logistic regression, accounting for the complex sampling design. Analyses of 2023 YRBS data showed that adolescents with more sexual partners and more frequent marijuana use were more likely to get tested, whereas those engaging in frequent binge drinking and physical fights were less likely. These findings highlight the need to refine policy and digital outreach strategies to better engage youth, while integrating behavioral interventions to increase HIV testing uptake among adolescents.

**Presenter(s): Brooke Dekle**
**Faculty: Andrew Altieri**
**Additional Authors: Dakota Lewis**

## ***Title: Quantifying Age and Body Condition of White and Bluestriped Grunts in the Florida Keys***

Grunts (Haemulidae) play a critical role across coastal marine ecosystems throughout the Florida Keys as links from lower to higher tropic levels, as well as between seagrass and coral reef habitats. Identifying the drivers of age structure and health of this family can be used as an indicator of overall reef community stability. Here we quantify the ages and body conditions of Grunts within the Florida Keys. Furthermore, this study investigates if these metrics vary between inshore and offshore reef, between a fished and unfished species, and between seasons. For this study two model species were collected using hook and line, and spear, White Grunts (Haemulon plumierii; n =148) and Bluestriped Grunts (Haemulon Sciurus; n = 137).

Results indicate that older White and Bluestriped Grunts are remaining within inshore reef habitats as opposed to shifting to deeper offshore reefs as they age. Comparative analysis suggests that there are no quantifiable differences in body condition between inshore and offshore habitats or between species. There is also a slight decline in body condition over the sampling periods from June 2022 to June 2024. Construction of Von Bertalanffy Growth Curves for both species shows similar growth rates for both White and Bluestriped Grunt.

**Presenter(s): Kathryn DeLuca**
**Faculty: Catalin Voiniciuc**
**Additional Authors: Talia Jacobson**

## ***Title: Engineering Pichia pastoris for antimicrobial peptide production: evaluating bacterial growth inhibition against gram-positive and gram-negative bacteria***

Antimicrobial peptides (AMPs) are naturally occurring defense molecules found in a diverse range of organisms, including plants, bacteria, and animals, where they play an important role in innate immunity. These short peptides function primarily by disrupting microbial membranes, leading to cell lysis or growth inhibition. By targeting the bacterial cell envelope, AMPs effectively combat pathogens with minimal risk of resistance, making them promising candidates for novel antimicrobial drug development. Yeast species Pichia pastoris is known for its high-yield recombinant protein production and has a structurally distinct cell wall from bacteria. We engineered Pichia to produce and secrete several bacteria-targeting AMPs and assessed their effectiveness inhibiting bacterial growth. Given the structural cell wall differences between Gram-positive and Gram-negative bacteria, we evaluated AMPs against both groups through inhibition zone assays and liquid co-culture assays with Bacillus subtilis and Escherichia coli. Collectively, this study demonstrates the ability of various AMPs to inhibit microbial growth. Being able to produce effective AMPs at scale creates opportunities for future research into drug development and their potential as novel antimicrobial treatments. Additionally, expressing AMPs in planta could create plants with enhanced disease resistance providing sustainable alternatives to chemical pesticides.

**Presenter(s): Anna Julia DeMasi**
**Faculty: Eleonora Rossi**
**Additional Authors: Hailey Vasquez, Michael Miarecki, Grace de Vries**

## ***Title: Identifying neurophysiological correlates of opaque and transparent word-processing in monolingual English speakers.***

Background: Languages like English are composed of lexical items that are either opaque (i.e., knight) or more transparent (i.,e., cat). It is assumed that opaque words are processed via holistic coding, while transparent words are processed in smaller processing windows (Grainger & Ziegler, 2011). The aim of this study is to investigate the neurophysiological correlates of opaque and transparent word processing in English.

Methods: 12 English monolingual speakers from the UF student population have been tested. During the study, participants completed an EEG-based Lexical Decision Task. During the task, the conditions included real english words, either transparent or opaque, as well as nonexistent english words. Participants were asked to determine if the item on the screen was a real word in English by pressing a green button, or a nonexistent word by pressing a red button.

Analysis: Analysis using standard ERP pipelines is underway.

Future Directions: We intend to compare this data with a population of Italian-English bilinguals who have completed the task in English

**Presenter(s): Haley Desai**
**Faculty: Julie Maupin**
**Additional Authors: Zoe Chu, Katherine R Weber**

## *Title: Gene Expression Analysis of Urease and Carotenoid Biosynthesis Pathways in Haloferax volcanii*

The halophilic archaeon, Haloferax volcanii, is considered a model among extremophiles as the genome is sequenced and the organism displays robust growth. Among other traits, H. volcanii is of interest in biotechnology due to its unique resiliency to stress. H. volcanii encodes for urease, the enzyme that catalyzes the hydrolysis of urea into ammonia and carbon dioxide and is of interest for bio-concrete generation. This study aims to determine expression of the ureC and ureB genes encoding the urease subunits based on nitrogen source. Understanding potential differences will provide a broader understanding of how haloarchaea respond to fluctuations in nitrogen sources, including their metabolism of urea which is of interest in water reuse, pollution prevention and other applications. In this study, our qRT-PCR results display an increase in abundance of ureC transcripts when the parent strain, H26, is grown in glycerol minimal media containing urea, compared to ammonium chloride. During this investigation, we aimed to focus on urease activity; however, we found that H. volcanii grown with urea had a visibly darker color, suggesting an impact on carotenoid production. To further probe these findings, we examined expression a key gene of carotenoid biosynthesis by qRT-PCR and found it to be increased in transcript abundance during oxidative stress. As carotenoids are of interest for various biotechnology applications and H. volcanii prefers glycerol (an abundant waste product of biodiesel production), current research aims to evaluate the impact of biodiesel-derived glycerol on carotenoid production and to refine extraction protocols for improved efficiency.

**Presenter(s): Rohan Desai**
**Faculty: Weizhou Zhang**
**Additional Authors: Tanzia Tithi**

## ***Title: Roles of MSH2 and MLH1 in Basal Like Breast Cancer (BLBC)***

Basal-like breast cancer (BLBC) is an aggressive breast cancer subtype lacking FDA-approved targeted therapies. In our investigation we focused on the roles of MSH2 and MLH1. BLBC is characterized by high genomic instability and a median survival rate significantly lower than other breast cancer types. Our analysis of TCGA RNA-Seq data indicated an inverse relationship between MSH2 and MSH6 protein levels and overall survival in BLBC patients. Using BLBC mouse models, we found that deleting MSH2 reduced metastasis without affecting primary tumor size and increased immune cell infiltration via elevated chemokine expression. In contrast, MLH1 exhibited opposite effects on metastasis and immune cell presence. We hypothesized that MSH2 plays a crucial role in regulating chemokine expression through epigenetic or transcriptional mechanisms. Our genomic studies showed that MSH2 interacted with the IFNAR1 gene promoter, reducing its expression. We proposed that MSH2 loss activated IFNAR1-dependent signaling pathways, essential for effective antigen presentation and immune cell activation, leading to anti-tumor responses. Future research will explore the molecular mechanisms of IFNAR1-dependent signaling, chemokine regulation, and immuno-modulation in MSH2-deficient contexts. This study aimed to provide insights for inhibiting BLBC progression and enhancing immune checkpoint inhibitors' efficacy.

**Presenter(s): Neal Desai**
**Faculty: Catalina Lopez-Quintero**
**Additional Authors: Pranav Gupta** - UFID: 79942040

# ***Title: Alcohol Use Screening Brief Intervention and Referral to Treatment (SBIRT) by Cancer History Status among Individuals with Problematic Alcohol Use***

To examine whether a lifetime history of cancer was associated with increased likelihood of being screened, receiving advice, or treatment information from healthcare providers among individuals with problematic alcohol use.

2022-2023 National Survey on Drug Use and Health data were analyzed to determine whether a lifetime history of cancer (5.5% of sample) was associated with being (1) asked about alcohol use among individuals with problematic alcohol use who visited healthcare providers within 12 months and weren't receiving treatment (sample 1, n=21,098); (2) asked about problematic use; and (3) advised to reduce consumption and/or offered treatment information, among those in sample 1 asked about alcohol use (n=11,097).

About 53% in sample 1 were asked about alcohol use (64% with cancer vs. 52% without). Among them, 24% were asked about problematic use, 15% were advised to reduce consumption, and/or offered information. No significant differences existed between those with/without cancer in screening (aOR= 1.31; 95%CI=0.98-1.76), problematic use assessment (aOR =0.87; 95%CI=0.50-1.49), or receiving advice/treatment (aOR =0.93; 95%CI=0.62-1.42).

Given alcohol's role as a modifiable cancer risk factor, effective SBIRT is critical. Despite slightly higher screening rates among those with cancer, no significant differences existed in addressing problematic alcohol use, suggesting alcohol-related interventions remain underutilized.

**Presenter(s): Srija Dey**
**Faculty: Victoria Pagán**

## ***Title: Bosom Buddies: Female Friendship in Senecan Tragedy***

Jessica Sisk's study in 2013 marks the first exploration of ancient female friendships but did not account for Roman tragedy. My analysis of Seneca's Euripidean tragedies – Medea, Phaedra, and Troades – provides insights into displays of friendship in the dialogues among female characters. While aspects of these dramas align with Konstan's analysis, noticeable patterns also emerge that deviate from his definition. These patterns are substantial enough to warrant a reevaluation of the concept of friendship in antiquity and how it may differ for women due to the societal roles and expectations placed on them.

The poster will contain the primary literary analysis in the central panel. The left panel will feature an introduction with definitions of friendship in antiquity and earlier research on female friendships. Below, there will be a collection of poignant quotes from the texts. The right panel will house the references and conclusion, ultimately proposing a more inclusive friendship definition.

**Presenter(s): Gabriele Di Gianluca**
**Faculty: James Hamlin**

## ***Title: Synthesis of Antiferromagnetic NdBi***

Recent experimental work on antiferromagnets has shown that these materials provide a promising platform for spintronics devices. Angle-resolved photoemission spectroscopy (ARPES) studies have demonstrated a non-trivial band topology within NdBi, with further studies detecting Shubnikov–de Haas (SdH) oscillations that confirm its topological nature. To further explore the band structure of NdBi, we want to apply pressures up to 2 GPa and measure electronic transport properties and SdH oscillations. To make these measurements, we first had to synthesize high-quality NdBi single crystals. To achieve this goal, we used flux growth, trying both an In and Bi flux and various heating patterns. After the growth was complete, we verified the purity and structure of our crystals through X-ray Diffraction (XRD). To confirm that our samples were consistent with previous work, we measured the electrical and magnetic properties with a Physical Property Measurement System (PPMS) and Superconducting Quantum Interference Device (SQUID), respectively. Obtaining high-quality single crystals and confirming the transport properties of NdBi was the first step in exploring the exciting properties of this system. Next, we will apply pressure to our samples and measure the effect on the electrical and magnetic properties.

**Presenter(s): Catalina Diez**
**Faculty: May Khanna**

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

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

**Presenter(s): Camila Djurinsky Zapolski**
**Faculty: Hina Shaikh**

## ***Title: Health Disparities in COVID-19***

In this thesis, I explore health disparities related to gender and race, and their effects on COVID-19 between 2020 and 2024. I examine several variables beyond demographic information, including ICU admissions, hospitalization and mortality as they relate to the consequences and longevity of the disease. My research questions are: Is there a correlation between gender, race, and the congregation of the two, in the impact and the longevity of COVID-19? What is the impact of social determinants of health in the comparison of respective age groups, within different racial communities impacted by COVID-19? Does the health disparities analysis on the CDC data align with the results found in similar literature?
Using HiperGator and Random Forest classifiers, I determine whether race, gender, and their intersection are significant predictors of COVID-19. Key preliminary questions include examining the correlation between social determinants of health and the disease's impact and longevity and determining whether these factors remain predictive of patient outcomes when other variables are controlled.
Through this research, I aim to integrate statistical analysis with intersectionality feminist theory to better understand the social determinants that contribute to health disparities in the U.S. and how their analysis is impacted by data collection and labeling.

**Presenter(s): Ana Dogan**
**Faculty: Mei He**
**Additional Authors: L. Hewitt, N. Erwin, C. Wasserfall, M. He**

# ***Title: IL-2 Loaded Extracellular Vesicles Provide High Efficiency Treatment of Type 1 Diabetes***

Diabetes effect around 11.3 percent of the U.S. population and requires life-long insulin tracking and exogenous replacement. It is characterized by pancreatic islet-specific autoimmunity causing dysfunction of β-cells, resulting in catastrophically low insulin production. Previous findings show that systemic delivery of IL-2 can reverse established T1D in the non-obese diabetic (NOD) mouse model by increasing regulatory T cells (Treg) and expression of Treg-related proteins. Adversely, they observed side effects causing expansion of natural killer and myeloid cells in NOD islets. We propose delivery of IL-2 through oral administration to leverage the biological gut-based uptake system and unique higher internalization capacity of the neonatal gut. We additionally want to explore IL-2 drug loaded into extracellular vesicles (EVs) to benefit from their unique properties of cargo protection, tissue targeting, and biocompatibility for a therapy that is more efficient with lesser side effects. We will optimize loading to create a platform that utilizes high efficiency loaded EVs to deliver protected and concentrated dose IL-2 while preserving positive outcomes. Overall, oral delivery of IL-2 loaded EVs are a promising therapeutic platform for increasing Treg function and reversing T1D while mitigating harmful side-effects.

**Presenter(s): Jaquoi Dorsett**
**Faculty: Autumn McClellan**
**Additional Authors: Jomelys Gonzalez-Molina, Ashley Guarino, Makenna Morrow, Asha Puthanveetil, Sergio Ray, Olivia Schick, Nik Solano (listed in alpha order)**

## ***Title: Exploring Parasocial Relationships: A Quantitative Study of Media, Belonging, and Well-Being***

Parasocial relationships (PSRs) are one-sided connections between media consumers and media personalities, and their relevance has grown with the rise of mass media consumption. PSRs have been linked to outcomes like loneliness, social self-esteem, and social media addiction. We will use Tukachinsky’s (2010) Multiple Parasocial Relationship (M-PSR) scales, which distinguish between friendship-based and love-based PSRs, to examine their relationship with psychological outcomes such as sense of belonging (Leary et al., 2013) and subjective well-being (Diener et al., 1985). We also explore homophily—the tendency to form relationships with similar others—and its impact on PSR intensity. Homophily is well-documented in interpersonal relationships but underexplored in one-sided relationships. We hypothesize that homophily positively influences PSR intensity, with this effect stronger for friendship-based relationships and real personas compared to love-based relationships and fictional personas. We also expect more intense PSRs to be associated with a higher need to belong, which in turn negatively impacts subjective well-being. Data for this research was collected through a quantitative survey experiment on Prolific, an online data collection platform. Our sample is nationally representative by age, sex, ethnicity, and political affiliation. This research highlights the role of media figures as social surrogates and their influence on individuals ’social needs and mental health. As mental health concerns rise, understanding the effects of PSRs becomes increasingly important and raises questions about the social responsibility of media personalities.

**Presenter(s): Kaitlyn Drew**
**Faculty: Lizi Wu**
**Additional Authors: Kyle Scheller, Dr. Lizi Wu, Dr. Zhou Xin, Dr. Mu Yu**

## ***Title: Roles of CRTC1-MAML2 Nuclear Condensates in Mucoepidermoid Carcinoma (MEC)***

Mucoepidermoid carcinoma (MEC), the most common salivary gland malignancy, is commonly associated with the CRTC1-MAML2 fusion oncogene. This chimeric oncogene encodes for a novel constitutively active transcriptional coactivator for the transcription factor CREB, driving an aberrant cAMP/CREB-mediated transcriptional program, ultimately promoting MEC establishment and maintenance. Using immunofluorescence imaging, we observed that CRTC1-MAML2 forms nuclear puncta, reminiscent of biomolecular condensates which form through liquid-liquid phase separation (LLPS).

LLPS is a process by which proteins can self-assemble into membraneless biomolecular condensates that carry out essential cellular functions, such as regulating transcription. Aberrant condensate formation has been implicated in various diseases, including cancer. Given what we know about CM transcriptional dysregulation and subcellular localization, we hypothesize that the CRTC1-MAML2 fusion drives MEC through aberrant LLPS-mediated transcriptional condensates.

Here, we show that CM exhibits rapid recovery in a fluorescence recovery after photobleaching (FRAP) assay. Additionally, we show CM condensates dissolve upon 1,6-hexanediol treatment. Together, these results indicate that CM forms dynamic, liquid-like condensates through LLPS. To assess the functional significance of CRTC1-MAML2 condensates, we generated two condensate-defective mutants – CM-ΔIDR1 and CM-ΔIDR2 – lacking intrinsically disordered regions, which are known to drive LLPS. These CM mutants were then used in downstream functional assays. We characterized general and CREB-specific transcription activation capabilities using GAL4 and pCRE dual luciferase transcriptional reporter assays, respectively. Additionally, we characterized oncogenic transformation potential using an RK3E colony formation assay. These studies have provided crucial insight into the role of CRTC1-MAML2 biomolecular condensates in MEC and will provide a rationale for developing therapeutic targets aimed at disrupting CM condensates.

**Presenter(s): Leah Dublino**
**Faculty: Julie Maupin-Furlow**
**Additional Authors: Erika Prendes Martin, Heather Judd PhD**

## ***Title: Identification and Characterization of a Novel Protein: Investigating its Role as a Substrate or Regulator of Pat2***

The haloarchaeon Haloferax volcanii (Hv) is a well-characterized model organism for studying archaea and their metabolic mechanisms. Despite their evolutionary connection to eukaryotes, archaea are often under-studied compared to bacteria and eukaryotes. Post-translational modifications (PTMs) are chemical changes made to proteins after translation, playing a crucial role in regulating protein structure, activity, and interactions across all three domains of life. In Hv, lysine acetylation is an essential PTM that regulates protein function and stability, supporting Hv's ability to metabolize glycerol and survive in high-salt environments. While three lysine acetyltransferases (Pat1, Pat2, and Elp3) have been identified in Hv, little is known about their structure or the proteins they interact with. Recently, site-directed mutants of the HvPat2 enzyme were generated, and upon purification, these mutants co-purified with an unknown protein, prompting further investigation into its role in Hv's metabolism. The goal of this study is to identify and characterize this protein. Using mass spectrometry and bioinformatics, the unknown protein was successfully identified, marking the first step toward understanding its role in Hv's metabolic regulation and survival in extreme environments. Future work includes generating a knockout of this protein and conducting growth curve analysis to assess its role in cellular processes.

**Presenter(s): Tahiris Duran**
**Faculty: Anatoly Martynyuk**
**Additional Authors: Zeeshan Khan, Dewan Sumsuzzman, Ling-sha Ju, Christopher Seubert, Anatoly Martynyuk**

## ***Perioperative Neurocognitive Disorder in Individuals with a History of Traumatic Brain Injury: A Systematic Review and Meta Analysis***

Postoperative neurocognitive disorder (PND) refers to an accelerated cognitive decline that occurs after general anesthesia (GA) and surgery. This condition can be influenced by preexisting neurodegenerative conditions, increased stress levels, and inflammation. Traumatic brain injury (TBI) exacerbates stress responses, triggers neuroinflammation, and leads to cognitive deficits. Many TBI patients undergo extracranial surgeries under GA to treat TBI-related or TBI-unrelated injuries, potentially increasing the risk of developing PND. In this study, we aimed to systematically review and meta-analyze published studies to determine whether TBI and extracranial surgery under GA interact to induce neurocognitive abnormalities or PND. Using AI-assisted (ASReview) and manual screening, we identified 27,139 studies from five major databases. After applying set PICO criteria, six studies were found to be eligible for further analysis. No statistical difference was found in the Trail Making Test (TMT) A completion time between TBI patients exposed to and unexposed to GA/surgery. However, TBI patients exposed to GA/surgery took longer to complete the TMT-B test than those who did not undergo GA/surgery ($p = 0.011$).
Our findings may enhance understanding of PND risks in TBI patients, inform clinical decisions, and suggest future research directions.

**Presenter(s): Kadin El Bakkouri**
**Faculty: Meghan Ferrall-Fairbanks**

***Additional Authors: Adriana Del Pino Herrera***

Ovarian cancer is the second most common gynecological malignancy with a 5-year survival of 50.8%. Standard chemotherapy, delivered at maximum tolerated doses, effectively targets sensitive cells but allows resistant clones to emerge, with approximately 80% of patients recurring after treatment. To address this, mathematical models of tumor population dynamics can inform adaptive therapy strategies, optimizing treatment schedules to control tumor size while reducing toxicity.

Cell growth dynamics of an ovarian cancer cell line with both sensitive and resistant phenotypes to cisplatin were collected. Sensitive and resistant cells were cultured individually under untreated and treated conditions for 8 days with images taken every 48 hours. The untreated data was used to evaluate different growth patterns (logistic, Monod, Gompertz, and exponential models) and BIC quantified model performance. Logistic growth models yielded the best architecture for both cell types. Adding a death term improved the model for sensitive cells but not for resistant ones. Lastly, treated cell counts were used to parameterize treatment terms. Treatment terms accounting for accumulation of drug in the cells performed the best in sensitive cell model. On going work involves model refinement and validation with co-culture experiments and models to develop novel treatment schedules.

**Presenter(s): Soma Elefánti**
**Faculty: Arthur Porto**
**Additional Authors: Moritz Lürig**

## ***Title: Comparative Performance Analysis of Image Classification Algorithms on SEMs of the Bryozoan Order Cheilostomata***

This study investigated the application of image classification algorithms to scanning electron microscope (SEM) images of Cheilostomata, with the goal of advancing taxonomic identification methods. Recognizing that biological datasets often presented challenges such as limited and imperfect data—particularly for understudied or rare taxa—this research evaluated the suitability of several algorithmic approaches under these constraints. Modern machine learning methods were employed for image classification. The study involved a systematic curation of the dataset to ensure that only images containing at least one full autozooid were included. Subsequent training and statistical analysis were conducted to assess the relative performance of these methods in classifying SEM images to their respective genera.

By focusing on the performance of these algorithms on an imperfect, domain-specific dataset, the work provided valuable insights for taxonomists, offering guidance on the selection of appropriate image classification methodologies for species identification.

**Presenter(s): Lauren Epstein**
**Faculty: Dayane Oliveira**
**Additional Authors: Abigail Meador, Lauren Lamoutte, Mateus Rocha, Dayane Oliveira**

## ***<u>Title: Influence of Ceramic Shade and Thickness on the Degree of Conversion of Light-Cured Resin-Based Cements</u>***

Objectives: The aim of this study was to evaluate the effect of light attenuation through lithium disilicate ceramics with different shades and thicknesses on the cure efficiency of light-cured resin-based cements.

Methods: Lithium disilicate CAD/CAM blocks (Emax, Ivoclar Vivadent) with the same translucency (HT) but different shades (A1, A2, and A3) were sectioned in different thicknesses (0.5, 1.0, 1.5, 2.0, 2.5, and 3.0mm) and crystalized according to the manufacturer instructions (n=3). A commercial light-cured resin-based cement (PermaShade LC, Ultradent) was placed in the ATR FT-IR sensor (Nicolet iS20, ThermoFisher), covered with a transparent mylar strip and light-cured through each of the different ceramic specimens.

Results: The thicker and/or darker the ceramic specimen, the lower the degree of conversion (%) of the light-cured resin-based cement underneath it (p<0.001), with the exception of the A1 shade and 0.5mm specimens. Overall, all A1 specimens provided a similar degree of conversion regardless of the thickness (p>0.05). All 0.5mm specimens also provided a similar degree of conversion regardless of shade (p>0.05).

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

Keywords: dental photoinitiators; resin cements; dental curing lights.

**Presenter(s): Zeynep Erdogan**
**Faculty: Sara Burke**
**Additional Authors: Clune Hill, Raghav Balaji**

## *Title: Understanding the Role of the Perirhinal Cortex in Age-related Cognitive Decline*

Performance on cognitive tasks declines in old age for a large proportion of older adults, affecting both everyday activities and more demanding cognitive functions. This decline is particularly evident in tasks that require fine discrimination among similar stimuli which can be linked to dysfunction in the cortical-hippocampal circuit, including the perirhinal cortex (PRC). While previous studies have examined the effects of hippocampus (HPC) inhibition on object discrimination in rodents (Johnson et al., 2017), the role of the PRC remains less understood. The PRC shares reciprocal connections with the HPC, facilitating the integration of object recognition and memory processes critical for discrimination tasks. Using Designer Receptors Exclusively Activated by Designer Drugs (DREADDs), this study investigates how PRC inactivation impacts object discrimination using a Lego object-based mnemonic similarity task (MST), in which Fischer 344 x Brown Norway F1 rats (4-21 months old) were tested on their ability to differentiate between target (S+) from lure (S-) objects that share 0-90% overlapping features with a pretrained target object. Preliminary results suggest that PRC inhibition impairs lure discrimination, underscoring its critical role in object recognition. These findings provide insight into PRC contributions to cognitive decline and may inform targeted interventions for age-related memory impairments.

**Presenter(s): Callen Evans**
**Faculty: Andreas Keil**
**Additional Authors: Faith Gilbert, Hannah Engle, Laura Ahumada**

## ***Title: Population-Level Tuning in Human Visual Cortex Reflects the Unlearning of Conditioned Fear***

Populations of neurons in the human visual cortex respond to aversive fear conditioning, in which a neutral cue (CS+) is paired with an aversive outcome. After few trials, the CS+ evokes heightened physiological responses compared to other, safety-related cues. This includes heightened visual evoked potentials. Neural tuning is often quantified through the presentation of generalization stimuli (GSs) that vary in similarity to the CS+. The present study examined the recall of conditioned tuning patterns a week after initial learning and extinction. In this ongoing study, 11 participants were initially conditioned to associate a specifically oriented visual grating with a noxious loud noise, whereas other orientations predicted safety. Electroencephalography was recorded during recall (acquisition +1 week) from 129 sensors, and all gratings were flickered at a fixed rate of 15 Hz, for a duration of 2 seconds, evoking rhythmic, high-amplitude, steady-state visual evoked potentials. Data were artifact corrected and averaged by condition. It was found that the tuning functions at recall, in which no noise was present, completely reversed into a pattern opposite to the originally conditioned tuning function. Specifically, the CS+ response became selectively attenuated, compared to all GSs, suggesting that extinction learning prompts adaptive changes in sensory reactivity.

**Presenter(s): Rachel Evans**
**Faculty: Nikhil Urs**
**Additional Authors: Courtney Sercander, Joon Paek, Aaron Snell, Jena Delaney, Nicole Fatovic, Janani Kumaran, & Nikhil Urs**

## *Title: The Role of Dopamine Receptor-Expressing Neuronal Projections from the Ventrolateral Orbitofrontal Cortex in Cognitive Flexibility*

The ventrolateral orbitofrontal cortex (VO/LO) is a brain region located in the prefrontal cortex (PFC). Previous studies have shown that the VO/LO connects stimuli with expected outcomes to facilitate adaptive decision-making, with VO/LO impairment leading to deficits in reward-related memory. Within the PFC, it is known that dopamine impacts reward-driven behavior. Specifically, D1 and D2 receptors exert opposing effects on cognitive flexibility. Based on this knowledge of the role of both the VO/LO and PFC dopamine receptors in cognitive flexibility, we sought to understand the distinct role of dopamine receptor neuron projections in the VO/LO in cognitive flexibility. To do this, we used DREADDs in the VO/LO to either inhibit D1 projections, excite D2 projections, or inhibit all neurons in the VO/LO. We coupled this with fiber photometry in the dorsomedial striatum and behavioral conditioning to measure the impact of VO/LO dopaminergic receptor neuron projections on cue-outcome learning and reversal learning. We observed distinct effects of dopamine projection neuron manipulations on cue-reward learning, but not reversal learning. Understanding the driving brain regions behind cognitive flexibility is crucial for developing pharmacological treatments for disorders where dysregulation of this system impairs environmental adaptivity.

**Presenter(s): Allyson Exum**
**Faculty: Katherine Thompson-Witrick**

## ***Title: Effects of Seeping Time and Temperature on the Physical and Chemical Characteristics of Kombucha***

Kombucha is made by using a symbiotic culture of bacteria and yeast (SCOBY) to ferment sweetened tea. Kombucha has gained popularity in the United States due to its health benefits as a source of probiotics. The objective was to determine the influence seeping time and temperature have on its physical and chemical characteristics. An initial sugar solution with a Brix of 9.6 was created. Black tea was added to some of this mixture while still hot and allowed to cool. In contrast, the other three portions of solution were cooled to room temperature prior to seeping. Black tea was seeped in the sugar solution for eight, twelve, and eighteen hours. These served as the experimental treatments, while the traditionally seeped tea served as the control. Pre- and post-fermentation products were analyzed for total acidity, pH, Brix, total polyphenols, and caffeine. Flavor and aroma compounds were analyzed after fermentation using a Gas Chromatogram – Mass Spectrometer. A one-way ANOVA was run to determine statistical (p<0.05) differences between the samples. Statistical differences were observed for total polyphenol content, and total acidity. This project showed that there was a difference in the physical and chemical characteristics of kombucha when made using different seeping techniques.

**Presenter(s): Anne Fang**
**Faculty: Piyush Jain**
**Additional Authors: Sydney Antal**

## ***Title: Efficient Genome Editing with Chimeric Oligonucleotide-Directed Editing***

Prime editing has emerged as an efficient and powerful genome editing tool, offering a favorable gene editing profile compared to other Cas9-based approaches. Here we report new nCas9-DNA polymerase fusion proteins to create chimeric oligonucleotide-directed editing (CODE) systems for search-and-replace genome editing. Through successive rounds of engineering, we developed CODEMax and CODEMax(exo+) that achieve efficient genome modifications in human cells with low unintended edits. CODEMax and CODEMax(exo+) contain an engineered Bst DNA polymerase derivative known for its robust strand displacement ability. Additionally, CODEMax(exo+) features a 5 ’to 3 ’exonuclease activity that promotes effective strand invasion and repair outcomes favoring the incorporation of the desired edit. We demonstrate CODEs can perform small insertions, deletions, and substitutions with improved efficiency compared to PEMax at many loci. Overall, CODEs complement existing prime editors to expand the toolbox for genome manipulations without double-stranded breaks.

**Presenter(s): Nick Farahani**
**Faculty: Katelyn Bruno**
**Additional Authors: Ashley Darakjian, Jacob Ricci, Katherine Gegoutchadze**

## ***Title: Effects of Stem-Cell Derived Therapy on Myocarditis in Translational Animal Model***

Myocarditis, inflammation of the myocardium, can lead to dilated cardiomyopathy, sudden death, or heart transplant and is often caused by viral infections such as SARS-CoV-2 and coxsackievirus B3 (CVB3). Adipose stem cell (ASC)-derived secretome, a regenerative therapy containing cytokines, proteins, and exosomes that modulate inflammation, was hypothesized to reduce the effects of myocarditis in CVB3-infected mice. ASCs were isolated, cultured, and the secretome was administered via intraperitoneal injection. Secretome experiment 1 conveyed conflicting results. Though treated mice showed reduced inflammation through histology and a decrease in weight loss, suggesting some regenerative effects, immune activity and viral presence remained high when assessed with RT-PCR. A potential explanation is the administration of secretome (days -1,0,1) was prior to viral clearance so the immune system elicited a further response to the virus. However, in experiment 2, there was no significant reduction in inflammation, viral clearance, or immune markers (CD45, CD3, TLR2, CASP1, C3AR1, C4b) with later administration (days 7-9). Possible explanations include insufficient uptake in the heart, with secretome accumulating in other organs like the lungs, or the presence of microRNAs that do not impact the NLRP3 inflammasome pathway. Future experiments will explore alternative injection routes and later-stage interventions to improve therapeutic efficacy.

**Presenter(s): Nicole Fatovic**
**Faculty: Nikhil Urs**
**Additional Authors: Joon Paek, Aaron Snell, Jena Delaney, Rachel Evans, Shashank Pothu, Dawson Geller, Noel Gaytan, Janani Kumaran, Nikhil Urs**

## ***Title: Effect of Elevated Dopamine on Cognitive Flexibility and Motivation in Heterozygous DAT Knockout Mice***

The neurotransmitter dopamine is crucial for many functions, including motor function, motivation, and cognition. Dopamine is also important in reinforcement learning and cognitive flexibility. As a result, many neuropsychiatric and neurodegenerative disorders result from a disruption in dopamine neurotransmission, such as schizophrenia, ADHD, OCD, and Parkinson's. Specifically, in ADHD, which is in part caused by elevated dopamine levels, a lack of cognitive flexibility may be driven by hyperactivity and/or impulsivity. In rodents, the genetic deletion of the dopamine transporter (DAT), which is the primary reuptake site for dopamine within the striatum, causes elevated dopamine levels. This enables recapitulation of behavioral differences, including hyperactivity, excessive repetition and compulsive-like behavior, and cognitive deficits. We aimed to explore the consequences of elevated dopamine in heterozygous DAT knockout (DAT Het-KO) mice on cognitive flexibility and motivation. We used fiber photometry to measure phasic dopamine transients and behavioral conditioning tasks, including a probabilistic reversal learning task to measure cognitive flexibility. We observed that DAT Het-KO mice displayed reduced cognitive flexibility and enhanced phasic dopamine transients.

**Presenter(s): Tyler Favier**
**Faculty: Lindsey Rodriguez**
**Additional Authors: Gianna Degracia, Michael Valuta, Julianna Ross, Daniella Rojas**

## ***Title: Overeating and Overpouring: Drinking Motives Mediate the Association Between Binge Eating and Alcohol Consumption***

Previous research has established that binge eating may precipitate binge drinking (Rolland et al., 2017). While studies have examined motives for eating and drinking as co-occurring behaviors (Trojanowski et al., 2019), less is known about the mechanisms underlying the direct relationship between binge eating and alcohol consumption. The present study examined whether drinking motives (i.e., coping, social, enhancement, and conformity) help explain the association between binge eating and alcohol use. We hypothesized a significant relationship between binge eating and alcohol consumption, with drinking motives serving as mediator variables. Undergraduate students (N=555) completed a cross-sectional Qualtrics survey, including the Binge Eating Scale (Gormally et al., 1982), Drinking Motives Questionnaire-Revised (Cooper, 1994), and a self-report of weekly drinking frequency. Regression and mediation models were conducted in SPSS. Results revealed a significant positive association between binge eating behaviors and alcohol consumption (p<.001), fully mediated by drinking motives. Only social drinking motives significantly mediated this relationship. Coping, conformity, and enhancement motives were non-significant. These findings provide novel insight into the relationship between binge eating and alcohol use. Future research should explore these relationships longitudinally to clarify causal pathways and observe how drinking motives evolve over time.

**Presenter(s): Sebastian Fernandez**
**Faculty: Douglas Fernandez**
**Additional Authors: Makenzie E. Mabry, Tyler Radtke, Tori M. Ford, Jonathan C. Barz, Douglas E. Soltis, Pamela S. Soltis**

***Title: Modeling Tomato Wild Relatives Distributions to Uncover Climate-Ready Traits***

Densely nutritious and with a near-global popularity, tomatoes (Solanum lycopersicum) stand as a universally appealing vegetable crop with great potential to address the growing demand for food. However, the effects of climate change threaten to upend the production of most tomato varieties. Therefore, prioritizing the development of climate-ready tomato crops is a must. Studying the wild relatives of other crops has already yielded promising results, particularly in cultivating blight-resistant potato varieties. This success emphasizes the importance of evaluating wild species of tomatoes for climate-ready genes that can be introduced into S. lycopersicum. Using environmental niche modeling (ENMs), we predict the responses of wild tomato species to climate change by identifying the factors that influence their habitat suitability. Locality information for 12 different tomato crop wild relatives (CWRs) was sourced from the records of natural history collections. Combining this data with environmental variables (soil pH, carbon, etc.) and 19 layers of the current (1970-2000) bioclimatic variables from the WorldClim v2.0 database yielded ENMs for each of the species. Models were then projected across global croplands to future climate conditions to assess shifts in species' habitat suitability. Future climate projections were based on the ACCESS-CM2 and GISS-E2-1G models for periods 2041-2060 and 2081-2100. Three Shared Socioeconomic Pathways (SSPs) 2-4.5, 3-7.0, and 5-8.5 were employed to capture varying levels of climate change. Species that demonstrated a growth in their habitat suitability indicated climate-ready adaptations.

**Presenter(s): Julie Fernandez**
**Faculty: Andrew Altieri**
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## ***Title: Response of Acropora cervicornis and Orbicella annularis coral microbiomes to warming and deoxygenation***

The microbial community living in and on corals plays an important role in their responses to environmental stress. Two environmental stressors, warming temperatures and ocean deoxygenation, threaten the health of modern coral reefs. It is poorly understood how prior exposure to warming can influence later responses of the coral host and associated microbiome to stress. To test whether history can increase vulnerability or tolerance of the coral microbiome to subsequent stress, we exposed fragments of Acropora cervicornis and Orbicella annularis to reef sites in the Florida Keys, followed by four different warming and deoxygenation scenarios in a multistressor laboratory experiment. Site history, host species, genotype, and the interaction of temperature and dissolved oxygen significantly shaped corals ' microbial community composition. Warming and deoxygenation affected the abundance for more taxa (at the family and Amplicon Sequence Variant level) in the Acropora cervicornis microbiome than in the Orbicella annularis microbiome. The increased abundance of potential pathogens in the microbiome of A. cervicornis exposed to warming and low-DO suggests both stressors may increase susceptibility to disease in Acropora cervicornis. Our study shows that warming and deoxygenation can shape the microbial consortia in two species of Caribbean reef-building corals with differential stress tolerances.

**Presenter(s): Sophia Florea**
**Faculty: Ramon Sun**
**Additional Authors: Cameron Shedlock, Terrymar Medina**

## ***Title: Less Stress, More Success: Optimizing Cryosectioning Thaw Times in Spatial Metabolomics***

Cryosectioning is a foundational technique in pathology, histology, and spatial biology. While protocols are often optimized for tissue integrity and sample morphology preservation, there is limited data supporting an optimal technique for metabolite preservation. Maintaining sample integrity is critical for spatial analysis, but the impact of the thaw mounting process on both tissue structure and metabolite preservation is unknown. To address this, we will control the amount of heating time during thaw mounting and optimize our protocol for spatial metabolomics. Our objective is to compare a long thawing time with a fully dried sample to a short thaw time with a partially wet sample. By controlling all other variables in cryosectioning and data acquisition, we will determine how thaw mounting impacts metabolic profile, tissue degradation, and metabolite delocalization. Using matrix assisted laser desorption ionization (MALDI) mass spectrometry imaging (MSI), we will spatially map metabolite distribution in mouse brain sections prepared with these cryosectioning techniques. We will assess signal intensity, delocalization distances, and tissue quality as endpoint metric after MALDI MSI to compare the efficacy of each protocol and determine a cost-benefit relationship. Since cryosectioning is widely used, this research could help improve sample fidelity in spatial metabolomics and other fields.

**Presenter(s): Amaya Fong**
**Faculty: Maurice Swanson**
**Additional Authors: Mackenzie L Davenport, Gloria Montoya Vazquez, Maria F Alves de Moura, Jodi L Bubenik**

## ***Title: Differential pathology and susceptibility to MBNL loss across mouse muscles in a myotonic dystrophy model***

There are two subtypes of Myotonic Dystrophy (DM): DM1 caused by a CTG repeat expansion in the 3'UTR of the DMPK gene and DM2 caused by a CCTG repeat expansion in intron 1 of the CNBP gene. The leading DM pathogenic mechanism is RNA mediated toxicity whereby (C)CUG expansions lead to sequestration of the muscleblind-like (MBNL) family of RNA binding proteins. While the diseases share many clinical features, skeletal muscles are differentially affected both by histological presentation and which muscles are most impacted. The cause of these disparities in affected muscles is unknown, and it is unclear if DM mouse models recapitulate these differences. To address this, we collected a series of muscles from Mbnl knockout mice and evaluated them for characteristic histologic and molecular features of DM pathology. Our results indicate that Mbnl loss discordantly affects muscles yet does not recapitulate the specific spatial manifestation observed in either subtype. Some muscles, such as the TA, better resemble histological features of DM, while muscles like the EDL and diaphragm have a fiber atrophy profile more like DM1 than DM2. These findings have important implications for muscle choice when investigating new DM mouse models and for therapeutic development.

**Presenter(s): Bianca Forsyth**
**Faculty: Keith Willmott**

## ***Title: A Review of DNA Barcoding in Lepidoptera Stu*dies**

Lepidoptera (butterflies and moths) are well-studied insects acting as pollinators and environmental indicators. However, their diversity often complicates identification due to morphological similarities. Researchers use 'DNA barcoding ' to address this, sequencing DNA from standard regions like the mitochondrial cytochrome oxidase subunit (COI) to compare unidentified specimens with a library of known sequences. DNA barcodes have various applications in ecology and evolution research. While DNA barcoding has been crucial in Lepidoptera studies for the past two decades, its future relevance is uncertain due to advances in comprehensive genome sequencing. This study reviews DNA barcoding's use and value in Lepidoptera research and explores future perspectives.

A systematic literature review will gather studies using DNA barcoding in Lepidoptera research, organized by family, immediate use, study goals, species count, and geographic region.
Data from these studies will be quantitatively analyzed to identify patterns and trends, including the frequency of DNA barcoding across Lepidoptera families, correlations between geographic regions and their use, and their significance for species counts and diversity. This understanding may highlight gaps in current research while providing insights into DNA barcoding's role in Lepidoptera biodiversity, conservation, and ecological efforts, guiding future research initiatives.

**Presenter(s): Tanner Fortier**
**Faculty: Kyle Riding**
**Additional Authors: Randa Zeidan, Sristi Das Gupta**

## ***Title: Carbon Curing to Boost Early Strength of Low-Carbon Footprint Concrete***

With the increased construction demand the world is experiencing, it is crucial to develop new solutions that minimize concrete's environmental impact. The most common method to reduce the concrete's environmental impact is to replace part of the portland cement with supplementary cementitious materials that have a lower environmental footprint. These materials have a slower strength development, limiting the amount that can be used in construction. This study investigates the effect of CO2 injection on early-age strength in concrete mixtures with reduced cement content. Compression tests, isothermal calorimetry, and R3 tests were conducted to investigate the impact of using metakaolin as a supplementary cementitious material in CO2-injected mixes. Preliminary results showed promising strength boosts at an early age for the CO2-treated concretes. These findings offer a promising solution for sustainable concrete mixtures with reduced carbon emissions and adequate structural performance.

**Presenter(s): Gebril Fradj**
**Faculty: Eleni Bozia**

## ***Title: Open-Source Real-Time Speech-to-Speech Translation: A Data-Driven Comparison***

In today's interconnected world, bridging language barriers through real-time speech-to-speech translation is an increasingly vital area of research. This project systematically evaluates open-source models for Automatic Speech Recognition (ASR), Machine Translation (MT), and Text-to-Speech (TTS), including Whisper, Kaldi, MarianMT, M2M100, and Coqui TTS. Our primary goal is to identify the fastest and most accurate configurations for multilingual communication without relying on paid APIs. We measured critical factors such as word error rate, translation latency, and voice synthesis quality, employing standardized test corpora in English, Spanish, and French. We also examined real-time performance by tracking end-to-end latency under various conditions, including GPU vs. CPU usage and chunk-based vs. streaming architectures. Preliminary results show that smaller ASR models deliver faster inference, albeit at some cost to accuracy, while neural TTS engines significantly enhance naturalness but require higher computational resources. Ultimately, we provide a data-driven comparison of free solutions, offering insights on the trade-offs between speed, accuracy, and resource demands. Our findings inform developers and researchers seeking to build low-latency speech translation pipelines for cross-lingual communication and accessibility applications.

**Presenter(s): Brynn Fricke**
**Faculty: Orlando Acevedo-Charry**
**Additional Authors: Mia Keriazes, Miguel A. Acevedo, Scott K. Robinson, Orlando Acevedo-Charry**

## ***Title: Intraspecific Trait Variation of Island and Mainland Populations of Coereba flaveola***

We contrasted the morphological functional space of a Caribbean bird species that underwent reverse colonization, Coereba flaveola, across different populations in islands and continental settings. Using 81 specimens from the FLMNH and the LSU Museum of Natural History, we measured wing length, secondary length, tarsus length, tail length, beak width, beak length, and beak depth. We also noted the body mass of the specimens and calculated the Kipp's distance to estimate the hand-wing index (HWI). We compared the traits across five subregions within the Caribbean. We employed mean trait comparison through ANOVAs, using the traits as response variable, and a principal component analysis (PCA) as a multidimensional reduction approach. Higher dispersal ability (HWI), tarsus length, and beak depth was evident on specimens from the Lucayan archipelago, while the other subregions did not show strong differences in these traits. Shorter tails concentrated on mainland and continental islands. Specimens from Lesser and Greater Antilles had narrow beaks when compared with the other archipelagos. Nonetheless, some of the differences had low statistical power, suggesting the need for more specimens in future comparisons. These multiple responses of traits were confirmed through the PCA, which showed differences in morphological functional space between the subregions.

**Presenter(s): Daniel Fudge**
**Faculty: David Fuller**

## ***Title: Spinal Neuron Histopathology in the Gaa-/- Rat Model of Pompe Disease***

Pompe Disease (PD) is a lysosomal storage disorder caused by mutations in the acid α-glucosidase (GAA) gene, leading to impaired glycogen breakdown and neuromuscular dysfunction. Neuropathology contributes to respiratory dysfunction in PD, but the only approved treatment, enzyme replacement therapy (ERT), has limitations, including a short half-life and inability to cross the blood-brain barrier.

We developed a Gaa-/- rat model displaying early mortality and cardiorespiratory impairments. Previous studies demonstrated neurodegeneration in human Pompe spinal cords and Gaa-/- mice, but total neuronal counts had not been quantified. Using histological methods, we analyzed the spinal cords of 12-month-old male Gaa-/- (n=3) and Sprague-Dawley (S-D, n=3) rats. Tissue sections were stained with NeuN antibody to identify neurons, imaged, and analyzed using QuPath software.

Results showed lysosomal storage disease histopathology, including vacuolization and swollen neuronal soma in Gaa-/- rats. Total NeuN-positive neurons were reduced by 8.1% in the cervical (p=0.037) and 9.3% in the thoracic (p>0.05) spinal cord, with no significant difference in the lumbar region (p>0.05). This aligns with prior findings of greater neurodegeneration in rostral spinal segments. We conclude that neurodegeneration occurs in Gaa-/- rats, progressing more rapidly in the rostral spinal cord.

**Presenter(s): Tara Fullmer**
**Faculty: Sharon DiFino**

## ***Title: Unsafe at Work: Exploring the Public Health Crisis Among Immigrant Workers in the United States***

In a nation celebrated for its promise of opportunity, immigrant workers encounter a hidden crisis marked by perilous conditions and alarmingly high fatality rates. This study examines the stark public health challenges these essential workers face, revealing that their contributions come at a dangerous cost.

Despite constituting a growing share of the workforce, immigrants experienced disproportionately high risks; for example, Hispanic and Asian immigrant workers suffered fatality rates exceeding those of their native-born counterparts. The study explored factors such as limited English proficiency, lower educational attainment, and differences in risk perception that compounded these vulnerabilities.

First, a literature review analyzed peer-reviewed articles from PubMed, ASSIA, and CINAHL. Second, a survey distributed via Qualtrics on social media assessed comprehension and retention of safety information by comparing traditional OSHA posters with alternative formats. However, low response rates precluded definitive survey conclusions. The literature review revealed that inadequate training and a lack of protective policies were also key contributors to poor health outcomes.
The results of this study point to an urgent need for tailored safety communication reforms and policies to protect immigrant workers.

**Presenter(s): Gabriela Gaarder**
**Faculty: Courtney Sprain**
**Additional Authors: Expedition 392 Scientists**

## ***Title: Rock magnetic characterization of marine sediments across the Cretaceous-Paleogene Boundary***

The Cretaceous-Paleogene (KPg) boundary mass extinction ~66 million years ago serves as an analogue to how modern global ecosystems may collapse and recover. An extended record of paleoenvironmental change is necessary to understand the causes of the KPg extinction and the dynamics capable of pushing a large-scale ecosystem to collapse. Although paleoenvironmental records do exist, there are currently none which provide both information on diverse paleoenvironmental changes and have an extended focus from the Late Cretaceous through the early Paleogene. In this study, we conducted rock magnetic experiments on marine sediments recovered from International Ocean Discovery Program (IODP) Expedition 392, documenting trends in magnetic properties such as mineralogy and concentration of magnetic minerals around the KPg boundary. These sediments extend from the Late Cretaceous through the early Paleogene and were drilled from two locations along the central and southern-central Agulhas Plateau (Holes U1579D and U1580A). Shipboard records indicate a change in magnetic properties around the KPg (increase in magnetic susceptibility and magnetization) at both sites. Here, we will present new rock magnetic data that suggests a unique magnetic signature at the KPg boundary which could be environmentally forced. Future work includes further rock-magnetic testing to better characterize magnetic components.

**Presenter(s): Beatriz Galatti Pedro**
**Faculty: José Valentino Ruiz-Resto**

## ***Title: "Unveiling the Cultural and Entrepreneurial Potential of Música Popular Brasileira"***

Música popular Brasileira (MPB) is a genre of Brazilian music that emerged in the mid-1960s. It is characterized by its eclectic mix of samba, bossa nova, tropicalia, rock, pop, electronic, and samba-pop incorporating elements from African, European, and indigenous Brazilian music traditions. MPB is known for its rich lyrical content, which often addresses social, political, and cultural themes, and its innovative fusion of traditional and contemporary musical styles. This paper explores the allure and entrepreneurial prospects of MPB in the global music sphere. Through qualitative analysis of insights from industry experts Beatriz Malnic, Bruno Miranda, and Derris Lee, it delves into MPB's distinctive elements, its global influence, and strategies for enhancing its commercial success. Despite barriers, MPB's diversity, rhythmic appeal, and genre fusion captivate audiences globally. The paper advocates for collaborative partnerships with educational institutions, language-inclusive promotion, and digital engagement to expand MPB's reach. Embracing MPB's cultural legacy and entrepreneurial ethos can deepen connections with audiences and enrich the global music landscape with Brazil's musical treasures.

**Presenter(s): Gretel Garcia**
**Faculty: Sharon DiFino**

## ***Title: A Survey Analysis of Healthcare Communication: Assessing the Impact of Bilingual Providers vs. Interpreters on Patient Experience***

Language barriers in healthcare significantly impact patient satisfaction, quality of care, and health outcomes, particularly among Hispanics, who represent 62% of the 25.7 million individuals in the U.S. with limited English proficiency (LEP) (Haldar et al., 2023). Although Hispanics make up 19% of the U.S. population, only 6% of physicians identify as Spanish-speaking (Balch, 2023), leading to communication challenges that contribute to misdiagnoses, treatment delays, and reduced patient trust. This study builds on a previously completed literature review by analyzing data from a bilingual Qualtrics survey to examine the real-world experiences of Spanish-speaking patients and clinicians regarding language barriers in healthcare. The survey, funded by the USP and shared via social media, evaluates patient satisfaction, provider communication preferences, and the perceived effectiveness of professional interpreters versus bilingual providers. Key factors examined include interpreter availability, accuracy of medical translations, and whether language barriers have influenced treatment adherence. Previous studies suggest that patients feel more comfortable and confident in their care when communicating directly with Spanish-speaking providers (Lopez Vera et al., 2023). This research provides data-driven insights into the challenges posed by language barriers and highlights the need for improved communication strategies to enhance healthcare accessibility and equity for Hispanic populations.

**Presenter(s): Amaya Garcia**
**Faculty: Advait Jukar**

## ***Title: The Megafaunal Extinction in North America: How Much Do We Know?***

One of the most significant extinction events occurred in the Americas during the last 50,000 years ago. North America lost nearly 80% of its mammals weighing over 45 kg (megafauna). The causes of this extinction are debated, but can only be resolved using a well-defined extinction chronology. Despite these extinctions being known since the 1800s, a continent-wide picture of the timing of the extinction is still full of many gaps of knowledge. This research project examined the various existing dates of megafaunal extinctions in North America through multiple databases and literary sources to identify gaps in this extinction chronology across the continent, i.e., to identify species for which we have no direct dates, and regions where no direct dates are available for megafaunal species. I compiled information on radiocarbon dates, locations of extinctions for every valid extinct megafaunal species that is hypothesized to have gone extinct within the last 50,000 years. I cross-analyzed across multiple sources and databases to determine the validity of radiocarbon dates in order to gain a better understanding and fill in the existing gaps of knowledge. I found that well-known species such as Canis dirus (dire wolf), Smilodon fatalis (sabre-toothed cat), and Equus spp. (horse) are found throughout North America, but existing dates come from primarily the western regions of the United States including Oregon, Nevada, California, Wyoming, Utah, and Arizona. This represents a major gap in our understanding of the extinction of these species, and of the extinction and its drivers as a whole because we still no not understand the variation in the timing of the extinction in all parts of the continent. Large regions such as the American southeast are under-sampled for radiocarbon dates, despite the presence of megafauna, including in regions like Florida where they are found in association with humans. Lastly, I highlight avenues for future targeted research to close these gaps in knowledge and get a more complete understanding of this extinction.

**Presenter(s): Vedant Garg**
**Faculty: Joshua Wong**
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## ***Title: Beyond Pallidal or Subthalamic Deep Brain Stimulation to Treat Dystonia***

Deep brain stimulation of the subthalamic nucleus and globus pallidus internus is approved by the Food and Drug Administration for treating dystonia. Both targets have shown effectiveness in improving symptoms, but post-operative outcomes can vary significantly among patients. This variability has led researchers to explore alternative neuromodulation targets that might offer more consistent results. Emerging research has highlighted several promising new targets for DBS in dystonia. This review examines pre-clinical and clinical data on novel DBS targets for dystonia and explores non-invasive neuromodulation studies that shed light on the disease's underlying pathological circuitry.

**Presenter(s): Kevin Gerrity**
**Faculty: Florin Curta**
**Additional Authors: Mallorie Pope**

## ***Title: Pope, King and Emperor: Innocent III, Andrew II and Henry of Flanders***

Pope Innocent III has been the subject of much debate among historians regarding his transformation of papal authority. Many historians have chosen to classify him as a “political pope”, with some going as far as to allege that Innocent believed himself to be not only the supreme spiritual authority, but also the supreme political authority of Christendom. The goal of this study is to test that claim against Innocent’s relationship with two important Catholic leaders in Eastern Europe--Henry of Flanders, the Latin Emperor of Constantinople; and Andrew II, the King of Hungary. Through a thorough examination of the correspondence between those political leaders and the pope, Innocent’s principles and political philosophy will become apparent.

The letters that Innocent exchanged with the two men do not support the idea that Innocent viewed himself as the direct political superior either of Henry or of Andrew. The two rulers were allies, not inferiors, in the achievement of Innocent’s religious goals. Those relations furthermore paint a clear image of Innocent’s political philosophy: Innocent used his political authority to achieve goals which he deemed spiritually important, and consistently justified his actions with canon law or biblical precedent.

**Presenter(s): Finnley Gibbons**
**Faculty: Alexander Angerhofer**
**Additional Authors: Megan Wisniewski, Zain Becerra**

## ***Title: Nanoencapsulation of Oxalate Decarboxylase for Improved Activity***

Oxalate decarboxylase (OxDC) is an enzyme found in Bacillus subtilis, a soil bacterium, that catalyzes the breakdown of oxalate into carbon dioxide and formate. Largely thought of as a biological response to raise the pH of its environment, OxDC has optimal activity in acidic conditions around pH 4. OxDC has a wide variety of possible applications, but one notable possible use is its potential as a descaler in the pulp and paper industry. Given its affinity for acidic conditions and an optimum temperature of 35 ºC as well as its tendency to aggregate and denature in solution, OxDC was encapsulated in a polymer shell in an attempt to overcome these limitations and ultimately to increase its activity and stability under industrial conditions. In this experiment, nanocapsules of OxDC (nOxDC) were successfully synthesized and characterized in terms of mass, charge, and size. In addition, the enzymatic activity of the nanocapsules was tested and compared to that of the native protein. At pH 4, the nanocapsules demonstrate significant activity, and their catalytic efficiency is higher than that of the pure protein. At pH 7, both the native protein and the nanocapsules demonstrate a dramatic decrease in activity. Importantly, nOxDC also shows an improvement in its thermal stability and activity under acidic conditions resulting in higher activity compared to native protein at higher temperatures up to 55ºC.

**Presenter(s): Gunnar Gierschke**
**Faculty: Yi Luo**

***Title: Design Against Division: The Relationship Between Urban Segregation and Urban Form***

Urban segregation in the United States has arisen from racially unjust policies that have shaped cities, perpetuating segregation long after it was outlawed. Urban form, a city's physical design and spatial organization, plays a crucial role in reinforcing or dismantling these patterns. This research investigates how urban form influences segregation and identifies design interventions and policies that facilitate a more inclusive urban fabric.

This is achieved through a multifaceted approach. A literature review analyzes the historical evolution of planning and development structures 'impacts on segregation. Case studies in New Orleans, Louisiana, and Washington, D.C, review specific urban settings to understand how urban form relates to segregation patterns, involving systematic analyses of communities 'historical development, viability, and physical form. A comparative assessment of these communities highlights disparities and identifies potential solutions.

Results show that urban form remains rooted in segregative policy, even following its official disbandment, seen in inequitable planning and reinvestment strategies like those in New Orleans following Hurricane Katrina. While urban form is no longer a distinctive perpetrator, this study provides evidence of a reinforcing relationship between segregation and urban form, highlighting the need for standardized planning practices to move our cities towards a more inclusive future.

**Presenter(s): Joshua Gillis**
**Faculty: Sivaramakrishnan Balachandar**
**Additional Authors: T.L. Jackson, S. Balachandar**

## ***Title: Multi-Shock Instability Effects on a Dense Distribution of Particles***

The effects of a multi-shockwave release are well understood for a confined region with a potential flow. These effects are much less researched and understood within the context of a dense distribution of particles. The prediction of instabilities is applicable to particulate dispersal following a shockwave for methods pertaining to paint splattering a wall and the diffusion of a gas within a room. The leading reason behind the need for a split release shock rests on the presence of the shock's reflection off of the outer domain wall. With the presence of a single shock wave, the leading data suggests that the shock's reflection is strong enough to significantly slow, if not mildly reverse, the positive progress of the particle's motion. The theory for this work rests on the principle that a dual shock would provide enough forward momentum to propel the particles to the outer wall before the second reflection counters the particle's motion. We use Euler-Lagrange simulations to model interactions between a constant-design particle bed and various shockwave divisions and release times. Through comparisons between progression with these changes, we observe that a split-release shock will more effectively disperse particles. The most optimal time for the secondary release is to coincide with the inner reflection of the initial shock, after the particles have encountered the outer reflection. Supporting the future development of dispersal techniques is one of the goals of this work.

**Presenter(s): Melanie Gomez**
**Faculty: Robert Lamb**
**Additional Authors: Franz Smith, Jon D. Witman**

## ***Title: Top-down vs Bottom-up Control on Competitive Dynamics Amongst Benthic Communities***

Nutrient availability influences benthic communities by shaping primary production and modifying herbivore impacts. Increased nutrient supply promotes algal growth, altering competition and top-down control. However, the role of herbivory in regulating community composition under different nutrient conditions remains unclear, particularly in tropical ecosystems.
This study examines how nutrient availability and herbivory interact to shape benthic diversity in the Galápagos Islands. Using a factorial field experiment, we manipulated herbivore access with exclusion cages at two sites with differing environmental conditions. Community composition was assessed through percent cover of functional groups, and statistical analyses, including ANOVA and NMDS, were used to evaluate differences in algal diversity and species richness.
Our results show seasonal differences in the effects of herbivory on species richness. In January, when nutrient availability was low, increased herbivory reduced species richness, likely due to slower algal growth making primary producers more vulnerable to grazing. In August, when wave-driven nutrient turnover was high, herbivory increased species richness by preventing dominance by fast-growing species, promoting coexistence. However, this pattern was not observed in protected areas, where reduced wave action limited nutrient availability, leading to conditions where grazing pressure lowered, rather than enhanced, richness.
These findings highlight how bottom-up forces influence top-down control of benthic diversity, with implications for predicting ecological responses to environmental change.

**Presenter(s): Sofia Gonzalez**
**Faculty: Rick Kates**
**Additional Authors: Benjamin Z. Churba**

# ***Title: Unmasking Asthma: Analyzing Trends and Risk Factors from NHIS Data***

Background:
Asthma is a prevalent respiratory condition that significantly impacts public health in the United States. Understanding its prevalence and associated risk factors is crucial for informed policymaking and public health interventions. Utilizing National Health Interview Survey (NHIS) data, this study aims to examine asthma prevalence and identify major risk factors in the U.S. adult population.
Methods:
We analyzed NHIS data from 2019 to 2023, encompassing 141,640 adults (>18 years old). We conducted a backwards stepwise regression to identify the optimal set of demographic and health-related variables explaining asthma prevalence. Subsequently, a binary logistic regression investigated the relationship between these variables and asthma prevalence.
Results:
Asthma severity was associated with key predictors including female sex, obesity, lack of medical coverage, and comorbid conditions such as COPD. Urbanization also played a role in asthma severity, with older adults and individuals in less urbanized areas generally having decreased odds of severe asthma.
Conclusion:
Sociodemographic and behavioral factors are associated with asthma severity. These findings highlight the need for targeted interventions to address modifiable risk factors and reduce the asthma burden in vulnerable populations.

**Presenter(s): Malena Gonzalez Fernandez**
**Faculty: Katherine Deliz Quiñonez**
**Additional Authors: Sanneri Santiago Borres**

## ***Title: From Stadium to Sewer: Assessing the Impact of College Football Games on PFAS Concentration in Local Wastewater***

Per- and polyfluoroalkyl substances (PFAS) represent a significant environmental concern due to their widespread presence in consumer and industrial products, leading to their leaching into the environment. These compounds, which have been in use since the 1950s, are known for their toxic effects. Traditional wastewater treatment processes, which were not originally designed to remove or destroy PFAS, pose the threat of releasing additional PFAS back into the environment. Past research has shown that these processes succeed in removing long-chain PFAS and precursor compounds, but also result in an increase in the concentration of some short-chain & long-chain PFAS. This study investigates how PFAS concentrations change during wastewater treatment processes, and whether large sporting events influence these concentration patterns. A 24-hr composite influent & effluent sample was collected from the UF Water Reclamation Facility during regular operating days and during UF football home-game days. The concentration of 36 PFAS compounds was characterized using ultra-high performance liquid chromatography-tandem mass spectroscopy (UHPLC-MS/MS). Resulting concentrations were statistically analyzed to determine how PFAS are being transformed or broken down in the wastewater treatment process and the role of large sporting events on increasing the PFAS loads seen in wastewater.

**Presenter(s): Adrian Gonzalez Socorro**
**Faculty: Mingjie Liu**

## ***Title: Synergetic Effects of Transition Metal Atoms Anchored on Graphdiyne: A Comparative Analysis of Finite and Periodic Models***

Graphdiyne (GDY) is a novel 2D carbon allotrope consisting of sp2 and sp hybridized carbon atoms. This structure consists of hexagonal carbon rings linked by two acetylenic chains, leading to a highly conjugated network of π bonds. The transition metals anchored on GDY pores have been intensively studied computationally and proposed as new electrocatalysts for CO2 reduction reaction. However, periodic calculations of the electronic structures are computationally expensive; thus, finite molecular representations are used to speed up first-principles calculations. In our study, we analyzed the geometry, charge, and formation energy of 3d transition metal atoms on GDY for similarities with finite and periodic structures by density functional theory simulations. The finite model was found to be susceptible to buckling, while the periodic model remained 2D. We observed that late 3d transition metals anchored on the finite model have the best accuracy when compared with the periodic model in terms of metal-metal bond lengths, distortion of the pore chain, and metal-carbon bond lengths. The formation energy has the same trend for both models. Bader charge analysis indicates that charges highly delocalized from the metals to the carbon structure in the finite model compared to the periodic model.

**Presenter(s): Jomelys Gonzalez-Molina**
**Faculty: Kate Ratliff**

## ***Title: Marginalized Identities and Thin-Slice Autism Identification Accuracy***

Stigma toward out-groups influences interactions, perceptions, and relationships. Autism Spectrum Disorder (ASD) is a severely stigmatized developmental disability. Because of this stigma, autistic individuals face social isolation, which negatively impacts their mental health. This project utilizes live-action fictional portrayals of autistic characters to evaluate thin-slice judgments—personality/trait judgments based on brief observations. Thin-slice judgments are especially intriguing because assumptions are accurate at a rate higher than chance. This study utilized identification, i.e., if participants thought this person was autistic, as the thin-slice judgment. This experimental quantitative survey collected data from approximately 600 participants. This project measures the accuracy of thin-slice judgments, and how intersectional identities influence accuracy. Insights from this study can encourage professionals to be critical of the biases that impact diagnosis and be conscious of how diagnoses, even assumed ones, can impact autistic individuals.

**Presenter(s): Kyli Gooden**

**Faculty: Charles Ellis**
**Additional Authors: Evans, Elizabeth MS CCC-SLP, Jones, Nicole MS CCC-SLP**

## ***Title: When Accents Speak Louder Than Words: Accent Discordance's Impact on Patient-Provider Communication and Health Outcomes***

Studies have shown that poor patient-provider communication can have a negative impact on health-related outcomes and well-being. There is also evidence that when patients and providers lack linguistic concordance the likelihood of unsuccessful healthcare interactions increases and contributes to further misconceptions and biases. Consequently, patients may feel marginalized, and the perceived credibility and competence of providers decreases. To date, there is limited information on how combined speech (pronunciation, prosody, accent) and linguistic diversity (native language) contribute to health-related outcomes. The objective of this review was to examine the current literature related to the impact of accented speech on patient-provider communication and satisfaction with healthcare experiences. A review of the current literature suggests accent and linguistic diversity can reduce the quality of care and inevitably contribute to reduced overall satisfaction and quality of life. More specifically, a lack of accent concordance can negatively influence patient-provider communication in a similar fashion to a lack of language concordance between patient and provider.

**Presenter(s): John Gracey**
**Faculty: Jason Brunson**

## ***Title: Tidy Geometric Data Analysis in R: Extensions and Applications***

Geometric data analysis (GDA) is a statistical tradition that uses geometric principles to explore relationships within multivariate data. GDA methods share many of the same mathematical foundations, but implementations to the programming language R obscure this unity with varied class and object naming conventions.

The goal of this project is to provide R users with an intuitive and unified framework for common GDA tools (principal component analysis and factor analysis, in particular) that accurately reflects the underlying mathematical theory.

We are working to develop and extend a published package, {ordr}, to properly handle GDA techniques based on eigenvalue decomposition. The approach requires careful validation of multiple software implementations against each other. We are recording the development process in a package vignette.

By integrating mathematical modeling approaches with intuitive workflows, we aim to make such methods accessible to a wider range of users. Additionally, by publishing a vignette detailing the research and development process, we hope to reduce ambiguity often found in statistical analysis software and welcome user contributions. We intend this software to help researchers who use geometric techniques but are not themselves statisticians leverage the unity of these techniques to more clearly and efficiently conduct and communicate their analyses.

**Presenter(s): Alexandra Grant**
**Faculty: Andrew Altieri**
**Additional Authors: Sara Swaminathan**

## ***Title: Key Drivers of Growth and Survival for Coral Outplanting Restoration Success in the Florida Keys***

Coral reef restoration aims to replenish degraded systems, but environmental variability challenges success. This study monitors the growth and survival of three coral species (Montastraea cavernosa, Orbicella faveolata, and Pseudodiploria clivosa) in the Florida Keys National Marine Sanctuary. The sanctuary aims to restore structure, function, and resiliency to the Florida Coral Reef. Fragments of each species were grown in land-based nurseries and outplanted across four sites. The influence of factors such as inshore/offshore conditions, site protection status, and species were examined from 2022 to 2024. A severe marine heatwave occurred in the summer of 2023, causing mass bleaching in the region and providing an opportunity to test species 'resilience to extreme thermal stress. Our results indicate that inshore conditions were favorable for growth and survival in some coral species (Montastraea cavernosa and Orbicella faveolata), while others appeared unable to thrive regardless of site conditions. Montastraea cavernosa had slower overall growth rates, but was more resilient to thermal stress, indicating ecological trade-offs between growth and thermal tolerance. Our findings have implications for optimizing coral reef restoration in the Florida Keys and further showcase the importance of site-specific management practices as a strategy for improving ecological resilience in response to climate change.

**Presenter(s): Daniela Gray**
**Faculty: Sarra Tlili**

## ***Title: Perpetuating Orientalism: Middle Eastern Representation in Disney***

The Orientalizing of the Middle East has left a lasting impact in the interactions between the East and West. In my paper, I will analyze contemporary Middle Eastern stereotypes–particularly those of barbarism, eroticism, and laziness–as they appear in Disney films. Specifically, I examine how Aladdin (1992), Aladdin (2019), Alice and Wonderland (1951), Alice and Wonderland (2010), DuckTales the Movie: Treasure of the Lost Lamp (1990), Descendants (2015), and Descendants 2 (2017) perpetuate Orientalist tropes. Despite Disney's efforts to remake many of these films, I find that many of these negative stereotypes persist–or, in some cases, intensify.

As one of the most influential producers of children's media, Disney holds a unique responsibility to ensure that it does not contribute to the reinforcement of harmful stereotypes. My analysis explores how children, particularly susceptible to implicit biases, internalize these portrayals and how these depictions shape their perceptions of the Middle East. Furthermore, I examine how seemingly "harmless" stereotypes manifest into real-world prejudice and ultimately fuel discrimination and hate crimes. Overall, my findings suggest that the repeated reinforcement of these stereotypes in mainstream media has tangible, harmful consequences in the United States.

**Presenter(s): Ashley Guarino**
**Faculty: Tracie Baker**

## ***Title: Multigenerational Transcriptomic Effects of Sublethal Dioxin Exposure in Developing Zebrafish Brains***

Dioxin, or 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD), is a persistent organic pollutant and endocrine disruptor known to cause developmental toxicity in the nervous and reproductive systems of vertebrates. Our lab has previously reported that sublethal dioxin exposure has multigenerational impacts on neurobehavior and body morphometrics, as well as transcriptomic alterations in lipid and glucose metabolism, oxidation, xenobiotic response, and sperm cell development genes in zebrafish gonad tissue. To clarify the extent and mechanisms of neuro-specific TCDD-induced pathway disruption, zebrafish brains underwent transcriptomic analysis. Zebrafish (Danio rerio) were selected as a vertebrate model due to their genetic similarity to humans, short generation time, and ability to be maintained as large cohorts of exposed individuals. Zebrafish were exposed to low levels of TCDD (1h; 50 pg/mL) during development at 3- and 7-weeks post-fertilization, and subsequent unexposed F1 and F2 generations were produced from these exposed F0 founders. Brains of the F0 and F2 generations were dissected at adulthood, and RNA was isolated from the tissue. cDNA libraries have been prepared from the extracted RNA, which were sequenced and analyzed for differential gene expression between the control and exposed groups across generations. Significant differently expressed genes will be uploaded into Ingenuity Pathway Analysis to explore the underlying signaling and metabolic causes of observed fold changes, with a particular interest in the transgenerational dysregulation of reproductive pathways, hormone and lipid metabolism, and oxidative stress.

**Presenter(s): Hailey Guzik**
**Faculty: Sharon DiFino**

## ***Title: Fatal Disconnect: The Alarming Reality of Women's Underrepresented Risk in Cardiovascular Emergencies and CPR (Cardiopulmonary Resurrection) Training***

Women in the United States are more likely to die from cardiovascular disease than any other health complication (American Heart Association), meaning there is an alarming probability anyone who is reading this abstract knows someone who is currently or will be impacted by cardiovascular disease. "Approximately 60% of Black women ages 20 and older have a cardiovascular disease" (Women's clinic-Scripps) resulting in a disproportionate effect on minority populations as well. However, research regarding cardiovascular disease and emergency medicine such as CPR, has targeted mainly males, leaving gaps in women's CPR treatment. My research poster will present the contributing factors such as inadequate gender specific training and education that contribute to the high percentage of cardiovascular disease mortalities among women. A comprehensive literature review of the research topic was conducted using traditional search engines such as Google Scholar, University of Florida databases, as well as hand searching. A Qualtrics survey was developed and administered to CPR certified individuals to assess the complexities that contribute to the gaps in CPR administration. Factors such as: the lack of training on mannequins with female anatomy, absence of educational instruction, as well as stigmas that contribute to inadequate practice of CPR will be assessed.

**Presenter(s): Emma Hair**
**Faculty: Phil Hahn**

## ***Title: Herbivory Variability in Florida Plants: Rare Species Show Higher Mean but Less Skewed Distributions of Damage***

Herbivory is a key interaction shaping plant populations, ecosystems, and evolution. Most studies focus on mean herbivory levels and variation among populations differing in density or abundance. However, herbivory is often unevenly distributed among individuals, complicating ecological predictions. This study examined herbivory by chewing insects on eight Florida plant species—four rare and four common. We hypothesized that rare species would have higher mean herbivory but less skewed damage distributions than common species. Field surveys at two Florida sites assessed herbivore damage metrics mean, variance, and skewness across 480 plants, mostly in Asteraceae, with one species each in Fabaceae, Polygonaceae, and Cactaceae. Statistical analysis showed rare species had significantly higher mean herbivory and lower skewness, supporting our hypothesis. Herbivory data fit better to a log-normal distribution, which accounts for skewed data, than a normal distribution, which assumes symmetry. These results suggest rare species may be more vulnerable to herbivores due to limited defenses, while greater herbivory variability in common species may result from resource availability or predator-prey interactions. This study highlights the ecological importance of herbivory variability and its effects on plant populations. Expanding research across more plant families and regions could enhance our understanding of these patterns.

**Presenter(s): Chase Hap**
**Faculty: Alexandre Gomes de Siqueira**

***Title: ZenFLOW Desk Platform***

Modern academic learning environments, such as collegiate library spaces, attempt to maximize student learning opportunities. Considering this, we propose ZenFLOW Desk: a user-centric platform combining passive and active approaches to enhance learning, productivity, and well-being (LPW) in university library settings. Passive LPW strategies focus on optimizing the environment itself, incorporating attention restoration theory (ART) principles, proper lighting, ergonomic furniture, and peripheral interaction. Active LPW strategies address user-driven behaviors, such as time management and intentional work habits. Traditional approaches to enhancing student LPW consider either passive or active characteristics in isolation. The ZenFLOW Desk bridges this gap by seamlessly integrating both, creating a holistic platform designed to enhance student success. By embodying the ZenFLOW desk with passive and active approaches, we aim to maximize its effectiveness in enhancing learning, productivity, and well-being. Preliminary summative and formative evaluations from a participatory design study with 39 college students were highly encouraging, showcasing the desk's potential to create an engaging learning environment. The findings contribute to the broader understanding of enhanced learning spaces and their profound impact on users' well-being, productivity, and overall learning experience.

**Presenter(s): Sara Harold**
**Faculty: Chris Vulpe**
**Additional Authors: Christian Maugee**

## ***Title: Identifying the Gene Expression Phenotype of FRDA Cardiomyocytes***

Friedreich's Ataxia (FRDA) is an inherited neurodegenerative disorder caused by a triplet repeat of an intron that leads to mutations in the frataxin gene. This gene encodes for the protein Frataxin (FXN) which serves its main functions in mitochondrial processes. Mutations in the frataxin gene disrupt FXN production, leading to mitochondrial impairment, which is especially prominent in high-energy requiring cells. Heart cells in specific are a key focus, as cardiac dysfunction is the most common cause of death in FRDA.

In this research, we have differentiated wild type (WT), FRDA, and isogenic control (ISO) induced pluripotent stem cells (iPSCs) into ventricular cardiomyocytes (VCMs) to better understand the disease presentation in the heart. Following differentiation, we performed bulk RNA sequencing to determine the differentially expressed genes (DEGs) between different cell lines, aiming to characterize their transcriptional phenotypes. We then compared the results acquired from the FRDA, WT, and ISO cell lines to ascertain the variations in gene expression phenotype (GEP).

We expect to see distinct transcriptional differences between the FRDA and WT cell lines, while the use of isogenic controls will help us pinpoint gene pathways for possible therapeutic intervention.

By investigating the transcriptional phenotypes of VCMs, our goal is to enhance our understanding of cardiac dysfunction in FRDA cells and guide the future development of targeted treatments for the disease.

**Presenter(s): Riley Harper**
**Faculty: Meixia Zhao**
**Additional Authors: Iman Khalid, Mark Ou, Layla A. Schuster, Karun Katoch, Lakesh K. Sharma, Meixia Zhao**

## *Title: Exploring the Influence of Nitrogen on Rhizosphere and Apoplastic Microbiomes in Maize*

This study explores how varying nitrogen levels affect microbial communities in the rhizosphere and apoplastic fluid of maize, influencing plant growth and stability. DNA was extracted from both regions at two time points, before and after flowering, and 16S rDNA sequencing was performed to analyze bacterial composition. Preliminary results revealed distinct microbial communities between the rhizosphere and apoplastic fluid. Bacterial genera such as Nitrosospira and Enterobacter were negatively correlated with nitrogen levels, showing reduced abundance at higher nitrogen concentrations. Conversely, genera like Allorhizobium and Leadbetterella exhibited increased abundance with higher nitrogen levels, suggesting their potential role in supporting maize growth. These findings indicate that elevated nitrogen influences microbial taxa in maize, promoting plant health through the enrichment of beneficial bacteria. Future work will compare microbial communities across time points and different maize tissues to further explore the relationship between microbial diversity and maize growth under varying nitrogen conditions. This research may offer insights into optimizing nitrogen fertilization for both plant productivity and soil health.

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

## ***Title: "Implicitly Restricting Education": Exploring Florida's Western Canon Laws and Its Consequences for Higher Education Humanities***

This paper examines the meaning and definition of the "Western canon" and how it influences higher education in the humanities at UF. Through a qualitative and quantitative analysis, this study explores varying interpretations of the Western canon and its influence in the classroom, the importance of global perspectives in the humanities, the value of the collegiate humanities, Florida's legislative history with higher education, and the impacts of Florida SB 266 at UF.

The humanities are a broad set of ideas and disciplines, subject to many interpretations. Their overriding purpose, however, is to provide insights into diverse human experiences and teach students critical thinking skills so that, as one first-year student I interviewed said, "you can see the underlying supplemental messages that are being sent through different forms of rhetoric."

Within the humanities, legislation broadly defines the Western canon as a set of works and ideas contributing to Western culture and philosophy. As part of Florida Senate Bill 266, updated Florida statutes, specifically provisions 1007.25 and .55, dictate that general education humanities courses "must include selections from the Western canon" and "Whenever applicable, provide instruction on the historical background and philosophical foundation of Western civilization and this nation's historical documents."

**Presenter(s): Megan Harris**
**Faculty: Carol Mathews**

## ***Title: Examining Insight in Neuropsychiatric Disorders using the Brown Assessment of Beliefs Scale***

Belief systems and their distortions are central to understanding and treating mental health conditions such as Obsessive-Compulsive Disorder (OCD), Hoarding Disorder (HD), Generalized Anxiety Disorder (GAD), and Major Depressive Disorder (MDD). The Brown Assessment of Beliefs Scale (BABS) is a widely used tool to assess belief rigidity and insight across psychiatric diagnoses. This study explores diagnostic differences in BABS Total Score to clarify patterns of belief rigidity across disorders and guide targeted clinical interventions.
We analyzed data from 141 participants with OCD, HD, GAD, and MDD. BABS Total Scores were the dependent variable, while Diagnosis (recategorized as a first-level categorical variable) served as the primary predictor. Additional covariates included age, gender, race, and Hispanic/Latino identity. We performed a multiple regression analysis using JMP Pro 17. Least Squares Means comparisons were conducted to identify significant differences in BABS Total Score across diagnostic groups.
The regression model explained 17.8% of the variance in BABS Total Scores (R^2 = 0.178). Post-hoc analyses revealed that there does not seem to be a significant difference in BABS Scores across these disorders. While age, gender, race, and Hispanic/Latino identity were included in the model, they did not significantly predict BABS scores individually. Visual analysis of the Least Squares Means plot suggested overlapping confidence intervals for all groups, emphasizing the need for robust pairwise comparisons to validate findings.
These findings indicate that belief distortions may vary across diagnostic groups, but no significant difference was found. BABS Scores trended slightly higher in the Black/African American group; this may not be significant due to the small number of individuals in the group. Overall, the sample is largely HD, White, and Female, which is not representative of the population. This emphasizes the importance of a representative sample and further research to identify other factors that may impact level of insight. Future research will compare insight between treatment-seeking and non-treatment-seeking groups, as well as include level of education as a covariate in the model.
This study highlights diagnostic differences in BABS Total Scores, particularly among OCD and Hoarding Disorder populations. Observations from analysis can inform clinical assessments and interventions, supporting more precise, diagnosis-specific treatments for belief-related psychopathology.

**Presenter(s): Zara Haruna**
**Faculty: Dominick Lemas**

## ***Title: The Impact of Maternal Iron Status During Pregnancy on Infant Health Outcomes***

Pregnant women are prone to developing iron deficiency anemia from increased blood volume and iron demand. This condition increases risks for low birth weight and preterm birth, which are leading causes of infant death in the United States. This project investigates the relationship between iron intake during the third trimester and birth weight and gestational age. A food processor obtained iron intakes from 42 self-reported diet records. Using R-statistical programming and dietary guidelines, we grouped participants by their probability of having inadequate iron intakes. We ran statistical tests to determine if the groups differ in birth weight and gestational age and analyze the outcomes ’relationship with mean iron intake. Infant birth weights of participants with a high risk of inadequate iron intake are significantly less than infant birth weights of participants with a moderate risk of inadequate iron intake, while there is no difference in gestational age. Furthermore, birth weight has a positive correlation with mean iron intake, while gestational age has no association with mean iron intake. Although increases in birth weight were observed with increasing iron intake, there was no observable difference in gestational age as iron intake changed. This finding may inform prenatal care for iron-deficient women.

**Presenter(s): Shyama Hausner**
**Faculty: Victor Harris**

## ***Title: Acting Through Adversity: The Impact of Drama Therapy for Child and Adolescent Mental Health***

Child and adolescent mental health disorders have increased at alarming rates, with the potential to cause severe lifelong consequences. Unfortunately, traditional therapeutic modalities such as cognitive behavioral therapy (CBT) have struggled to address the diverse scope of child and adolescent mental health needs. Drama therapy has emerged as an alternative intervention, harnessing the power of theatrical techniques to facilitate emotional exploration and regulation, resilience, and healing. The nonverbal, embodied, and experiential nature of drama therapy provides children with an intuitive and accessible therapeutic modality. This systematic literature review offers an analysis of existing quantitative and qualitative drama therapy literature, examining its efficacy in addressing child and adolescent mental health disorders. Six studies published between 2014 and 2024 were selected, evaluating participant outcomes across varied settings. Results demonstrated statistically significant improvements in mental health outcomes in five out of six studies. To strengthen practical applications for mental health practitioners, researchers, and educators, the use of group formats, cultural adaptations, school-based public health frameworks, and recommendations for future research are discussed.

**Presenter(s): Emily Hayes**
**Faculty: Luke Maloney**

## ***Title: On Dosimetric Water Equivalency of 3D Printed Materials***

Purpose: To determine the dosimetric water equivalency of polylactic acid (PLA) and commercial 3D printing resin using electron stopping power, for use in radiochromic film calibration and phantom development.

Methods: A variable-depth phantom was 3D-printed to assess dosimetric equivalency. The phantom consists of cylinders (r=25mm, height=2-20mm) enclosed in a 100x100x50mm lateral scatter block, printed in PLA and resin using filament and stereolithography printers. The phantoms were irradiated with 6 MeV electrons at variable film depth using an Elekta accelerator. After 48 hours, films were scanned to determine optical density, and percent depth dose curves (PDDs) were compared to water. The slope ratio of the linear PDD region was evaluated against each material's specific gravity to assess equivalency.

Results: The depths of maximum doses (dmax) were 12.5mm (resin), 10mm (PLA), and 13mm (water). The maximum doses were 199.2cGy (resin), 210.3cGy (PLA), and 200cGy (water). The "percent dosimetric differences" relative to water were 2.26% (PLA) and –0.87% (resin).

Conclusions: This work enhances clinical accuracy by enabling greater flexibility in calibration of film and development of patient-specific phantoms. This work will discuss a device enabling single-irradiation calibration for film batches, simplifying workflow for physicists using film for in vivo measurements.

**Presenter(s): Emma Heidelberg**
**Faculty: Lindsey Rodriguez**
**Additional Authors: Sarah Wutzler**

## ***Title: Lost in the Spiral: Emotion Regulation's Impact on Relationship Conflict and Alcohol Use***

This research examines how the association between relationship issues, as measured by the Romantic Partner Conflict Scale (RPCS), and alcohol-related problems, as assessed by the Rutgers Alcohol Problem Index (RAPI), is moderated by difficulties in emotion regulation (DERS). It was hypothesized that the association between the interreactivity subscale of relationship issues and alcohol-related problems would be strengthened by greater difficulties in emotion regulation. The study utilized a sample of 314 participants who completed a survey at the University of Houston. Results supported the hypothesis, indicating that the relationship between the interreactivity subscale of RPCS and alcohol-related problems was significantly moderated by difficulties in emotion regulation, amplifying the overall association. These findings underscore the critical role of emotion regulation in the intersection of relational conflict and problematic drinking. Specifically, individuals with greater difficulty regulating emotions may be more vulnerable to using alcohol as a maladaptive coping mechanism in response to relational distress. This highlights the need for interventions aimed at improving emotion regulation skills, particularly in the context of romantic relationship conflict, as a potential means of reducing alcohol-related problems. Future research should explore whether interventions focused on enhancing emotional regulation could reduce the impact of relationship distress on alcohol misuse.

**Presenter(s): Erica Hengartner**
**Faculty: Xin Tang**
**Additional Authors: Chenyu Liang, Miao Huang, Yuning Feng, Yinong Chen**

## ***Title: Interrogation of Spatial-temporal Calcium Signaling in Colon Cancer Progression***

Calcium (Ca2+) signaling regulates key functions in cancer progression, including tumor initiation, growth, and metastasis. Long-distance intercellular calcium waves (ICWs) are important for colon cancer (HCT-8) cell-cell communication and tumor development. We recently identified that extracellular ATP release precedes the propagation of calcium waves and activates G protein coupled receptors (P2Y receptors) triggering a downstream pathway to induce Ca2+ release from the endoplasmic reticulum. In this study, we performed RNA sequencing on calcium wave-initiating, wave-receiving, and non-spiking cells in HCT-8 populations to determine epigenetic differences. Bioengineering models of physiologically relevant tumor environments were used to investigate linked ICW and ATP signaling during tumor growth and invasion. The regulatory impact of ATP-mediated calcium waves in colon cancer cell invasion was tested using Matrigel and PET membranes in Ibidi chemotaxis chambers. The functional roles of calcium wave propagation were evaluated during the initiation and growth of colon cancer organoids in 3D polyethylene glycol gels with and without apyrase (15 unit/ml), which enzymatically hydrolyzes extracellular ATP. Our results provide new evidence of how ICWs and ATP wave dynamics enable HCT-8 cell colonization, proliferation, and invasion. These findings demonstrate the potential for using targeted ATP and calcium signaling suppression to inhibit tumor growth.

**Presenter(s): Kamili Henry**
**Faculty: Nick Keiser**

## ***Title: Testing the Effects of Pathogenic Fungal Infections on Spider Behavior***

Several specialist fungal parasites have been found to manipulate the behavior of their insect hosts to improve transmission, though parasite manipulation of spider behavior has never been tested directly. Here, we exposed Lyssomanes viridis jumping spiders to a specialist pathogen (Gibellula) and a generalist pathogen (Metarhizium) and measured their mortality compared to control spiders. We also recorded whether spiders that died produced a silken "deathbed", which has been hypothesized to improve parasite transmission in the wild. Exposure to both Gibellula and Metarhizium appeared to reduce spiders 'lifespan compared to the Control group. Deathbed behavior was observed in one spider in the Gibellula group. This suggests that, with further testing, Gibellula fungus may manipulate host behavior prior to host death to place the host in a location more hospitable for transmission.

**Presenter(s): Elle Henson**
**Faculty: Megan Ennes**

## ***Title: Self-Efficacy of Pre-Service Educators in Facilitating Youth Civic Engagement for the Environment***

With environmental issues developing globally, action for environmental protection is necessary to prevent further loss of biodiversity. One effective but challenging avenue for action is getting involved in civics. Programs have been developed to introduce youth to civic action during adolescence with the help of trained adult educators. The self-efficacy (SE) of these educators in facilitating the programs is crucial for youth outcomes in civic engagement. To assess the SE of pre-service educators (PSEs) in facilitating the Community Action Projects for the Environment (CAPE) curriculum, a program for youth civic engagement for the environment, we hosted a workshop introducing these PSEs to the process of a CAPE project. We used a mixed-methods pre- and post-survey to compare SE before and after the workshop. A statistically significant increase in SE was observed from the pre- to the post-survey (p < 0.01), indicating improvement in PSE confidence in their overall ability to guide youth through a civic engagement project. This paper underlines the importance of introducing youth civic action programs to pre- or in-service educators who are in a position to implement civic engagement projects with the youth they work with, in order to make lasting environmental change.

**Presenter(s): Xiomy Hernandez**
**Faculty: Gabriel Prieto**

## ***Title: A Vessel for Ethnic Expression: How Pottery Reflects Identity in the SIAR of Chan Chan***

This study investigates the role of pottery in expressing social identity within the residential neighborhoods of Chan Chan, capital of the ancient Chimú civilization in Peru. The research examines 255 ceramic materials excavated during the 2022 field season under the direction of UF Professor Dr. Gabriel Prieto. Previous excavations at Chan Chan have uncovered non-local materials such as featherwork, textiles, and food, suggesting diverse ethnic groups inhabited the city. How these groups functioned in Chimú society is still under speculation, but the material evidence suggests production of local and non-local styles were contemporaneous in the city. While prior studies have extensively examined wares from the small, irregular, agglutinated rooms (SIAR) of Chan Chan, this research uniquely focuses on the expression of ethnicity through ceramic decoration. The materials reveal the production techniques and artistic styles of residents from the BJ unit, a neighborhood part of the SIAR that housed the majority of Chan Chan's population and potentially served as a dynamic space of cultural interaction. By analyzing stylistic attributes, surface treatments, and decorative elements through a comparative lens informed by the archaeological context, this study aims to uncover how local and non-local identities were expressed in the great urban metropolis.

**Presenter(s): Jade Hernandez**
**Faculty: Wendy Dahl**

## ***Title: The Relationships Between Oral Health, Dysphagia, and Nutritional Risk in Adults Experiencing Homelessness***

The homeless population faces many challenges, especially due to the lack of access to health care. Dentistry has many barriers that discourage patients from prioritizing their oral health. Poor oral health contributes to oral pain and discomfort, missing and broken teeth, and difficulty chewing and swallowing (dysphagia), which may be associated with malnutrition. Diet adaption, specifically food texture restrictions, may lead to nutritional deficiencies and unintentional weight loss, increasing the risk of malnutrition. Research is needed to elucidate how oral health contributes to dysphagia and nutritional risk. This study aims to explore the interrelationships between oral health, dysphagia and related food avoidance behaviors, and nutritional risk. A cross-sectional study of adults experiencing homelessness (n = 50; 18-90 years of age) will be conducted. Oral health will be assessed using World Health Organization: Oral Health Questionnaire for Adults, dysphagia-related symptoms using the EAT-10: A Swallowing Screening Tool, and nutritional risk using the abridged Patient-Generated Subjective Global Assessment (abPG-SGA). Additionally, food texture avoidance strategies will be queried. It is hypothesized that oral health factors such as missing teeth and oral pain will be directly associated with dysphagia and oral health factors, dysphagia, and food texture avoidance will contribute to nutritional risk.

**Presenter(s): Jhonathan Herrera**
**Faculty: Eric Du**

## ***Title: Rope Manipulation through Tactile Sensing and Reinforcement Learning in Robotic Fingers***

Recent advances in robot manipulation highlight the crucial role of tactile sensors in enabling autonomous decision-making. In our research, we aim to enhance robotic independence by eliminating the need for camera-based positioning or human feedback. Utilizing GelSight tactile sensors, we propose a novel method for guiding a rope through tube structure without prior knowledge of the internal path. Our approach leverages diffusion models and masking techniques to generate accurate images of the rope's position, which are then used to update the off-policy component of our Reinforcement Learning framework. This approach could really improve how robots adapt and perform in complex, unpredictable environments.

**Presenter(s): Juan Hidalgo**
**Faculty: Evgeny Mavrodiev**
**Additional Authors: Douglas Soltis, Pamela Soltis**

## ***Title: What Molecular Data Tell Us About the Origin of the Newly Discovered Populations of Tragopogon miscellus (Asteraceae) from Wyoming State***

Tragopogon (goatsbeard) is a genus of flowering plants native to Europe and Asia. Three diploid (2n = 12) species (I. pratensis, I. dubius, T. porrifolius) were introduced into the Pacific Northwest of the USA in the early 20th century. Following hybridization and chromosome doubling, two unique allopolyploid species (2n - 24) were formed: I. mirus (parents T. dubius, I. porrifolius) and I. miscellus (parents T. pratensis, I. dubius). Herbarium records indicate the parents were first introduced into the area in the 1920s, suggesting these new polyploids are no more than ~100 years old. I. miscellus formed multiple times, sometimes with reciprocal parentage resulting in distinctive morphologies, with long and short ligules, respectively. Long-liguled I. miscellus occurs only in Pullman, Washington, and Sheridan, Wyoming. This project looks to answer whether these populations are of independent origin. To answer this, DNA was extracted from plant tissue, and PCR was performed to amplify the DNA. Cleaned PCR product was sequenced, and the sequencing results suggest that the Pullman and Sheridan populations are of separate origin. The geographic separation of these populations also supports separate origins of long-liguled T. miscellus. The study shows the importance of polyploidy as a driver of speciation and biodiversity.

**Presenter(s): David Hilferty**
**Faculty: Eleni Bozia**

## ***Title: Shifting Roman Views on Foreigners From Julius Caesar to Claudius***

The Roman Empire might be best known for its advancements and influence on Western civilization, but Rome was not built in a day and was largely facilitated by Roman expansion and colonization. This project explores the relation of Rome to foreign groups across time, pre- and post-colonization, as well as the use of "othering" terminology in extant literature, such as "barbaros." The word for non-Romans, which evolved from the original Greek term for non-Greeks, "βάρβαρος," first appearing in Homer and later in paradoxographical texts, evolved to take on a much more pejorative connotation. Broadly speaking, attitudes towards those in Gaul and Germany were most negative, first written about in Julius Caesar's The Gallic War. Over time, the intensely negative opinions he described would have been incorporated into the public consciousness. However, with expanded exposure to foreigners as part of the Roman Empire, attitudes shifted, as indicated in Tacitus 'Germania and Agricola. Though complex, the attitudes in these works not only evolve but also offer a more nuanced and occasionally positive portrayal of foreigners. From Caesar to Claudius, Rome's expansion increased the multiculturality of the empire and the city, altering the political and cultural landscape, and challenging Roman stereotypes of barbarity.

**Presenter(s): Cuong Ho**
**Faculty: Larissa Strath**
**Additional Authors: Lurrie Leon, Larissa J. Strath, PhD, Soamy Montesino-Goicolea, MD, Kristina L. Bell, Camesha Tate, MPA, Yenisel Cruz-Almeida, MSPH, PhD, Roger B. Fillingim, PhD, Barbara A. Gower, PhD, Zhiguang Huo, PhD, Ronald Cohen, PhD, Steven DeKosky, MD**

## ***Title: KIVA: Knee Pain, Integrated Vitamin Assessment, and Mental Health***

Objectives: While recent evidence suggests associations between diet pattern and pain outcomes, as well as diet pattern and cognitive outcomes, the influence diet pattern has on the relationship between pain and cognitive outcomes in tandem remains unexplored. Presently, this study aimed to explore preliminary associations between the dietary inflammatory index (DII), cognitive function (NIH Toolbox domains) and self-reported pain (severity and interference) data.

Methods: A subset (n=34) of participant data were used. Study personnel were trained to properly deliver a 24-hour Food Recall to participants. Nutrition reports containing detailed macronutrient and micronutrient intake were generated and used to calculate the DII for each participant. Pain severity and interference were captured using the Brief Pain Inventory (BPI). The NIH Toolbox Cognitive Battery was used to assess various domains of cognitive performance.

Results: The participants had an average age of 63.27 years old, were mostly female and non-Hispanic Black. Preliminary correlational analyses revealed significant associations (p<0.05) between DII score and self-reported pain severity, whereby as DII scores became more positive/proinflammatory, pain was reported to be more severe. This was primarily driven by females and those with high impact pain. The DII was also significantly correlated with several cognitive measures on the NIH toolbox: fluid cognition, and inhibitory control were significantly correlated whereby as DII score become more positive/proinflammatory, the cognitive scores tended to be worse. Pain severity, but not interference, was also associated with cognitive measures, including fluid cognition, total cognition, inhibitory control, picture card processing speed, picture sorting memory, whereby as self-reported pain scores increased, cognitive scores decreased.

Conclusions: These data support the relationship between pain and cognitive function and demonstrate the potential of diet pattern having impact on this relationship.

**Presenter(s): Leif Holmstrom**
**Faculty: Wenjun Xie**
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## Title: Evaluating Generative Models for Bioluminescent Enzyme Engineering

Enzyme engineering is typically led by the goals of altering catalytic activity, thermal stability, and other protein properties to generate novel/desirable enzymes. Such research has been dominated by rational design and directed evolution, contingent upon our abilities to suggest mutations from molecular interactions or chemically screen for desired traits, respectively. However, recent innovations in generative modeling may streamline the mutation identification process by incorporating evolutionary/structural data into predicting desirable point mutations. Three models- Maximum Entropy, Protein Language Model, and Protein Message-Passing Neural Network- were used in this experiment to generate 25 total mutations for the Firefly Luciferase (FLuc) enzyme. We chose FLuc because its ability to luminesce makes activity, stability, and spectral measurements easier to perform. We performed site-directed mutagenesis on FLuc-containing plasmids to generate a library of 25 mutants. Then, the enzymes were expressed and extracted for plate reader measurements of catalytic activity, thermal stability, and spectrum of light emission. This study is still ongoing, but it may yield desirable FLuc mutants with enhanced activity/stability or altered emission spectra. Further, our integration of generative AI into a biochemical engineering pipeline serves as a template for future research that bridges the computational-biochemical gap in enzyme research.

**Presenter(s): Sam Horton**
**Faculty: Drew Brown**

## ***Title: "An Emotional Liability": Examining Discussions of Caleb Williams 'Masculinity on X***

The rise of Black quarterbacks (QBs) in the National Football League (NFL) has challenged racial biases that have historically associated the position with whiteness and intellectual superiority. As these narratives shift, fan discourse plays a crucial role in shaping perceptions of Black QBs 'masculinity. This study examines how these narratives are negotiated on social media, using Chicago Bears QB Caleb Williams as a case study. Selected first overall in the 2024 NFL Draft, Williams has drawn attention not only for his athletic ability but also for his subversion of traditional masculine norms. His emotional expression—particularly his widely discussed postgame reaction to a USC loss—has sparked debate about acceptable behavior for a high-profile Black QB. Using X's advanced search feature, this study gathers fan posts from key moments in Williams 'college and professional career. A qualitative thematic analysis, grounded in a functionalist framework and Connell's theory of hegemonic masculinity (1987), identifies patterns in how his masculinity is framed online. This research explores how fans interpret Black QBs 'identities within a sports culture that has historically marginalized them. Ultimately, this exploration contributes to discussions on Black masculinity in sports, shifting leadership expectations in the NFL, and social media's role in shaping representation.

**Presenter(s): Madelyn Hotaling**
**Faculty: Sungyoon Jung**

## ***Title: Optimization of a Sequential Method for Microplastic Extraction from Environmental Samples***

Environmental contamination by microplastics (MPs) is well documented, with potential for large-scale contamination. Growing public concern over environmental, ecological, and human exposure to MPs has led to an exponential increase in publications, news articles, and reports. It is necessary to expand existing data on the contamination levels of MPs. Increasing quantification efforts have led to a variety of density- separation methods for plastic extraction. Recently, the potential for a sequential, or two-step, density separation to extract MPs from soil samples has been proposed. Here, we investigated a set of potential sequential step extraction methods, aiming to identify the sequence of density-separation chemicals that led to the highest efficiency. The selected sequential method of water and sodium polytungstate was then tested within spiked and environmental samples, proving the method retains acceptable recovery rates while potentially increasing plastic mass extracted from samples. This data indicated that a sequential extraction methodology was more effective in separating high-density and small-size MPs from samples. Data also showed that a greater mass of MPs was extracted from environmental samples when the sequential method was employed. This study aimed to introduce the optimized sequential methods for enhancing the accuracy of quantification data when extracting MPs from soil samples.

**Presenter(s): Zachary Hotchkiss**
**Faculty: Federico Pozzi**
**Additional Authors: Kinyata Cooper, Sean Forbes, Virginia Jackson, Kevin Farmer**

## ***Title: Regional Differences in Fatty Infiltration of the Supraspinatus Muscle in Chronic Rotator Cuff Tears***

Rotator cuff tears cause significant pain and impairment, with over 4.5 million Americans seeking care annually. Fatty infiltration, a marker of muscle degeneration, can be assessed using magnetic resonance imaging (MRI). In the supraspinatus muscle, fatty infiltration can be measured in the supraspinous fossa or muscle belly. This study investigates fatty infiltration in these regions in individuals with chronic full-thickness supraspinatus tears.
We recruited 22 participants with full-thickness supraspinatus tears (66.6 ±7.7 years; 7 males). Using a 3T MR Phillips system, Dixon images of the supraspinatus muscle were acquired in the sagittal plane, Y-shaped view. Three MRI slices were selected, and two regions of interest (ROIs) were drawn: one in the supraspinous fossa and one in the muscle belly. The ROIs were transferred to fat-discriminating slices and adjusted to capture fatty tissue in the fossa. Fat fraction (FF), [fat/(fat + water)x100], was calculated and averaged across slices. A paired t-test compared FF between regions ($\alpha = 0.05$).
Average FF was greater in the supraspinous fossa than the muscle belly (40.9% ± 0.1% vs. 27.8% ±0.1%, p < 0.001). This suggests the supraspinous fossa may be a more sensitive region for assessing muscle degeneration in rotator cuff pathology.

**Presenter(s): Brooke Hube**
**Faculty: Matthew Burns**
**Additional Authors: Swetha Jeyagopal, Gabrielle Summers, Barry Setlow, Jennifer L. Bizon, Matthew R. Burns**

## ***Title: Effects of Intra-striatal Injection of α-synuclein Pre-formed Fibrils in Young and Aged Rats***

Parkinson's disease (PD) is often characterized by cognitive and motor decline, particularly in aging populations. Lewy bodies, a main contributor to PD, are primarily composed of misfolded alpha-synuclein (a-syn) proteins. Previous research suggests that intra-striatal injection of a-syn pre-formed fibrils (PFF) in rat models can simulate PD pathology. Our research aims to study the effects of PFF injections in both young and aged rats. We hypothesized that aged rats injected with PFF would exhibit greater cognitive impairments compared to their younger counterparts and the monomer control groups. Fifty-seven male Fischer 344 x Brown Norway F1 hybrid rats (young: 6 months, aged: 22-24 months) were bilaterally injected with either a-syn PFF (experimental) or a-syn monomer (control) in the dorsal and medial striatum for a total of four injection sites. After two months of food restriction, the groups underwent a delayed working memory response task followed by a probabilistic reversal learning task. Then, we collected fMRI data at the 4-month post-injection checkpoint to assess brain network changes. Results show that aged PFF did significantly worse than other groups in week two of the working memory task. fMRI shows that young monomers rats typically have more connectivity, indicating that PFF impacts network connectivity.

**Presenter(s): Serena Huberty**
**Faculty: Matthew Hallett**

## ***Title: Comparing the Efficacy of Camera-Trap Photos and Videos in Identifying Animal Behavior***

Animal behavior is an important facet of a species 'natural history and ecology; however, behavioral data on wild animals is limited, often due to logistical constraints. Camera traps - motion-triggered cameras that can be set to capture photos or videos - are an increasingly common tool in ecological studies due to their convenience and ability to observe wildlife without the presence of a researcher in the field. Despite their use in elucidating many different aspects of ecology, there is a lack of research applying camera traps to the study of wild animal behavior. Employing a survey of paired camera traps, where one camera captures photos and the other, videos, this study aims to determine the utility of camera-trap videos and their advantages compared with photos in their ability to identify animal behavior across a range of taxa. The results indicate that while both types of collected camera-trap media can provide valuable behavioral information, videos are more effective in identifying specific behaviors. These findings can encourage ethologists to consider utilizing camera traps in future research studying the behaviors of wild animals, which is important in order to better understand their ecology and establish a baseline to compare with captive behavioral data.

**Presenter(s): Rebekkah Hudson**
**Faculty: Philip Janzen**

## ***Title: Twahamwe: Reconceptualizing Gikuyu Agency in the Creation of Forestry Scouting in Kenya***

British Lieutenant-General Sir Robert Baden-Powell's 1908 creation of Boy Scouting was introduced in Africa to convince native populations to support the colonial regime. However, Baden-Powell's intentional ambiguity exposed vulnerabilities, allowing local actors to appropriate this program. One example is the 'Men of the Trees': Gikuyu 'boys 'and men in Kenya Colony who served as Forest Scouts and Scoutmasters in the 1920s, following the Boy Scout principle of doing one good deed a day. As the previous coverage of this organization mostly centered on its colonial co-creator, the Gikuyu Forest Scouts 'distorted role must be reexamined. Rather than passive colonial subjects, Gikuyu were intellectuals drawing on indigenous philosophies to understand and adapt to their material realities. By emphasizing pre-colonial irua practices and the Gikuyu 'moral economy ' framework, I argue that the Men of the Trees was not merely a colonial invention, but a product born from the interaction between Gikuyu agency and colonial ideas.

**Presenter(s): Sean Huntington**
**Faculty: Ben Lewis**
**Additional Authors: Iqbal N, Phalin B, Hunt J, Solomon L, Janner A, Mathias K, Teitelbaum SA**

## ***Title: Early Initiation of Cannabis and Alcohol Impact Symptom Severity in Substance Use Disorder***

Background: It is well appreciated that early substance use confers significant risks for adulthood use problems, including development of substance use disorders (SUDs). However, whether early use constitutes a significance barrier/challenge to successful recovery remains unclear. The current study addresses this question by examining a sample of patients initiating treatment for SUDs.

Methods: Participants included 755 patients endorsing cannabis use and 1352 patients endorsing alcohol use prior to age 17. Craving, alcohol abstinence self-efficacy (AASE), and drug abstinence self-efficacy (DASE) were assessed. Linear models were employed to examine associations between age of use and craving/abstinence self-efficacy.

Results: Earlier alcohol use was associated with higher craving (p = .007) and lower abstinence self-efficacy for alcohol (p < .001) and drugs (p < .001). Earlier cannabis use was associated with higher craving (p = .003) and lower abstinence self-efficacy for drugs (p = 0.000). In contrast, no association was observed for alcohol self-efficacy (p = .277).

Discussion: Results indicated that earlier substance use was associated with more severe craving and less confidence in the ability to maintain abstinence. This data is consistent with literature indicating consequences of early use, but provides a novel contribution regarding symptom severity.

**Presenter(s): Nofel Iftikhar**
**Faculty: Naueen Chaudhry**
**Additional Authors: Tomas Potlach, Rafena Boyd, Jeremy Grant, Chelsea Salmon, Bishal Paudel, Johan Nordenstam, Naueen Chaudhry, Ellen M. Zimmermann**

## ***Title: Hispanic Patients with Inflammatory Bowel Disease who Underwent Bowel Resection are Less Likely to Receive All-Cause Opioid and Non-Opioid Agents Used in Multimodal Pain Management***

Effective pain management is critical for recovery after bowel resections and during inflammatory bowel disease (IBD) exacerbations. We studied disparities in pain medication use across demographic groups using a large database that includes robust patient-level electronic health record data from public and private health care systems in the southeastern US.

A retrospective analysis (October 2015–October 2024) utilized the Ii2b2 tool and OneFlorida Data Trust. Patients with >2 ICD- 10 CM codes for Crohn's disease or ulcerative colitis were identified. Bowel resections were determined using codes for enterectomies and colectomies. Medications assessed included opioids, NSAIDs, gabapentin/pregabalin, antispasmodics, TCAs, and SSRIs.

Post-resection analyses revealed racial/ethnic disparities in pain management. Hispanic patients were less likely than NHW patients to use weak opioids (OR 0.56, 95% CI [0.42, 0.74], p<0.0001), strong opioids (OR 0.41, 95% CI [0.33, 0.52], p<0.0001), gabapentin/pregabalin (OR 0.70, 95% CI [0.54, 0.90], p=0.005), antispasmodics (OR 0.73, 95% CI [0.54, 0.98], p=0.035), and SSRIs (OR 0.57, 95% CI [0.39, 0.82], p=0.002). TCA and NSAID use showed no significant differences.

These findings emphasize differences in all-cause pain management among IBD patients undergoing bowel resections. Hispanic patients consistently used fewer opioids and non-opioid pain medications compared to NHW patients, despite similar resection rates.

**Presenter(s): Chance Jackson**
**Faculty: Paul Fulda**

## ***Title: Development of a Compact Heterodyne Phase Camera***

Previous work in the University of Florida's LIGO group resulted in the development of a heterodyne phase camera, a device capable of measuring the transverse phase profile of optical components. Due to its applicability both in the optical sciences and beyond, work has begun to compactify the set-up (which currently occupies most of an optical bench) with the aim of producing a more portable version, which could conceivably be operated by non-experts in labs lacking the advanced equipment necessary to operate the full-scale device. Work in the Department of Physics, supported by the University Scholars Program, has been focused on the design and implementation of the compact device; both of its housing and optical path, and the locking procedures to generate the 10Hz beat-note necessary for phase imaging using an off-the-shelf infrared camera. A user interface for the device is also under development through collaboration with members of the Electrical and Computer Engineering department, which will allow non-expert users to operate the device. Once completed, the compact Heterodyne Phase Camera (cHPC) promises to be a highly commercializable product, as precision metrology instruments such as the cHPC enjoy a vast range of applications.

**Presenter(s): Julia Jamieson**
**Faculty: Julia Jamieson**
**Additional Authors: Natalia Andraka, John Sommerville, Olivia Phillips, Coy Heldermon**

## ***Title: Gastrointestinal Motility in Mucopolysaccharidosis Type IIIB Mouse Models***

Mucopolysaccharidosis type IIIB (MPS IIIB) is a fatal lysosomal storage disease caused by a mutation in the NAGLU gene, which causes a build-up of heparan sulfate in the body (Wagner & Northrup, GeneReviews, 2019). MPS IIIB has systemic manifestations in patients including gastrointestinal (GI) issues, causing incontinence, vomiting, constipation with abdominal pain, and diarrhea (Thomas et al., Journal of Clinical Medicine, 2021). The current optimal model for MPS IIIB is the NAGLU knockout (NAGLU -/-) mouse model (McCullough et al., Journal of Neurodevelopmental Disorders, 2024). This study investigates if NAGLU -/- mice experience GI abnormalities. NAGLU (-/-) and NAGLU (+/-) mice at 122-200, 200-267, and 280-333 days old were enrolled in the study. Mice were fasted for 6 hours, then gavaged with FITC dextran. Stool samples were collected hourly, weighed wet and dry, and then homogenized and measured spectrophotometrically. In this study, the dry-to-wet ratio of stool in NAGLU (-/-) and NAGLU (+/-) mice showed minimal differences. Numerical differences in timing of stool fluorescence passage were observed and statistical analysis is underway. By establishing that gastrointestinal differences manifest in NAGLU (-/-) mice, the mouse model could be used to study corrective treatments targeting dysfunction of the digestive system.

**Presenter(s): Olivia Janzen**
**Faculty: Harrison Clarke**

## ***Title: Mapping Tumor Metabolism in Lung Adenocarcinoma Using Spatial Imaging and Advanced Metabolomics***

Lung adenocarcinoma, the most prevalent and aggressive subtype of non-small cell lung cancer (NSCLC), remains a leading cause of cancer-related mortality, with an estimated 125,070 deaths projected in the U.S. in 2024. A critical challenge in NSCLC research is deciphering the molecular mechanisms that drive tumor progression, as these insights are essential for identifying predictive biomarkers and developing targeted therapies. To investigate the metabolic landscape of NSCLC, we employ a genetically engineered mouse model carrying KRAS and p53 mutations—alterations frequently observed in human lung cancers. Tumor initiation is achieved through viral adenocre delivery to lung epithelial cells, closely mimicking disease progression in patients. Longitudinal tumor growth is monitored using high-resolution, non-invasive imaging via a 7 Tesla magnetic resonance imaging (MRI) system, enabling precise visualization of tumor development and vascular remodeling. Following tumor assessment, mice are euthanized, and lung tissues are harvested for metabolomic analysis using matrix-assisted laser desorption/ionization-mass spectrometry imaging (MALDI-MSI). MALDI-MSI enables spatial mapping of metabolites directly within tumor sections, offering crucial insights into tumor-specific metabolic reprogramming. By integrating advanced imaging techniques with MALDI-MSI, this study provides a comprehensive approach to characterizing metabolic vulnerabilities in NSCLC, revealing potential biomarkers and novel therapeutic targets for future clinical intervention.

**Presenter(s): Marcos Javith**
**Faculty: Ana Maria Porras**
**Additional Authors: Karen Mancera Azamar**

## ***Title: Exploring the Effects of Environmental Variables on the Growth of Opportunistic Bacteroides Members***

Extracellular matrix (ECM) remodeling is increasingly recognized as a characteristic of inflammatory bowel disease (IBD) onset and progression. During active disease, the integrity of the intestinal epithelial barrier is compromised allowing commensal microbes to interact with the underlying ECM. Studies have shown increased proteolytic activity in IBD patients; this enzymatic activity has been attributed to host cell-derived proteases, but recent evidence suggests bacterial-derived contributions. Our previous findings have confirmed that multiple Bacteroides species, key members of the core human gut microbiota, can degrade ECM components. Notably, some Bacteroides fragilis (B. fragilis) strains contain a pathogenicity island that encodes for multiple proteases. We hypothesized that disease-like conditions may influence microbial growth and modulate the degradation of individual ECM components. To investigate this, we altered the pH of growth media and assayed degradation of a fluorescent elastin substrate using B. fragilis culture supernatants, respectively. Through absorbance based growth curves, multiple B. fragilis strains displayed more rapid growth under acidic conditions. Meanwhile, degradation of elastin was more pronounced in supernatants from bacteria grown in basic conditions. Physiologic pH fluctuations in the intestine may be influencing bacterial behavior and their enzymatic activity. These findings highlight potential microbe-ECM interactions contributing to tissue remodeling in IBD.

**Presenter(s): Nayla Jimenez**
**Faculty: Nancy Padilla-Coreano**
**Additional Authors: Albert Li, Charles Ye, Nancy Padilla-Coreano**

## ***Title: Dominance Influences Dopamine Dynamics in the Medial Prefrontal Cortex and Nucleus Accumbens During Social Interactions in Mice***

Dopamine (DA), a modulatory neurotransmitter, plays a distinct role in social interactions, motivated behaviors, and dominance hierarchy. Studies have linked dominance to increased DA release in the nucleus accumbens (NAc) and medial prefrontal cortex (mPFC) (Lozano-Montes et al. 2019). DA dynamics in the NAc encode motivation and valence during social interactions (Dai et al. 2022), while manipulation of D1 and D2 neurons in the mPFC induces dominance-related behavioral changes (Xing et al. 2022). While studies have examined DA responses in dominance and social interaction independently, their intersection in relation to social memory remains unexplored. We address this gap by recording DA dynamics in the NAc and mPFC during different social interactions in mice. Using dLight1.3b and in vivo fiber photometry, we recorded DA fluorescent transients in C57BL6 mice during behavioral assays testing DA responses to long-term (cagemate), short-term familiar (10-minute prior exposure), and novel social agents. Preliminary analysis suggests mPFC and NAc DA is influenced by social context, particularly familiarity and valence. Additionally, a bimodal distribution of preference for the long-term agent in a multi-agent social preference assay suggests dominance hierarchy influences social behaviors. These findings enhance understanding of dopamine's role in social memory and dominance.

**Presenter(s): Kevin Jin**
**Faculty: Miklós Bóna**

## ***Title: Exploring K-factor in Elo Rating Systems***

The Elo rating system, developed by Arpad Elo in the 1950s, measures the relative skill of players in a zero-sum game. It assigns each player a rating that is updated based off their performances against other players and their respective ratings. In this research, we investigate the K-factor, a variable responsible for determining the sensitivity of ratings to change. In practice, it is often set heuristically. However, we seek to optimize the K-factor by minimizing the expected error between true skill and skill estimated by rating. We aim to address three main questions. Firstly, how should a new player be assigned an initial rating? Secondly, how does the player's rating accuracy change after each game? Thirdly, what is the long-term accuracy of a player's rating after many games? We will also show evidence for our theoretical results using Monte Carlo computer simulation.

**Presenter(s): Samuel Johnson**
**Faculty: Glen Billesbach**

## ***Title: Self-Interpretive Freedom and the Politics of the Quantified Self***

The Quantified Self (QS) movement, encouraging individuals to track and analyze their lives through digital technologies, challenges Charles Taylor's notion of self-interpretive freedom. Taylor argues humans are unique as self-interpreting beings, shaping identities through temporal, dialogical, and embodied exercises. QS technologies—like Fitbit, smartwatches, or mood-tracking apps—may undermine this process by reducing complex experiences to quantifiable data. These algorithms prioritize precision and prediction, often at the expense of narrative-based self-understanding. As QS technologies predict behavior more accurately, individuals may become more predictable or manipulable. We must not relinquish creative, reflective practices, which are important for self-interpretation and political agency. While QS technologies promise self-knowledge, they risk limiting the interpretive freedom needed to construct meaningful identities. Relying heavily on algorithmic predictions may prioritize logic and isolation over narrative richness and diverse experiences. Yet whether these practices truly narrow our capacity for self-authorship or political action remains open. QS technologies are not inherently detrimental; used reflexively, they can support self-awareness and contribute to personal growth, well-being, and community. The challenge is how to effectively embrace technological advancements while sustaining our interpretive faculties.

**Presenter(s): Garrett Johnson**
**Faculty: Joanna Neville**

## ***Title: Queering Horror: Exploring the Connection Between Sexual Orientation and Recreational Fear***

Recreational fear—the voluntary experience of fear for fun—is the foundation of the haunted attraction industry, which attracts millions of patrons annually. However, research is only beginning to explore why people seek out these experiences. A recent survey from a local haunted house, The Gainesville Fear Garden, found that approximately 42% of its participants identified as lesbian, gay, or non-heterosexual. This overrepresentation suggests a unique connection between LGBQ+ individuals and haunted attractions, inspiring the present study. Using a feminist qualitative methodology, I conducted 23 semi-structured interviews with LGBQ+ identifying Gainesville Fear Garden participants. The interview data is currently being coded, but initial themes include feelings of presentness and groundedness in haunted spaces, the importance of Halloween season to LGBQ+ identity and community, the aesthetics of horror, and control as a crucial element underscoring the data. These preliminary findings suggest that haunted houses provide LGBQ+ individuals with a space for identity formation, coping and building resiliency, and community connection. Additionally, these findings highlight how haunted attractions serve as sites of queer agency, joy, and resistance within a heteronormative context.

**Presenter(s): Delaney Johnson**
**Faculty: Gabriele Belletti**

## ***Title: Unveiling the Italian Ecopoetic Voice: Translations and Transcultural Perspectives***

In an increasingly precarious world, the emerging field of environmental humanities can be used to better understand literary representations of relationships with and within the natural world. In particular, the genre of ecopoetry can help us to redefine our position as humans, to confront the realities distant from us but facing similar environmental problems. This research looks at Italian ecopoets that engage with environmental challenges, local identities, and peninsular landscapes. A section on Florida poets is included to create a transcultural comparison between these two peninsulas, taking into account their differences and similarities (for example, coastal overbuilding). In the article, analyses and translations of the main voices of both Italian and Floridian poets underline the common effort to increase the awareness of human's impact on natural landscapes. This approach represents an introduction of Italian ecopoets not yet known to an English-speaking audience, putting them in transcultural dialogue with a reality that is equally peninsular and at risk, like that of Florida.

**Presenter(s): Anna Jones**
**Faculty: Lindsey Rodriguez**

## ***Title: Relationship Trust as a Predictor for Satisfaction in Cohabitating, Queer Couples***

As societal attitudes surrounding relationships continue to evolve, cohabitation has become increasingly common among young adults, especially among LGBTQ+ individuals. However, research suggests that cohabiting relationships, particularly among same-sex couples, experience higher dissolution rates than married couples. This study examines the moderating role of relationship trust in the satisfaction of cohabiting LGBTQ+ couples. Using data from adults across the United States (n=214), this study compares relationship satisfaction between same-sex and different-sex cohabiting couples, with a focus on the perceived level of trust. The independent variables include couple type (same-sex vs. different-sex) and trust level (high, moderate, low), while the dependent variable is relationship satisfaction. It is hypothesized that LGBTQ+ cohabiting couples with high levels of trust will report greater relationship satisfaction compared to those with lower levels of trust, potentially aligning with satisfaction levels observed in different-sex couples. Findings may highlight trust as a key predictor of relationship success, reinforcing the idea that relationship dynamics, rather than sexual orientation, play a central role in stability and satisfaction. This research contributes to a deeper understanding of the factors that promote healthy, long-term relationships among LGBTQ+ individuals.

**Presenter(s): Nicholas Joyner**
**Faculty: Marit Østebø**

## ***Homelessness, Mental Health, and Barriers to Care in Gainesville, FL***

Homelessness continues to rise in the US, and many have declared homelessness a national public health issue. Previous research has suggested a bidirectional relationship between homelessness and mental health. The interaction of mental illness and homelessness exacerbates their effects, complicating individuals' efforts to escape homelessness and impeding progress in addressing mental health challenges. This study explores this self-reinforcing cycle in a local narrative-driven context, identifying barriers to mental healthcare access among homeless individuals and common themes in the lived experiences of this demographic.

This ethnographic study collected data through semi-structured interviews with homeless individuals experiencing mental illness and local psychiatry providers serving homeless patients. Additional data was gathered through participant observation and surveys at a local community shelter and free clinic. The fieldnotes and transcribed interviews were analyzed together to identify common themes in the experience of homeless individuals suffering from mental illness and the barriers they face in accessing care. Preliminary analyses identified transportation issues and substance abuse as the most frequently reported barriers. These findings contribute to discussions on improving psychiatric care accessibility and developing broader strategies to address homelessness in our community.

***Presenter(s): Yousef Bani Ahmad***
***Faculty: Yousef Bani Ahmad***

## *Project 3D Bioprinted Approach to Biofilm-based Corrosion Control Coatings*

This research proposes a 3D bioprinted biological coating system structurally designed to effectively inhibit corrosion on metal surfaces. Corrosion poses a significant economic burden, costing the United States nearly half a trillion dollars annually. Traditional chemical coatings used for corrosion mitigation are costly, environmentally hazardous, and often require frequent reapplication. Microbiologically influenced corrosion inhibition (MICI) presents a promising solution, as biofilms can provide protective barriers through self-healing and bioactive properties. However, translating MICI into a practical, scalable application requires precise manufacturing techniques that maintain biofilm integrity and functionality. Layer-by-layer biofilm prototypes will be developed using extrusion-based 3D bioprinting with a focus on refining bioink composition, adjusting factors like hydrogel viscosity, bacterial cell density, and extracellular polymeric substance (EPS) concentration to achieve high print fidelity and structural stability. Prototyping efforts are centered on ensuring that printed biofilms adhere well to steel surfaces and retain their corrosion-inhibiting properties over time. Results from initial prototypes indicate that printed biofilms can reduce corrosion rates on steel by over 50% and maintain their structure and function in accelerated corrosion tests for up to eight weeks. This study demonstrates that 3D bioprinting can provide a scalable platform for biofilm-based corrosion inhibitors, offering a viable, environmentally friendly alternative for industrial applications. In conclusion, this research advances the use of 3D bioprinting in developing biofilm coatings and opens pathways for broader adoption of MICI in corrosion control across infrastructure and manufacturing sectors.

***Presenter(s): Joseph Benjamin***
***Faculty: Chang Zhao***

## *Project Modelling spatial relationships and disparities in the supply and flows of aesthetic green views as a cultural ecosystem service*

Aesthetic green views (AGV) is a cultural ecosystem service (CES) that can improve quality of life for human beneficiaries. However, the delivery of AGV is dependent on both the biophysical supply and actual flows, or the use of services by human beneficiaries.. A comprehensive understanding of the spatial dynamics and relationships among street-level AGV supply and flows across a city is important for reducing disparities in residents' access to these benefits. The overall objective of this study is to quantify and analyze the spatial relationships and disparities in the supply and flows of AGV in an urban environment. A street-level AGV index was measured in the city of Tampa, Florida by applying an image segmentation model to Google Street View imagery. Cell phone human mobility data suggests that realized flows to AGV were spatially mismatched with the supply in resident's home neighborhoods, highlighting the importance of urban greening across land use types. Modelling AGV supply points to clear disparities between socioeconomic groups, though the flow patterns suggest that visited access may be a key tool in reducing such inequities. Ultimately, the study aims to guide urban planners' integration of vegetation in the streetscape beyond traditional park settings.

***Presenter(s): Caelan Brindise***
***Faculty: Dikea Roussos-Ross***

## *Project Impact of Insurance Type of Frequency of Emergency Room Visits in the Postpartum Period*

Overutilization of the Emergency department (ED) occurs among those who are underinsured or uninsured. Postpartum women are recommended to follow up, this study investigated ED utilization patterns among postpartum women based on insurance type.
The study design is cross-sectional. Participants were previously enrolled in a postpartum digital health intervention known as "MOMitor™". Data collection consisted of retrospective chart review of those that completed the intervention from 2021-2023. The outcome of interest was presence of at least one ED visit. The independent variable of interest was insurance status and type (Medicaid, private,
uninsured). We calculated proportions of ED visits by insurance type and analyzed differences across insurance types via chi square testing where
alpha=0.05. A total of 912 charts were reviewed, 161 charts were excluded due to undocumented insurance type, leaving 751 included in the
analysis (412 insured by Medicaid, 322 by private insurance, and 17 uninsured). 108 of Medicaid, 52 of private, and 4 of uninsured insurance types had at least 1 ED visit in 12 months postpartum, indicating privately insured women had statistically significant fewer ED visits (p=0.005) relative to those with medicaid and the uninsured. This study did not consider social determinants of health.

***Presenter(s): Mia & Selora  Comas & Langston***
***Faculty: Kimberly Wiley***

## *Project Times of Uncertainty: Nonprofits' Response to Obstructive Policies*

Since 2022, nonprofits serving vulnerable populations have faced increasing legislation that targets the legitimacy of their programming. Under recent political polarization, this problem has only worsened, leaving life-saving nonprofit programming at risk of closure. How do the dynamics between state actors and nonprofits serving vulnerable populations serve to challenge, maintain, or strengthen life-saving programming and the populations served? To better understand how nonprofits responded to these challenges, critical theory was applied. Data collection consisted of two parts: interviews and public policy tracking. Nonprofit leaders were interviewed through zoom calls, and the data from these interviews was analyzed using a grounding theory coding schema. Additionally, state-level public policy tracking and analysis was employed in order to pair the information with topics discussed in the interviews. The preliminary findings indicate that (1) nonprofits struggled to maintain programming, (2) the sector observed foundational changes in operations, and (3) the policies designed to target specific groups sometimes mistargeted other groups, including those originally promoting the harmful policy. Our continued research will serve to inform researchers of the harmful impacts legislation can have on nonprofits and as a guide for the operation of nonprofit organizations under an increasingly polarized and uncertain political climate.

***Presenter(s): Tesslyn Dahl***
***Faculty: Sarah McKune***

## *Project Exploring the Feasibility and Sustainability of Increasing Egg Consumption in Rwanda*

Child malnutrition is a major problem in sub-Saharan Africa, where limited dietary diversity means most pregnant women consume nutritionally inadequate diets. Stunting (short height for age) among children under 5 is an issue in Rwanda, with one-third of children stunted due to poor maternal health. Increased Animal Source Food (ASF) consumption and improved child health outcomes is known; ongoing research tests the benefit of egg consumption among pregnant women. However, Rwanda's ability to meet demand for eggs in the event of positive ongoing research is unknown. Three data collection methods were used: comprehensive document review; meeting of key stakeholders in the Deux Oeufs Project, and semi-structured interviews with targeted stakeholders and community members. A prominent barrier to increasing production across all levels is a lack of existing market demand for eggs that satisfies the cost of increased output. Women show willingness to eat eggs upon understanding their nutritional impact, but many view them as a product to be sold and not for personal consumption; others indicate economic barriers to explain not consuming eggs. To effectively utilize eggs to combat stunting, there is need to generate sufficient demand in poor communities by demonstrating that the benefit of consumption outweighs monetary value.

***Presenter(s): Teagan Frazier***
***Faculty: Christine Angelini***

## *Project Sand source and fertilizer addition effects on the growth of two foundational dune grasses: implications for restoration*

A common strategy for restoring coastal dunes involves adding sand to create an elevated berm and then planting foundational grasses, often with fertilizer, that mediate dune geomorphic evolution. The sand used for dune construction is often sourced locally by dredging nearshore or offshore deposits. In Florida, limited supply of these deposits has led to the use of alternative sand sources, including sand extracted from upland mines. However, no studies have examined how sand source may interact with fertilizer addition to influence transplanted dune grass growth. We conducted a two-month greenhouse experiment to determine how the two most commonly deployed foundational dune grasses, Uniola paniculata (sea oats) and Panicum amarum (bitter panicum), performed in sands from different sources (nearshore, upland, and native) and under control (ambient) and fertilizer addition scenarios. Fertilizer addition caused bitter panicum to produce more biomass than sea oats, while under ambient conditions neither species grew appreciably. However, sea oats did not grow appreciably in upland sand even with fertilizer addition. Through sediment analyses, we found that native sand had the largest grain size, fastest infiltration rate, highest water holding capacity, and the most naturally occurring nutrients including carbon, nitrogen, and organic matter. Upland sand had larger grain sizes and faster infiltration than nearshore sand but the lowest levels of all nutrients, likely contributing to the observed plant growth differences. These findings suggest that dune restoration projects using upland sand may benefit from planting bitter panicum with fertilizer.

***Presenter(s): Divya Huilgol***
***Faculty: Dr. Paramita Chakrabarty***

## *Project Exploring the Colocalization of ApoE isoforms with Amyloid Beta Deposition within the SAA-APP model*

Alzheimer's disease (AD) is the most common form of dementia, affecting nearly 7 million elderly Americans. A neuropathological hallmark of AD patients are extracellular deposits of amyloid-beta (Aβ) peptide in the brain. These Aβ deposits associate with many proteins, a major one being Apolipoprotein E (APOE). There exist three human APOE isoforms, with the E4 isoform increasing AD risk, E2 isoform being protective, and E3 being the reference allele. In our laboratory, we have generated mouse models that are humanized for Aβ and the three human APOE isoforms, referred to as SAA-APPxAPOE4, SAA-APPxAPOE3 and SAA-APPxAPOE2. We have aged these mice models and conducted immunohistochemical analyses, showing that SAA-APPxAPOE4 mice have significantly higher Aβ (1-way Anova, p<0.001 compared to APOE2 and APOE3). Additionally, deletion of the APOE gene prevents Aβ deposition, indicating that APOE-Aβ interaction regulates Aβ deposition.To characterize this interaction, we performed used Qupath colocalization studies and showed that APOE2 has lower propensity than APOE4 to associate with Aβ deposits (t test, p=0.014). Thus, we hypothesize that APOE4 acts as a pathological molecular chaperone of Aβ. In future studies, we will investigate if similar pathologic chaperone proteins related to the APOE family are involved in promoting Aβ deposition in AD.

***Presenter(s): Claudia-Elena Johnson-Cuellar***
***Faculty: Michelle Phillips***

## *Project Exploring the Relationship Between Climate Change and Human Trafficking*

Climate change is a pressing global challenge, disrupting environmental, economic, and social stability. This paper examines the relationship between climate change and human trafficking, investigating how extreme weather events caused by environmental disruptions heighten the risk of exploitation. Using a sample of 98 countries from 2013 to 2020, an Ordinary Least Squares (OLS) regression analysis is conducted to isolate the effect of heat waves, storms, and wildfires on the number of detected human trafficking victims, while controlling for total population, GDP per capita, unemployment, government effectiveness, and refugee population. The results indicate that heat wave events are a statistically significant predictor of detected human trafficking victims, while storm and wildfire events do not exhibit a statistically significant relationship. These findings suggest that heat waves are expected to create conditions conducive to exploitation by exacerbating economic instability and resource scarcity. This emphasizes the urgent need for comprehensive policies that address both the environmental and socioeconomic drivers of human trafficking. As climate conditions worsen, communities may face increasing socioeconomic instability, heightening their vulnerability to exploitation, and thereby posing a critical threat to human rights.

***Presenter(s): Aishwarya Kandukuru***
***Faculty: Abhishek Kandukuru***

## *Project A disproportionality analysis of cardiac adverse events associated to citalopram treating Alzheimer's Disease in the FDA Adverse Event Reporting System (FAERS)*

Background: Alzheimer’s disease (AD) is a progressive neurodegenerative disorder characterized by amyloid-beta (Aβ) plaque deposition, tau neurofibrillary tangles, and synaptic dysfunction, leading to cognitive decline and neuropsychiatric disturbances. Depression and anxiety are highly prevalent in AD, with selective serotonin reuptake inhibitors (SSRIs) frequently prescribed to manage these symptoms. Citalopram, a widely used SSRI, has shown potential in reducing Aβ aggregation in preclinical models, suggesting a possible disease-modifying effect in AD. However, concerns persist regarding its cardiovascular safety profile, particularly its propensity to induce QT prolongation and arrhythmias. Elderly patients with AD are particularly vulnerable to cardiovascular complications due to underlying autonomic dysfunction, polypharmacy, and age-related cardiac remodeling. This study aims to assess the pharmacovigilance signal strength of citalopram-associated cardiovascular adverse events (AEs), stratified by age and gender, to evaluate its safety profile in populations at risk, including those with AD.

Methods: Data Sources: Spontaneous adverse event reports from pharmacovigilance databases were analyzed. Signal Detection Metrics:Reporting Odds Ratio (ROR): Quantifies the association between citalopram and cardiovascular AEs compared to other drugs, Proportional Reporting Ratio (PRR):Assesses the relative frequency of adverse event reporting.
Information Component (IC) with 95% Credibility Intervals (CIs): Bayesian approach to evaluate statistical signal strength. Stratification Analysis: Age Groups: Pediatric (0–18 years), Adult (19–65 years), Elderly (>65 years, including AD patients). Gender-based risk assessment. Temporal Analysis: Evaluation of IC fluctuations over time to assess emerging trends in cardiovascular AEs.

Results: Strong signal detection for major cardiovascular AEs, with highest ROR and IC values observed in: QT prolongation (ROR: 11.37; IC: 11.18) – Highest signal, suggesting a strong pharmacovigilance alert. Cardiac arrest (ROR: 3.71; IC: 3.67) – Significant association, particularly in elderly patients. Tachycardia (ROR: 2.99; IC: 2.97) – Moderate risk of arrhythmic events. Age Stratification: Elderly patients (>65 years, including those with AD): Higher risk of QT prolongation and cardiac arrhythmias, likely due to age-related cardiac remodeling, reduced drug metabolism (CYP2C19), and polypharmacy. Adults (19–65 years): Highest signal strength, warranting caution in those with preexisting cardiovascular conditions. Pediatrics (0–18 years): Limited data but potential concerns due to off-label SSRI use in younger populations. Temporal Trends: IC fluctuations indicate evolving pharmacovigilance signals, with peaks correlating to regulatory warnings and clinical awareness of citalopram's proarrhythmic effects.

Discussion & Conclusion: Clinical Implications: Citalopram's proarrhythmic risk necessitates dose adjustments and ECG monitoring, particularly in elderly AD patients. Potential neuroprotective effects in AD must be weighed against cardiovascular risks, especially in frail populations. Pharmacokinetic variability in CYP2C19 metabolism may contribute to interindividual differences in drug response and toxicity. Regulatory & Pharmacovigilance Considerations:
Findings support current dose limitations (e.g., max 20 mg/day in elderly patients) and contraindications in those with congenital long QT syndrome.
Continued post-marketing surveillance is essential to refine risk-benefit assessments in AD and geriatric populations.
Future Directions: Further randomized controlled trials (RCTs) and observational studies are needed to clarify citalopram's long-term safety and efficacy in AD.
Pharmacogenetic studies exploring CYP2C19 polymorphisms may enable personalized SSRI therapy to optimize safety in elderly and AD patients.

***Presenter(s): Pallavi Kantipudi***
***Faculty: Crystal Bishop***

## ***Project Preschool Teacher and Family Collaboration to Support Children's Learning Through Embedded Instruction:***

A Case Study
Embedded Instruction for Early Learning (EIEL) is a multi-component intervention focused on embedding learning opportunities within children's typical routines across school, home, and community environments. Research on one component of EIEL, called Tools for Teachers, has shown that when preschool teachers implement EIEL as intended for children with identified disabilities, children experience enhanced developmental and learning outcomes compared to children whose teachers do not implement EIEL. Tools for Families (TFF) is a new component of EIEL developed to promote teacher-family partnerships focused on EIEL. TFF includes family-centered practices focused on EIEL and a 5-Question Embedded Instruction Framework with tools to guide shared decision-making about EIEL. Teachers receive professional learning supports to enhance their use of EIEL in the classroom and TFF with families. We will present a case study using a mixed methods design to examine one preschool teacher's use of EIEL, including Tools for Teachers and TFF, with two children with disabilities and their families. Data were drawn from a Development and Innovation research project funded by the US Department of Education. Data analyses are in progress. We are examining the teacher's use of family-centered practices focused on EIEL, family self-efficacy, and teacher and caregiver implementation of EIEL over the course of the school year in which the teacher received professional learning supports focused on Tools for Teachers and TFF. Results of the case study will be presented, and implications will be discussed during the presentation.

***Presenter(s): Serina Kaochari***
***Faculty: Chun Nin Wong***

## *Project Taste sensitivity and consumption responses to sucrose and artificial sweeteners in Drosophila melanogaster and the impact of the microbiome*

Artificial sweeteners may alter taste sensitivity and feeding behavior, yet their effects compared to natural sugars, along with the potential influence of the gut microbiome, remain unclear. Using Drosophila melanogaster and its microbiome as a model system, this study examines how the fly responds to erythritol (Truvia), sucralose (Splenda), and sucrose in terms of taste sensitivity and consumption. The effect of the microbiome on the response to artificial sweeteners was tested by comparing flies with a conventional gut microbiome to axenic flies without a microbiome. Taste sensitivity was assessed using the Proboscis Extension Response (PER) assay, while the Capillary Feeder (CAFE) assay measured consumption. PER results revealed that sucrose elicited a significantly stronger taste response than Splenda or Truvia, with higher concentrations leading to increased response rates. CAFE assays indicated an overall aversion to consuming Truvia. Significant microbiome interactions were observed in the Truvia trials, with axenic flies consuming more of certain diet choices compared to conventional flies. Although no microbiome effects were found in the Splenda trials, axenic flies in the Splenda treatment consumed significantly more yeast than those in the sucrose treatment, potentially compensating for the lack of calories in artificial sweeteners.

***Presenter(s): Neha Kashyap***
***Faculty: Marc Chevrette***

## *Project Fueling Future Antibiotic Discovery: An Analysis of Taxonomic and Biosynthetic Diversity in Antimicrobial-Producing Soil Bacterial Isolates*

Antimicrobial resistance is predicted to kill 10 million people annually by the year 2050. To make matters worse, our supply of effective antibiotics dwindles as poor antibiotic use practices have made multi-drug-resistant infections more rampant. More than 80% of clinical antibiotics are compounds produced by soil bacteria, and there are many more unknown pathogen-inhibiting compounds encoded by clusters of co-localized genes (i.e., biosynthetic gene clusters) in soil bacterial genomes. To find novel antimicrobial drug candidates using a genome-level approach, biosynthetic gene clusters (BGCs) can be identified and compared against a database of known BGCs to infer what secondary metabolite(s) may be encoded. This study aims to uncover the diversity of these BGCs and characterize evolutionary patterns of BGC distribution across a phylogeny of 305 soil-derived bacterial isolates. BGCs were predicted through antiSMASH and taxonomic classification was conducted via GTDB-tk. OrthoFinder was used to perform a multi-locus sequence analysis and phylogenetic tree construction. BiG-SCAPE was used to perform biosynthetic gene similarity clustering. The results of this investigation, an annotated phylogeny with mapped BGC data and a BGC similarity network, will provide future antibiotic discovery researchers with deeper genetic insight into the biosynthetic potential and patterns for the investigated bacterial strains.

***Presenter(s): Katya Kasprzak***
***Faculty: Ann Wilkie***

## *Project Experiential Learning in the Soil Sciences: Connecting Education, Management, and Outreach*

Soil is the medium that connects all life on Earth, allowing for thousands of years of agricultural productivity. Teaching about soil sciences is important, but often does not receive the attention it deserves. Many land-grant institutions lack dedicated soil science programs, with 36% not offering one, and 24% offering fewer than two courses in the subject.

Soil pits represent an underutilized but valuable resource for hands-on, field-based learning, offering students practical exposure to soil properties and management. When properly integrated into curricula and outreach efforts, these pits can provide real-world learning opportunities.

This study aimed to develop a management and educational plan for the soil pit at the University of Florida's Bioenergy and Sustainable Technology (BEST) Lab. It involved documenting soil pit profiles and creating a management strategy that included erosion control through native grasses and compost mulching. A learning plan was designed to engage students and visitors in experiential soil science education. Outreach efforts extend to local schools and university clubs, using educational resources and soil judging workshops. The plan's effectiveness will be evaluated through feedback from students and the community, with future development of another soil pit after mapping local soil types.

***Presenter(s): Ren Katz***
***Faculty: Kendal Broad***

## *Project Young Adult Trans & Queer Activist Response to Florida Anti-LGBTQ+ Legislation*

Since 2022, an unprecedented amount of anti-LGBTQ+ legislation has passed in the US, especially Florida. Damage-centered research on the effects of this legislation neglects the agency of young queer adults, thus this project centers the voices of those being targeted and their resistant responses. The purpose of this study is to learn from TQ (trans and queer) young adults in Florida about their activist responses in the anti-LGBTQ+ legislative moment of 2022-2024. I co-conducted 13 formal, in-depth, active interviews with trans & queer activists ages 18-25 throughout the state of Florida. Interviews have been transcribed and coded using a tiered approach from open to more focused codes. I have identified how maintaining momentum while asserting agency as a TQ youth activist is particularly challenging in this political moment. My analysis parses out differences in theories of change and tactics amongst TQ activists (often debated in response to the levels of state repression they have experienced), overwhelm balancing responsibilities as a student and an activist, and pervasive issues with coalition building. When focusing specifically on trans activism, these are exacerbated by inner conflict about leaving Florida versus staying and fighting while also feeling constricted and damaged by constructions of trans activists.

***Presenter(s): Madelyn Kavanagh***
***Faculty: Andrew Wolpert***

## *Project Rhetoric and Evidence in Athenian Law: Strategies in Contract Disputes Involving Foreign Litigants*

This research examines how ancient Athenian litigants employed laws and documentary evidence in forensic speeches. By analyzing three extant legal speeches—Demosthenes 32 (Against Zenothemis), Isocrates 17 (Trapeziticus), and Hyperides 3 (Against Athenogenes)—the study investigates rhetorical strategies in legal cases involving foreign litigants. Each speech concerns allegations of fraud in commercial transactions, with at least one party being a non-citizen—in order to assess whether anti-foreign sentiment was prevalent in Athens. The research employs a comparative case-study approach, identifying patterns in litigants' use of "artless" proofs (documentary evidence) and "artful" proofs (characterization, ethical appeals, etc.). By isolating variables across similar cases, this study explores whether litigants adapted their strategies based on the nature of the dispute or the citizenship status of those involved. Findings suggest that while appeals to law and precedent were fundamental, litigants strategically emphasized credibility and morality in ways that may have been influenced by biases against foreigners. This research contributes to broader discussions on law, rhetoric, and social identity in classical Athens.

***Presenter(s): Emma Kavanaugh***
***Faculty: Larry Page***

## *Project Deciphering morphological and molecular variation in a stone loach, Schistura jarutanini*

The taxonomic identification and distribution of fishes in the Mae Klong River basin in Thailand has been a focus of the Florida Museum's Ichthyology Division for several years. This study examines Schistura jarutanini, a species of stone loach found in the river basin. The original description of S. jarutanini described cave-inhabiting specimens from the Mae Nam Kwae Yai, a major tributary of the Mae Klong River. Notable characteristics of this species included reduced or absent eyes, a lack of dark pigment, and the presence of suborbital flaps in both sexes. However, limited information was provided in the original species description, and more recent collections indicate that S. jarutanini is only rarely found in caves. Recent collections in the Mae Klong and Ataran River basins provide a more complete description of the species, its habitat, and its distribution. Among species for which genetic data are available, S. jarutanini is hypothesized to be mostly closely related to Schistura mahnerti, another Nemacheilidae species found in the region.

***Presenter(s): Ania Kelegama***
***Faculty: Brian Law***

## *Project Blocking the Oncogenic Wnt Signaling Pathway for Cancer Therapy Using a Novel Small Molecule*

Colorectal and breast cancer are leading causes of cancer-related deaths in men and women, with many cases driven by overactive Wnt/β-catenin signaling, which fuels tumor growth through cell growth, development, and stem cell renewal. Despite its importance in cancer progression, effective inhibitors of this pathway remain limited, highlighting an urgent need for novel therapeutic strategies. A critical component of the Wnt/β-catenin pathway is the receptor proteins LRP5/LRP6, which must be properly folded and functional to activate the pathway. Our laboratory identified disulfide disrupting agents (DDAs), which inhibit protein disulfide isomerases (PDIs), including AGR2/AGR3, ERp44, and PDIA1. DDAs also disrupt the folding of LRP5/LRP6, effectively shutting down Wnt signaling. MESD, a ~30 kDa chaperone protein, is essential for the proper folding and transport of LRP5/LRP6. Immunoblot analysis shows that DDA treatment increases levels of a ~80 kDa MESD immunoreactive band. It is therefore possible that PDIs regulate LRP5/LRP 6 folding indirectly by regulating the disulfide bonding state of MESD. This study aims to identify the ~50 kDa protein disulfide bound to MESD, which correlates with its inactivation after DDA treatment, and demonstrate the functional importance of the interaction of MESD with this unknown protein.

***Presenter(s): Kaitlyn Kelly***
***Faculty: Jennifer Nichols***

## *Project Impact of Carpometacarpal Osteoarthritis on Range of Motion and Movement-Evoked Pain During a Jar Twist Task*

The first carpometacarpal (CMC) joint enables dexterous thumb movements. Osteoarthritis (OA) at this joint affects 85% of postmenopausal women, often impairing function and quality of life. This study examined range of motion (ROM) and movement-evoked pain (MEP) in women with CMC OA during maximal jar twist, a task commonly reported as challenging.

Participants were classified by radiographic severity using the Eaton-Littler scale: early-stage (Stages I-II) and end-stage (Stages III-IV) CMC OA. We hypothesized that women with end-stage CMC OA would exhibit (i) decreased ROM and (ii) increased MEP. Six women (three per group) completed three trials of maximal jar twist while motion capture data was collected. MEP was assessed using a 101-point Visual Analog Scale before, during, and after each trial. Inverse kinematics was applied to motion capture data to obtain joint angles.

ROM was analyzed for three thumb joints: CMC, metacarpophalangeal (MCP), and interphalangeal (IP) joints. Surprisingly, women with end-stage CMC OA exhibited greater ROM in CMC, MCP, and IP flexion, while women with early-stage CMC OA showed greater ROM in CMC abduction. As expected, MEP was higher in end-stage compared to early-stage CMC OA.

These findings highlight the importance of assessing both pain and movement in CMC OA.

***Presenter(s): Edward Kempa***
***Faculty: Daniel  Wiechmann***

## *Project Explainability, Accuracy, and Generalizability in ADHD Detection from Social Media Data*

Attention-deficit/hyperactivity disorder (ADHD) is a prevalent mental health condition affecting both children and adults, yet it remains severely underdiagnosed. Recent advances in artificial intelligence, particularly in Natural Language Processing (NLP) and Machine Learning (ML), offer promising solutions for scalable and non-invasive ADHD screening methods using social media data. This paper presents a comprehensive study on ADHD detection, leveraging both shallow machine learning models and deep learning approaches, including BiLSTM and transformer-based models, to analyze linguistic patterns in ADHD-related social media text. Our results highlight the trade-offs between interpretability and performance across different models, with BiLSTM offering a balance of transparency and accuracy. Additionally, we assess the generalizability of these models using cross-platform data from Reddit and Twitter, uncovering key linguistic features associated with ADHD that could contribute to more effective digital screening tools.

***Presenter(s): Savanah Kendrick***
***Faculty: Joann Mossa***

## *Project Historical Trends in Sandbar Size Along the Upper Escambia River, FL*

This study investigates sandbar morphology along the Upper Escambia River in Northwest Florida, focusing on the impact of Big Escambia Creek, a tributary that diverted into sand and gravel pits in 1978, introducing significant sediment into the river. A restoration project in 2005 returned the creek to its longer pre-avulsion course. Using historic and current aerial imagery and USGS flow and stage data, we address two research questions: 1) How does sandbar area differ historically versus recently for the same flow level? 2) How does sandbar area change as water level varies, and what can be learned from the residuals?
Sandbars were digitized from aerial photography in ArcGIS Pro using pixel values, from the Florida state line to 36 km north of the Hwy 90 bridge at Escambia Bay. Key findings from paired imagery sets at similar flows showed that sandbars downstream were smaller than upstream bars and that downstream bars continually increased over time. The relationships between stage levels and sandbar areas are also imperfect, with positive residuals departing from trendlines aligned with major flood events. The results give insights into the dynamic nature of sandbars on the Escambia River, and how they have changed concerning anthropogenic impacts.

***Presenter(s): Delaney Kennedy***
***Faculty: Frederick Kates***

## *Project Addressing Rural Diabetes Disparities in Florida: The Potential of the InPen Smart Insulin Pen System*

Background: Rural Florida experiences a 17% higher diabetes prevalence compared to urban areas, exacerbated by limited healthcare access and inefficient insulin delivery methods. The state's diabetes-related costs exceed $25 billion annually, with inadequate insulin delivery contributing to poor management and complications. This study explored the potential of the InPen, a smart insulin pen, to enhance diabetes care in rural Florida by improving treatment efficacy, access, and cost-effectiveness.

Methods: County-level data from the Florida Department of Health and USDA Rural-Urban Continuum Codes (RUCC) were used to assess rural diabetes prevalence. Geographic Information System (GIS) mapping identified the most affected regions. A comprehensive literature review analyzed InPen's effectiveness, cost implications, and potential impact while reviewing the burden of diabetes in rural Florida.

Results: Traditional insulin delivery methods, such as vials and syringes, present challenges in rural areas, including higher medication error rates (24.7% omissions, 13.9% wrong drug, 13% overdoses) and difficulties achieving consistent glycemic control. InPen offers a more user-friendly alternative, reducing insulin errors through dose tracking, reminders, and mobile app integration. While not directly compared to traditional methods in error rates, InPen's features decrease user errors. It is also more cost-effective than insulin pumps, though success depends on insurance, digital literacy, and telehealth infrastructure.

Conclusion: InPen shows promise in improving diabetes care in rural communities, potentially addressing barriers to treatment access and quality. With further research and expanded access, smart insulin pens can help reduce health disparities and improve diabetes outcomes in resource-limited settings.

***Presenter(s): Payson Keown***
***Faculty: Brent Sumerlin***

## *Project Leveraging hydroxyl-yne 'click' chemistry as a versatile post-polymerization method to synthesize covalent adaptable networks*

Polymer-based products are important in commercial use but often need to compromise on either durability or degradability. In search of novel materials, post-polymerization modification (PPM) can be used to synthesize polymers that cannot be synthesized by direct polymerization. 'Click' reactions that undergo dynamic exchange have been utilized to afford covalent adaptable networks (CAN) through PPM techniques, relying on dynamic covalent bonds to allow structural changes when exposed to external stimuli. CANs have the processibility of thermoplastics while also having the durability of thermosets because of their crosslinked structure. In this project, we aim to utilize the recently discovered hydroxyl-yne click reaction as a facile PPM strategy to afford dynamic materials. In the first aim, a variety of polymers derived from vinyl monomers will be synthesized to bear pendent alkynes. The pendent alkynes will be targeted with a library of alcohols and phenols under physiological conditions to demonstrate the versatility of the approach. For the second aim, CANs will be synthesized by leveraging the dynamic phenol-yne 'click' reaction. The vinyl-derived polymers bearing pendent alkynes will be targeted with multifunctional phenols to synthesize CANs. In the final aim, the CANs will then be tested via oscillatory rheology and stress relaxation.

***Presenter(s): Mia Keriazes***
***Faculty: Scott Robinson***

## *Project Morphological Trait Variation of Chlorophonia and Euphonia Across the Caribbean*

Morphological variation allows species to adapt to different environments. Reduced competition and predation drive morphological variation, enabling niche expansion or shifts—a phenomenon known as ecological release. Islands often have different selective pressures than the mainland, influencing foraging, movement, and dispersal. Although morphological variation has been studied on oceanic island communities, including non-endemic taxa, will deepen understanding of local adaptations at the meta-archipelago level. We use museum specimens to examine morphological differences within and among Chlorophonia and Euphonia species across the Caribbean's mainland, continental islands, and oceanic archipelagos. We measured morphological traits from the Florida Museum of Natural History and the Louisiana State University Museum of Natural History, while supplementing them with specimens from the AVONET dataset. We compared traits through functional trait space using principal component analysis, which showed broader trait dispersal in mainland species and clustering in island species. We contrasted the mean traits and trait probability density for each species, highlighting distinct morphological distributions. The strongest difference was in Euphonia jamaica, a Greater Antilles endemic, suggesting niche specialization. However, a paucity of specimens from the Lesser Antilles and other Greater Antilles islands limits broader conclusions. The power analysis estimated that 5–10 specimens per island are needed to validate our approach.

***Presenter(s): Shemsi Keyhani***
***Faculty: Evangelos Christou***

## ***Project Characterizing Performance Fatigability in Parkinson's Disease: Contribution of Motor and Non-motor Features***

Fatigue is among the most reported symptoms by individuals with movement disorders such as Parkinson's disease (PD). A measure under the umbrella term fatigue is performance fatigability, defined as the decline in an individual's performance of a motor task over time. Performance fatigability is understudied in movement disorders, yet when exacerbated, it may greatly affect motor function and quality of life. Here, we examined the contribution of motor and non-motor features to performance fatigability in individuals with PD. Performance fatigability was measured as the time to task failure (TTF) of a bilateral upper limb postural contraction. Participants sustained a position of 90° shoulder flexion while projecting lasers within a spatial target (3 cm radius) on a monitor placed 2 m in front of them. Their goal was to maintain this posture for as long as possible. The task was repeated five times. Participants also filled out self-reported questionnaires about their level of anxiety, depression, apathy, perceived exertion, and cognitive function. These served as the non-motor features used in analysis. We quantified several motor features such as strength (MVC) and motor control during a goal directed motor task. We found that while non-motor features, such as apathy, correlate with TTF within a trial ($R2=0.48$), they do not explain the decline in TTF across trials. The decline of TTF across trials correlated with the temporal motor variability during the goal directed task ($R2=0.54$). These findings provide novel characterization of the contribution of motor and non-motor symptoms to the fatigability of PD.

***Presenter(s): Iman Khalid***
***Faculty: Meixia Zhao***

## *Project Exploring the influence of nitrogen on rhizosphere and apoplastic microbiomes in maize*

This study explores how varying nitrogen levels affect microbial communities in the rhizosphere and apoplastic fluid of maize, influencing plant growth and stability. DNA was extracted from both regions at two time points, before and after flowering, and 16S rDNA sequencing was performed to analyze bacterial composition. Preliminary results revealed distinct microbial communities between the rhizosphere and apoplastic fluid. Bacterial genera such as Nitrosospira and Enterobacter were negatively correlated with nitrogen levels, showing reduced abundance at higher nitrogen concentrations. Conversely, genera like Allorhizobium and Leadbetterella exhibited increased abundance with higher nitrogen levels, suggesting their potential role in supporting maize growth. These findings indicate that elevated nitrogen influences microbial taxa in maize, promoting plant health through the enrichment of beneficial bacteria. Future work will compare microbial communities across time points and different maize tissues to further explore the relationship between microbial diversity and maize growth under varying nitrogen conditions. This research may offer insights into optimizing nitrogen fertilization for both plant productivity and soil health.

***Presenter(s): Kenneth Kho***
***Faculty: David Ostrov***

## *Project Development and Validation of Novel Small Molecule Inhibitors for the HIRA/H3.3 Pathway in Castration-Resistant Prostate Cancer*

Prostate cancer is a malignant tumor that develops within the prostate gland, an organ in male reproductive system responsible for producing seminal fluid. This cancer is most prevalent among the male population, and current therapies such as androgen deprivation therapy may lead to lethal advanced forms of this cancer. For example, castration-resistant prostate cancer (CRPC) is one of the most lethal forms due to its resistance to standard therapeutics. CRPC resists standard therapies by bypassing androgen receptor blockade through glucocorticoid receptor activation. It can progress to metastatic CRPC, spreading to other tissues and organs, leading to poor prognosis, limited treatment options, and increased morbidity. We will conduct high-throughput structure-based screening of 139,735 compounds from the NCI Developmental Therapeutics Program, targeting those that bind to the UBN1/H3.3 interface. Utilizing molecular docking on HiPerGator with AI-driven parallel processing, we aim to disrupt this interaction. Thus, inhibiting the HIRA complex. This study aims to identify novel druggable interactions between components of the HIRA/H3.3 pathway. This will provide new therapeutic avenues for drug development strategies targeting CRPC. Targeting UBN1 could potentially provide a strategy for overcoming AR resistance and mitigating GR-mediated tumor progression in prostate cancer.

***Presenter(s): Jayda Killinger***
***Faculty: Deborah Anderson***

## *Project Torino, Italy, 1863: A Slice of Life*

Torino's time as first capital of a united Italy was brief, and is often overlooked. However, through an analysis of this influential period for the city, the deeper social and cultural contexts of a freshly united Italy unfold. Diving into the history of Torino in 1863, I explore multiple aspects of the capital, creating an extensive "slice of life." I posit that the city can be defined via "contradictions": (1) Torino's longstanding conserative monarchy versus the city's status as an emerging liberal hub, (2) the Jewish community's vision of the Mole Antonelliana as a synagogue versus architect Antonio Antonelli's vision of an immortalized city symbol, (3) the urban poor and aristocratic classes' reliance on each other for survival via soft power and charity versus the rise of the meritocratic bourgeoisie elite, and (4) the foundation of the Club Alpino Italiano and its representation of desire to preserve the "purity" of nature versus the desire to "conquer" nature via urban development and tourism. Through this method of analysis, Torino's contradictions create a multi-faceted view into the fragmented nature of the city, which, as the Italian capital of the time, reflect the fragmented nature of post-unification Italy as a whole.

***Presenter(s): Jeremy Kleberg***
***Faculty: Ryan Kolb***

## *Project Angiopoietin-like 4 as a potential therapeutic target for clear cell renal carcinoma*

Angiopoietin-like 4 (ANGPTL4) is a secreted protein upregulated in some clear cell renal carcinoma (ccRCC) patients, where higher expression correlates with improved survival. Its C-terminal domain (cANGPTL4) regulates angiogenesis. We investigated the therapeutic potential of targeting cANGPTL4 in ccRCC. Anti-cANGPTL4 treatment reduced endothelial tube formation in RCC4 and 786-O cells and decreased tumor growth in 786-O cells. However, cANGPTL4 treatment in CAKI-1 cells had no effect, though ANGPTL4 knockout led to decreased endothelial cells, suggesting a complex role in tumor angiogenesis. These findings indicate cANGPTL4 as a potential therapeutic target in angiogenesis-dependent tumors. To elucidate its mechanism, live-cell receptor capturing identified endothelial cell-surface chemotaxis regulator (ECSCR) as a potential receptor, validated through binding assays. Our results highlight cANGPTL4's role in ccRCC progression and its therapeutic potential, particularly since ccRCC patients often develop resistance to tyrosine kinase inhibitors. Future studies will explore the cANGPTL4-ECSCR pathway for targeted therapies.

***Presenter(s): Keerat Kohli***
***Faculty: Angelos Barmpoutis***

## *Project Training and Assessing AI-generated MRI images of human brains with Parkinson's disease*

MRI image collection is essential for clinical studies but is a very time consuming and expensive process. With the recent advances in generative AI methods, in the near future it will be possible to expedite the data related processes of clinical studies. This project aims to assess the feasibility of generating anatomically accurate MRI images of human brains as well as quantitatively evaluate their quality. We trained a 3D Style GAN with a residual network for the discriminator and R1 regularization on a real dataset of MRI images with Parkinson's disease (PD). In order to assess the quality of the generated images we trained classification models to differentiate between PD and non-PD subjects. More specifically, we used Random Forest, Support Vector Machine (SVM), and K-Nearest Neighbors (KNN) methods to train classification models and compare their accuracy using the average and standard deviation of Fractional Anisotropy values extracted from 133 ground truth brain images. The experiments were performed on the University of Florida HiPerGator infrastructure using a dataset of MRI images from 249 subjects. The results indicate generative AI could be used as a scalable and cost-effective data source for the needs of early phase clinical studies.

***Presenter(s): Sriya Kommineni***
***Faculty: Tumader Khouja***

## *Project Clinical Decision Support Tools for Opioid and Antibiotic Prescribing in the ED, a Narrative Review*

Objective
Previous studies show that emergency department (ED) providers need guidance on prescribing opioids and antibiotics for non-traumatic dental conditions (NTDC). Although clinical decision support tools (CDST) are commonly used in EDs, their use for NTDC is not well described. This study aims to review the literature that evaluates the effectiveness of CDST for opioid and antibiotic prescribing in the ED to inform the development of a CDST for ED NTDC prescribing.

Methods
We included clinical trials, cohort studies, and systematic reviews published in the past 15 years that quantified CDST outcomes based on changes in opioid and antibiotic prescriptions for acute conditions in the ED.

Results
We identified eight articles on opioid CDST and 17 on antibiotic CDST, but none specifically for ED NTDC. Five opioid studies showed CDST reduced opioid prescribing at variable rates, while three studies found no significant impact. Among antibiotic studies, 12 found CDST effective in improving guideline-concordant prescribing, while five found no effect or an alternative effect.

Conclusion
Most CDSTs reviewed improved opioid and antibiotic prescribing in the ED. Effective CDSTs were integrated within electronic health records (EHR) and considered patients' evidence-based risk factors, issuing alerts to clinicians. Issues like alert fatigue and lack of provider engagement may have impacted some CDST's success. Following successful CDST models is important when developing an NTDC CDST for prescribing opioids and antibiotics in the ED.

***Presenter(s): Kelsey Konopka***
***Faculty: Mary Brown***

## *Project Development of a specific polymerase chain reaction assay to detect a novel Mycoplasma species isolated from Bearded Dragons*

Mycoplasmas are important pathogens of a wide variety of host species, especially reptilian hosts since many species are listed as threatened or endangered. Disease is generally chronic and clinically silent; however, there are Mycoplasmas capable of eliciting fulminant disease. In 2023, an acute death of an individual bearded dragon within a research colony occurred at Louisiana State University. Mycoplasma was identified in necropsied tissues by the University of Florida Mycoplasma testing lab. 16S rRNA sequencing indicated 99.86% homology to a previously reported undescribed Mycoplasma. Further screening of the colony was conducted monthly for 3 months. While >70% of samples were negative by direct PCR, we successfully isolated colonies in >90% of the samples. Although reliable, culture methods can be costly and time consuming. To address these challenges, we developed a primer set specific for this Mycoplasma based on the screening of three housekeeping genes--dnaK, uvrA, and recA. We then determined the limit of detection via qPCR. Type strain reptilian mycoplasmas were used as control species, including M. testudineum, M. agassizii, M. alligatoris, M. crocodyli, and M. floridensis to ensure specificity. We hope to provide an efficient and rapid diagnostic test for the screening of bearded dragon populations.

***Presenter(s): Kausthubh Konuru***
***Faculty: Aleksandr Kazachkov***

## *Project To Cut Or Not To Cut, That Is The Question*

Many real-world problems, such as transportation routing and resource allocation, are modeled as optimization problems, where optimization solvers use algorithms and heuristics to find the best solution efficiently. One such algorithm, cutting planes (cuts), reduces the search space for optimal solutions. While solvers enable cuts by default because they help performance on average, our preliminary study found that 39% of problems in a benchmark set would solve faster with cuts disabled. Accurately predicting when to disable cuts could yield an average speedup of 20%. We investigate whether machine learning can predict the optimal cut setting using features derived from problem structure and solver dynamics. Our approach involves training classifiers on synthetically generated problems before generalizing to real-world instances. We demonstrate that learned policies can improve solving time by nearly 15% for synthetic problems and 0.6% for real-world problems, for which heterogeneity poses an increased difficulty. These results highlight both the potential and challenges of using ML to dynamically set solver settings. With improved features, our methodology can provide deeper insights into problem characteristics that influence the effectiveness of cutting planes, leading to more efficient optimization strategies.

***Presenter(s): Kamila Koralasbayev***
***Faculty: Robert Lamb***

## *Project Effects of the reduction in dive tourism due to the COVID-19 pandemic on cleaning behavior in Galapagos reef fishes*

Cleaning interactions are an important mutualistic interaction in marine ecosystems, whereby "cleaner" species remove and eat ectoparasites and dead skin from "client" species. Cleaning behavior is essential for fish health but may be impacted by the disruptive presence of scuba divers in touristic locations such as the Galapagos Islands, which receives an average of ~25,000 visitors per month. Reef fish in the Galapagos are among the most diverse group of organisms that are not only highly impactful on the surrounding ecosystem, but also on the fishing industry. We took advantage of the complete cessation of dive tourism during the COVID-19 pandemic (March - October, 2020) to investigate the effects of scuba diver presence on the type and frequency of cleaning interactions. We documented over 2,000 cleaning interactions carried out by 4 different cleaner and 32 client species. At established cleaning stations, we observed 3-4 interactions per minute. While client species were primarily resident reef fish, the pandemic period was characterized by a marked increase in visitation to cleaning stations by migratory pelagic species such as large jacks and sea-chubs. The absence of open-water species from cleaning stations when divers are present suggests that this guild of clients is particularly skittish. The unique opportunity provided by the pandemic to examine Galapagos fish cleaning stations in the absence of divers allowed us to document the species-specific impacts of diver presence on cleaning mutualisms. While these effects were mild, enough divers visiting a cleaning station throughout the day may skew the client community towards resident reef fishes and away from pelagic visitors to the reef, thereby decreasing the benefits of the mutualism that would naturally occur and the overall species health.

***Presenter(s): Nicholas Kottas***
***Faculty: Thomas Angelini***

## *Project Characterizing a Mineralizable Composite: 3D Printed Spherical Shells Under Compression*

Soft biomaterials often lack the robustness needed for their application in tissue engineering and regenerative medicine. A novel collagen-microgel composite is examined in this study that combines the strain-stiffening behavior of biopolymers with the reconfigurability of microgels. Mineralization of the composite via a calcium carbonate Polymer-Induced Liquid-Precursor (PILP) process induces a nearly 10-fold increase in elastic modulus compared to the non-mineralized material, marking a significant advance toward developing robust yet soft biomaterials. The study investigated the mechanical performance of 3D printed mineralized composite spherical shells. Spheres of varying radii and shell thicknesses were 3D printed using a custom-built extrusion printer in a pH-neutral mineralization medium composed of xanthan gum swollen in tris buffer containing calcium chloride, magnesium chloride, and polyacrylic acid. The mineralization reaction was conducted at 37°C in a gaseous ammonium carbonate environment, and subsequent compressive properties were assessed using an Anton Paar MCR702 rheometer. Data collection is ongoing, and the results are expected to provide new insights into the composite's structural performance and its potential biomedical applications.

***Presenter(s): Leah Krawczuk***
***Faculty: Feng Tang***

## *Project Glycation and Epigenetic Reprogramming in Cancer Cells: Investigating DNA Methylation and Histone Modifications*

Glycation occurs when a sugar molecule reacts with proteins, nucleic acids, or lipids, forming an intermediate enzyme that rearranges into an Amadori product, the first stable adduct, which is then converted into an advanced glycation end-product (AGE). The accumulation of AGEs alter tissue and protein structures and functions, leading to cellular dysfunction, diabetes and neurodegenerative diseases.

AGEs bind to the Receptor for Advanced Glycation End Products (RAGE), initiating signaling pathways that induce epigenetic changes in tumor suppressor genes and premalignant lesions. Unregulated RAGE expression results in oxidative stress, stimulating the progression of cancer. While the relationship between glycation, protein damage, and cancer has been studied, the specific role of glycation in DNA methylation and epigenetic regulation remains underexplored.

This project consists of two stages:
1. Culture MCF-7 breast cancer cells, separating them into control and treatment groups using methylglyoxal (MGO)
2. Extract DNA and analyze for methylation patterns through bisulfite sequencing

In the future, liquid chromatography coupled with mass spectrometry (LC-MS/MS) will be utilized to analyze glycation and histone modifications on a proteome scale. By identifying glycation-modified genes, this study aims to observe epigenomic changes in MCF-7 breast cancer cells, identifying ways to restore normal cell function and inhibit tumor progression.

***Presenter(s): Kaitlyn Krinsky***
***Faculty: Steven Manchester***

## *Project Investigating fossil seeds of the Paleocene of North America by means of micro-CT scanning*

During the Paleocene, ecosystems in western North America adjusted to end-Cretaceous mass extinction and subsequent climate change. Studying plant reactions to past climate change can produce frameworks that can be applied to modern issues. Mammalian diversity during this time is well documented around this region, however, understanding of the area's plants has been limited mainly to data from fossil leaves and pollen. Fruit and seed fossils provide greater taxonomic resolution but are relatively rare in Paleocene floras. The late Paleocene Sand Draw locality in central Wyoming contains numerous plant reproductive fossils as molds and casts in siltstone. Research on existing specimens collected in the 1950s has been subject to the limitations of traditional methods that require surface exposure; damage can result from hammers, and photography can be impeded by shadow. Micro-CT scanning now facilitates discovery and documentation of fossil material inside matrix rocks as well as on the surface,  providing greater insight into the morphology and relationships of the Sand Draw plants. Using this technique, over 500 fossil flora have been identified within approximately 115 source rocks. The fossils are mostly subtropical plants, supporting the idea that this locality was a warm, humid environment during the late Paleocene.

***Presenter(s): Monique Kubovsky***
***Faculty: Amlan Biswasw***

## *Project Ferromagnetic Domain Movement in Hole-doped Manganites at Low Current Densities*

The hole-doped manganite (La1-yPry)1-xCaxMnO3 (LPCMO) shows electronic phase separation among the ferromagnetic metallic (FMM) and anti-ferromagnetic insulating (AFM) regions. The combined effect of these coexisting phases leads to magnetic behaviors that make LPCMO a promising candidate for magnetic memory. Due to the comparable free energies of the FMM and AFM phases, in-plane electric fields are known to rearrange the FMM domains. This work investigates whether the FMM regions can be moved at low current densities. Such electric-field-induced movement of ferromagnetic regions make hole-doped manganites materials of interest for applications in solid state magnetic memory devices, such as racetrack memory. We grew LPCMO thin films on NdGaO3 substrates using pulsed laser deposition and fabricated microstructures in the shape of wires using photolithography. The microwire widths are about 20 µm, with lengths on the order of 1 mm. We measured the magnetotransport properties of these wires to track the movement of the FMM regions at different electric and magnetic fields. Our results could provide an alternative technique for moving magnetic domains using electric fields at low current densities instead of the high current densities needed for spin transfer torque effects.

***Presenter(s): Arnav Kumbham***
***Faculty: Feng Tang***

## *Project Exploring Shieldin Loss and Therapy Resistance in BRCA-Deficient Cancers*

It has been estimated that an individual cell can suffer up to one million DNA changes per day (Lodish et al., 2005), but DNA damage repair pathways often suppress these changes. One key repair factor is the Shieldin complex, discovered in 2018 (Noordermeer et al., 2018), which promotes non-homologous end joining (NHEJ) and enhances tumor sensitivity to PARP inhibitors (PARPi, an inhibitor used for cancer cell death). However, Shieldin loss rewires DNA repair, enabling cancer cells to evade PARPi-induced lethality and develop resistance.

While prior research focuses on how Shieldin loss increases resistance, the mechanisms by which Shieldin-deficient cells compensate for DNA repair remain poorly understood. This project aims to investigate alternative repair pathways activated upon Shieldin loss to identify new therapeutic vulnerabilities.

The project consists of two stages:

1. Identifying DNA repair pathway shifts in Shieldin-deficient cells using CRISPR-based gene editing and repair reporter assays.
2. Pinpointing vulnerabilities by performing genetic screens to assess dependencies on alternative repair mechanisms.

By studying how Shieldin loss alters DNA repair, this research will provide insight into potential drug targets for overcoming resistance in BRCA1/2-mutant cancers. The findings will contribute to precision medicine strategies, improving treatment options and long-term patient outcomes.

***Presenter(s): Ashley Kung***
***Faculty: Liana Hone***

## *Project Examining Sexual Interest Misperceptions, Dating Behaviors, and Acceptability of an AI-Powered Intervention*

Sexual interest (SI) misperception can be one of many antecedents of sexual assault. Although the difference between the SI perceptions of cisgender, heterosexual (cishet) men and women has been thoroughly investigated, there is minimal research on the SI judgements of sex and gender diverse (SGD) populations, including SGD men. Examining SI misperceptions, dating behaviors, and acceptability of using AI in interventions will provide information needed to inform development of an AI sexual assault intervention. In Study 1, participants aged 18-34 (N = 790) completed a web-based survey and reported their sexual perception on a scale of 1 to 8. There were no significant differences between the SI perceptions of cishet men (M = 5.30, SD = 0.89) and SGD men (M = 5.31, SD = 0.77), t(384) = -0.11, p = .46. In Study 2, participants aged 18-34 will complete a web-based survey including sexual perception and AI-use acceptability measures. We plan to calculate means, standard deviations, and the correlation between AI-use acceptability and sexual perceptions. Future directions include developing an AI-powered intervention to address SI misperceptions.

***Presenter(s): Claire Kuntz***
***Faculty: Edith Kaan***

## *Project Tricked by grammar? Language processing in learners of Spanish*

Grammatical illusions occur when an ungrammatical sentence is deemed grammatical due to an interfering "attractor" that occurs between syntactically agreeing structures. "The key to the cabinets are rusty" demonstrates this idea, where the verb "are" should be singular to match the noun "key", but instead plural "cabinets" intervenes. In Spanish, noun/adjective gender agreement can create illusions if a prepositional phrase with an attractor noun occurs between the head noun and adjective. Consider sentence 1a.: the adjective "podrida" should be matching the masculine noun "plátano", but instead matches the feminine attractor "naranja".

1a. *El plátanoMasc bajo la naranjaFem estaba tan podridaFem que realmente olía fatal.
*The bananaMasc under the orangeFem was so rottenFem that it really smelled terrible.

While this type of grammatical illusion has been found for native speakers (Gonzalez Alonso et al., 2021), L2 speakers have yet to be studied. The current project examines L1 English L2 Spanish speakers through self-paced reading. Longer reading times are predicted for ungrammatical and attractor mismatch sentences. If this is the case, it suggests that L2 speakers are subject to illusions. If they are not, it is possible L2 speakers exercise more control when reading as suggested in Lee and Phillips (2023).

***Presenter(s): Matheus Kunzler Maldaner***
***Faculty: Domenic Forte***

## *Project Enhancing AI Security with FPGA-Accelerated Differentiable Logic Gate Networks*

As Artificial Intelligence (AI) systems become increasingly integrated into security-critical applications, ensuring model interpretability and resistance to adversarial manipulation is paramount. This work explores the implementation of Differentiable Logic Gate Networks (Difflogic) on Field-Programmable Gate Arrays (FPGAs) to enhance both inference efficiency and security. Unlike conventional deep neural networks, Difflogic architectures explicitly learn logical operations, allowing for increased transparency into their decision-making process. Mapping learned logic gates onto FPGA hardware accelerates AI models that remain inherently interpretable. Unique explanation methods both aid interpretation and provide a means for updating models' failure cases to improve security. Our results demonstrate that this approach not only outperforms traditional GPU-based inference in efficiency but also offers a clear path toward more explainable and trustworthy AI systems deployed on resource-constrained hardware.

***Presenter(s): Madeline Kwan***
***Faculty: Subhashinie Kariyawasam***

## *Project Characterizing the Zoonotic Potential of Canine Uropathogenic Escherichia coli (UPEC) in Urinary Tract Infections*

Urinary tract infections (UTIs), caused by uropathogenic Escherichia coli (UPEC) are common in companion animals. Antibiotic misuse promotes antimicrobial resistance (AMR) through horizontal gene transfer. Resistant bacteria pose public health risks as humans and dogs share illnesses and antibiotic treatments. This study aimed to profile the antimicrobial resistance patterns and virulence gene distribution in UPEC strains isolated from the urine samples of dogs with cystitis, highlighting their potential role in zoonotic transmission and the risk of UTIs in humans. 53 UPEC strains from canine UTI cases were collected from the UF College of Veterinary Medicine Diagnostic Laboratory. Antimicrobial susceptibility testing was performed using Kirby Baur disk diffusion, and the results showed that most isolates were resistant. To evaluate the zoonotic potential of canine UPEC strains, four virulence-associated genes (vat, fyuA, chuA, and yfcV) were analyzed using diagnostic multiplex PCR. The results revealed that most canine UPEC strains harbored all four virulence genes. A biofilm assay is currently underway to determine whether canine UPEC strains can form biofilms in human urine. Our findings underscore concerns regarding the zoonotic potential of canine UPEC and the risk of AMR dissemination, particularly in households where antibiotics are shared, or environmental reservoirs facilitate bacterial exchange.

***Presenter(s): Cailyn Lake***
***Faculty: Diana Taft***

***Project Dietary Monosaccharide Composition and Potential Association with Uremic Toxin Levels in Hemodialysis Patients.***

A high protein-to-fiber ratio in the diet is associated with higher levels of uremic toxins in people receiving hemodialysis. We hypothesized that specific dietary monosaccharides would be associated with uremic toxin levels. This study leveraged a study of hemodialysis patients in which dietary recalls were collected using ASA-24. Using the Davis Food Glycodedia and "ingredientalization," the dietary monosaccharide content of the diets was calculated. Using data from 11 patients, two sets of linear regression models were constructed. The first evaluated the association between dietary fiber monosaccharide composition (predictors) and uremic toxin levels (outcomes). The second analyzed dietary fiber monosaccharide composition in ratio to dietary protein (predictors) and uremic toxin levels (outcomes). Linear regression analysis revealed one significant association between glucuronic acid and indoxyl sulfate ($p = 0.0485$, $CI = 1.039 – 254.0$). The small sample size and large number of models created for this study severely limit the generalizability of this study. However, the observed association between glucuronic acid and indoxyl sulfate suggests that further research on dietary monosaccharide content in hemodialysis patients using a larger cohort and appropriate adjustment for multiple comparisons is warranted. Understanding how dietary monosaccharides influence uremic toxin levels could provide valuable insights into hemodialysis patient diets.

***Presenter(s): Simran Lamba***
***Faculty: Ben Lewis***

## *Project Utilizing Machine Learning Approaches to Predict Dropout from Substance Use Disorder Treatment*

Background: Completion of substance use disorder (SUD) treatment is a strong predictor of sustained long-term abstinence and recovery. However, early treatment discharge against medical recommendations remains common, with national estimates suggesting rates of ~30%. Although some predictors have been identified, the degree to which dropout can be meaningfully predicted remains unknown. The current project utilized a machine learning approach to predict dropout using a broad range of data gathered at treatment entry.
Methods: Baseline data were collected from 2,065 patients. A prediction model was created using a random forest algorithm trained on 70% of the data and tested on the remaining 30%. Over 100 biopsychosocial variables were available for training. Feature selection was applied to identify factors with the greatest contribution to dropout prediction.
Results: The model performed with 69% accuracy, 62% sensitivity, and 72% specificity. Features with the greatest contribution to prediction included profession, pain, and abstinence self-efficacy.
Conclusion: This model may serve as a novel risk prediction tool. Model performance underscores that dropout is a predictable outcome, but highlights the challenge in achieving high prediction accuracy. Future extensions of this work capable of enhancing model performance would substantially improve the feasibility of its application as a clinical tool.

***Presenter(s): Emma Lammens***
***Faculty: Amy Mobley***

## ***Project Exploring Fathers' Perceived Barriers and Facilitators to Engaging with an Online Early Childhood Feeding Module in Home Visiting Programs***

Many early childhood nutrition education interventions and programs target mothers, yet other caregivers are also involved in the feeding of young children. The lack of inclusion and representation of other caregivers, specifically fathers, may reinforce societal misconceptions about fathers' roles and limit access to important child feeding information. This study explores fathers' perceptions of the barriers and facilitators that may impact engagement with an online early childhood feeding module designed for nonmaternal caregivers (NMCs) to be used in tandem with home visiting programs (HVPs). Fathers (n=13) eligible for or involved in HVPs participated in a 60-minute Zoom interview using a semi-structured script to explore what barriers may limit the use of an online early childhood feeding module. Data were recorded, transcribed, and coded using inductive thematic analysis. Overall, key barriers mentioned by fathers included limited time, resistance to new information, and pre-existing perceptions on the traditional roles of fathers. To address these barriers, fathers suggested increasing module awareness, making it readily accessible, and tailoring the information and imagery for NMCs. Findings will inform the development and implementation of an online early childhood feeding module for fathers, mothers, and NMCs involved in HVPs to ultimately increase knowledge and promote behavior change.

***Presenter(s): Julia Lancaster***
***Faculty: Cora Best***

## *Project Comparing the Accuracy of a Mobile Food Record Against 24-Hour Dietary Recall for Dietary Intake Assessment*

Accurate assessment of dietary intake is necessary for understanding how diet affects wellbeing. Participant recall based assessment methods may have error related to limitations of specific memory. Traditional (analog) food records capture data prospectively but are known for high participant burden. New methods of dietary intake assessment that use mobile technology may reduce both measurement error and participant burden. The objective of this research is to determine the accuracy of dietary information collected prospectively using a mobile food record as compared to the use of a 24-hour dietary recall, a specific memory-based approach for measuring dietary intake. This thesis is part of a pilot clinical trial of a six-week dietary intervention with food provision being carried out by the Best Lab. To monitor adherence, participants use Nourishly, a mobile app designed for nutrition care, to maintain a mobile food record detailing food and beverage intake. Participants also complete a 24-hour dietary recall interview at three and six weeks. Bland-Altman analysis will be employed to compare daily energy, macronutrient, and key micronutrient intakes between the two assessment methods. Preliminary analysis indicates that participants underreport dietary intake in the mobile food record as compared to the 24-hour dietary recall.

***Presenter(s): Luke Langan***
***Faculty: Iris Rivero***

## *Project Integrating in-situ sensing for adaptive control of powder deposition to advance remanufacturing processes*

This research aims to elucidate the relationships between critical process parameters and the resultant microstructures and tensile strength for the deposition of nickel-base alloys upon low-alloy steel parts using powder-based directed energy deposition (DED). Deposition of nickel-based alloys have shown success in mitigating brittle phase formation in iron-carbon heat-affected zones under specific thermal conditions. Correlating in-situ geometric and thermal data to resultant microstructural outcomes remains difficult. Thus, this research explains functional relationships between DED processing parameters (laser power, scanning speed, powder mass flow rate) and the resultant properties of the remanufactured alloy, i.e., microstructural characteristics and tensile strength. Simultaneously combining in-situ structure light scanning with thermal imaging allows for correlating the thermal profile of depositions with laser parameters. Initial work points toward a correlation between in-situ and geometrical sensing and grain size outcomes. This study aims at developing intelligent DED processes for the remanufacturing industry by employing in-situ signals to better understand process outcomes.

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

## *Project Yeast Screening for Putative Hemicellulose Synthases to Produce Novel Polymers for Bioenergy Applications*

Cellulose Synthase Like (CSL) genes have been revealed to play a key role in plant cell wall biosynthesis by making enzymes synthesizing mannan and glucomannan, which are valuable polysaccharides with diverse industrial applications across food, feed, pharmaceutical, and biofuel industries. Pichia pastoris is a robust prototyping platform for expediting the Design-Build-Test-Learn Cycle of mannan production in planta due to its rapid growth and eukaryotic processing capabilities. In this study, 25 putative CSL genes samples from a diverse range of sources, including algae, monocots, and flowering plants, and synthesized by the Joint Genome Institute were investigated in Pichia pastoris via chemical inducible expression using pAOX1 promoter. We used a specially designed Pichia strain where a fluorescent probe can detect CSL enzyme products. Data from fluorescence analysis and cell wall monosaccharide analysis will be reported. Ultimately, these findings will contribute to a deeper understanding of CSL genes and their role in cell wall composition and integrity in Pichia, with potential applications in plant systems.

***Presenter(s): Adriana LaVopa***
***Faculty: Yeongseon Jang***

## *Project Leveraging ELP LCST Behavior for A Bottom-Up Construction of Sensory Artificial Cells*

In the quest to understand the fundamental building blocks of life, artificial cells offer a unique platform for experimentation. Recent studies have demonstrated methods for creating artificial cells, known as protein vesicles, which employ proteins as the main structural component of their membranes.
Elastin-like polypeptide (ELP) undergoes a transition from soluble to insoluble in aqueous solution above a lower critical solution temperature (LCST). This behavior enables the construction of artificial cell structures, such as coacervates and hollow vesicles, via thermally triggered self-assembly of ELP fusion proteins. Protein complex amphiphiles for vesicle assembly are created by genetically fusing ELP to one side of a leucine zipper motif (ZR), while hydrophilic sensory-globular proteins (FRB-mCherry, FKBP-sfGFP) are fused to the corresponding zipper motif (ZE). When exposed to a sensory analyte, the sensory proteins induce the colocalization of complementary vesicles. Vesicles were observed via epifluorescence microscopy over time and under varying analyte concentrations; statistical analyses were conducted to verify the efficacy of the sensory platform. By exploring the sensing capabilities of cell-mimetic vesicles made of ELP fusion proteins, this project contributes to biomaterials design for use in wide-reaching applications in cell therapy and drug delivery.

***Presenter(s): Rachel Lee***
***Faculty: Gene Crislip***

## *Project Time Restricted Feeding Does Not Alter Cortical Hypoxia-Inducible Factor-1 in Male Adult Mice*

Aging is linked with a decline in kidney function and an increase in susceptibility to renal injury and fibrosis. Several factors are associated with age and impact on kidney function. Time-restricted feeding (TRF) has been shown to have anti-aging properties, however, its impact on kidney health remains unclear. This study will determine if Hypoxia-Inducible Factor 1-alpha (HIF-1α) contributes to renal fibrosis in response to TRF. Male C57BL/6 mice, aged 6 and 18 months, were fed an ad-libitum high-salt diet (0.4% NaCl), with a subset of aged mice placed on a TRF schedule (8-hour feeding window during the active period) for five weeks. Both groups maintained similar food intake and activity levels. Renal cortex samples were analyzed for KIM-1 (Kidney Injury Molecule-1) and HIF-1α levels using multiplex immunoassay and immunoblotting, respectively. KIM-1 concentration was higher in TRF mice compared to those assigned to ad-libitum feeding. KIM-1 concentrations were also higher in aged mice compared to young mice. However, HIF-1α expression did not significantly differ across groups. These findings suggest that HIF-1α does not contribute to TRF induced renal fibrosis. Future studies will examine other pathways that may contribute to the formation of fibrosis.

***Presenter(s): Seungju Lee***
***Faculty: Laura Dedenbach***

## *Project Role of Graffiti in Shaping Urban Areas - Safety Analysis through NYC Case Study*

Graffiti originated as a powerful form of artistic resistance, providing marginalized communities with a means of self-expression in response to social struggles and limited access to traditional art spaces. Unlike street art or murals, which are commissioned and approved in advance, graffiti is an uncommissioned and unallowed form of art. Over time, it has become widely associated with urban decay and criminal activity. This study examines the relationship between graffiti prevalence and crime in New York City using spatial and statistical analysis. The findings indicate little to no direct correlation between the two, challenging the perception that graffiti encourages crime.

Given these results, this study reevaluates the stigma surrounding graffiti and explores its potential as a tool for urban revitalization. Rather than dismissing graffiti as a sign of disorder, cities can integrate it into urban planning initiatives to foster cultural expression, placemaking, and community engagement. By recognizing graffiti's historical significance and artistic value, policymakers and planners can develop strategies that harness its potential to create vibrant, inclusive public spaces. This research advocates for a shift in perspective, encouraging a balance between regulation and artistic freedom to transform graffiti from a perceived nuisance into a constructive element of urban design.

***Presenter(s): Wonchae Lee***
***Faculty: Walter Leite***

## ***Project Improving Early Literacy with AI: Fine-Tuning GPT-4o Mini for Phonics-Based Curriculum***

Artificial intelligence is emerging as a valuable tool for generating structured educational content, such as reading materials and comprehension questions. However, general-purpose large language models (LLMs) such as GPT-4o are high-cost and provide results not aligned with curricula adopted by schools. This study explores fine-tuning OpenAI's GPT-4o mini LLM to produce decodable stories aligned with a widely-used phonics-based reading curriculum for kindergarten to 2nd grade students. We developed a training dataset of 1290 stories tailored to specific lessons, ensuring they adhered to predefined lesson constraints, such as target sounds and preferred words. Our objective was to enhance the alignment to specific lessons and the instructional quality of the generated stories. The fine-tuned 4o-mini model demonstrates an improved ability to generate structured, curriculum-aligned content that supports phonics instruction and early reading development at a lower cost. The model's effectiveness is evaluated based on story coherence, word count, the run time of the model, words per sentence, and how well the story aligns with the curriculum. This research highlights the potential of LLMs to reinforce fundamental decoding skills while making reading more engaging and accessible for young learners, particularly as many students struggle with early literacy.

***Presenter(s): Chloe Leite Freitas***
***Faculty: David Fuller***

## *Project Histopathological Examination of Spinal Microglia in the Gaa-/- Rat Model for Pompe Disease*

Pompe disease, an autosomal recessive disorder caused by mutations in the GAA gene, leads to a deficiency in the GAA protein necessary for breaking down lysosomal glycogen. This deficiency results in significant glycogen accumulation, causing severe cardio-respiratory dysfunction. Our group's recent studies indicate that Pompe disease also affects the central nervous system, evidenced by abnormal microglial activity in the spinal cord and brain of affected individuals. Currently, there is no cure for Pompe disease. However, hyperbaric oxygen therapy (HBOT), which involves breathing 100% oxygen at 2 atmospheres absolute (ATA), has shown promise in reducing inflammation in spinal tissues after acute injury. Based on this, we hypothesized that HBOT could alleviate neuroinflammation in a rat model of Pompe disease. We treated male Pompe rats aged three months with HBOT three times a week for eight months. Our findings suggest that untreated Pompe rats exhibited a higher microglial presence compared to both Sprague Dawley rats and Pompe rats receiving HBOT, indicating that hyperbaric treatment could help reduce microglial activity to levels seen in normal rats.

***Presenter(s): Jordan Lewis***
***Faculty: Piyush Jain***

## *Project Antiviral immunity via de novo tandem repeat proteins*

Recent advancements in molecular biology have unveiled diverse bacterial defense mechanisms against phage infections, prominently featuring defense-associated reverse transcriptases (DRTs). This study focuses on DRT2, a minimal system comprising an RT domain and a noncoding RNA (ncRNA), capable of mounting an abortive infection (Abi) response. We investigate the DRT2-mediated defense mechanism, where the RT performs rolling-circle reverse transcription (RCRT) on ncRNA, generating long cDNA products with concatenated repeats. Upon phage infection, this single-stranded cDNA undergoes second-strand synthesis, forming double-stranded DNA transcribed into concatenated mRNA. The resulting mRNA encodes a nearly endless ORF (neo), which induces programmed cell dormancy, effectively halting bacterial growth.

Our research aims to decipher the biological pathway from Neo protein expression to growth arrest, exploring Neo's oligomerization, subcellular localization, and 3D structure. The goal of this study is to enhance our understanding of the DRT2 defense mechanism, highlighting the potential for innovative biotechnological applications and challenging traditional paradigms of genetic information encoding.

***Presenter(s): Andrew Li***
***Faculty: Lei Zhou***

***Project Temperature-Controlled Tumorigenesis in Drosophila melanogaster***
***Cancer is an age-associated disease, with metastasis being the primary cause of mortality.***

Innate immune cells, such as macrophages, serve as the first line of defense against tumorigenesis. However, macrophages have also been found to promote metastasis. Despite this knowledge, the mechanisms by which macrophages switch from defending against tumorigenesis to facilitating metastasis remain poorly understood. To investigate this, we use Drosophila melanogaster, which possesses a conserved innate immune system and oncogenic pathways.
In our lab, we found that Drosophila strains with oncogenes in the Df(IRER) background, where the irradiation-responsive enhancer region was deleted, showed dramatic metastatic phenotypes. Macrophages with Df(IRER) also exhibited an accelerated aging phenotype. To better understand the exact moment when macrophages begin to facilitate cancer metastasis, we developed a temperature-sensitive system to control tumorigenesis, allowing us to monitor macrophage interactions at different stages of tumor development. Using this system, we identified configurations that can manipulate the timing of tumorigenesis in wild-type flies.
In future experiments, we will investigate whether this temperature-controlled system also leads to metastasis in flies with Df(IRER) background and monitor the behavior and role of macrophages at different stages of tumor progression.

***Presenter(s): Anna Lim***
***Faculty: Alexander Angerhofer***

## *Project QM/MM Simulations for Determining and Visualizing OxDC Binding Mechanism*

Oxalate decarboxylase (OxDC) is an enzyme that catalyzes the breakdown of oxalate, a primary contributor to kidney stone formation, and is critical in targeted therapeutic strategies for kidney stone prevention and management. Recent results show that OxDC binds the substrate bidentate to the N-terminal active site Mn(II) ion based on 13C-electron nuclear double resonance experiments, density functional theory (DFT) calculations, and spectral simulations. We employ quantum mechanics/molecular mechanics (QM/MM) simulations with DFT to obtain additional data on whether OxDC binds the substrate mono- or bidentate. Proper force field parameterization is essential to model the Mn coordination sphere, metal-ligand modes, and charge density of the Mn active site accurately. Computational tools such as AMBER, H++, Gaussian, VMD, and PyMOL, are utilized to parameterize the OxDC monomer structure and provide insight into its stability and activity, providing evidence on whether the mono- or bidentate mode is energetically preferred. High-performance QM/MM simulations enable the detailed modeling of binding energetics, reaction pathways, and structural dynamics, offering an atomic-level resolution of OxDC's mechanistic properties. These findings contribute to a deeper understanding of OxDC's catalytic role and have broader implications for enzyme engineering, drug design, and biochemical research.

***Presenter(s): Abigail Lin***
***Faculty: Cătălin Voiniciuc***

***Project Fine-Tuning the Maximum Entropy Model Using Direct Preference Optimization for Enhancing CSLA Enzyme β-Mannan Polysaccharide Synthesis***

The synthesis of novel β-mannan polysaccharides is essential for applications in food, materials, energy, and biomedical industries. In addition, the cellulose synthase-like A (CSLA) enzymes which produce β-mannan are derived from Amorphophallus konjac plants, whose fibers are used to produce low-calorie foods such as Pasta Zero Spaghetti (Nasoya). However, optimizing CSLA enzymes through traditional experiments is slow and costly. Recent advancements in AI and machine learning have introduced computational models capable of predicting and ranking enzyme sequence mutations based on stability and efficiency. One such model, the Maximum Entropy (MaxEnt) model, leverages multiple sequence alignment (MSA) data to estimate single amino acid enzyme mutation performance. This project aims to enhance β-mannan production by refining MaxEnt with Direct Preference Optimization (DPO), using preference-based ranking. By integrating DPO, we seek to refine the model's ability to predict the functional impact of CSLA enzyme mutations. Additionally, we are programming liquid handling OT-2 robots to assist with DNA assembly and testing predicted mutations using yeast synthetic biology and carbohydrate profiling. This automation of experimental steps contributes to creating a more efficient pipeline for optimizing enzymes. In summary, this project seeks to facilitate the discovery of optimized CSLA enzyme variants for β-mannan polysaccharide production.

***Presenter(s): Maxwell Lindbergh***
***Faculty: David Fuller***

## *Project Investigating Safety of Early High-Volume Normobaric Oxygen as a Therapy for Cervical Spinal Cord Injury*

Cervical spinal cord injuries (SCI) cause significant neurodegeneration, with secondary injury mechanisms including tissue hypoxia and inflammation contributing to progressive neurological deterioration. Hyperbaric oxygen therapy reduces spinal inflammation in SCI models but requires specialized equipment limiting clinical accessibility. This pilot study evaluates whether high volume normobaric oxygen (N-O2) therapy (100% O2) is safe and could improve clinical feasibility. Adult male Sprague-Dawley rats received a C4 unilateral contusion injury. The treatment group (n=9) received N-O2 therapy (3 hours, twice daily) initiated within 10 minutes post injury and continued for 7 days. The control group (n=10) received sham treatment (21% O2) with the same frequency. Body weight and temperature were monitored daily. Respiratory function was assessed using whole-body plethysmography on day 7. Tissue, blood, and urine samples were collected for future analysis to identify changes in cellular mechanisms. Rats receiving N-O2 therapy showed similar body weight and temperature as the sham treated animals. These results indicate that early N-O2 therapy is a safe, accessible intervention after cervical SCI, supporting its investigation as a potential treatment for acute patients. Future studies on respiratory patterns, tissue histology, and biomarkers will elucidate cellular mechanisms, including effects on neuroinflammation, neuronal preservation, and glial activation.

***Presenter(s): Olivia Liu***
***Faculty: Roger Blair***

## *Project The NFL Sunday Ticket Nightmare*

This article provides an antitrust law and economics analysis of In re: NFL "Sunday Ticket" Antitrust Litigation, which ended in a jury verdict for two plaintiff classes and a surprising turn of events when the court vacated the jury's damage award. The article explains the economic incentives for pooling broadcast rights and marketing them jointly. It also examines the role of the Sports Broadcasting Act and discusses the reasons why the parties went to trial instead of settling the dispute.

***Presenter(s): Dimitris Liveris***
***Faculty: Dimitris Liveris***

## *Project Prosecution of Political Militancy in Florida: A Geospatial Approach*

This research aims to study the prosecution of political militancy in the state of Florida through a geospatial lens, visualizing and exploring the geographic distribution of cases, the socio-spatial contexts where these activities take place, and the relationships between geographic factors which affect the composition of different militant movements and thus produce different prosecutorial outcomes. Using a dataset drawn from the Prosecution Project with carefully filtered inclusion criteria related to the prosecution of political violence in Florida, this research maps the spatial patterns of arrest and perpetration locations, controlling for variables such as differing ideology and the nature of such action as against property or people. Research will focus on how geographic characteristics, such as distribution in densely populated vs. rural areas, or incidence in particular metropolitan areas, interacts with the tactics and culture of these militant groups. By integrating geospatial analysis with legal and political research, this study will engage the spatial dynamics of political militancy and its legal repercussions in Florida, contributing to discussion about the geography of politically organized violence and its spatial correlation with different phenomena.

***Presenter(s): Rebecca Liwang***
***Faculty: Whitney Stoppel***

## *Project Silk nanoparticles: A comparison of fabrication techniques for drug delivery*

Silk fibroin is a natural polymer that can be used in the formation of biomaterials, such as silk films and microspheres. Biomaterials formed from silk fibroin are biocompatible, biodegradable, and have tunable mechanical properties. In the formation of micro and nanoparticles for drug encapsulation and delivery, silk fibroin from Bombyx mori has demonstrated high efficiency in encapsulation of bioactive molecules along with tunable release kinetics. To expand the source of silk fibers used to form these nanoparticles, we evaluate differences in silk particles formed from Plodia interpunctella compared to those formed with Bombyx mori. We form particles through two methods: polyvinyl alcohol phase separation (PVA phase separation) and nanoprecipitation with acetone. From these two differing methodologies, we draw a comparison between their effects on the nanoparticles' properties, such as particle morphology, size, dispersity, zeta potential, and crystallinity. To quantify these characteristics, we evaluate the physical and mechanical properties through scanning electron microscopy (SEM), brightfield imaging, dynamic light scattering (DLS), and Fourier transform infrared (FTIR) spectroscopy. To further explore how the encapsulation method influences nanoparticle function, we explore the encapsulation efficiency of small molecules, including Alcian blue, Curcumin, and Doxorubicin-HCl. Results show that we are able to encapsulate these small molecules, and on-going work aims to quantify encapsulation efficiency. Future work aims to study the complex interactions between the different molecules encapsulated within silk nanoparticles and the impact on the use of these particles for small molecule delivery.

***Presenter(s): Jenny Lopez***
***Faculty: Alexander Angerhofer***

## *Project Using Directed Evolution to Improve the Optimum pH of Oxalate Decarboxylase from Bacillus subtilis*

Oxalate decarboxylase (OxDC) is an enzyme found in Bacillus subtilis, which catalyzes the decomposition of oxalate, a molecule commonly found in kidney stones. OxDC has an optimum pH at around 4.0, which limits its use under physiological conditions. An improved OxDC that is functional at a neutral pH would be active in the human body and may perhaps be utilized to break down or prevent kidney stones in a non-invasive manner. In this study, we used a directed evolution approach to alter the enzyme's optimum pH. Directed evolution is a method of steering proteins towards a desired new or optimized function. It mimics the process of natural selection to slowly refine phenotypes by inducing mutations until the protein exhibits the target characteristics. Initially, a gene library was created by generating small changes to the original DNA sequence for OxDC through error-prone PCR and saturated mutagenesis. Presently, we have identified promising protein variants with improved catalytic activity at a higher pH, and these are currently being sequenced for further characterization. These results will serve as the starting point for future rounds of directed evolution.

Presenter(s): Asher Lowe
Faculty: Richard Lutz

Project Beyond the Message: Exploring the Roles of Content Type and Message Strength in Building Brand and Influencer Trust

Influencer marketing has become a key tool used by companies to engage with their target audiences. However, previous research is limited in terms of what attributes are most important for successful influencer marketing. This study aimed to determine how message strength and message type impact consumers' perceptions of the influencer, product, and brand.

A 2 (organic vs. paid) x 2 (weak vs. strong) experiment was conducted using AI-generated Instagram posts featuring an AI influencer promoting a fictional sunscreen product. Visual designs were kept constant while captions varied in terms of detail and sponsorship disclosure. After viewing the post for 30 seconds, participants completed a survey assessing their perceptions of the influencer, product, and brand.

Results revealed that neither message type nor message strength significantly affected five of six variables. However, there was a marginally significant main effect of message strength on credibility, suggesting that message strength may influence the extent to which consumers perceive influencers as credible. Manipulation checks showed that the use of sponsorship disclosures did not affect perceptions of a sponsored vs. organic message.

Overall, this study shows that while stronger messages may increase perceived credibility, explicit disclosures of sponsorship may not alter consumer perceptions.

***Presenter(s): Colin Mach***
***Faculty: Boyi Hu***

***Project Enhancing Erognomics in Agricultural Seeding Tasks: The role of Collaborative Robots in Reducing Musculoskeletal Load***

Repetitive squatting in agricultural tasks, such as seeding, presents substantial risks for work-related musculoskeletal disorders (WMSDs), particularly in the spine. This study explores the potential of collaborative robots (cobots) to mitigate these risks by reducing biomechanical load, promoting ergonomic postures, and improving task efficiency during squatting. The primary research question examines whether cobot assistance impacts joint angles in key spinal regions, specifically the L5S1, L1T12, and T1C7 joints, thereby decreasing WMSD risk factors. Participants performed simulated seeding tasks using squatting-style postures, both with and without cobot assistance, while an Xsens motion capture system captured detailed joint movement data. Analyses focused on the average values of flexion-extension, lateral bending, and axial rotation degrees across all three spinal regions. Results indicated that cobot assistance significantly reduced lateral bending and increased flexibility in flexion-extension and axial rotation in several joints, fostering more ergonomic movement patterns. Additionally, cobot support reduced the time needed to complete the trials, enhancing task efficiency. However, not all joint movements showed significant differences, underscoring varied responses across the spine. This research demonstrates that cobots can positively influence biomechanical load, posture, and task efficiency in repetitive squatting tasks, highlighting their potential role in reducing WMSD risks and supporting safer agricultural practices. These findings contribute to a growing understanding of human-robot collaboration’s impact on ergonomic outcomes and reinforce the potential benefits of cobot integration in agriculture.

***Presenter(s): Maya Macintyre***
***Faculty: David Fuller***

## *Project Impact of ampakine CX1739 on histological neuronal counts after acute cervical spinal cord injury (SCI)*

Neuronal loss after spinal cord injury (SCI) is exacerbated by excess excitatory signaling (excitotoxicity) from the secondary injury cascade. Previous studies have reported that ampakines (positive allosteric modulators of AMPA type glutamate receptors) mitigate neuronal loss induced by AMPA agonists or excitotoxic drugs, suggesting a neuroprotective benefit of ampakines initiated 7 days post-SCI. We hypothesized that a low dose of a "low impact" ampakine (CX1739) would mitigate neuronal loss in the acute phase of cervical SCI. Adult (11 ± 1 weeks) Sprague-Dawley rats received a unilateral C4 contusion. CX1739 (n=7) or vehicle, hydroxypropyl beta cyclodextrin (HPCD; n=7) was administered 15-min post injury, then daily for 14 days. A group of uninjured rats (n=5) received the same anesthetic and analgesic regimen. Cervical spinal cord sections were stained for neuronal nuclear protein (NeuN, neuron marker). Tissues were imaged and NeuN+ cells in the vicinity of the lesion (C4-C6) were counted  using the Cellpose cellular segmentation algorithm. HPCD and CX1739 groups had reduced counts relative to intact. Neuronal counts across the lesion (C4-C6) were similar in the CX1739 and HPCD treated groups. We conclude that low dose of CX1739 administered in the acute phase of SCI has no detectable benefit on neuronal survival.

***Presenter(s): Cole Mackey***
***Faculty: Xin Tang***

## *Project Investigating Mechanosensitivity and YAP Expression in Drug-Resistant Non-Small Cell Lung Cancer*

PC9 Non-Small Cell Lung Cancer (NSCLC) is not typically mechanosensitive. However, recent studies suggest that surviving drug treatment increases nuclear localization of mechanosensitive protein YAP, indicating potential mechanosensitivity. This study investigated how YAP expression and location in drug-resistant PC9 NSCLC cells respond to substrate stiffness.

To visualize YAP, we tagged it with mNeonGreen2 fluorescent protein and used fluorescence microscopy. Drug-resistant cells were selected by exposing PC9 cultures to increasing AZD9291 concentrations. Selected and non-selected cells were seeded onto 5kPa polyacrylamide hydrogels (soft substrate) and glass (stiff substrate) and allowed to adhere for 48–72 hours. Fluorescence microscopy and ImageJ software quantified nuclear and cytoplasmic YAP concentrations to determine N/C ratios.

Results showed no significant difference in YAP N/C ratio between 5kPa gel and glass in non-selected cells, confirming that standard PC9 cells are not mechanosensitive. However, drug-resistant cells cultured on stiff substrate showed a significant increase in YAP N/C ratio, indicating acquired mechanosensitivity.

We conclude that PC9 NSCLC cells that resist drug treatment become mechanosensitive, allowing mechanical stimuli to influence YAP expression. Future work will explore YAP denuclearization via mechanical stimuli as a potential strategy to reverse drug resistance.

***Presenter(s): Lavi Madjar***
***Faculty: Mingyi Xie***

***Project Mapping and profiling N6-methyladenosine sites in 7SK small nuclear RNA***

This project aims to investigate N6-methyladenosine (m6A) modifications in 7SK small nuclear RNA (snRNA) and their role in transcriptional regulation in non-small cell lung cancer (NSCLC). Recent studies have revealed that 7SK snRNA contains high levels of m6A in NSCLC cells and that m6A-7SK plays a critical role in Pol II transcriptional control. Identifying the specific adenosine sites modified by m6A in 7SK snRNA will provide new insights into the transcription regulation that induces NSCLC cell growth. Two methods were utilized, a targeted method and a global profiling method. SELECT-qPCR has been employed to identify whether an adenosine site on 7SK snRNA has an m6A modification - SELECT-qPCR is a type of real time PCR. Another method we employed to investigate the percentage of 7SK snRNAs that contain an m6A modification for a given adenosine site is GLORI. GLORI works by deaminating all the unmethylated adenosines in 7SK snRNA into inosines (read as guanosine in sequencing) while leaving all the m6A adenine sites unmodified. Once we identify m6A candidates using both SELECT-qPCR and GLORI, we can further investigate the specific influence each modified site has on the structure of 7SK - which directly contributes to the transcription by polymerase II in NSCLC.

***Presenter(s): Lucas Magliaro Aburaya***
***Faculty: Brent Sumerllin***

## *Project Tandem Degradation-Depolymerization of Bio-derived Comb Copolymers*

In this study, we synthesized poly(methyl methacrylate-co-2-hydroxyethyl methacrylate-co-N-(methacryloxy)phthalimide methacrylate) (P(MMA-co-HEMA-co-PhthMA)-based comb copolymers, with poly(lactic acid) (PLA) grafted from the HEMA units. The comb architecture was targeted to impart unique thermal properties compared to that of the conventional linear analogs. Further, our design strategically expands polymer deconstruction methodologies to more complex macromolecular systems and promotes resource-efficient production. The PhthMA units facilitated depolymerization of the polymethacrylate backbone via pendent group activation, with simultaneous PLA sidechain degradation, both triggered by heat. This dual degradation-depolymerization process not only enhances the overall sustainability of lactide/vinyl-based copolymers but also demonstrates the synergistic potential of integrating multiple deconstruction pathways into a single system. Our reports expand the avenues for designing advanced, degradable copolymers with tailored lifespans, contributing to the development of sustainable polymer materials.

***Presenter(s): Viktoria Marcus***
***Faculty: McKenzie Landrum***

## *Project Pedestrian Interaction with Level-5 Automated Driving Systems Acceptance: The Role of eHMIs and Social Information*

Level-5 Automated Driving Systems (ADSs) promise safer roads for all users by reducing driver error, as they would eliminate input from a human driver. However, this can only be achieved if level-5 ADSs are able to efficiently interact with all road-users; however, the interactions between the most vulnerable road users—pedestrians—and level-5 ADSs are not well understood. Therefore, the factors that influence the interactions are important to explore. To facilitate these interactions, external human-machine interfaces (eHMIs), have been tested, though the best features are not agreed upon, and there is no standardized design. This study tested an eHMI including visual and aural features to give pedestrians information about the state and intentions of the ADS, and also extended the Theory of Planned Behavior (TPB) with safety, trust, understanding, and compatibility. Structural equation modeling (SEM) revealed significant relationships among most of TPB factors as well as external factors. The presence of an eHMI significantly influenced pedestrian behavior, decreasing cautious pedestrian behaviors and improving pedestrians' perceived trust, safety, understanding, control, and compatibility of ADS intentions, and decreasing pedestrians' reliance on social information. eHMI text displays were ranked as the most necessary feature, with less importance put on multimodal features, like audio components. This study contributes to the understanding of pedestrian behavior around ADSs, and the role of eHMIs to enhance pedestrians' perceived safety and confidence in their interactions with level-5 ADSs and provides insights into the best-practices for eHMI design.

***Presenter(s): Cassidy Marino***
***Faculty: Hannah Treadway***

***Project The influence of community-specific code-switching norms on online comprehension in early Spanish-English bilinguals***

Early Spanish-English bilinguals employ experiential knowledge of the differential production frequencies of code-switching (CS) in their linguistic environment to attenuate switch costs during online comprehension. To this point, such a finding has been attested for CS patterns which hold universally for Spanish-English bilingual communities. Do bilinguals similarly use community-specific CS production frequencies to guide their online processing of CS? The present study seeks to characterize the utility of regional CS norms in early bilinguals' online comprehension of switched structures.

A reading-while-eye-tracking experimental task is used to discern whether early Spanish-English bilinguals actively exposed to community-specific CS patterns exhibit sensitivity to said patterns during real-time comprehension. The main task features a 2x2 design in which critical compound verb switches (n=24) are manipulated for switch location (i.e. at auxiliary or at participle/light verb) and auxiliary type (i.e. progressive, which is regionally attested, or light verb, which is structurally permissible but not regionally attested). We expect that early Spanish-English bilinguals will be sensitive to the distributional production frequencies of CS specific to their bilingual community. We expect this sensitivity to arise more robustly and earlier than for learners of Spanish passively exposed to the same patterns.

***Presenter(s): Elizabeth Marlin***
***Faculty: Wesley Bolch***

## *Project 3D Reconstruction of Kidney Cortex from H&E-Stained Histology Slides*

Purpose: To develop 3D microscale mesh-type models of the renal cortical labyrinth from H&E-stained histology slides to support radiation dosimetry of alpha particles in
radiopharmaceutical therapies. Background: Alpha-particle radiopharmaceutical therapy is a promising cancer treatment that deposits dose directly to the tumor while sparing the surrounding healthy tissue. However, the kidney, particularly the radiosensitive renal cortex, is at risk for radiation-induced damage. The renal cortex is comprised of proximal and distal convoluted tubules, blood vessels, and the renal corpuscles. Methods: Thirty-one human H&E-stained histology slides examined, aligned, and analyzed by a predecessor, Dr. Bonnie President. Two regions of the histology slides were used to construct two models. The goal of this phase of the project was to model the remainder of the tubules not directly associated with the contained renal corpuscles. Residual tubules were segmented using 3D Slicer to mark center points, exported to Rhinoceros 3D, connected via polylines, and reconstructed using a multipipe function. Tubule reconstructions were adjusted to fit within the renal cortex while maintaining accurate volumetric distributions. Results: Two 1 mm3 models of renal cortex were generated. Conclusions: Two histology-based 3D models of renal cortex were successfully developed. Future work includes defining sources and targets to perform computational radiation dosimetry on the models.

***Presenter(s): Emma Martin***
***Faculty: Jason Vogel***

## *Project Soil Carbon Dioxide Flux and Wood Decomposition in Southeastern Pine Stands: Effects of Forest Management Practice*

Soil $CO_2$ efflux and decomposition rates can offer a larger insight to the effects of different management methods of pine stands. In this study, we examined two different treatments of pine stands at Austin Cary Forest, group shelterwood (GS) and continuous shelterwood (SC). Plots within the GS treatment had open space with no trees and relatively sparse shrub layer. SC treatment areas had a full canopy of longleaf and slash pine, as well as a substantially full shrub layer. We hypothesized that the GC treatments would have a higher decomposition rate and soil $CO_2$ efflux compared to SC because of the open canopy that allows for more solar energy to reach the ground. To measure decomposition rates, we set out small blocks of pine to be collected and weighed at six month intervals. We measured soil $CO_2$ efflux weekly using the LI-8100A Automated Soil $CO_2$ Flux System. For soil $CO_2$ efflux, temperature changes were shown to have more influence than soil moisture. SC plots on average were shown to have higher $CO_2$ flux rates than GS plots. For the decomposition blocks, the percent of mass lost was larger in the GS treatments (3.86%) compared to the SC treatment (2.32%).

***Presenter(s): Mia Martone***
***Faculty: Eleni Bozia***

***Project Contraception in Ancient Rome: An In-Depth Analysis of Ancient Contraceptive Measures and Their Relevance***

Although the concept of 'birth control' seems like a modern invention, something that was thought up in the 1950's and perfected in the 2000's, research shows that this was not the case. The concept of controlling pregnancy, not just to enhance fertility but also to prevent it, was a robust practice in ancient Rome; so much so that extensive written documents exist detailing the herbal concoctions and various actions practiced by ancient Roman women as a way to avoid pregnancy. Pregnancy for many women then (and even now) meant poverty, shame, or even a death sentence, making contraception a choice for survival. This paper examines the contraceptive practices of ancient Roman women and compares them to modern-day practices through their methods of action and efficacy. This will be done through a critical analysis of ancient sources like Soranus' Gynecology and Dioscorides' On Medical Material, as well as modern-day scientific research pertaining to both current contraceptive practices and ancient ones. In a society where reproductive rights are under severe scrutiny, understanding both how contraception works and why it has been so important in society for thousands of years can help fill the knowledge gap and prevent stigma.

***Presenter(s): Fabiana Mastantuono***
***Faculty: Mei He***

## *Project Bovine placental-derived natural bio-ink for the development of a deep wound healing hydrogel*

Trauma wound care seeks natural biomimetic materials to improve the regeneration of functional tissues and muscles. A shape-defined hydrogel could tailor to different trauma situations. To overcome the challenge of shape control fidelity in a hydrogel, we propose a bovine placental-derived natural bio-ink with 3D printing, which is composed of droplets encapsulating placental collagen type 1 (COL 1) and amniotic fluid-derived extracellular vesicles (AF-EVs).

Amniotic fluid is a rich source of EVs, and research has demonstrated their successful application due to their anti-inflammatory, angiogenic, and regenerative properties. We hypothesize that COL 1/3 from bovine placenta can better replicate human tissue environments, tapping into placenta's known rich regenerative and biochemical properties.

Our results demonstrate that bovine placental collagen is highly pure and gels faster than commercial collagen. AF-EVs significantly improve wound healing in comparison to stem cell EVs.

Thus, this bio-ink holds promise for deep wound healing and tissue repair applications, offering a novel approach for deep wound care using nature-derived, biomimetic materials that can be encapsulated into droplets. The next step is incorporating these droplets into a wound-healing hydrogel.

***Presenter(s): Samir Matloob***
***Faculty: Walter O'Dell***

## *Project Assessing Lung Vasculature Development and Application to Early Preterm Gestation Patients*

Bronchopulmonary Dysplasia (BPD) is a chronic respiratory disease associated with preterm gestation. It presents itself in patients from birth through reliance on ventilation devices due to improper lung development. Although the lungs become more independent through infancy, they never develop fully, leading to complications through adolescence and adulthood. The purpose of this study was to try and map the lung vasculature of preterm gestation patients in comparison to full-term gestation patients over time to track the development of lung vasculature. This was achieved by using the ImageJ software to create a 3-D model of the right lung vasculature. Lung vessels were counted from these 3-D models and compared to test whether there is a correlation between lung vessel counts and gestation age. So far, no definitive evidence has been shown for a correlation.

***Presenter(s): Natalia Maya***
***Faculty: Sarah Kim***

***Project Utilizing Artificial Intelligence To Analyze T1D Heterogeneity***
***Abstract***

Introduction:
Type 1 diabetes (T1D) is an autoimmune condition characterized by insulin deficiency due to destruction of pancreatic β-cells. Artificial Intelligence (AI) offers a groundbreaking approach for histopathological analysis of pancreatic tissue and heterogeneity in T1D.
Background:
Manual pancreatic tissue analysis is time-consuming and error-prone. AI, including machine and deep learning models, provides an alternate way to process whole slide images (WSI), segment endocrine cells, and detect T-cell infiltration.
Methodology:
A literature review investigated the applications of AI in T1D bioimage analysis, focusing on convolutional neural networks (CNNs) and deep learning for feature recognition and extraction, and pattern detection. The image analysis programs QuPath and Deep segmentation model SAM were utilized to enhance segmentation accuracy. Comparisons were made between AI-driven image analysis and manual methods to assess efficiency and accuracy.
Results:
AI use improved precision in identifying β-cell loss, islet heterogeneity, and T-cell infiltration. QuPath and SAM, proved more efficient than manual analysis by mitigation of human error, and acceleration of data processing time.
Conclusion:
AI-driven approaches for T1D histopathological analysis enhance the accuracy of research, offering a deeper understanding of pathogenesis and progression. Integrating deep learning models in T1D research assists in understanding disease progression and supports innovation.

***Presenter(s): Adam McAleer***
***Faculty: Eric Schwartz***

***Project Modular Architecture for the NaviGator Autonomous Maritime System***

The NaviGator Autonomous Maritime System is a robotic platform designed for autonomous navigation using sensing, path planning, and computer vision. Since 2016, NaviGator has biannually competed in the international RobotX Maritime Challenge. However, outdated components and a lack of organization made maintenance and upgrades difficult. This project aimed to enhance the system's architecture and organization through structural and electronic improvements. A vulnerability analysis guided the redesign of the robot's frame and the creation of a modular electronics system, prioritizing ease of use and reliability. Off-the-shelf components were selected to reduce cost and complexity. Finite element analysis studies were conducted to ensure structural integrity of the frame while minimizing material usage and cost. The redesigned frame and modular electronics system have been designed, with testing planned later this year. This project details the design and implementation of a modular architecture for NaviGator, improving maintainability and performance for future competitions.

***Presenter(s): Calypsa McCarthy***
***Faculty: Noah Jones***

***Project A Functional and Statically Typed Framework for Correctness and Scalability Implemented in Haskell***

Uniform Manifold Approximation and Projection (UMAP) is a dimensionality-reduction and clustering algorithm that takes a high-dimensional dataset and uses that to optimize a low-dimensional embedding. While UMAP is widely used for efficient and reliable dimensionality reduction, there is a growing demand for improved scalability across heterogeneous datasets. A UMAP implementation in Haskell would boast advantages over other languages due to Haskell's functional programming properties such as lazy evaluation and static typing, which can provide improved concurrency, parallelization, and scalability, resulting in a more user-friendly experience by enhancing reliability. Despite this, no distributed version of UMAP implemented in Haskell is currently available to the public. To address this gap, this project developed a UMAP implementation that processes fuzzy simplicial sets concurrently. This allows for the distribution of the UMAP algorithm across multiple GPUs as each GPU only keeps a portion of the dataset in VRAM. To accomplish this, a purely functional UMAP was implemented using Haskell (GHC2020) and wrapped in a concurrency monad using the parallel programming library. Typed parsing of datasets was found to be compatible with a functional UMAP implementation, and the fuzzy simplicial sets in UMAP allowed for concurrent processing and the implementation of a scalable UMAP.

***Presenter(s): John McCauley***
***Faculty: Rolf Renne***

## *Project Bioinformatically Characterizing KSHV miRNA Splicing Effects on Latency*

Micro RNAs (miRNAs) are a class of short, regulatory RNA molecules which play an important role in human health and disease. miRNAs regulate gene expression by influencing both the stability of transcripts and protein translation. Kaposi's Sarcoma-Associated Herpes Virus (KSHV) encodes 25 regulatory miRNAs necessary for maintaining the virus's latent phase, which leads to the development of Kaposi's Sarcoma (KS). However, despite years of dedicated research, the extent of KSHV miRNAs' involvement in promoting latency remains unknown. Here, we explore how KSHV miRNAs affect transcript splicing in infected cells and their effect on latency. Certain KSHV miRNAs have exhibited alternative splicing (AS) activity, suggesting potential links to latency. A knockout of a particular KSHV miRNA has shown splicing factor dysregulation, displaying differentially expressed transcripts. We are characterizing exonic binding sites for motifs associated with dysregulated transcription factors using bioinformatics tools. Our pipeline utilizes both established Bioinformatics tools and newly developed scripts, including hard-coded motifs. The goal of this project is the creation of a pipeline to allow investigators to characterize AS events for knockout miRNAs of KSHV. On completion, this work could help uncover the contribution splicing has on latency, helping create treatments for the eradication of the cancer entirely

***Presenter(s): Brianna McDonald***
***Faculty: Catherine Flores***

## *Project Genetic engineering of hematopoietic stem and progenitor cells*

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

***Presenter(s): Andrew McGrath***
***Faculty: Katie Basinger***

## *Project The Effect on Student Performance and Course Perception Given an Interactive Module in Online Learning*

Online education has been rapidly becoming the norm for Generation – Z education; however, the pandemic catapulted the movement of online learning in ways educators were not prepared for. Due to this rapid change, several aspects of online education need to be evaluated to ensure the best integration. For starters, GenZ is the first truly digital native generation, making it challenging to focus on a single device in an educational environment like an online lecture. Educators are also competing with the myriad of resources online that students often use to supplement online education. Finally, we are missing evidence-based research that can help provide guidelines for providing the best online education in today's society. Therefore, this work investigates using active learning in an online course to determine the effect on students' performance and perceived learning outcomes based on exam, final grade, and course evaluation data to compare traditional passive online exercises with active in-lecture online exercises. Active lectures require students to continually engage with the video via practice problems with an option to watch solutions for incorrect responses. This work is a continuation of a work-in-progress paper submitted in 2021 and compares two modules in an online engineering economy course expanded over five semesters. The work-in-progress paper showed no evidence that active online lectures affect performance-based indicators (grades) but may affect students' perception of the course. This work will evaluate these two outcomes and provide guidelines and lessons learned for online courses using active exercises.

***Presenter(s): Connor McLoon***
***Faculty: Damon Woodard***

## *Project Standardizing Multi Agent Reinforcement Learning Algorithms with StarCraft II*

As Multi-Agent Reinforcement Learning (MARL) develops into a promising field of artificial intelligence research and mathematical experimentation, a noticeable lack of performance comparison studies have been published, despite the standardization of training environments. To address this challenge, we have conducted a performance comparison of the top-performing MARL algorithms in the StarCraft Multi-Agent Challenge (SMAC), measuring their performance under equivalent training and execution conditions called "scenarios". We utilized PYMARL, a training and development framework published by the authors of SMAC, in order to split models into modular units that could be interchanged without affecting environmental conditions. The data resulting from these experiments was used to generate several graphs, showing the win rate of each model over time as a measure of performance and learning rate, along with several other metrics. Interestingly, as testing was performed in a lightweight environment, the resulting data implied a lessened impact on model complexity, including cases where more complex models suffered drawbacks. The compiled findings demonstrated the performance of each model in uniform experimental conditions, demonstrating a process by which new MARL models could be developed, trained, and tested entirely within a standardized framework.

***Presenter(s): Cameron McMullen***
***Faculty: Douglas Soltis***

## ***Project Ecological Niche Models Reveal Climate Threats to Florida's Hardwood Forest Biodiversity***

Florida hardwood forests are important ecosystems that support diverse temperate plant species at their southernmost distributions within the North American Coastal Plain biodiversity hotspot. These forests are increasingly threatened by human activities including deforestation, changes in land use, and the challenges induced by climate change, necessitating the development of ecological niche models to predict the putative distributions of key hardwood forest species in the future and inform conservation strategies. Using occurrence data collected from global biodiversity databases such as GBIF and iDigBio, we compiled, cleaned, and filtered thousands of records for native hardwood forest species. Environmental variables were used to map current suitable niche distributions and then to estimate potential future habitat availability under various climate scenarios. These ecological niche models provide important insights into the potential impacts of climate change on species distributions, enabling a deeper understanding of how the species comprising these hardwood forest ecosystems may shift in the future. Our findings can help guide conservation efforts to protect Florida's hardwood forests, ensuring the preservation of biodiversity and ecosystem function amidst ongoing environmental changes.


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***Presenter(s): Megan Meese***
***Faculty: Eleni Bozia***

***Project Impacts of Digital Technology on the Preservation and Transmission of Heritage and History***

People's identities are deeply connected to the objects and places that are part of their history and heritage. Many sources of tangible cultural heritage are inaccessible to the public at best and threatened by imminent eradication at worst. In between lie many dangers, including environmental degradation, anthropogenic destruction, and continued displacement. It is important to consider how technological advancements can be employed to address and mitigate the detrimental implications. By creating digital 3D models of artifacts and consulting existing literature, it became evident that digitization can safeguard and disseminate knowledge of such sites and artifacts, thereby maintaining and immortalizing integral aspects of various cultures. Examples include 2D scans of documents, digital and physical 3D models of artifacts, online tours of heritage sites, and virtual reality simulations that portray ruins prior to their state of disrepair. The accessibility granted by such digital preservation methods promotes these virtual versions as instruments of learning in museums, classrooms, and other settings. It also helps bridge the disconnection between people and the objects of utmost importance to their heritage. This project provides key insights into how digitization technologies can be utilized to advance education, access, and preservation of histories and heritages from around the world.

***Presenter(s): Astha Mehta***
***Faculty: Brittany Bruggeman***

## ***Project Longitudinal Assessment of Exocrine Pancreatic Function and Fecal Elastase 1 as a Biomarker for Early Type 1 Diabetes Prediction***

Type 1 diabetes (T1D) is characterized by the autoimmune destruction of pancreatic β-cells; however, emerging evidence suggest that exocrine pancreas atrophy occurs prior to the onset of Stage 3 T1D. The aim of this study is to longitudinally assess markers of exocrine pancreatic function, particularly fecal elastase-1 (FE-1), to determine its trajectory in pre-clinical T1D and evaluate its efficacy as a predictive biomarker for T1D. Previous studies show conflicting evidence of reduced exocrine mass and function before islet AAb seroconversion or between Stage 1 and Stage 3 T1D. With the cross-sectional nature of these studies, assessing the reduction in exocrine pancreatic function may provide more evidence as a prognosis to T1D. Examining FE-1 is an indirect measure that expresses changes in pancreatic function and more importantly correlated with reduced pancreatic volume in T1D as opposed to more invasive procedures. Using data from the TEDDY cohort, which follows high-risk children from birth, we will compare longitudinal FE-1 levels in those who develop T1D or multiple islet autoantibodies (AAb+) with matched controls. FE-1 reduction could serve as an early biomarker for T1D onset and offer insights into exocrine dysfunction and β-cell autoimmunity in T1D pathogenesis. This study will provide a timeline of exocrine changes, informing early risk detection and intervention strategies.

***Presenter(s): Maria Melara***
***Faculty: Dayane Oliveira***

## *Project Biocompatibility of New Polyurethane-based Polymeric Materials for Sports Mouthguard Fabrication*

Objectives: The aim of this study was to compare the biocompatibility of new polyurethane-based polymeric materials for sports mouthguard fabrication.

Methods: The new polyurethane-based polymeric materials tested were Elastic 50-A and Flexible 80-A (Formlabs). EVA and PolyshokTM (Bufallo) were used as negative control groups. First, L929 fibroblast cells were seeded in 96-well plates using Dulbecco's Modified Eagle Medium (DMEM), supplemented with 10% fetal bovine serum (FBS) as the culture medium for 24h at 37oC in an incubator with 5% $CO_2$ and 95% humidity. Then, 12mm diameter, 4mm thick samples of each polymeric material tested (n=5) were immersed in 24-well plates filled with non-supplemented DEMEM for 24h and stored in the incubator at similar settings. After 24h, the culture medium was replaced with either fresh non-supplemented DEMEM (blank; positive control group) or each extract medium from the different polymeric materials (n=5). After 72h, the cell viability was evaluated using the (3-(4, 5-dimethylthiazolyl-2)-2, 5-diphenyltetrazolium bromide) (MTT) method. This procedure was replicated three times per ISO 10993-5. A power analysis was conducted to determine the sample size to provide a power of at least 0.8 at a significance level of α=0.05. Statistical analyses were performed using ANOVA and Tukey's tests.

Results: All polymeric materials caused reduction of cell viability (p< 0.0006; F=12.63) in the following order, PolyshokTM < EVA < Elastic 50-A < Flexible 80-A. However, according to ISO 10993-5, all of them were classified as grade 1, reactivity mild.

Conclusions: The new polyurethane-based polymeric materials seem a biocompatible alternative to substitute conventional polymeric sports mouthguards' materials.

***Presenter(s): Suvanti Meraney***
***Faculty: Julie Maupin-Furlow***

## *Project Biomolecular Condensates in Archaea: Insights from RecJ3/4-aRNase J*

Biomolecular condensates within eukaryotes and prokaryotes allow for the membrane-less compartmentalization of important biochemical processes and cell responses to environmental stressors by concentrating nucleic acids and proteins in a defined space. RecJ3 and RecJ4 are subunits of a large exonuclease complex observed to have a critical role in DNA repair in the haloarchaeon Haloferax volcanii. RecJ3/4 complexed with aRNase-J (an endo- and 5'-3' exoribonuclease) to form a ubiquitin-like protein-associated nuclease complex that has 3'-5' exoribonuclease activity. 3D-modeling suggests this complex may form biomolecular condensates. To enable better visualization of RecJ3/4-aRNaseJ complex and its role in DNA repair, a fluorescent reporter (mChartreuse, mChar) was incorporated to generate final tryptophan-inducible plasmids including: mChar-strepII-recj3, aRNAse J-strepII-mChar, and recJ4-strep II-mChar. These strains were grown on Ca+ medium with tryptophan to induce expression of the genes. The cellular localization of the fluorescently tagged proteins was then investigated with an epifluorescence microscope. Fluorescence in the cells was also monitored using an empty vector plasmid as the negative control and OxsR-mChar-StrepII was used as a comparison since OxsR binds genomic DNA during oxidative stress. The observed cellular localization of RecJ3/4-aRNase J closely resembles biomolecular condensates, providing an insight into how halophilic archaea may survive in high-salinity environments.

***Presenter(s): Alexa Merkens***
***Faculty: Charles Telesco***

***Project Spectropolarimetric Analysis of Net Chirality as a***

Many molecules come in two mirror-image forms, called enantiomers. If a molecule has an enantiomer, it is chiral. Enantiomers are referred to commonly as either right- or left-handed based on the orientation of their atoms. In non-biological substances, there are comparable amounts of both enantiomers, but in organisms, there is a significant excess of one handedness. This can be observed using circular polarization; if unpolarized light is shone on an organic sample, the enantiomers will absorb the polarized light of their respective handedness. The reflected and/or transmitted light from the sample will then only include the unabsorbed light, which, in the case of life, will be circularly polarized in one direction or the other.
The Integrated Miniature Polarimeter and Spectrograph (IMPS) is an instrument used to detect life; utilizing spectropolarimetry, it can detect linear and circular polarization of reflected and transmitted light. The primary goal of this study is to establish a database of biological chiral signatures that can be compared to similar observations on other worlds. Preliminary field tests have been conducted around Gainesville; the results are consistent with expectations. When fully portable, IMPS will be used in the Everglades to study salinity's effect on microbial mat health.

***Presenter(s): Florencia Merlino***
***Faculty: Brent Sumerlin***

## *Project Polymers of Dynamic Sequence through Depolymerization*

All living organisms undergo transformation, whether through gradual processes like growth and evolution or more sudden changes like metamorphosis, which alter both structure and behavior in response to environmental factors. Similarly, at the molecular level, the relationship between structure and function has guided the development of synthetic polymers with controlled architectures and sequences. Synthesis of polymers with increasingly ornate architectures and sequences have thus been made more accessible through the advent of reversible-deactivation radical polymerization (RDRP) methodologies. A key feature of RDRP methods is the very high end-group fidelity. High end-group fidelity is essential for block copolymer preparation, but also for the depolymerization of polymethacrylates via chain-end activation. Depolymerization of vinyl polymers has seen an explosion in the literature, most often noted as a method to address the plastic waste crisis. The depolymerization process regenerates the starting monomer at high purity and can thus be repolymerized back into the initial polymers, creating a circular economy. However, depolymerization techniques can also be leveraged to make polymers that are dynamic. While its potential for such broader synthetic applications has been noted, it has yet to be demonstrated in this particular fashion. Herein, we propose expanding depolymerization methods as tools to redefine synthetic vinyl polymers as evolving materials rather than static entities. To do this, poly((benzyl methacrylate)-b-(methyl methacrylate)) (P(BnMA-b-MMA)) was depolymerized in both solution and bulk conditions to regenerate the respective monomers. In a one-pot fashion, the monomers are used to repolymerize a material into a random sequence and can continue to be reprocessed.

*Presenter(s): Elizabeth Michels*
*Faculty: Lien Nguyen*

*Project Association of hexanucleotide repeat expansion in SVA elements and Alzheimer's Disease*

Alzheimer's disease (AD) is the most common form of neurodegenerative disorder without any effective treatment. AD causes around 60-70% of dementia cases worldwide and there are ~6.7 million Americans living with AD. Previous studies proposed that genetics are the main factors contributing to AD but our understanding about the genetic components is limited. In this study, we used long-range PCR (LR-PCR) to study the length of GGGAGA hexanucleotide repeat expansion (HRE) in SVA elements in Praja ring finger ubiquitin ligase 2 (PJA2) and Heparan alpha glucosaminide N-acetyltransferase (HGSNAT) in 1589 AD and 1919 control cases. The LR-PCR products from AD and control samples were then analyzed by DNA fragment analysis and calculated by odds ratio (OR) to show the relationship between the HRE and AD. Our data suggested that the HRE length from 40 repeats in SVA of PJA2 is significantly associated with AD (OR=2.0736, P<0.0001) and AD risk increasing depends on HRE length of this SVA. Additionally, the homozygous HRE from 20 repeats SVA elements of HGSNAT associated with increased AD risk in the people older than 83-year-old (OR=1.6683, P=0.0006). In summary, our results suggest expanded repeats in PJA2 and HGSNAT increased risk of developing AD.

***Presenter(s): Hayden Mickley***
***Faculty: Julien Beuzelin***

## ***Project Preference of a weevil pest, Listronotus sparsus, for six apiaceous crops grown in Florida***

Florida's Everglades Agricultural Area (EAA) plays a crucial role in producing apiaceous crops for national markets in the winter. Since 2020, celery and parsley growers in the EAA have faced unexpected damage caused by Listronotus sparsus weevils, previously not recognized as crop pests. The larvae of these weevils pose a significant threat to celery, parsley, and other apiaceous crops, by tunneling through petioles, crowns, and roots. The reasons for the weevil's emergence as a pest remain unclear, but changes in production practices, insect biology, or weather patterns could be contributing factors. This project aimed to determine the preference of L. sparsus adults for celery, parsley, cilantro, dill, carrot, and fennel. The six crops were grown in the greenhouse. In a lab experiment, foliage of all crops was tested using a multiple-choice design. The number of weevils feeding on crop foliage was recorded 24 hours after weevil release. In a field experiment, the six crops were transplanted to plots following a randomized block design with four blocks. Seven weeks after transplanting, eight plants were collected in each plot, and weevil injury and infestation levels were recorded.

***Presenter(s): Sarah Milbrandt***
***Faculty: Heather Stark***

## *Project Socio-Cultural Barriers to Long-Term Behavior Change: Egg Consumption Among Mothers and Children in Burkina Faso*

Background: Despite the success of behavior interventions promoting egg consumption to combat childhood malnutrition, socio-cultural barriers can hinder the sustainability of dietary changes. The Un Oeuf Study (2018-2019), a randomized controlled trial (RCT) in Burkina Faso, used behavior change intervention to increase egg consumption among infants and young children. Since 2019, conflict and violence have displaced most participants. This study examines how social approval, traditional beliefs, and household decision-making impact mothers' ability and willingness to feed their children eggs. Methods: This cross-sectional study analyzes data from a follow-up survey conducted five years post-RCT. The survey was administered to 181 mother-child dyads from the original 260 Un Oeuf cohort by trained enumerators. Key variables include dietary assessment, decision-making power, and perceived social approval of dietary behaviors. Results: Preliminary analysis shows that before displacement, 98.9% of women regularly fed their child eggs, while 44.2% were likely to continue. Perceived social approval for egg consumption was highest from husbands (95.0%) and lowest from religious leaders (36.5%). Conclusions: Understanding socio-cultural barriers to long-term dietary behavior change is critical for designing effective nutrition interventions. Findings will inform public health strategies to promote sustainable dietary improvements in LMICs, particularly in contexts of displacement and food insecurity.

***Presenter(s): Sydney Miller***
***Faculty: Lisa Spiguel***

***Project Impact of Routine Genetic Testing in Breast Cancer Patients***

Introduction: National Comprehensive Cancer Network, NCCN, guidelines are developed to guide clinicians in identifying individuals at risk for carrying pathogenic or likely pathogenic (P/LP) genetic variants. The guidelines for patients with breast cancer still rely on age, Ashkenazi ancestry, personal and family cancer history, and tumor biology despite evidence that heritable cancers may be missed with these guidelines. Routine use of genetic testing may guide personalized medicine and prompt cascade testing. We aimed to investigate the use of routine genetic testing, potential disparities in testing, and implications on surgical management in breast cancer patients.

Methods: In this retrospective study, we identified patients treated by a single surgeon who began routinely offering genetic testing in 2019-2020. Patients who established care with this surgeon from Jan. 1, 2019 – Dec. 31, 2020 were included. Patients were excluded if surgery was performed by another surgeon. Demographic data, genetic testing, pathogenic or likely pathogenic (P/LP) variants, and surgical procedure were obtained from medical records. Statistical analysis included Fisher's Exact and Mann-Whitney U Tests.

Results: Over a 2-year period of routine genetic testing, 88.9% of female breast cancer patients were offered genetic testing. Older age was the only significant finding in not offering genetic testing, with no racial or ethnic disparities noted. 83.9% of patients offered testing elected to undergo testing. Older age was again the only significant finding in not electing to undergo testing, with no racial or ethnic disparities noted. 15% of patients tested were identified as P/LP carriers, 41.3% of whom carried moderate or high risk variants. Of the patients with P/LP results, the majority of patients with no or low risk results underwent breast conservation, whereas the majority of patients with moderate/high risk results underwent mastectomy.

Conclusions: When offered, most patients complete genetic testing after a diagnosis of breast cancer, which does not appear to be associated with racial/ethnic disparities, yet is associated with younger age. Moderate and high risk P/LP variants are associated with the decision to undergo both mastectomy and contralateral risk reducing mastectomy. Routine offering of genetic testing may inform surgical treatment, surveillance and risk reduction of other diseases, as well as cascade testing.

***Presenter(s): Marius Misiunas***
***Faculty: Todd Brusko***

## *Project Characterizing the Influence of Growth Hormone Signaling on Regulatory T Cell Function*

Type 1 diabetes (T1D) progression is characterized by insufficient suppression of autoreactive T cells by regulatory T cells (Tregs), resulting in the destruction of insulin-producing pancreatic β-cells. Our lab recently reported that interleukin-2 (IL-2) and insulin-like growth factor (IGF-1) synergize in vitro to augment Treg proliferation. Additionally, we have identified deficient serum levels of IGF-1 preceding and following T1D onset, highlighting the need to identify strategies to augment IGF-1 using a combinatorial therapy. Recombinant human growth hormone (rhGH) bolsters IGF-1 production by the liver, although the impact of GH receptor (GHR) signaling on immune cells is not fully understood.
We sought to examine T cell GHR expression patterns, along with the influence of rhGH on Tregs and effector T cells. Across both human donors and the non-obese diabetic (NOD) mouse model, we identified GHR upregulation on memory T cells, with in vitro rhGH augmenting T cell proliferation. Furthermore, we observed that rhGH and IL-2 synergistically induce greater amounts of phosphorylated-STAT5 in Tregs in the presence of a PTP-1B inhibitor. Overall, given its immunomodulatory capacity and ability to boost IGF-1 levels, our pre-clinical data supports further investigation of the use of rhGH in combination with IL-2 for the treatment of T1D.

***Presenter(s): Kennedy Moes***
***Faculty: Gopal Agarwal***

***Project Humanized Injectable Hydrogel for Spinal Cord Injury Regeneration***

***Spinal cord injury (SCI) can result in permanent loss of sensory and motor functions. According to the World Health Organization, it is estimated that 15.4 million people were living with SCI globally in 2021. Currently, there are no FDA-approved treatments for locomotor recovery after SCI.*** Decellularized human peripheral nerves have shown the potential to promote axonal regeneration in peripheral nerve diseases. In this study, we developed an injectable hydrogel using decellularized human sciatic nerve (iHPN). Developing an injectable hydrogel provides us with a minimally invasive hydrogel that can be administered at the site of injury. Furthermore, the presence of pro-regenerative cues like Collagen I, laminin, and various growth factors can promote axonal regeneration in the injured spinal cord. In the current study, human nerves were decellularized modifying the Hudson protocol previously published by our lab, and delipidated using various organic solvents. The nerves were then digested and neutralized to p.H. 7.4 and to match the CNS native mechanical strength genipin, a natural crosslinker was used. The resultant hydrogels exhibited injectability and mechanical strength that can support neuronal cell growth. Overall, iHPN has the potential to promote axonal regeneration in the injured spinal cord and can also be used clinically as a delivery vehicle for SCI regeneration.

***Presenter(s): Jack Moreland***
***Faculty: Desika Narayanan***

## *Project The relationship between infrared flux and super massive black hole mass in sub millimeter galaxies*

Discovered in the 1990s, Ultra Luminous Infrared Galaxies (ULIRGs) are a class of galaxies found with high illuminations in the infrared and at high redshift. Also referred to as submillimeter galaxies, these galaxies are the most luminous, and heavily star-forming galaxies in the Universe. Often found at redshift z = 2 - 4 (~15 - 20 billion ly away), the galaxies are observed to be largely obscured by dust which absorbs and re-emits the light from internal star formation in the infrared. This fact makes observations of these galaxies a very challenging endeavor. In lieu of observations, astronomers have turned to simulations to learn more about these fascinating structures. Using the UF supercomputer HiPerGator and galaxy modeling software Powderday and CAESAR, we ran cosmological simulations of ULIRG formation at redshift 2. From the results of these simulations, we explored the correlation between the mass of the supermassive black holes located at the centers of the galaxies, and the flux of the galaxy at the 850 micron wavelength.

***Presenter(s): Faith Morrison***
***Faculty: Eleni Bozia***

## ***Project Greek Love: Homoerotic Elements Portrayed in Antiquity and How They Reflect Ancient Views on Sexuality***

"Greek Love" has played a crucial role in modern discussions on same-sex relationships, particularly in how homoerotic elements in classical Greek literature and poetry reflected their society and culture. This study argues that, unlike contemporary binary classifications of sexual orientation, ancient Greek societies viewed sexuality as a spectrum, emphasizing social roles rather than fixed identities. The modern terms "homosexual" and "heterosexual" did not exist in their framework; instead, relationships were often defined by social roles rather than attraction to a certain sex. Poetry, in particular, illustrates this fluidity, as expressions of love and desire were not confined to one gender. Additionally, this study explores how the concept of "Greek Love" influenced later intellectual movements and perspectives on sexuality. Greek models of same-sex love served as a source of inspiration for prominent writers such as Oscar Wilde during his trial in the nineteenth century where he attempted to use classical frameworks of sexuality in an effort to legitimize homosexuality in a more modern setting.

In closing, by critically engaging with ancient texts, this study highlights the evolving nature of sexuality, and how it has evolved over time.

***Presenter(s): Kristen Moy***
***Faculty: Amanpreet Kapoor***

### *Project Predicting Internships Across Machine Learning Algorithms*

Participating in an internship during undergraduate studies allows students to gain hands-on experience and technical skills as well as increases their employability for full-time job opportunities. However, only 40% of students in computing participate in internships across the degree program. To investigate why students are not participating in internships, we conducted a survey-based study to examine predictors of internship participation among 512 undergraduate computing students enrolled at three universities in the US. We previously modeled the data, but in this study, we evaluated the efficacy of predictive machine learning models such as K-Nearest Neighbors, Random Forest, Neural Networks, and Logistic Regression to understand student participation in internships based on demographic, academic, and identity-related factors. Our findings indicate that the Random Forest and Logistic Regression algorithms achieved the highest accuracy (71%) in predicting internship participation, while K-Nearest Neighbors and Neural Networks performed the worst, with an accuracy of 64%. Random Forest had the highest precision (64%) and tied with K-Nearest Neighbors for the highest specificity (76%). Logistic Regression had the highest recall (71%). These insights improve our understanding of the factors influencing internship participation and can help academic institutions and career services better support students' professional development.

***Presenter(s): Dean Mucaj***
***Faculty: Aladdin Alwisy***

## *Project Researching effective teaching methods and learning strategies for robotics education*

Robotics are rapidly transforming industries, with established integration in manufacturing supported by comprehensive educational frameworks. While these technologies hold immense potential for the construction sector, a significant gap exists in tailored educational and training programs. This research addresses this disparity by synthesizing existing educational studies on robotics, aiming to establish a robust foundation for their integration into industrialized construction (IC). A comprehensive literature review is conducted to analyze diverse educational techniques, pedagogical theories, and key parameters employed in current robotics education. The study critically evaluates the limitations of these approaches, particularly concerning their applicability to the unique demands of IC. By identifying these limitations, the research pinpoints the challenges preventing seamless knowledge transfer and practical implementation in construction environments. This analysis culminates in the recommendation of optimal educational frameworks, theories, and parameters specifically designed for IC. These recommendations aim to bridge the knowledge gap and foster a skilled workforce capable of effectively deploying and managing robotic technologies. Ultimately, this research seeks to accelerate the adoption of robotics in construction by establishing the necessary educational and training foundations, thereby enhancing productivity, safety, and innovation within the industry.

***Presenter(s): Annemarie Mueller***
***Faculty: Cassandre Stirpe***

## *Project Neodymium Isotope Evidence for Circulation Changes in the Indian Ocean Over the Last Glacial Termination*

The goal of this project is to investigate the last glacial termination, the transition from the Last Glacial Maximum (LGM) to the warm interglacial climate of the Holocene, which occurred between approximately 18,000 and 11,000 years ago. The role of the Indian Ocean in climate regulation and its circulation changes during this period are poorly understood. To address this gap, we focus on the southern Indian Ocean, an area with limited prior research.

In this study, we present a new record of neodymium isotope data from a sediment core located at 35.833ºS, 91.783ºE and a water depth of 3,816 meters. Neodymium (Nd) isotopes serve as a tracer for water mass movement. By comparing our data to modern reference points, we can determine the relative influence of Atlantic and Pacific waters in the southern Indian Ocean during the transition into the interglacial period.

Our findings indicate a more radiogenic signature at our core site during the LGM compared to today, suggesting greater influence from the Pacific and/or Southern Oceans. However, during deglaciation, the signature became less radiogenic, indicating increasing influence from the North Atlantic across this transition. This suggests that as the climate warmed, North Atlantic deep water traveled to the Southern Ocean and eventually began feeding into the Indian Ocean.

These circulation changes are significant in understanding atmospheric carbon dioxide variations during deglaciation. Pacific water masses hold more carbon than Atlantic waters because they have been isolated from the atmosphere for hundreds of years, allowing organic carbon to accumulate. The transition to increased North Atlantic influence in the Indian Ocean during deglaciation suggests a reduction in carbon storage compared to the LGM, when Pacific influence was stronger. Understanding these past ocean circulation patterns is crucial for predicting how modern oceans may respond to ongoing climate change and their potential impact on global carbon storage.

***Presenter(s): Arnav Mujumdar***
***Faculty: Paul Fulda***

***Project Detection of the Displacement Gravitational Wave Memory Effect of LIGO Binaries in LISA Data Streams***

The displacement gravitational-wave (GW) memory effect predicts a permanent displacement between the reference test masses of a GW detector after the passage of a GW. The GW memory of individual compact binary coalescences (CBCs) is orders of magnitude below the detector background noise, which necessitates the use of data-stacking algorithms to yield a cumulative memory signal-to-noise ratio (SNR). The Laser Interferometer Space Antenna (LISA) will be well-suited to detect the GW memory of CBCs merging in the LISA and LIGO bands due to gigameter arm lengths and sensitivity in the millihertz frequency band. Third-generation (3G) ground-based detectors like Cosmic Explorer (CE) and Einstein Telescope, which are scheduled to operate concurrently with LISA, improve the prospects of detecting GW memory.
We use simulated ground-based detector network triggers using source populations from the CE MPSAC dataset and search for corresponding memory strains in the LISA data stream. Improving on the time-domain stacking algorithm used by S. Ghosh et al. (2023) and accounting for uncertainty effects in the arrival time and memory sign, we estimate that a 0.5-year coincident detector runtime with LISA and 3G ground-based detectors will be sufficient to accumulate a GW memory SNR of 5.

***Presenter(s): Sloane Murphy***
***Faculty: Gabriela Hamerlinck***

## *Project Exploring seasonal dispersal behavior in adult Triatomine sanguisuga kissing bugs in Gainesville, Florida*

American Trypanosomiasis, commonly known as Chagas' Disease (CD), is a vector-borne disease that has unknown burden in the United States. Despite the known presence of vector, pathogen, and competent hosts in Florida, it is a highly neglected disease. Links between vector infection and climatological and environmental variables have been proposed for other regions of the United States, but no concerted collection efforts have been conducted in Florida. To validate this proposed correlation, we collected actively dispersing adult Triatomine sanguisuga bugs in Gainesville, FL over a four-month period (April-August 2024). The collection effort yielded limited bugs, but a wealth of information about the local climate patterns. Relative humidity, sky level coverage, and wind direction were found to be associated with dates where an adult Triatomine bug was found. Further collection efforts are needed to provide longitudinal verification of vector burden and climatological and environmental correlates, as they may influence higher CD transmission rate in summer months.

***Presenter(s): Ceanna Murray***
***Faculty: Kelly Rice***

## *Project Metabolic Adaptation of Staphylococcus aureus in Simulated Microgravity*

S. aureus was isolated from astronauts' nostrils when returning to the United States from spaceflight missions. S. aureus is a potentially deadly pathogen if in contact with humans that may lead to heath issues such as sepsis or death due to versatility of metabolic pathways used for growth and viability of infectious cells. Multi-omics comparisons of flight (FLT) and ground control (GC) cultures (BRIC-23 mission) revealed increased AGR quorum sensing and altered virulence factor expression in FLT S. aureus, linked to metabolic changes. However, it remains unclear how S. aureus metabolically adapts to growth in simulated microgravity (SuG), and whether growth temperature influences this adaptation. To understand what metabolic pathways are altered when S. aureus is grown at room temperature and at 37°C in SuG, RNA sequencing was performed on RNA isolated from these growth conditions and corresponding normal gravity controls. To model spaceflight, a random positioning machine (RPM) was used to simulate microgravity conditions. Differential expression analysis and bioinformatics tools are currently being used to analyze transcriptome data. These studies will provide insight into how growth and metabolic adaptation is regulated by temperature in SuG.

***Presenter(s): Nikita Nangia***
***Faculty: Daiqing Liao***

## *Project Analyzing the Effects of HDACi and PROTACs on Gene Expression*

***Histone deacetylase inhibitors (HDACi) and PROTACs are promising*** therapeutic agents for cancer treatment. Understanding their mechanisms of action and predicting their efficacy across different cancer cell lines is crucial for developing personalized medicine. This study aims to leverage machine learning techniques to address these challenges.

In the first part of this study, we developed a model to predict gene expression changes in response to HDACi treatment. By integrating diverse genomic and proteomic data from the Cancer Cell Line Encyclopedia (CCLE), we trained our model to identify genes that are differentially expressed upon HDACi exposure. Our model demonstrated robust performance in predicting drug response across various cancer cell lines, providing valuable insights into the molecular mechanisms of HDACi action.

Building upon the success of the HDACi model, we are currently exploring machine learning to predict gene expression changes induced by PROTACs. This research demonstrates the potential of machine learning techniques to advance our understanding of drug action and improve cancer treatment. By integrating diverse data sources and leveraging advanced algorithms, we aim to develop predictive models that can guide the development of more effective and targeted therapies.

***Presenter(s): Vartika Narang***
***Faculty: Meghan Ferrall-Fairbanks***

## *Project Sensitivity of Pancreatic Cancer Cell Lines and Pancreatic Stellate Cells to Gemcitabine*

Pancreatic ductal adenocarcinoma (PDAC) has a 5-year survival of 12.8%. Optimizing drug dosing with mathematical models to reduce toxicity while maintaining efficacy has shown effective in prostate cancer. However, we need a more complete understanding of pancreatic tumor ecology and how pancreatic stellate cells contribute to resistance to develop treatment strategies.

To investigate this, we are developing in vitro models using sensitive/naive and resistant PDAC cell lines to gemcitabine and pancreatic stellate cells. To develop the resistant PDAC phenotypes, cells are exposed to increasing concentrations of gemcitabine across many passages till a stable cell growth cycle is established. First, the sensitivity of each cell line (AsPC-1, BxPC-3, PANC-1, MIA PaCa-2) is assessed by a 13-point dose-response curve measuring cell viability with CCK-8 assay. This process is iteratively refined to identify LD50 values as well as changes in morphology and proliferation rates, providing insight into cell tolerance.

Ultimately, these models will inform a mathematical framework for adaptive therapy strategies, improving our understanding of treatment resistance. Future work will focus on establishing gemcitabine-resistant cell lines and explore tricultures incorporating stellate cells. By integrating these experimental models with mathematical models, we aim to refine treatment approaches and improve patient outcomes.

***Presenter(s): Sierra Natal***
***Faculty: Craig Smith***

## *Project Historicizing AI Images Through Alternative Process Photography*

The photographic process has been an ever-changing medium since its creation in the 19th century, beginning in 1839. With this evolution of the photographic, a digital counterpart has risen; that is one which is classified as Artificial Intelligence and generative image platforms. The handmade nature of the photograph becomes devalued as a result of these advancements. Considering these opposite ends of photographic progression, what would happen if the digital and analog were to combine? In my USP project, research was conducted to understand the process in generating an AI image via Stable Diffusion. Alternative photographic processes were researched as well, providing the different ways in which these AI generated images would be printed. These images, after undergoing different analog photographic processes, materialize the digital into the physical space. A history for each of the images is created, even though its origins were digitally fabricated. Undergoing the physical and labor intensive alternative photographic processes provides new meaning to the AI generated images.

***Presenter(s): Ankitha Nath***
***Faculty: Maria Zajac-Kaye***

## *Project TYMS Induces Acceleration of Pancreatic Ductal Adenocarcinoma in the hTS/KRAS^(G12D) Mouse Model*

Thymidylate synthase (TYMS or TS) is an essential enzyme in DNA synthesis and repair, overexpressed in pancreatic cancer. Prior studies have demonstrated its oncogenic potential, linking elevated TYMS expression to increased tumorigenesis, genomic instability, and resistance to chemotherapeutics. However, its role in early pancreatic tumor progression remains unclear. The goal of our study is to investigate TYMS expression in pancreatic development using a hTS/KrasGI2D transgenic mouse model. Mice were sacrificed monthly until six months of age, and pancreatic tissues were analyzed using hematoxylin and eosin (H&E) and alcian blue staining. Image processing software was employed to quantify preneoplastic lesions and tumor area. Preliminary results indicate that TYMS plays a significant role in early tumor development since increased number of pancreatic preneoplastic lesions (PanIN) were found in hTS/KrasGI2D mice compared to control mice that do not overexpress TYMS. However, beyond 5–6 months, no significant correlation between TYMS expression and lesion progression was observed, suggesting a temporally restricted influence of TYMS. Additionally, sex-based disparities were noted, with female mice exhibiting higher mortality rates and greater lesion burden than males. Given the established link between TYMS and genomic instability, these findings suggest that early TYMS dysregulation may contribute to pancreatic tumorigenesis. Further investigation into its regulatory mechanisms could inform targeted therapeutic strategies.

***Presenter(s): Eden Navarrete***
***Faculty: Hitomi Greenslet***

## *Project Driving Magnet Geometry in Magnetic Field-Assisted Double-Sided Incremental Forming*

The Magnetic Field-Assisted Double-Sided Incremental Forming (M-DSIF) manufacturing method involves the deformation of a sheet metal workpiece utilizing a magnet ball as a forming tool. The sheet metal is clamped in place while the motion of the magnet-ball tool is guided by a driving magnet attached to a programmable robot arm. In M-DSIF, the driving magnet is in contact with the workpiece throughout the forming process. The sheet metal is deformed step-by-step as the magnet-ball tool is driven along a set number of contours designated in the program. This study investigates the effect of the driving magnet geometry on the forming accuracy using an example of truncated cones formed in 0.2 mm-thick AA1060 aluminum sheets. A cylindrical flat-tip driving magnet and 12.7 mm ball-tip driving magnet were used for this study. Both yielded similar results in final truncated cone geometry, with wall angles greater than 50 degrees and depths greater than 7 mm. However, the ball-tip driving magnet displayed a greater force during the process and did not create a center protrusion in the workpieces as seen with the flat-tip driving magnet. The ball-tip driving magnet displays more accurate results toward future work in increasing workpiece wall angles.

***Presenter(s): Alexa Neilson***
***Faculty: James Davidson***

***Project Consumer Choice in the Company Store: The Material Culture of Tenant Farmers with Insights from an 1873 Alachua County Store Ledger***

Labor took on new shape during the Reconstruction Era (1865-1877) with the widespread adaptation of tenant farming, wage labor, and contract work. Growing rural communities were built around these tenuous systems, and many landowners ventured into the establishment of companies and stores. Despite their storefronts, many did not pay their workers in cash, thus necessitating purchases on credit. Such restricted access to capital has resulted in minimal assemblages at sites associated with labor, especially tenant farms, subsequently hindering archaeological analysis. Therefore, this project utilizes archival methodologies to supplement the minimal archaeological record and provide a more comprehensive understanding of labor dynamics during the Reconstruction Era. Integrating the purchase records of a saw mill company's store ledger (Alachua County, Florida, circa 1873) with additional primary historical sources, biographical sketches were obtained for the tenants, laborers, and other community members purchasing from the store. Furthermore, by associating individuals with their material culture, it became possible to identify demographic patterns in purchases. Findings revealed that many purchases made by laborers were ephemeral and did not persist in the archaeological record, but that one might be able to exercise agency as a consumer—where possible—through these daily choices in the company store.

***Presenter(s): Ashley Nelson***
***Faculty: Erin Westgate***

***Project Underestimating the Meaning of Super Bowl Sunday***

NFL football comes with big wins - and big losses. While fans no doubt prefer their teams to win, we predict that even disappointing losses can be surprisingly meaningful. Work on meaning forecasting suggests that we underestimate how meaningful imagined future events will be, regardless of whether the outcomes are positive or negative. We sought to replicate this effect in a real-world study of NFL football fans. To find out, we recruited 100 NFL fans and asked them to predict how meaningful it would be for their team to win (or lose) the Super Bowl. To control for the possibility that anticipation might change people's feelings, we randomly assigned fans to either make predictions (predictors) or not  (experiencers), and then followed up with all fans after the game. We predict that football fans will underestimate how meaningful it is for their team to lose, as well as win.

***Presenter(s): Alexander Newman***
***Faculty: Habibeh Khoshbouei***

***Project Sex-specific Differences in Methamphetamine-Induced Dopamine Dynamics and Reward Behavior***

Methamphetamine Use Disorder (MUD) remains a significant public health crisis. Methamphetamine (METH) hijacks the mesolimbic pathway, dramatically increasing extracellular dopamine (DA) levels. While MUD affects both men and women, sex-dependent differences remain poorly understood. Notably, females are at greater risk of developing MUD while using similar quantities of METH. Unfortunately, most studies focus on males and limit sex-specific understanding of MUD. We hypothesized that female mice exhibit greater dopamine release in a METH-paired environment compared to male mice. Four weeks after GRIN lens implantation and AAV-αSyn-dLight1.3b injection in the ventral striatum, animals underwent conditioned place preference (CPP), a preclinical model used to assess the rewarding properties of a drug. Over eight days, animals received alternating injections of METH and saline. Simultaneous in vivo imaging measuring DA dynamics in the ventral striatum as well as behavioral assessments were performed during drug-paired conditioning and preference test days. However, dopamine peak frequencies were strongly correlated with males rather than females – disagreeing with our hypothesis. Despite lower dopamine responses, METH-exposed males and females displayed similar CPP scores. These findings highlight sex differences in dopamine signaling during METH conditioning and provide neurobiological insights underlying MUD, informing the develop of sex-specific treatments.

***Presenter(s): Uriel Ngwa***
***Faculty: Angelika Neitzel***

## *Project Targeting Low Degrees of Functionalization for Polystyrene-Thianthreneation Reactions*

Polymers bearing a low fraction of highly polarizable ionic comonomers are promising building blocks for the bottom-up assembly of nanoscale-structured soft matter. We present the post-polymerization modification of polystyrene to yield random copolymers of styrene and thianthrenated styrene. Reaction conditions to precisely control the fraction of ionic comonomer were established and the resultant weakly charged copolymers characterized by proton nuclear magnetic resonance (1H NMR) spectroscopy. Thermal properties, including thermal degradation profiles and glass transition temperatures were determined using thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). Blending of weakly charged polystyrene with an immiscible weakly and oppositely charged polymer is predicted to drive microscopic phase separation analogous to what is well-known for neutral block copolymers composed of immiscible homopolymers.

***Presenter(s): Analuz Nieves***
***Faculty: Jessie Fernandez***

## *Project Investigating soil and leaf bacterial isolates from Everglades rice fields for inhibitory activities against rice blast disease.*

Rice blast disease, caused by Magnaporthe oryzae, destroys 10-30% of the global rice crop annually. Traditional control methods depend on harmful fungicides and costly resistant cultivars, disproportionately affecting low-income communities and worsening food insecurity. Our research investigates biological control as a sustainable alternative. We isolated 30 bacterial colonies from soil and 35 from rice field leaves in the Everglades Agricultural Area. Using in vitro antagonism assays, we assessed interactions between these bacterial isolates and the fungal pathogen. For each assay, we applied 5 µl of the bacterial sample onto plates and allowed them to grow for five days. Positive controls included Bacillus subtilis and Pseudomonas chlororaphis strain EA105, while Escherichia coli DH5-ɑ served as a negative control. Our initial findings identified five soil-derived and six leaf-derived bacterial isolates as potential biological control candidates, exhibiting inhibition rates between 20% and 40%.Biological control utilizes natural bacterial antagonists to manage rice diseases, offering an effective and eco-friendly alternative to chemical fungicides and costly resistant cultivars. This approach reduces environmental impact and provides a more accessible solution for low-income farmers, potentially enhancing sustainable agriculture and global food security, especially in regions vulnerable to rice crop losses.

***Presenter(s): Amanda Noy***
***Faculty: Sharon DiFino***

## *Project Transforming Attitudes: The Role of Interprofessional Education in Enhancing Speech-language Pathologist and Board-certified Behaviour Analyst Collaboration in ASD Care*

Speech-language pathologists (SLPs) and board-certified behavior analysts (BCBAs) frequently collaborate with children diagnosed with autism spectrum disorder (ASD). While both professions significantly contribute to enhancing language skills in this population, empirical research examining their interprofessional interactions to optimise language development is limited. Existing discourse suggests that collaborative practices between these professions are infrequent, potentially due to disparate field-specific training, clinical recommendations, and theoretical frameworks (Lane et al., 2023). A 2017 study identified a need for enhanced interprofessional education and collaboration, highlighting the complementary overlap between SLP and BCBA practices (Cardon, 2017). Furthermore, studies indicate that a multidisciplinary and collaborative approach improves the efficacy of healthcare services for children with ASD (Strunk et al., 2017). This study aims to investigate the attitudes of SLPs and BCBAs towards each other's respective fields and assess the impact of a brief interprofessional education intervention on these attitudes. This research seeks to provide insights into the role of interprofessional education in optimising client treatment through collaborative SLP and ABA practices.

***Presenter(s): Lauren Nunag***
***Faculty: Aaron Costin***

## *Project Machine Learning-Based Heat Stress Prediction for Construction Workers*

Heat stress is a critical occupational hazard in the construction industry, leading to serious health risks such as heat exhaustion and heat stroke. Existing prevention methods rely on generalized guidelines that may not account for individual and environmental variability, highlighting the need for data-driven, adaptive solutions.

This study focuses on developing a machine learning-based predictive model to assess heat stress risk in construction workers. Our approach integrates physiological data (heart rate, core body temperature, etc.), environmental data (wet bulb globe temperature, humidity, etc.), and historical heat stress cases. A key component of this research is synthetic data analysis, which has successfully balanced underrepresented scenarios and demonstrated high fidelity in capturing real-world trends. Additionally, our work incorporates prior research from NIOSH, CDC, and other occupational safety standards to refine risk level categorization.

XGBoost is being applied to analyze newly incorporated datasets of fatal heat stroke cases, aiding in feature selection and model optimization. The data from XGBoost will determine key predictors of heat stress outcomes, enhancing the accuracy of risk assessment models. These advancements will contribute to a proactive heat stress alert system, ultimately improving worker safety in high-risk environments.

***Presenter(s): Kristian O'Connor***
***Faculty: Stephen Wormald***

## ***Project Causal Clusters: Representing Explainable Features Learned by Deep Neural Networks as Causal Graphs***

We aim to visualize the inner workings of deep neural networks by investigating the clustering patterns that emerge within the latent space at each layer and representing the relationships between learned patterns using a causal graph. By identifying clusters at every layer during training, we can use traditional explainable AI methods such as SHAP to analyze and interpret the behavior of each cluster. Using this information, we can construct and explain a causal diagram that highlights how certain clusters influence or predict the activation of downstream clusters across the network. Our method provides insights into the hierarchical decision-making process within the DNN, shedding light on how information is transformed and propagated through layers. We evaluate the performance and interpretability of this approach by showing how these explanations can help model inspectors predict the false positive and negative cases in a neural network.

***Presenter(s): Ramila Odzakovic***
***Faculty: Sharon DiFino***

## *Project Exploring the Impacts of Language and Cultural Barriers on the Underdiagnosis of Post Traumatic Stress Disorder among Bosnian Immigrants in the United States*

This study investigates the impact of language and cultural barriers on Bosnian immigrants' access to mental health services in the United States, focusing on the underdiagnosis of Post-Traumatic Stress Disorder (PTSD). Following the 1992 Bosnian civil war, which caused significant trauma and displacement, approximately 300,000 Bosnians immigrated to the U.S. These refugees established tight-knit communities, but cultural and linguistic challenges persisted, hindering their access to mental health care. The World Health Organization estimated that 10% of Bosnia's population had PTSD, suggesting that a significant number of Bosnian immigrants may also suffer from this condition. The study used a combination of a literature review and surveys administered through Qualtrics, in Bosnian, to examine demographic factors, language proficiency, PTSD awareness, and symptoms specific to Bosnian war victims. The findings inform an understanding of how cultural attitudes, language barriers, and limited access to culturally competent care contribute to the underdiagnosis of PTSD. The research suggests strategies for improving mental health services for Bosnian immigrants and provides a framework for addressing similar challenges in other immigrant populations. Ultimately, the study proposes actionable recommendations for enhancing mental health care and support for this vulnerable group.

***Presenter(s): Michael Officer***
***Faculty: Jennifer Nichols***

## ***Project Variation in Thumb Muscle Coactivation: A Study of Age and Sex Differences***

Agonist-antagonist coactivation patterns provide valuable insights into the coordination and stabilization of motor tasks, particularly in complex movements like thumb flexion and extension. The thumb plays a crucial role in daily activities such as grasping and pinching; however, the coordination of muscles involved in these movements have been relatively understudied. This study aims to investigate how age and sex influence the coactivation of the flexor pollicis longus (FPL) and extensor pollicis longus (EPL) muscles during thumb flexion and extension. Fine wire electromyography (EMG) was employed to record muscle activity in n=30 participants during thumb flexion and extension. Participants were divided into two age groups: younger than 45 years (young) and older than 45 years (old), with further separation by sex. Coactivation indices were calculated using maximum normalized EMG values for the FPL/EPL muscles, and coactivation levels were compared during both flexion and extension. Preliminary analysis of 16 participants suggests greater agonist coactivation during thumb flexion compared to extension. Furthermore, younger participants exhibited significantly higher agonist coactivation during extension than older participants, but showed less coactivation during flexion. No significant differences were observed between sexes.

***Presenter(s): Jennifer Onime***
***Faculty: Kesavalu Lakshymyya***

## *Project Periodontal bacteria dissemination following ecological time-sequential polybacterial periodontal infection (ETSPPI) in the TLR4-/-*

INTRODUCTION: Periodontitis (PD) is a polymicrobial chronic inflammatory disease involving bacteria, viruses, and fungi in subgingival pockets. Key bacterial colonizers include Streptococcus gordonii, Fusobacterium nucleatum, Porphyromonas gingivalis, Treponema denticola, and Tannerella forsythia. This study investigated the intravascular dissemination of PD bacteria during ecological time-sequential polybacterial periodontal infection (ETSPPI) in toll-like receptor knockout (TLR4-/-) mice. TLR1 to TLR9 are essential microbe-associated molecular pattern (MAMP) recognition receptors.

METHODS: Ten-week-old TLR4-/- mice (n=20) underwent polymicrobial (Group I) or sham (Group II) infections. After 19 weeks of infection, internal organs were harvested and stored at -80°C. Bacterial genomic DNA (gDNA) was detected via 16S rRNA gene-specific PCR and visualized using 1.5% agarose gel electrophoresis.
RESULTS: Successful bacterial colonization was confirmed in polymicrobial-infected mice gingiva surface, while no gDNA was detected in sham-infected mice. F. nucleatum was found in the heart, P. gingivalis in the lungs, and T. forsythia in the kidneys. No bacterial gDNA was detected in the brain, liver, or spleen.

CONCLUSION: The results strongly suggest that oral bacteria adhered to gingival epithelial tissue and further intravascular dissemination of three oral bacteria to infect internal organs.

***Presenter(s): Aitana Ortega***
***Faculty: Gayle Zachmann***

## *Project Artists in the Concentrationary Universe:First Witnesses*

Lou Albert "Mabull" Lasard, though largely unknown, was among the first to witness the horrors of World War II in France. This project, joining French History, Art History, and Jewish and Holocaust Studies, examines her artistic production while imprisoned at Gurs Internment Camp. Like many of the artists of the Montparnasse neighborhood of Paris, Lasard was detained, where unlike many, she defied her circumstances and created art in the face of deportation. Lasard produced genre scenes of women's rituals, landscapes of Gurs, and portraits of internées, often emphasizing barbed wire fencing. Mabull's works remain largely unnoticed and inaccessible within the realms of art history. This study explores how Lasard, as an early witness in a hostile environment, innovated with materials and production. Did these works engage or escape their imprisonment? By analyzing her artworks, camp archives, survivor testimonies, and official records, this project contributes to a broader understanding of the role of women and the arts during World War II. The aim of the project is to show how these neglected traces, artifacts, and archives of the internment experience serve as among the earliest testimonies of documentation and resistance, offering insight into the concentrationary universe and the artists within.

***Presenter(s): Joana Padron***
***Faculty: Lindsey Rodriguez***

## *Project Are Extroverts Happier with Their Lives? Exploring the Role of Emotion Regulation*

This research aims to explore the relationship between extraversion and satisfaction with life. Specifically, we are interested in better understanding the role of emotion regulation skills and its potential mediating role on the association between extraversion and well-being. Previous studies have suggested that extraversion is a strong positive predictor for life satisfaction (Anglim et al., 2020). In addition, emotion regulation is also an important predictor of well-being, with studies showing that engaging in emotion regulation skills like the awareness and acceptance of emotions is associated with greater satisfaction with life (Yiğit et al., 2014; LeBlanc et al., 2021). One possible explanation for this link is that extroverts may be better at regulating their emotions, as studies suggest that people with strong emotion regulation skills also report higher relationship satisfaction (Cheung et al., 2015). We hypothesized that the reason extroverts are more satisfied with life is because they are more equipped at regulating their emotions. Using a sample of 528 undergraduate psychology students, we tested the indirect effect of extraversion on satisfaction with life through emotion regulation skills. To test this, we used the Difficulties in Emotion Regulation scale (DERS; Gratz & Roemer, 2004), Big Five Inventory (Soto & John, 2017), and Satisfaction with Life Scale (SWLS; Diener et al, 1985). Our study aims to add clarity to current extraversion literature and the potential benefits of having strong emotion regulation capabilities.

***Presenter(s): Matthew Pancorbo***
***Faculty: Leslie Murray***

***Project Modeling cyanide docking and isomerism in H cluster maturation***

***Cyano)-poly(carbonyl)diiron species and Fe4S4 clusters constitute the reaction center of FeFe hydrogenases, also known as the H-cluster.***
The biosynthesis and maturation of the H cluster remains an area of active research and, particularly, the mechanisms of synthesis and incorporation of biologically atypical ligands (e.g., cyanide and carbonyl donors) into the cluster. During maturation, there is a Fe2(CO)4(CN)2 transfer from a Fe4S4 cluster in the protein HydF to a Fe4S4 cluster on HydA. There is a proposed coordination mode change in one of the cyanide ligands (i.e., M–CN–M' to M–NC–M') on the Fe2(CO)4(CN)2 fragment based on studies of HydF. However, it is suggested to be energetically inaccessible based on multiple models. Herein, efforts to develop accurate models of HydF cluster prior to transfer to HydA by using tripodal-ligand-supported Fe4S4 clusters bridged by a cyanide ligand to the diiron cluster Fe2(C3H6S2)(CO)5 will be presented. Both orientations of the CN linker are accessed synthetically, allowing the feasibility of a cyanide flip to be directly probed. These results will be contextualized to that of the H cluster maturation as well as the broader reactivity of Fe4S4 clusters.

***Presenter(s): Dillon Parker Parker***
***Faculty: Ranga Narayanan***

## *Project Electrostatic Resonance in Levitated Molten Metal Droplets*

This research investigates the use of electrostatic resonance to determine key thermophysical properties, such as surface tension and viscosity. Conventional measurement techniques are often unsuitable for materials like liquid metals due to their extreme temperatures. Electrostatic levitation (ESL) provides a contactless method for studying materials by suspending a molten metal droplet in an electrostatic field, effectively eliminating gravity and container-induced effects. In this study, a varying electric field is applied to a levitated droplet, inducing oscillations. The shape and magnitude of these oscillations are measured and analyzed to extract thermophysical properties. This material property characterization is essential for advanced manufacturing processes, particularly in-space fabrication techniques such as laser welding and 3D printing, where precise control over molten metals is crucial. Additionally, the resulting data contributes to refining theoretical models for liquid metal behavior, improving our understanding of fluid dynamics in extreme conditions. By providing critical insights into liquid metal dynamics, this research supports the development of reliable manufacturing methods for future space missions and high-performance terrestrial applications.

***Presenter(s): Luke Parker***
***Faculty: Wesley Bolch***

## *Project Mesh-Type Histology-Informed Microscale Model of the Human Spleen for Radionuclide Dosimetry*

The focus of this project is on developing 3D computational models of human organs and tissues for the purpose of refined radiation dose assessment. Many radionuclides of concern emit alpha particles which have soft tissue ranges of only 50 to 100 microns. As such, a new generation of 3D tissue dosimetry models must be established at the microscopic scale – specifically tailored for alpha particle irradiation. This project is being completed with the help of the UF Department of Anatomy and Cell Biology in which previously prepared serially sectioned histology slides of human spleen are digitally imaged, orders, aligned, and segmented. To fully characterize regional variations in the microanatomy, seven different volumes of interest (VOIs) are assembled. Each VOI is roughly 1 mm^3 in volume, converted from polygon surface mesh format to tetrahedral volume mesh format, and imported in a PHITS radiation transport simulation code. In the code, each tissue region will be declared a source of radionuclide concentration and a target region for dose computation. The data generated are termed radionuclide S values.

***Presenter(s): Emerson Parks***
***Faculty: Todd Brusko***

## *Project Assessing the impact of a BACH2 KO on CD8+ T cell activation and Treg stability*

BACH2 is a transcription factor implicated in the development of numerous autoimmune diseases, including type 1 diabetes (T1D). An important mediator of inflammatory responses, BACH2 negatively regulates T cell receptor (TCR) signaling, hinders terminal exhaustion of CD8+ T cells, and contributes to Treg development. We sought to investigate the role of BACH2 and a T1D-associated SNP, rs72928038, which acts to reduce the chromatin accessibility of BACH2, through isogenic CRISPR/Cas9 knockouts (KO). BACH2 KO CD8+ T cells activated with via polyclonal stimulation increased production of effector cytokines, including interferon gamma, perforin, and granzyme B. Similarly, BACH2 KO of CD8+ T cells reactive to autoantigen pre-proinsulin resulted in enhanced antigen specific killing of β-cells. In CD4+ T cells, BACH2 KO Tconv showed enhanced proliferation. Additionally, BACH2 KO Tregs exhibited increased bystander suppression of responder T cell division. However, after repeated polyclonal stimulation, BACH2 KO Tregs downregulated activation markers. These data suggest that BACH2 is an important regulator of effector function in CD8+ T cells and the suppressive capabilities of Tregs. Combined, BACH2 plays a critical role in regulating inflammation and likely contributes to T1D progression in humans.

***Presenter(s): Niya Patel***
***Faculty: Daniel Czyz***

## *Project Isolation and Host-Range Testing of Bacteriophage from Florida Water Samples for Treatment of P. aeruginosa Infection*

Pseudomonas aeruginosa, a ubiquitous and opportunistic pathogen, is responsible for numerous infections, most notably pneumonia. P. aeruginosa is associated with 500,000 deaths annually worldwide, with 300,000 attributed to antimicrobial resistance (AMR). Recently, this pathogen has increasingly developed resistance to multiple antibiotics, including carbapenems, a class of last-resort antibiotics. As AMR grows alarmingly, public health officials have become increasingly wary of more bacterial strains developing resistance, underscoring the push for alternative therapies. Bacteriophages (phages), viruses that specifically attack and kill bacteria, offer an alternative to antibiotics in treating infections caused by P. aeruginosa. We isolated five novel P. aeruginosa phages from freshwater samples collected from various locations across Florida. Water samples were enriched with P. aeruginosa PAO1, a frequently used control strain, and plated using double-layer agar plating. After overnight incubation, the isolated phages were picked and replated multiple times to ensure complete homogeneity. Furthermore, the phages were purified using filtering methods and their specificity will be tested against a panel of 55 P. aeruginosa clinical isolates. Such host-range testing will reveal the specificity of our novel phages against clinical isolates of P. aeruginosa. It can thus be used in further clinical applications against P. aeruginosa infection. The results of this research could be integral in advancing the development of targeted phage therapy for immunocompromised patients.

***Presenter(s): Mansi Patel***
***Faculty: Brent Sumerlin***

## *Project Bulk Depolymerization of Poly(methyl methacrylate) via Pendant Group Functionalization*

As a primary material in many of society's operations, plastic waste is becoming an increasingly alarming issue. Traditional thermomechanical recycling methods are one approach to address polymer waste but often result in diminished material properties. In contrast, chemical recycling degrades polymers to their respective monomers for reuse in making polymers with identical material properties.

Poly(methyl methacrylate) (PMMA) is a common commercial plastic used in the construction and automotive industry. Current PMMA depolymerization methods require high temperatures that result in a number of byproducts due to the polymer's robust all-carbon backbone. PMMA synthesized with thermolytically labile chain-ends/ pendent groups have resulted in significantly lower depolymerization temperatures. However, these approaches rely on 'designer' polymers programmed to depolymerize, limiting applicability to existing PMMA waste.

To address these challenges, we propose using post-polymerization modification to install thermolytically labile pendent groups to initiate depolymerization of PMMA. Our first aim is to partially hydrolyze PMMA to afford methacrylic acid units along the polymer backbone. Subsequently, functionalization of the methacrylic acid units with N-hydroxyphthalimide will afford pendent phthalimide esters which have been shown to result in high extents of depolymerization. For the final aim, we will demonstrate that this approach can depolymerize commercial PMMA in high yields.

***Presenter(s): Shrina Patel***
***Faculty: Chalermchai Khemtong***

## *Project Alanine Metabolism in HepG2 Human Hepatoma Cells*

Cancer cells can metabolize a wide range of substrates for energy production and biosynthesis, including amino acids such as alanine. In this study, we investigated the metabolic usage of alanine in HepG2 human hepatoma cells using isotope-labeled tracers and gas chromatography-mass spectrometry (GC-MS). The HepG2 cells were divided into two groups: one group was treated with uniformly labeled carbon 13 glucose ([U-13 C6]glucose) and alanine labeled with carbon-13 at the methyl carbon ([3-13C]alanine) during a two-hour incubation, while the other group was incubated for the same time period with only [3-13C]alanine. GC-MS analyses of cell extracts showed alanine transamination into pyruvate which was then further metabolized into lactate or oxidized to acetyl-CoA before entering the tricarboxylic acid (TCA) cycle. The results from our study show that [3-13C]lactate (M+1) and [4-13C]glutamate (M+1) were clearly detectable, indicating the metabolism of [3-13C]alanine to lactate, via pyruvate, and into the TCA cycle, while [U-13C6]glucose was primarily metabolized to lactate, as expected. These findings highlight the metabolic flexibility of HepG2 cells with the capability to utilize amino acids for energy production.

***Presenter(s): Asha Patel***
***Faculty: Autumn McClellan***

## ***Project Latent Political Orientations: Structural Equation Modeling of Attitudes Toward Key Issues***

Traditional measures of political orientation, such as party affiliation or ideological self-identification, may not fully capture the latent structure underlying political attitudes. This study employs structural equation modeling (SEM) to examine the relationships between demographic factors, ideological constructs, and attitudes toward key sociopolitical issues. Using a sample of 138 participants, this model tests the influence of gender, sexual orientation, race, age, education, income, and religiosity, along with measures of echo chamber involvement and political polarization. After evaluating model fit, echo chamber involvement and political polarization were excluded due to non-significance, while religion, education, gender, and sexual orientation emerged as significant predictors of political attitudes. The latent construct "attitudes" demonstrated a strong correlation with the Pew Ideological Consistency Scale and a weaker, though still notable, correlation with self-reported political affiliation. Among the dependent variables, attitudes toward gun rights (−), immigration rights (+), and abortion rights (+) contributed to the final model, while transgender rights and parental rights in education were excluded due to poor fit. These findings suggest that, within this sample, traditional demographic predictors of political ideology remain more robust in shaping political attitudes than contemporary constructs like echo chamber involvement and political polarization, which did not significantly contribute to the model.

***Presenter(s): Khushil Patel***
***Faculty: Zhe Ma***

## *Project The Role of KSHV-encoded CGAS-STING inhibitors in lytic replication*

Kaposi's sarcoma-associated herpesvirus (KSHV) is the causative agent of various malignancies, including Kaposi sarcoma (KS), Multicentric Castleman's disease (MCD), primary effusion lymphoma (PEL), and the recently identified Kaposi sarcoma inflammatory cytokine syndrome (KICS). Individuals with compromised immune systems, such as those undergoing organ transplantation, advanced in age, or living with HIV infection, face an elevated risk of developing KSHV-associated cancers. Currently lacking targeted treatments or prophylactic vaccines, understanding how KSHV evades the host immune system is crucial. In this study, we investigate KSHV-encoded cGAS-STING inhibitors, particularly focusing on less characterized proteins (ORF48, ORF55, and ORF67). Our hypothesis is that these viral proteins inhibit the cGAS-STING pathway to promote KSHV replication. Through gain- and loss-of-function analyses in physiologically relevant cell lines, we aim to shed light on the immunomodulatory mechanisms employed by KSHV and contribute to the development of targeted therapies against KSHV-associated diseases.

***Presenter(s): Stephen Patten***
***Faculty: Andrew Crowl***

***Project Phasing Alleles Allows for Accurate Ploidy Estimates and Provides Insights into the Evolution of North American Lobelia (Bellflower Family: Campanulaceae)***

Polyploidization, the process by which the genome of an organism is duplicated, is a common phenomenon in plants and has been implicated as a driver of genetic diversification and trait evolution. Therefore, characterizing the timing and effects of polyploidy is of great interest to evolutionary biologists and botanists. Alleles, or variant forms of a gene, may provide important data for better understanding polyploidization events and gene flow between species. To this end, we attempted to phase alleles from genomic sequence data across a large sampling of North American species of Lobelia (bellflower family). Our method uses short DNA sequence reads, which are mapped onto larger pre-existing consensus sequences to separate (phase) the gene copies. We successfully phased alleles from >900 individual plants and used this data to infer genome size and evolutionary relationships between species. Phasing alleles from polyploids remains an understudied technique but shows great promise as a tool to better understand this important phenomenon.

***Presenter(s): Mallory Paul***
***Faculty: Mallory Paul***

***Project Heart rate and Ventilation During Submaximal Cycling Exercise Reveal Physiological Inefficiency in Boys with DMD***

Background: Outcomes from standard functional tests for Duchenne's Muscular Dystrophy (DMD) are subject to motivation and ambulatory ability while providing limited information on cardiorespiratory ability, so a new outcome measure is needed. Our goal is to examine heart rate (HR) and the oxygen-efficiency uptake slope (OUES) during submaximal cycling and highlight their potential as physiological measures in ambulatory (A) and non-ambulatory (NA) boys with DMD.

Methods: 11 A-DMD (10+3.5 years), 3 NA-DMD (15.6+4.1 yrs, on beta-blockers) and 7 healthy controls (11+2 years) performed submaximal exercise on a leg or arm ergometer. HR, VE and VO2 were measured by stage and OUES/BSA was calculated.

Results: Mean HR was higher in A-DMD (133+11.6bpm) and NA-DMD (140+24.3 bpm) compared to controls (95.2+16.8 bpm, p<0.001). Similarly, HR was higher (133.3+14.4 versus 96.5+17.4 bpm, p<0.01) (145.4+16.9 versus 101.3+18.3 bpm, p<0.01) at 10 & 15 W respectively. Compared to controls, OUES/BSA was lower in A-DMD and NA-DMD (1530.0+195; 963.1+178; 645.1+285.0 ml/L/m2 respectively p<0.0001).

Conclusion: Boys with DMD demonstrate high HR and ventilatory responses during submaximal exercise reflecting inefficient physiological responses to exercise. Our data supports the use of submaximal HR and OUES/BSA to elucidate cardiorespiratory limitations relating to disease severity in A and NA-DMD.

***Presenter(s): Dexter Paulson***
***Faculty: Sungyoon Jung***

## *Project Microplastic Detection and Quantification in Human Blood Samples*

Microplastics (MPs) have gained widespread attention from both the public and research communities due to their presence across the globe and within the human body. Recent studies have detected MPs in various human organs, including the brain, lungs, blood, and urine. To perform a comprehensive risk assessment of their potential negative impacts on human health, a sufficient dataset is essential. However, there is still limited data for such an assessment. This study aims to identify and quantify MPs in human blood samples, a largely understudied sector of MPs research. Ten blood samples from female patients at UF Shands Hospital were collected and carefully transported to the laboratory for pretreatment before analysis. The samples underwent a digestion process with potassium hydroxide (KOH) and were filtered prior to analysis. Their physical properties, such as morphology, color, and size, were evaluated using a stereomicroscope, while their chemical composition was determined through pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS). Through the analysis, we identified and quantified the types of plastics and their mass-based concentrations. These datasets would be beneficial for future risk assessments aimed at understanding their potential negative impacts on human health.

***Presenter(s): Isabel Perea***
***Faculty: Karyn Esser***

## *Project Impact of Uremic Toxins on Circadian Clock Function in C2C12 Myotubes*

The circadian clock regulates daily gene expression in skeletal muscle, playing a crucial role in maintaining muscle health. Disruptions in core clock genes, such as Bmal1, have been linked to aging-related muscle dysfunction. Chronic kidney disease (CKD) is linked to muscle wasting and reduced function, in part due to accumulation of uremic toxins such as indoxyl sulfate. However, studies that define the impact of uremic toxins on circadian rhythms in skeletal muscle remain limited. This study aims to determine whether indoxyl sulfate disrupts circadian clock function in C2C12 myotubes, contributing to CKD-related muscle degeneration. We will assess myotube formation via immunostaining and analyze circadian rhythmicity using real-time bioluminescence recording of BMAL-luciferase activity. We expect indoxyl sulfate to impair myotube formation and alter circadian rhythmicity, potentially reducing amplitude, dampening oscillations, or shifting phase. These findings would suggest that uremic toxins interfere with the circadian clock, contributing to muscle dysfunction in CKD. Understanding this relationship could inform therapeutic strategies, such as scheduled exercise, or improved dialysis methods, to improve clinical outcomes for patients with CKD.

***Presenter(s): Sofia Pereda***
***Faculty: Torrey Baines***

## *Project Pediatric Sepsis Biomarker Risk Model (PERSEVERE) Secondary Analysis: Assessment of Whether Percent Change in White Blood Cell Count Within 48 Hours of Admission Serves as an Indicator of Clinical Outcomes in Pediatric Sepsis Cases*

The Pediatric Sepsis Biomarker Risk Model (PERSEVERE) study aims to evaluate whether certain genomic biomarkers can accurately predict clinical outcomes in immunocompromised pediatric patients. This secondary analysis aims to retrospectively determine the relationship between change in white blood cell (WBC) count within 48 hours of pediatric intensive care unit (PICU) admission and clinical outcomes of pediatric sepsis patients. Specifically, it aims to evaluate whether a significant positive change in WBC count within 48 hours of admission predicts favorable clinical outcomes. Data points include age, sex, race, ethnicity, day 0 PRISM III Score, day 0/1 WBC count, PICU admission/discharge dates, and hospital admission/discharge dates. The final analysis included 25 pediatric patients. The unadjusted odds ratio of a positive clinical outcome with significant improvement in WBC count within 48 hours of PICU admission is 3.15, with a 95% confidence interval (0.6083, 16.3119), and a p-value of 0.1715. Additionally, a sub-analysis was done in order to assess whether patients 2 years old or younger were at higher risk for poor clinical outcomes despite WBC count improvement within 48 hours of PICU admission. Neither analyses yielded a statistically significant correlation between a favorable change in WBC count and positive clinical outcomes. This is most likely due to insufficient sample size indicating future studies are needed to further evaluate this association.

***Presenter(s): Casey Perez***
***Faculty: Whitney Stoppel***

## *Project Aligned Silk Fibroin Scaffolds as an in vitro Skeletal Muscle Tissue Model*

Silk from the Bombyx mori can be used to engineer biomaterials for tissue applications. 3D silk-based scaffolds containing cardiac tissue-derived extracellular matrices have successfully produced anisotropic architectures simulating muscle tissue. The extraction of silk fibroin begins with boiling Bombyx mori silk cocoons in a sodium carbonate salt solution to remove sericin for silk fibroins. Silk fibers are set to rinse three times in deionized water while rotating. Once the silk mats have dried under a fume hood, we can dissolve the silk mats in lithium bromide. Dialysis of new silk utilizes a semipermeable membrane to purify the substance. Centrifugation separates the remaining solid components.1 The silk solution is then placed into a mold with dry ice on opposite sides, resulting in a sponge with physical properties similar to that of skeletal muscle. Directional freezing properly aligns silk fibers within the scaffold material to be seeded with skeletal muscle cells to evaluate migration. Hematoxylin and Eosin staining of sections of cell-seeded constructs was utilized to visualize cell migration. Fluorescence staining was used to confirm cell maturation. In pursuit of a replicable skeletal muscle model, future work will quantify cell phenotypes and mechanical properties with embedded mature skeletal muscle cells.

***Presenter(s): Rebekka Perinne***
***Faculty: Sharon DiFino***

## *Project Cultural Influences on Pain Perception and Management*

Pain perception and management are deeply influenced by cultural, linguistic, and systemic factors, shaping both patient experiences and outcomes. This study explores cultural perceptions of pain through a literature review and a qualitative survey, examining how race, ethnicity, and language influence pain assessment and treatment disparities. The purpose is to explore how linguistic and cultural factors impact the accuracy of pain assessment for people with limited English proficiency in the U.S. healthcare settings.

A preliminary literature review highlights disparities in pain assessment and treatment have been documented across multiple settings, with Asian patients and those with limited English proficiency (LEP) less likely to receive numeric pain assessments and opioid prescriptions (Rambachan, 2023). Similar inequities persist in nursing homes, where pain is less frequently documented and treated in Black and Hispanic residents compared to white residents (Morrison, 2021). Traditionally 1-10 pain scales are used to assess pain levels, but they are subjective and inconsistent, leading to inadequate pain management (Medico, 2017). This literature will be furthered through PubMed and traditional search engines.

To further investigate these issues, this study uses a qualitative survey to assess patient-reported experiences of pain perception, communication, and treatment. The goal is to better understand disparities that affect patient experiences in pain management.

***Presenter(s): Aditi Persad***
***Faculty: Lisa Taylor***

## *Project Does odor alter pattern aversion in foraging jumping spiders?*

Many animals defend themselves with toxic chemicals and use multimodal warning displays consisting of odors and bright colors to advertise their toxicity. Yet, how these odors and colors work together to deter predation is not well understood. Recent work with the jumping spider genus Habronattus illustrated that defensive odors from multiple species of chemically defended bugs (Hemiptera) increase aversion to the color red, which is used as a warning. We extend this work to ask whether these defensive odors also increase avoidance of another warning color scheme: high-contrast stripes. We gave Habronattus trimaculatus the choice between three types of color-manipulated termites (Reticulitermes flavipes): black, white, and black and white striped in the presence or absence of defensive odors from three different species of bugs (Morimidae sp., Leptoglossus phyllopus, Acanthocephala femorata). We hypothesized that the spiders would be averse to striped termites, but the aversion would be stronger in the presence of the defensive odors. These results will be discussed in the context of evolution of multimodal prey defenses and predator-prey interactions.

***Presenter(s): Truc Pham***
***Faculty: Sharon DiFino***

## *Project Healthcare Interpretation and Miscommunication Among People with Limited English Proficiency*

In the United States, over 25 million Americans reported having limited English proficiency (LEP). Despite federal regulation requiring interpreter access for healthcare, a 2016 study found that nearly a third of all hospitals fail to offer interpreter services (Cohen, 2016). The lack of interpretation options resulted in patients with LEP receiving delayed emergency care, as well as experiencing an increase in medical errors, and a decrease in patient satisfaction (Bhambra, 2022).

A literature review was conducted to assess the current state of interpreter services provided for primary care, outpatient care, and speech therapy, and the perception of healthcare quality among patients with LEP. This study looked into factors including the use of untrained interpreters, selective underuse of interpretation services, and limited language options. Barriers to interpreter use and deficits in healthcare for patients with LEP were identified. Healthcare providers' underutilization of interpreter services along with the scarcity of interpreters, results in suboptimal healthcare attention and mistrust among patients with LEP. This research aims to demonstrate the necessity of interpretation services for all healthcare disciplines and emphasize the importance of cultural component practices. Data was obtained through traditional search engines such as Google Scholar and PubMed, along with UF databases.

***Presenter(s): Spenser Pham***
***Faculty: Ben Lewis***

### *Project Spiritual Coping in Substance Use Treatment*

Spirituality is considered to play an important role in substance use disorder `(SUD) treatment and recovery, yet it remains understudied. Spirituality encompasses connections with others, nature, or with ‘higher’ powers. It often influences coping responses during difficult periods, such as addiction recovery. However, the extent of spiritual coping in treatment, its changes over time, and its impact on treatment outcomes remain unclear. This study examined these aspects and the moderating role of religiosity. Patients in SUD treatment completed assessments of spiritual coping, abstinence self-efficacy, and craving at admission, 30 days into treatment, and at discharge. Spiritual coping was categorized into positive and negative coping. Results showed significant increases in positive spiritual coping (ps<.001) and decreases in negative spiritual coping (ps<.001) over treatment. However, negative spiritual coping was rare and excluded from further analysis. Positive spiritual coping was associated with greater abstinence self-efficacy (p=.001) and reduced craving (p=.005). While these effects were stronger for religious individuals, they persisted regardless of religiosity. Findings highlight spirituality’s role in recovery and suggest that spiritual coping, independent of religious affiliation, may enhance treatment outcomes. Religiosity appeared to strengthen these effects, emphasizing its potential as a moderator in recovery processes.

***Presenter(s): Xavier Phillips***
***Faculty: Jessie Garcia***

***Project Characterization of Potential Peptidases in Magnaporthe***

***oryzae:*** Investigating Their Role in Pathogenicity and Host Interaction Magnaporthe oryzae (M. oryzae) is one of the leading causes of rice blast disease threatening global food security because it accounts for 23% of calories consumed globally. Recent research on Fusarium oxysporum has shown the importance of secreted peptidases in host invasion. Determining whether M. oryzae's PEP1, PEP2, and PEP3 homologues function as peptidases that contribute to pathogenicity addresses a key gap in literature. In vitro studies will assess fungal fitness, signal peptide function, and enzymatic activity. Preliminary results from a yeast secretion assay indicate a functional signal peptide in the PEP1 mutant, suggesting its secretion. These findings were further validated with the TTC colorimetric assay. Additionally, we expressed and purified recombinant protein of Pep1. We then assessed the peptidase activity of Pep1 via its interaction with l-lysine-p-nitroanilide; enzymatic activity was detected through spectrophotometer analysis. These findings serve as the basis for future investigations that will continue to characterize and delineate the functional mechanisms of putative peptidases in M. oryzae, giving insight into their new roles for these virulent mechanisms and their influence in the context of the rice blast. Understanding how M. oryzae degrades host proteins can lead to the development of resistant rice cultivars.

***Presenter(s): Amanda Pilozo***
***Faculty: Gerardo H Nunez***

## *Project It's All in the Berries: Parthenocarpic Fruit Development in Everbearing Blueberry (Vaccinium corymbosum interspecific hybrids)*

Most blueberry fruits develop in spring when pollinator activity is high and environmental conditions are ideal. In contrast, fall-bearing blueberries face high temperatures and reduced pollination, which can hinder fruit set. Despite these challenges, some blueberries produce fruit without pollination, a phenomenon known as parthenocarpy. However seeded blueberries are generally larger than their parthenocarpic counterparts. Understainding the relationship between temperature, seed production, and fruit weight is essential to improving fall blueberry yield and quality.

This study invvestigates the impact of temperature on fruit development in two fall-yielding cultivars, FL16-64 and FL18-188 by analyzing fruit weight and fruit production over a six-week period. Blueberries were collected weekly (weeks 43-48), and data on fruit weight and seed count were recorded. Temperature trends from weeks 34-48 were also recorded.

Results indicate that both cultivars primarily produced seedless fruit, with FL16-64 occasionally containing seeds while FL18-188 remained completely seedless in the study period. FL16-64 exhibited larger fruit, particularly in weeks 43-46.

These findings suggest that parthenocarpy is the primary reproductive strategy for fall-bearing blueberries.

***Presenter(s): Marcus  Pina***
***Faculty: Todd Brusko***

### *Project Mutant CD155 Expressing Human Stem Cell-Derived β-cells Reduce Activation and Effector Function of Antigen-Specific T Cells*

Beta cell replacement strategies have immense promise as a curative treatment for type 1 diabetes but are hindered by donor shortage and ultimate graft failure from immune-mediated destruction. Protocols to differentiate beta cells from human pluripotent stem cells (hPSC) have opened the door to generate a potentially limitless pool of cells for transplantation. However, once transplanted, stem cell-derived beta cells (sBC) are still susceptible to immune-mediated destruction. Here, we genetically engineered hPSC to overexpress either a wildtype (WT) or high affinity variant (SNP rs1058402 (G>A; Ala67Thr) (Mut) of the T cell checkpoint inhibitor CD155. Engineered hPSC lines retain pluripotent stem cell markers and efficiently differentiated into functional sBC, compared to the unmodified parental hPSC line. CD155 Mut sBC displayed increased TIGIT-Ig and CD226-Ig binding affinity and suppressed the proliferation of allogeneic CD8+ T cells. We then assessed the impact of these receptors on human autoreactive CD8 T cell avatar responses. CD155 WT and Mut overexpression suppressed the secretion of cytolytic effector molecules and autoreactive CD8+ T cell-mediated sBC killing compared to control sBC, with further suppression seen in the CD155 Mut sBC group. This protective effect was abrogated in the presence of TIGIT blockade.

***Presenter(s): Regina Pina Martin***
***Faculty: Alison Reynolds***

## *Project The Rhetoric of Women's Pain: Gendered Experiences and Insights of College-Aged Persons Within Clinical Settings*

This study examines gendered experiences of pain management and treatment within clinical settings through the narratives of six college-aged interlocutors. Their testimonies reveal patterns of dismissal and minimization of women's pain reports, highlighting the intersection of gender identity, sociocultural influences, and institutional barriers to adequate healthcare in these contexts. Common themes include difficulty in articulating pain in ways that elicit effective provider responses, the psychological toll of persistent pain, and the necessity of self-advocacy. These findings underscore the urgent need for structural reforms in medical education and clinical practice to ensure equitable pain management for women. By analyzing these lived experiences, this study contributes to a broader discourse on gender disparities in healthcare and the rhetorical framing of women's pain in medical settings. Through a combination of content analysis of the interviews conducted and review of relevant literature, this paper sheds light on current realities surrounding women's illness experiences and provides insights for effecting meaningful change in pain care for women.

***Presenter(s): Audrey Plauche***
***Faculty: Yang Lin***

## *Project Land Management Practices Impact Soil Health on Florida Dairy Farms*

The dairy and cattle industry is a top commodity in Florida. Multiple land uses and management strategies are common in dairy operations to feed cattle that may affect soil health: crop fields and hay fields see frequent use of heavy machinery and chemical inputs; hay fields and grazing areas often receive organic inputs in the form of manure and effluent. Carbon is a frequent metric for soil health due to its various benefits, and previous research has found that managed lands often have lower stocks of labile carbon pools than native ecosystems, reflecting degraded soil health conditions. This study aims to evaluate the responses of soil health indicators, especially carbon-related ones, to different management systems associated with dairy operations, including crop fields, hay fields, grazing areas, and low input areas. Mehlich-III-extractable nutrient concentrations were significantly greater on hay fields compared to their low input counterparts, reflecting intense fertilization (paired t-test; p<0.05). Carbon-related indicators were significantly lower in crop fields compared to their low input pairs (paired t-test; p<0.05), likely due to intensive tillage practices. Reduced tillage and application of organic amendments can increase soil health and organic carbon beyond native ecosystem quantities for long-term fertility, soil conservation, and carbon storage.

***Presenter(s): Harrison Pollack***
***Faculty: Todd Brusko***

## ***Project Elucidating the Pleiotropic Impacts of Verapamil on Regulatory and Effector T Cell Function***

The etiology of type 1 diabetes (T1D) is distinguished by the decline in immune tolerance and increased autoreactivity uninhibited by regulatory T cells (Tregs). The calcium-channel blocker verapamil, prescribed for the treatment of hypertension, is gaining interest due to its potential to treat autoimmune diseases, given its protection of pancreatic β-cell function while increasing serum levels of the immunomodulatory molecule IGF-1. We have previously demonstrated that IGF-1 synergizes with IL-2, promoting the homeostatic proliferation of IL-2. Therefore, we sought to determine whether a combination therapy of verapamil and IL-2 further augments Treg functionality.

This study characterizes the functionality of T cells following verapamil treatment in non-obese diabetic (NOD) mice and healthy human donors. We identified that an in vitro concentration of 20 µM significantly inhibits human and murine T cell proliferation following four days of expansion without compromising the overall viability of cultures in individual T cell subsets. Notably, verapamil improved the in vitro suppressive capacity of Tregs and reduced the cytotoxicity of antigen-specific T cells, augmenting protection for pancreatic β-cells. Our findings support the continued investigation of verapamil to promote immunomodulatory responses, particularly in combination with IL-2 to enhance Treg functionality.

***Presenter(s): Wyatt Powell***
***Faculty: Amor Menezes***

## *Project Microgravity-Sensing Genetic Circuits: Adapting Hfq-Based Regulation for Space Biomanufacturing*

Microgravity during spaceflight alters bacterial gene expression1. For instance, Hfq, a small ribonucleic acid (sRNA) chaperone that regulates protein expression by sequestering messenger RNA (mRNA), is downregulated in bacterial cells experiencing microgravity 1. Previously, a microgravity sensor that leveraged Hfq downregulation to regulate gene expression was designed and tested in Escherichia coli 2. This sensor can be used to switch on the heterologous bioproduction of essential medicines in bacteria only during space travel, an approach that can save feedstock resources so that useful products are manufactured only as needed. There are numerous candidate bacteria that are being evaluated as host organisms for space biomanufacturing. These include Vibrio natriegens and Pseudomonas putida, and we have previously engineered both organisms to produce □-carotene, a provitamin, in space. To compensate for species-specific effects of microgravity on biomanufacturing, such as variations in Hfq downregulation, we tested the efficacy of the E. coli microgravity sensor in V. natriegens and P. putida under simulated microgravity. We grew microbes transformed with the sensor in slowly rotating 3D cell culture bioreactors known as High Aspect Rotating Vessels (HARVs). Each HARV provides low-shear modeled microgravity to its culture. Our results confirmed that sensor expression is specific based on species, and we obtained insights into future sensor re-design to improve its performance in different space biomanufacturing hosts.

***Presenter(s): Erika Prendes Martin***
***Faculty: Julie Maupin-Furlow***

***Project Identification and Characterization of a Novel Protein: Investigating its Role as a Substrate or Regulator of Pat2***

The haloarchaeon Haloferax volcanii (Hv) is a well-characterized model organism for molecular studies of archaea and their metabolic mechanisms. Despite their close evolutionary ties to eukaryotes, archaea are often under-studied compared to their bacterial and eukaryotic counterparts. Post-translational modifications are chemical changes made to proteins following translation, and are highly conserved across all three domains of life. These modifications play an essential role in regulating protein structure, activity, and interactions. Despite advances in genomic and biotechnological research, our understanding of post-translational modifications (PTMs) in Hv, particularly lysine acetylation, remains limited. Lysine acetylation plays a crucial regulatory role in protein function and stability, and is essential for Hv's ability to metabolize glycerol and survive in high-salt environments.While three lysine acetyltransferases (Pat1, Pat2, and Elp3) have been identified in Hv, little is known about their structure and the proteins they interact with. Recently, site-directed mutants of the HvPat2 enzyme were generated, and upon purification, these mutants co-purified with an unknown protein, prompting further investigation into its potential role in Hv's metabolic processes. The goal of this study is to identify and characterize this unknown protein to better understand its function within Hv's complex metabolic network. To achieve this, we used mass spectrometry and bioinformatics tools to identify the unknown protein. Preliminary results from the mass spectrometry analysis successfully identified this protein, providing the first step toward uncovering its role in Hv's metabolic regulation and its potential contribution to the species' survival in extreme environments. In future work, we plan to generate a knockout of this protein and conduct growth curve analysis to assess its role in cellular processes and under varying energy conditions.

***Presenter(s): Ayana Price***
***Faculty: Raquel and Joseph Dias and Larkin***

## *Project Unraveling Immune Modulatory Protein Interactions Through Molecular Docking and Computational Evolutionary Analysis*

Suppressor of cytokine signaling 1 (SOCS1) regulates immune responses by inhibiting the JAK-STAT pathway, but its structural interactions remain poorly understood. Recent studies suggest that the SOCS1 dimer binds JAK2 with higher affinity than the monomer, influencing immune signaling and inflammatory diseases. However, structural distortions in the monomer may impact its regulatory function. This study employs AlphaFold-generated models, molecular docking, and the GLM-Score tool to analyze SOCS1-JAK2 interactions across multiple species. Ramachandran analysis assessed structural stability, identifying disallowed regions in the SOCS1 monomer, while GLM-Score predicted receptor-ligand binding affinities to quantify interaction strength. Docking results confirmed that the SOCS1 dimer exhibits stronger binding to JAK2 than the monomer. Structural distortions in monomers suggest reduced binding efficiency, potentially altering immune regulation. Comparative analysis identified conserved residues crucial for JAK2 interactions, revealing evolutionary adaptations in SOCS1 function. These findings provide insight into the molecular basis of SOCS1's regulatory role in immune signaling and its implications for inflammatory and autoimmune disorders. Understanding these interactions may guide future therapeutic strategies targeting the JAK-STAT pathway.

***Presenter(s): Skyler Prieto***
***Faculty: Won-Ki Moon***

## *Project Human and Synthetic Futures for Research: Perceptions of Artificial Intelligence in Science*

Artificial intelligence (AI) has become increasingly integrated into scientific research, yet public and professional perceptions of its usage remain underexplored. Although AI can enhance research efficiency and innovation, its applications raise credibility, accuracy, and ethical disclosure concerns. This study examines how AI adoption across a range of STEM fields and social sciences influences public trust in research and the scientific process. Through qualitative interviews with researchers at the University of Florida and the general public in Alachua County, we investigate how beliefs about scientists, AI, research outputs, and ethical issues shape attitudes toward AI-assisted scientific work. Specifically, we explore whether AI use is considered to enhance scientific rigor or undermine the authenticity of human scholarship from the public's perspective. Our findings contribute towards understanding public misconceptions and knowledge gaps regarding AI applications in science. This research advances our understanding of AI's social implications, and it offers insights into communication strategies that foster public confidence in AI-integrated scholarship.

***Presenter(s): Emily Prins***
***Faculty: Carl Denard***

## *Project Using a High-Throughput System to Discover and Characterize Proteases*

Proteases are essential enzyme regulators of the cell. However, proteases can be harmful in some ways, such as promoting cancer by degrading proteins that break down tumors and replicating the genetic information of viruses. To find ways to control these activities, we developed our High-throughput Activity screen for the functional Reprogramming of Proteases (HARP) system to find protein-based inhibitors that block protease action. HARP is a yeast-based system that uses yeast properties, such as its ability to facilitate surface display and properly fold human proteases in the endoplasmic reticulum.

For the initial validation of HARP, we selected tobacco etch virus protease (TEVp) as our first protease target. TEVp is an efficient protease that is well characterized, cleaving its canonical substrate (ENLYFQS) with high catalytic efficiency. Once we transformed a large nanobody library into our TEVp-engineered yeast strain, we used activated cell sorting, which sorts cells based on fluorescent markers, allowing us to visualize which nanobodies induce an inhibitory phenotype. As our substrate cassette contains unique epitope tags (FLAG and HA) flanking the substrate sequence, we can visualize protease cleavage based on which tags remain on the substrate peptide displayed on the cell surface. A loss of the HA signals means the substrate was cleaved right between the HA and FLAG tags, indicating that the nanobody did not inhibit TEVp. With this, we selected for the retention of both FLAG and HA tags, relating to the corresponding fluorescence of the anti-FLAG and anti-HA antibodies. Once we enriched the desired inhibitory phenotype, we isolated Nbs from this final population and characterized their inhibitory potency, along with their binding affinity, using biolayer interferometry (BLI) and FRET kinetic assays.

We have successfully isolated and characterized inhibitory nanobodies for TEVp using HARP. This suggests that a similar approach can apply to other protease targets, as HARP has made nanobody screening expeditious and accessible. scientific community.

***Presenter(s): Corbin Puckett***
***Faculty: Andrea Lucky***

## *Project Taxonomic revision of Nylanderia (Hymenoptera: Formicidae) from The Galápagos Islands*

The ant genus Nylanderia has a near global distribution which includes 131 described species, at least 15 of which are documented as introduced outside their native ranges via human-mediated-dispersal. These 'globetrotting' Nylanderia raise significant economic and conservation concerns as difficult to identify and potentially destructive invasive species. Distinguishing native from invasive Nylanderia species is difficult due to unresolved taxonomy and their subtle cryptic morphology. The Galapagos Islands hold paramount significance as a conservation need due to their unique and fragile ecosystems. Nylanderia fauna inhabiting the islands is poorly understood, including species presence, status, and distributions. The globetrotting species N. steinheili and N. fulva have been identified on the islands, with the only native record prior being the subspecies N. fulva nesiotis. However, we have found at least six total species of Nylanderia are present. The goals of this project are to revise the taxonomy of Nylanderia species on the Galápagos Islands based on morphology, distribution, and phylogenetic data, map their distributions, and provide identification resources, including a dichotomous key and high-resolution images for each species. This foundational knowledge is crucial for preserving the region's biodiversity and improving rapid detection and management of invasive Nylanderia species.

***Presenter(s): Alina Qiu***
***Faculty: Ben Lewis***

## *Project Comparing Treatment Outcomes in Voluntary vs. Involuntary Substance Use Disorder Admissions*

Involuntary civil commitment (ICC) provides a legal mechanism by which family, healthcare providers, or others can petition the court to require substance use treatment for someone who may harm themselves or others. Despite ICC being in practice for decades, the policy remains controversial. ICC critics argue that extant data do not sufficiently demonstrate its effectiveness, as few studies have examined recovery outcomes between individuals entering treatment voluntarily vs. involuntarily.

Longitudinal data were collected from patients in treatment for substance use, including 104 ICC patients and 608 patients who entered voluntarily. Data were collected at treatment entry, 30 days after entry, and at discharge. Treatment outcomes included alcohol/drug craving, PTSD symptomatology, commitment to change, and negative affect. Longitudinal mixed models were employed to detect group differences in these outcomes across treatment.

***Presenter(s): Nalani Quintana***
***Faculty: Mingyi Xie***

## *Project Unraveling circRNA and miRNA expression in Alzheimer's Disease Using Induced Pluripotent Stem Cells (iPSCss)*

Alzheimer's disease (AD) is a progressive neurodegenerative disorder marked by cognitive decline, memory loss, and neuronal damage; however, the precise mechanisms driving AD pathogenesis remain elusive. Non-coding RNAs (ncRNAs), including microRNAs and long ncRNAs, have been implicated in neurodegenerative diseases. In light of altered circRNA expression profiles in AD-affected brain tissues from preliminary studies, circRNAs likewise show potential involvement in disease progression. Utilizing induced pluripotent stem cells derived from AD patients and healthy controls, total RNA extracted from these cells was treated with RNase R in LiCl-containing buffer to selectively eliminate linear RNAs, efficiently enriching the circRNA content. Libraries of circRNA were constructed from the treated RNA samples using high-throughput sequencing technologies to profile circRNA expression. The sequencing data was analyzed to identify differentially expressed circRNAs between AD and control groups. Upon qPCR verification, our results suggest that at least ten circRNAs in AD cells are expressed at significantly different levels compared with controls. Moreover, we'll quantify miRNA abundance via AQ-seq in AD and healthy samples, construct miRNA libraries at various developmental stages, and identify miRNAs involved in AD regulation. This study enhances our ability to develop early detection methods, ultimately offering hope for improved patient outcomes and advancing our understanding of neurodegenerative diseases.

***Presenter(s): Chloe Quintero***
***Faculty: Anastasia Castillo***

## *Project Association of Hyperchloremia and Acute Kidney Injury in Pediatric Patients with Severe Traumatic Brain Injury*

Background: Traumatic brain injury (TBI) is a leading cause of death and disability in children, often requiring intensive care. Hypertonic saline, a salt water solution that has a higher concentration of sodium chloride (NaCl) than normal saline, is a common treatment for TBI that helps reduce intracranial pressure (ICP) when used as a continuous infusion or as bolus doses. However, the use of hypertonic saline as treatment can lead to hyperchloremia, an elevated level of chloride in the blood. Emerging evidence suggests that hyperchloremia may be associated with acute kidney injury (AKI), defined as an impairment of kidney function leading to decreased urine output and an accumulation of waste product in the blood. Research demonstrates a relationship between hyperchloremia, AKI, and mortality in adult patients with TBI. There is limited data on this association in the pediatric population, demonstrating the need for more investigation.

Objectives: 1. Identify the incidence and burden (duration) of hyperchloremia among children admitted to the PICU with severe TBI (sTBI)
2. Evaluate the association between hyperchloremia and development of AKI in children admitted with sTBI
3. Explore the association between hyperchloremia and incidence of fluid accumulation >10%, duration of mechanical ventilation (ventilator free days), PICU length of stay (LOS), hospital LOS, unfavorable neurologic outcome defined by a discharge pediatric cerebral performance category (PCPC) >3 or worse than baseline, and in-hospital mortality

Methods: This study is a multi-institutional retrospective cohort study conducted at trauma centers in the United States from 01/2018 to 01/2023. Pediatric patients with sTBI (defined by a post-resuscitation Glasgow Coma Score [GCS] ≤8) will be grouped by the presence or absence of hyperchloremia (serum chloride ≥110 mEq/L) and evaluated for the presence of AKI (defined by the pediatric Kidney Disease: Improving Global Outcomes [KDIGO] criteria) within 7 days of hospitalization.

Expected Outcome: We hypothesize that hyperchloremia will be associated with an increased risk of AKI in pediatric patients with sTBI. Results from this study could help clinicians implement early preventative measures (adjusting fluid management or medication choice) and potentially avoid therapies that may harm the brain or kidneys and lead to worse outcomes.

***Presenter(s): Cathleen Rabideau***
***Faculty: John Ligon***

***Project Establishing a fusion based Ewing sarcoma mouse cell line.***

Ewing sarcoma (ES) is the second most common pediatric bone cancer and is marked by the EWS-FLI1 gene fusion in 85% of cases with metastases and local recurrence occuring in 40% of cases. Establishing ES murine models has been challenging. We will develop a mouse cell line to accurately represent metastatic lung disease in vivo. We designed an EWS-FLI1 piggyBac system to transfect an osteosarcoma cell line (K7M2). This was followed by cell sorting and subsequent cultures. Once established, Balb/c mice were injected with the cells and monitored for disease progression. After transfection, the images showed approximately 2-5% of cells were GFP positive. After the first round of flow cytometry, images showed approximately 50% of cells were GFP positive and after a final round of flow cytometry, the cells were 100% positive. After injection, tumors grew slowly and were not characteristic of ES.
We have made progress in generating an EWS-FLI1+ murine model but are currently overcoming obstacles. We will use interferon-alpha to suppress immune activity and provide a more favorable environment for tumor growth. This experiment is ongoing and we hope to see tumors characteristic of ES in order to test immunotherapy on the fusion positive model.

***Presenter(s): Olaia Rackauskas***
***Faculty: Christopher Hass***

## *Project Impact of ACL Graft Type on the Onset of Osteoarthritis: A Retrospective Analysis*

Introduction: Anterior cruciate ligament (ACL) reconstruction restores knee stability
after injury. However, concerns remain about its long-term effects, particularly development of osteoarthritis (OA), which may be influenced by graft choice.

Background: The Bone-Patellar Tendon-Bone (BPTB) autograft is widely used for ACL reconstruction, but its high donor site morbidity has increased interest in the QuadTendon (QT) autograft. Yet, limited long-term data exists on QT autografts and their potential role in OA development.

Methods: A retrospective chart review will identify patients diagnosed with osteoarthritis (OA) with a history of anterior cruciate ligament reconstruction (ACLr). Data collected will include graft type, additional injuries, age at ACLr, age at OA diagnosis, and anthropometric variables. All data will be de-identified and stored in an Excel spreadsheet.

Expected Outcomes: This study aims to identify differences in the time to osteoarthritis (OA) onset among patients with different ACL graft types. While trends are uncertain, variations in graft selection and patient-specific factors may contribute to differences in OA progression.

Significance: Comparing OA development rates between BPTB and QT autografts can improve graft selection and patient outcomes. This study also addresses gaps in the literature by providing long-term outcomes data on the QT graft, improving
understanding of its viability.

***Presenter(s): Theresse Angela Racpan***
***Faculty: Amy Parziale***

## ***Project Global Perspectives and Local Identities: The Intersection of Culture and International Business***

Cultural, familial, and social norms around the world vary greatly, affecting how a specific region's residents interact in professional and informal settings, and influencing standard business practices both domestically and internationally. As the world seemingly becomes smaller through technology and globalization, we must consider how differences in cultural backgrounds affect international business methods, and how these differences can be viewed as a strength in multinational teams.

This article examines the cultural practices of the United States, Japan, Brazil, and Spain, and how their differing business styles can shift when interacting with each other. Hofstede's Cultural Dimensions as well as Erin Meyer's The Culture Map were foundational in analyzing, understanding, and comparing these countries and their perspectives. By describing the history, cultural and social norms, and family values of each country, the article emphasizes how unique cultures have influenced and inspired our modern business practices. Finally, this article concludes with how cultural differences can be championed to create an open-minded company culture that strengthens international relationships.

***Presenter(s): Tyler Radtke***
***Faculty: Pam, Doug Soltis***

## *Project Using ecological niche models to predict the Pleistocene distribution of the conifers Torreya taxifolia and Taxus floridana*

Torreya taxifolia and Taxus floridana are two species of small conifers only found growing on the north-facing side of ravines in the Apalachicola River area, just on the border of Florida and Georgia. They are often purported to be “glacial relicts”, meaning that their distribution shifted south during the last glacial period to avoid the cooling temperatures farther north. This project employs ecological niche models (ENMs) to predict current and historical distributions of T. taxifolia and T. floridana. This is done by correlating species’ occurrence records with environmental variables using machine learning algorithms, which generates a prediction for what types of habitats are suitable for each species. Climate models for the Pleistocene epoch will be used to generate a prediction of where these species occurred during and before the last glacial maximums. Their predicted habitat suitability will also be compared to some close associate species; those which are found growing in the same ravines, but often have wider distributions northward. By comparing species with similar habitat preferences but different ecological niches, we can test if T. taxifolia and T. floridana may have other ecological barriers that have prevented them from recruiting new populations further north since the last glacial period.

***Presenter(s): Veronica Ramos***
***Faculty: Jonathan Nations***

***Project Qualitative Anatomical Analysis of Unknown Bone within Crocidura Shoulder Girdle***

Shrews are a highly diverse group of small, insectivorous mammals found throughout the world. The different species specialize in different activities, such as tunneling, climbing, swimming, or rapid surface movement. Despite their widespread distribution and high diversity, the anatomy of shrews is insufficiently studied. Here, we investigate an undocumented bone located between the clavicle and the scapula in the shoulder girdle of Crocidura shrews. It is unknown if this bone serves an adaptive purpose in shrew ecology or biology. Using DiceCT scans of Crocidura brunnea, we digitally dissected out the musculoskeletal system of the forelimb and shoulder. We discovered that the bone is embedded within the acromioclavicular ligament, lacks unique muscle attachments, and does not move independently, suggesting it serves no specific function. We also discovered that other small, undescribed bones near the clavicle might have developed similarly. These findings hint that the bone may be a sesamoid or a vestigial trait. We plan to name the bone in a future manuscript. Further research is necessary to understand its evolutionary role and developmental origins. This study enhances our understanding of anatomical variation in small mammals and highlights how little we know about the anatomy of many understudied animals.

***Presenter(s): Nicholas Randazzo***
***Faculty: Steven Bruner***

## *Project Probing the Interactions of Colibactin Analogs with Oligomeric DNA*

Colibactin, a genotoxic metabolite produced by pks+ E. coli strains, alkylates adenine residues in DNA and contributes to mutagenesis in the human gut microbiome. This compound is implicated in up to 67% of colorectal cancers. Due to challenges in isolating naturally occurring colibactin, synthetic colibactin analogs have been developed to study its DNA interactions. In this study, we investigate the activity of these analogs, demonstrating that they exhibit comparable reactivity to naturally occurring colibactin, primarily forming mono-adducts and, to a lesser extent, multiple alkylated DNA adducts with oligomers. MALDI analysis reveals sequence selectivity in colibactin-induced DNA adduct formation. Additionally, we seek to characterize the DNA binding and alkylation activity of these analogs through crystallization and X-ray crystallographic analysis.

***Presenter(s): Nicholas Raney***
***Faculty: Sara Burke***

## *Project Exploring the role of the nucleus reuniens in mediating hippocampal-prefrontal circuit on the PAL task*

Dysfunctional connections between the hippocampus (HPC) and the medial prefrontal cortex (mPFC) are associated with deficits in cognition. Coordination of this network seems to be facilitated by the nucleus reuniens of the thalamus (RE). We've shown that inactivation of RE results in decreased performance on the Paired Associates Learning (PAL) task, which engages the HPC-mPFC circuit. The goal of this study is to further understand the mechanisms of how RE inactivation impairs behavior by silencing specific neurons in RE that bifurcate to both the HPC and mPFC.

5 rats were trained on PAL using automated touchscreens, then received viral injections of DREADDs in the HPC and mPFC. Rats were injected with actuator DCZ that temporarily inactivated the bifurcating RE neurons. To control for confounding effects, rats were also injected with saline. We compared performance on PAL after saline or DCZ injections. Histology confirmed the targeting of the bifurcating neurons.

Unlike what was observed with complete RE inactivation, we did not observe a significant change in PAL performance after silencing the bifurcating neurons with DREADDs.

Silencing the bifurcating neurons may not cause significant change in cognition, or the PAL task may not be sensitive enough to detect these changes.

***Presenter(s): Nathan Rao***
***Faculty: Dominique Laroche***

## *Project Towards Cryogenic Noise Thermometry in Nanostructures*

In low-temperature physics, accurately characterizing a nanostructure's temperature is crucial for understanding the properties of its electron systems. Conventional methods of measuring temperature during experiments are often impractical for nanostructures due to their small size and thermal isolation. Lock-in amplifiers, widely used in nanotechnology and materials science, are adept at detecting and measuring very small alternating current signals, even in the presence of much larger noise signals.

The present study examines the use of lock-in amplifiers to sweep across a range of frequencies and measure the noise generated by devices. These frequency sweeps were carried out using a Python-based code developed specifically for the experiment. Analyzing data using large resistors at known temperatures helps evaluate the method's efficacy in extracting temperature values. The extracted temperatures matched the expected values at room temperature. Furthermore, at lower temperatures—when the resistor was immersed in liquid nitrogen—the measured temperature was consistent with the known temperature of liquid nitrogen.

To determine the unknown temperatures of nanostructures within thermally isolated systems, it is essential that the findings align with current temperature benchmarks. These results provide a foundation for extending the technique to cryogenic temperatures and, ultimately, to the characterization of nanostructures themselves.

***Presenter(s): Christos Raptis***
***Faculty: Barry Setlow***

## *Project The rola of dopamine in decision making*

Risky decision-making involves evaluating choices to optimize rewards while mitigating potential losses. Dysregulation of the risky decision-making process has been associated with psychiatric conditions such as behavioral addiction and substance-use disorder. There has been foundational work implicating ventral tegmental area dopamine (VTA DA) neurons in signaling whether outcomes are better or worse than expected; however, their role in decision-making under risk of punishment remains uncertain. To investigate the role of VTA DA neurons in risky decision making, rats were trained on a risky decision-making task (RDT) whereby they were given the option to choose between a small, safe reward and a larger reward accompanied by an increasing probability of mild footshock (0%, 25%, 75% risk of punishment). After rats achieved stable baseline performance in the RDT, they performed an optogenetic version of the RDT such that halorhodopsin-expressing VTA DA neurons within these rats would be inhibited during specific timeframes of the RDT. Inhibition of VTA DA neurons during Win or Lose outcomes significantly reduced the likelihood of choosing the risky lever in subsequent trials. In contrast, inhibition during deliberation or safe outcomes did not alter risky decision-making. These findings indicate a causal relationship between VTA DA neuron activity and risky decision-making, providing important insight into how maladaptive behaviors might give rise to psychiatric disorders.

***Presenter(s): Sergio Ray***
***Faculty: Dr. Julie Moore***

## *Project Efficacy of Machine Learning Algorithm in Determining Health Status of Mice*

Malaria is one of the leading causes of death in Africa with a majority of those deaths being in children caused by severe malaria syndromes such as lung or cerebral malaria. We do not fully understand the disease processes in these syndromes. Mouse models are an important tool to expand our knowledge and find viable solutions. However, it is critical that these models be applied with strict humane endpoints to minimize suffering which can be challenging due to rapid onset of disease. Researchers can achieve this by frequent monitoring of infected mice, but this is labor intensive. To meet this challenge, we created a machine-learning (ML) algorithm to evaluate videography to distinguish infected from uninfected mice. Videos of mice infected with Plasmodium berghei NK65 were inputted into the Vertex AI platform and compared to videos of healthy mice. The resulting algorithm, which evaluated data from 14 consecutive days, was able to identify sick and healthy mice from the test data set with an accuracy rate of 92.6%. These results can be built upon to further develop a model that is capable of monitoring mice in real time and notifying users when a mouse's health has declined below a certain threshold to allow for timely and humane intervention.

***Presenter(s): Norah Reedy***
***Faculty: Yogesh Scindia***

## *Project Functional role of iron in T follicular helper cell development*

Background: T follicular helper cells (Tfh) are essential for the maintenance of systemic lupus erythematosus (SLE) as they help B cells produce high affinity auto-antibodies. The activation of STAT3 is critical for Tfh generation by promoting the transcription of BCL6 (the essential transcription factor for Tfh cell differentiation). SLE CD4+ T cells contain more iron than healthy controls. Iron activates STAT3 signaling. The relationship between SLE CD4+ T cells' iron content and their differentiation into Tfh has not yet been investigated.

Methods: RNAseq and qPCR were used to compare iron regulatory pathways in purified Tfh from WT and SLE-prone mice. Labile iron (bio-active) content was measured in freshly isolated Tfh. The effect of iron chelator on in vitro Tfh differentiation and effector function was evaluated.

Results: Compared to WT, SLE Tfh cells displayed significant increase in genes associated with iron uptake and transmembrane iron transport. Labile iron content and CDK1 gene expression were elevated in SLE Tfh cells. Iron chelation attenuated STAT3 activation and BCL6 expression in in vitro generated Tfh.

Conclusion: Our novel data identified an essential role of iron in Tfh cell differentiation and effector function.

***Presenter(s): Haylee Reisen***
***Faculty: Vandana Baweja***

## *Project Passive Design Techniques in The Florida Cracker House*

Climate change is an existential threat that requires the transition from fossil fuels to alternative energy sources. Understanding how historic buildings achieved thermal comfort without excessive reliance on mechanical conditioning systems is one method to reduce our carbon footprint. This study examined the Cracker House typology, an eighteenth-century vernacular dwelling in Florida. The pioneers developed the building type using Passive Design, a method of building in which the building design is used to create indoor physiological comfort with minimal or no reliance on mechanical conditioning systems. The indoor climatic conditions which contribute to comfort are—temperature, humidity, and illumination levels. Architects employ a range of design strategies including—site planning, plan organization, design of the building envelope, fenestration (window) design, façade shading devices, and using materials' thermal properties to modulate the indoor climate. The first strategy, site planning, examines orientation for sun and cross-ventilation while simultaneously using site features such as existing vegetation and topography to optimize the building for maximum heat gain in winters and minimum solar heat intake in summers. Organization of the plan of the building, involves grouping and location of rooms to control indoor temperature. The building envelope includes the outermost boundary: the roof, outer walls, and the floor of the structure, which in Passive Design are used to control the flow of temperature and air between inside and outside. The window or fenestration design entails controlling the size, location, and materials of the windows. This study established a methodology to study examples of the Cracker typology and determine how these houses use Passive Design through optimal building form and orientation. The researcher studied six Cracker Houses—with different orientations and architectural arrangements of porches—through archival sources and field work. The researcher established a standardized temperature grid at one-meter intervals to measure surface temperatures and deduce the impact of natural ventilation at for each structure. This study concluded that the presence of wrap around porches modulates the interior microclimate of these structures, providing a shaded buffer. The presence of a covered porch on the full or a portion of the south façade is most effective in cooling the structure. This study is meant to be the start of a framework that can be extended to encompass a greater range of comfort factors in these structures for the testing of Passive Design techniques.

***Presenter(s): Evangelin Rejeev***
***Faculty: Juan Andrade***

## *Project Quality Specifications for Ready-To-Use Therapeutic Foods*

Ready-to-Use Therapeutic Foods (RUTFs) are essential in emergency relief efforts to treat severe acute malnutrition. These peanut-based products are fortified with essential micro and macronutrients for weight gain and supplementation. However, their quality is often compromised by oil separation, lipid oxidation, and fatty acid hydrolysis under harsh storage conditions. This study uses centrifugation-decanting (CD) and filter paper absorption (paper) methods to quantify oil separation under simulated high-temperature and high-humidity conditions. Key parameters like water activity, oil separation kinetics, and changes in textural and oxidative properties were examined to understand how RUTFs lose quality. Results showed that temperature significantly affected oil separation (p<0.05) in both methods. The CD method was effective in establishing a KPI to predict oil separation over time, while the paper method was less expensive and also predicted oil separation. Oil separation was influenced by water activity (aw), a key safety parameter for preventing microbial growth. Increasing aw by 0.1 reduced oil separation, maintaining a safe microbial growth parameter (aw = 0.4). Evaluation of texture profiles showed significant differences among formulations, emphasizing the need for uniform quality standards. In conclusion, establishing quality parameters for RUTFs ensures consistency and better compliance, improving storage and saving lives globally.


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***Presenter(s): Mahak Reji***
***Faculty: David Brown***

## *Project Volatility in Long-Maturity U.S. Treasury Yields*

This project will examine the changes over time in the United States Treasury bond yield curve. The drivers of short maturity yields are well understood. Changes in long maturity yields are often smaller than changes in short maturity yields. However, recently long-term yields are much more volatile. Understanding the recent volatility of long maturity bond yields is the focus of this thesis. The statistical relation between long maturity bond yields and several macroeconomic variables will be examined. Further insights are expected by decomposing the nominal US Treasury bond yields into (1) real yield and (2) break even inflation rate components. Macroeconomic variables may impact the two components differently.

***Presenter(s): Victor Remley***
***Faculty: Adam Wong***

***Project Exploring genetic variations among Haitian Vibrio cholerae strains by comparative genomics analysis***

V. cholerae is an aquatic bacterium whose toxigenic strains lead to cholera, a severe diarrheal disease of serious public health concern, upon ingestion. Between human hosts, the bacterium persists in the environment, often being harbored in biofilms. Following an infrastructurally devastating earthquake in Haiti in 2010, a cholera epidemic broke out and continued through 2019. After 2019, no cases were reported for three years, and the disease was deemed eliminated in the country in February of 2022. Only months later, another outbreak emerged. Comparative genomics studies identifying the causal bacteria during both outbreaks as an endemic clade indicated that between outbreaks, V. cholerae was able to persist in aquatic environments for years before reemergence. To assess genetic variation across Haitian environmental strains collected during and between outbreaks, SNPs were identified and compared among strains. Following alignment of genomes using Burrows-Wheeler Aligner, variants were identified using Snippy. To better understand their functional significance, variants were annotated using SnpEff. Due to the frequency of horizontal gene transfer in Vibrio spp., manual inspection using Integrative Genomics Viewer was performed to filter out false positives. This analysis may reveal spatial or temporal patterns of SNPs underlying persistence and evolution of V. cholerae between outbreaks.

***Presenter(s): Abbigail Renger***
***Faculty: Pankaj Singh***

## *Project Metabolomics Analysis of Cerebrospinal Fluid and Serum in Lafora Disease (LD) Patients: Unveiling Metabolic Dysregulation and Potential Biomarkers*

Lafora disease (LD) is a fatal neurodegenerative disorder characterized by the accumulation of poorly branched, hyperphosphorylated glycogen (Lafora bodies, LBs) in multiple tissues including the brain. Despite extensive characterization of metabolic aberrations in preclinical mouse models of LD, the underlying metabolic changes linked to disease progression in humans remains poorly understood. We performed an untargeted metabolomics analysis using gas chromatography-mass spectrometry (GC-MS) on cerebrospinal fluid (CSF) and serum samples from LD patients compared to age-matched controls, aiming to uncover distinct metabolic signatures indicative of the disease. Additionally, we evaluated biofluids from LD patients treated with VAL-1221—a fusion protein that combines the 3E10 antibody fragment for cell penetration with acid alpha-glucosidase (GAA) to degrade LBs. Our findings revealed significant dysregulation in a subset of metabolites within the biofluid of LD patients. Notably, these metabolites strongly correlated with disease progression, potentially serving as diagnostic and prognostic biomarkers. Moreover, following VAL-1221 treatment, some patients exhibited a reversal in these dysregulated metabolites. Together, these results lay a strong foundation for the identification of novel metabolic biomarkers for LD, which may not only enhance our understanding of the disease's pathophysiology and progression but also provide valuable insights into the efficacy of emerging therapeutic interventions.

***Presenter(s): Cate Richardson***
***Faculty: Eddy Matthew***

## *Project Magnesium impacts the stability and function formation 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 facilitates the binding of the G protein with guanine nucleotides and can enhance its GTPase activity. This research presents the use of biophysical tools to study the role magnesium plays in the thermal stability, function, and mechanisms of GαS and GαS variants associated with diseases. We designed variants to further explore the impact magnesium has. We observe that magnesium decreases the stability of GαS when bound to both GDP and GTP, with more pronounced effects on 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. Results from smFRET, in collaboration with the Lamichhane Lab at UT, Knoxville, showed the role magnesium plays in maintaining the closed conformation of GαS. 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): Jenna Richman***
***Faculty: Jay McLaughlin***

## *Project Evaluating analogs of [D-Trp]CJ-15,208 for orally-active kappa opioid receptor antagonism as a potential therapeutics to prevent stress-induced cocaine reinstatement*

The macrocyclic tetrapeptide cyclo[Phe-D-Pro-Phe-D-Trp] ([D-Trp]CJ-15,208) demonstrates kappa opioid receptor (KOR) antagonist activity following oral administration, preventing stress-induced reinstatement of cocaine-seeking behavior. To enhance KOR antagonist activity for potential treatment of cocaine use disorder, we evaluated 35 macrocyclic tetrapeptide analogs in vitro with competition binding assays, identifying 20 that possessed KOR affinity with a Ki value of 50 nM or less. Of these, analog BPN-37145 possessed a KOR Ki value of 2.2±0.15 nM, 3.3-fold less than [D-Trp]CJ-15,208 and 9.5-fold less than the established KOR antagonist navacaprant. BPN-37145 antagonized KOR-agonist inhibition of stimulated cAMP production in hKOR-CHO cells with an IC50 value of 49±5.4 nM, 1.4-fold more potent than navacaprant. In mice pretreated orally 2.5 h, a 30 mg/kg dose of multiple analogs antagonized the antinociception of the KOR-selective agonist U50,488 (10 mg/kg, i.p.) in the 55oC warm-water tail-withdrawal test. Upon further characterization, oral BPN-37145 produced dose-dependent and selective antagonism after U50,488 was administered either peripherally (10 mg/kg, i.p.) or centrally (30 nmol, i.c.v.) at doses equivalent to navacaprant. Moreover, pretreatment with either navacaprant or BPN-37145 did not alter breathing rate or spontaneous ambulation, but dose-dependently prevented stress-induced reinstatement of extinguished cocaine conditioned place preference at doses as low as 10 mg/kg, p.o., but was without effect on cocaine-induced reinstatement. Collectively, these data demonstrate new structure-activity relationships to enhance KOR antagonist activity of [D-Trp]CJ-15,208, as well as the therapeutic potential of KOR antagonists to prevent relapse to drug-seeking behavior in abstinent subjects. (Supported by UG3/UH3 NS132600 from NIH).

***Presenter(s): Emily Richter***
***Faculty: Edward Phlips***

## *Project Importance of Picoplankton in a Nearshore Flow-Restricted Lagoon vs. an Open Offshore System*

In both freshwater and saltwater systems, picoplanktonic algae (i.e., algae less than 2µm in size) can be a significant portion of total planktonic biomass. In this study I compared the importance of picoplanktonic algae in a nearshore flow-restricted lagoon along in east Florida Indian River Lagoon, versus an open offshore region on the Atlantic coast of Florida, the Cape Canaveral Shelf. Phytoplankton data for the comparison was based on microscopic analyses of surface water samples collected bimonthly from the Indian River Lagoon and monthly at the Cape Canaveral Shelf from October of 2013 to July of 2019. Phytoplankton biomass values (i.e., carbon equivalence values) were organized into three size groups: picoplankton (≤ 2.0µm), nanoplankton (>2.0 to 20µm), and microplankton (>20µm). In both systems, picoplanktonic algae were important in terms of numerical abundance, but in terms of biomass the importance of picoplanktonic algae relative to the other two size groups was generally higher in the Canaveral Shelf environment than the Indian River Lagoon. The results indicate that in the less nutrient-rich environment of the Cape Canaveral Shelf picoplanktonic algae are able to compete effectively for the more limited nutrient resources of the open ocean environment, while in the nutrient-rich eutrophic lagoon environment of the Indian River Lagoon larger algal species are more often capable of taking advantage of a larger portion of the available nutrients.

***Presenter(s): Lilu Richter***
***Faculty: John Krigbaum***

## *Project From Whence They Came: Isotopic Analysis and Origins of 16th Century European Remains from St. Augustine, Florida*

During the 16th century, the territory encompassing much of the southeastern United States experienced large-wave settlement and intermingling of Spanish settlers and Native American peoples, leading to the establishment of Catholic missions and large-scale infrastructure and trade. This study incorporates isotope analysis, a valuable tool for investigating human migration patterns in anthropological contexts and seeks to answer questions about the childhood origins of human remains interred at the site of the first Catholic church in St. Augustine, Nuestra Señora de los Remedios (Our Lady of Remedies). Strontium (87Sr/86Sr) and oxygen (δ18O) isotope ratios, which are influenced by the unique geographical composition of local foods and water sources respectively, offer distinct signatures that can help identify an individual's geographic origins. By analyzing strontium and oxygen isotope ratios from the first and third molars of these individuals, we can compare early and later childhood exposure to local diets and environments. This approach will provide new insights into the origins of the Spanish colonists and their descendants who once inhabited the oldest continuously occupied European settlement in the continental United States, helping to contextualize their migration patterns during an early yet vital stage of American history.

***Presenter(s): Zoe Ringewald***
***Faculty: Alex Angerhofer***

## *Project Investigation of Structure-Function Relation of Oxalate Decarboxylase*

Oxalate decarboxylase (OxDC), an acid stress regulatory enzyme from Bacillus subtilis, elevates periplasmic pH by catalyzing the disproportionation of oxalate into formate and carbon dioxide in the presence of dioxygen. It belongs to the bicupin protein family and forms a hexamer (dimer of trimers) with each monomer binding a Mn(II) ion in its two cupin domains. Dioxygen is required for long-range electron transfer (LRET) between the Mn ions of adjacent subunits and is essential for catalytic activity. An OxDC trimeric variant from Photohabdus luminescens exhibits lower activity, prompting questions about the relationship between catalytic activity and quaternary structure. Despite retaining similar active sites, metal-binding motifs, and LRET pathway tryptophan dimer, this variant adopts a trimeric configuration due to the absence of the first 47 amino acids that stabilize the association of trimers in OxDC. Understanding the role of the quaternary structure is critical for elucidating the catalytic mechanism. We report on engineering a trimeric OxDC and running mechanistic and structural studies of this truncated protein to better understand its structure-function relationship. Insights into the catalytic mechanism of OxDC will optimize its use for biomedical and industrial applications, including treating kidney stones and mitigating oxalate crystal formation in paper production.

Literature:
[1] A. J. Pastore, R. D. Teo, A. Montoya, M. J. Burg, U. T. Twahir, S. D. Bruner, D. N. Beratan, and A. Angerhofer, Journal of Biological Chemistry 297 (2021) #100857.

***Presenter(s): Elizabeth Riotto***
***Faculty: Megan Ennes***

## *Project Understanding Museum Educators' Sense of Community in the Workplace*

Informal educational experiences in spaces such as zoos, aquariums, and museums are developed and facilitated by museum educators. In recent years, in part due to the COVID-19 pandemic, many individuals working as museum educators left the informal education field to pursue alternative careers. Understanding museum educators' working experiences and feelings of belonging within their community of practice is therefore a subject of interest, yet remains under-researched. This study aims to explore museum educators' sense of community within both the overall museum community as well as the informal education community under a framework of self-determination theory. To investigate this, the Sense of Community Index (SCI) developed by Chavis, Lee, & Acosta (2008) was modified and distributed to currently employed museum educators throughout the United States. 369 participants completed the survey, and select participants then participated in semi-structured interviews to provide qualitative insights into their experiences with belonging as informal education community members. The survey and interview data were analyzed using SPSS and MAXQDA, respectively. Resultantly, a greater understanding of the components, emotions, and actors that contribute to museum educators' sense of community were gained. It is anticipated that this understanding will contribute to efforts to retain more highly qualified educators within the informal education community.

***Presenter(s): Jessica, Shenandoah Ritchie, Sedio***
***Faculty: Sungyoon Jung***

## *Project Abundance and properties of microplastics in impacted coastal regions following 2024 Hurricanes.*

Microplastics are small, easily transferrable plastic pollutants between 1 µm - 5 mm in size. Currently, there is concern about the potential impacts that microplastics have on human and environmental health. Despite the abundance of microplastics in the environment, the field of microplastic research is still relatively new, though growing as detection and analysis technologies improve. This study aims to assess the impacts of Hurricanes Helene and Milton and the resulting microplastic pollution within the aquatic environments that were affected. Sampling took place at sixteen locations across Tampa Bay and Fort Meyers coastal regions. Sampling at each site was performed using a 25 µm sieve, while the permeate was also collected to examine smaller microplastics. These water samples underwent treatment, including digestion, prior to analysis. The physical properties, such as morphology and size, were evaluated using a stereomicroscope, while the plastic types were identified and quantified using pyrolysis-gas chromatography/mass spectrometry (Py-GC/MS). The data is being analyzed to understand the difference in microplastic compositions and quantities between the impacted sites and compared to data collected prior to these severe weather events. The results provide valuable insight into how microplastics are introduced and shift throughout the environment due to strong weather phenomena.

***Presenter(s): Johanna Rizo***
***Faculty: Jose Lemos***

## *Project Exploring Enterococcus faecalis and Enterococcus faecium interactions using a coculture model*

Enterococcus faecalis (Efc) and Enterococcus faecium (Efm) are two major species of the Enterococcus genus commonly found in the human gastrointestinal tract (HGIT). Together, Efc and Efm are among top 5 most common pathogens in hospital-acquired infections. Although both Efc and Efm are known to be multidrug resistant (MDR) pathogens, Efc is the more pathogenic despite MDR clinical isolates being more prevalent in Efm. Interestingly, the two species are rarely found colonizing the same patient, with some evidence suggesting that Efc can antagonize Efm in the HGIT. Because the mechanisms used by Efc to outcompete Efm are unknown, we developed an Efc-Efm co-culture model to assess how conditions encountered within human hosts, such as differences in oxygen levels, affect their competition. We first investigated how differing oxygen levels (aerobic versus anaerobic conditions) and the use of complex (BHI) or chemically-defined (FMC) media influenced their interactions. Our data revealed that Efc inhibits Efm growth in both media, regardless of oxygen level. Future experiments will focus on exploring additional host-derived conditions and identifying the genetic factors that give Efc a competitive advantage over Efm within the host.

***Presenter(s): Samantha Robbins***
***Faculty: Mateus Rocha***

## *Project Investigating the Polymerization Shrinkage Stress of Dental Composites: A Comparative Study*

The aim of this study was to evaluate the polymerization shrinkage stress (PSS) of two new universal resin-based composites. Six resin composites were tested: 2 new universal composites prototypes, 2 bulk fill, 1 commercially available universal composite and 1 conventional composite. The PSS was analyzed using a universal testing machine (Instron 5550). Two glass rods had their contact ends roughened with 180-grit SiC grinding paper. The test began with the curing light (Valo Cordless) positioned below the glass rod, emitting 1000 mW/cm$^2$ for 20s. Composite shrinkage was recorded by the load cell, measuring tensile stress (N) over five minutes of polymerization. Maximum stress (MPa) was obtained by dividing the maximal force by the cross-sectional area of the glass rod. Data were analyzed using one-way ANOVA with a level of significance of 5%. The overall results showed that FS had the lowest PSS (12.20 ± 0.92 MPa), while Reveal HD had the highest PSS (15.27 ± 1.23 MPa). Clinicians should be aware of the limitations of different composites since low PSS can minimize the potential of restoration debonding, marginal staining, microleakage, and secondary caries.

***Presenter(s): Lang Roberts***
***Faculty: Cameron Jack***

## *Project Hangry Bees: How Colony Nutrition Effects Defensive Behavior*

When honey bee (Apis mellifera) breeders select traits, emphasis is often placed on selecting bees that are less defensive, as this makes working those colonies safer for the beekeeper to manage. Historically, one of the barriers for beekeepers preferring a hygienic stock that has been shown to naturally reduce pest and pathogen levels in their hives is the belief that these stocks display elevated defensive behaviors. Thus far, most of the research on defensive behaviors has focused on the differences between European-derived and African-derived honey bees, but rarely on intra-European-derived stock comparisons. Here, we examined the stocks: New World Carniolans, USDA Pol-Line, Russian, and a local stock of mixed breed. We developed a method to measure and compare the defensiveness of the colonies. Additionally, we compared strength measurements across stocks. We believe these data inform beekeepers to select the best stocks and help remove barriers to the selection of hygienic stock.

***Presenter(s): Ariana Robinson***
***Faculty: Yenisel Cruz-Almeida***

## *Project DNA Methylation of the NR3C1 Genes and its Association with Chronic Pain*

Chronic pain is commonly associated with stress, which can cause epigenetic modifications across the genome. Emerging evidence shows that methylation of the NR3C1 gene impacts stress response, which may influence chronic pain severity. However, few studies explore epigenetic modifications as a mechanism to understand the stress-pain interaction. This study examines how DNA methylation (DNAm) of the NR3C1 gene, which codes for the glucocorticoid receptor, affects stress response and chronic pain. DNAm patterns at the NR3C1 gene were compared in middle-aged and older adults (ages 45-85) from a sample of non-Hispanic Black and White participants with knee osteoarthritis (OA). The Graded Chronic Pain Scale (GCPS) classified participants as having no pain, low-impact pain (pain without disability), or high-impact pain (pain with disability). DNA from blood samples was analyzed using Infinium Methylation EPIC arrays (>850 CpGs). Cytosine-phosphate-guanine (CpG) sites along the NR3C1 gene were quantified to determine differential methylation between pain groups. Data showed three CpG sites for NR3C1 (cg08818984, cg03906910, and cg065241) were hypermethylated in those with chronic pain compared to those without pain. Additionally, two CpG sites were differentially methylated in high-impact pain groups compared to low or no pain groups. Future research should consider modifications to other stress genes.

***Presenter(s): Ybriana Rodriguez***
***Faculty: Michelle Phillips***

## *Project The Informal Economy: Who's Fueling it?*

Economic growth is a primary objective for any nation, driving improvements for standard of living, income, and public services. However, one obstacle that hinders this is the informal economy, which consists of activities that have market value but are not formally registered. A common example is fruit vendors on the side of the road. A key demographic that has been analyzed by previous researchers are immigrants, who, due to limited opportunities in the formal sector, participate largely in the informal sector (Thukral, 2010). This research explores the relationship between immigrant populations and the informal economy, contributing to the ongoing discourse on economic developments and the factors influencing the persistence of informal labor. This paper using data from 81 countries from 2003-2013, estimating informality in each country and observing its relationship with the independent variables: Net Migration Rates, Human Development Index, Gender Inequality Index, and Governance Indicators. The main results showed that a higher Human Development resulted in a lower informal sector, Net Migration Rates had no impact on the informal sector, and certain dimensions of the Governance indicator has some impact. This is vital research because it adds to our understanding of the informal economy and how it functions.

***Presenter(s): Eleni Rodriguez***
***Faculty: Zachary Siders***

## *Project Comparing Body Shapes of Four Hermaphroditic Families of Fish.*

Hermaphrodism in fish is an underexplored field, despite the pervasiveness of hermaphroditic fishes and the economic significance of many of these species in fisheries. Previous literature reviews have classified various forms of hermaphroditism across multiple species, but surprisingly little is known about what structures these groups. Our goal was to understand if external morphology between hermaphroditic fishes were more similar to each other than to gonochoric fishes. We collated traits on mating styles, reproductive mode, and scientific illustrations from four families containing both gonochoristic species and representatives of the four forms of hermaphroditism. A total of 80 species were analyzed (20 per family), with 286 pictographs digitized and transformed using Elliptical Fourier Analysis to reconstruct each image and then were analyzed with principal components analysis (PCA) to identify dominant axes of morphological variation. Our PCA results revealed nestedness, where the range of body shapes of gonochoristic fishes encompassed all types of hermaphroditic fishes. When examining just mating styles, we also observed nestedness with haremic fishes encompassing all other mating styles. For both reproductive mode and mating styles, less prevalent reproductive strategies were nested within more common reproductive strategies. This indicates that morphology could be similar constrained as reproductive strategies but, also, some reproductive strategies, such as harems or gonochorism, are prevalent across a wide range of morphologies. This research provides a foundation for understanding the relationships between morphology, mating styles, reproductive traits in hermaphroditic fish, facilitating broader comparative analyses across additional species.

***Presenter(s): Cecilia Rodriguez***
***Faculty: Whitney Stoppel***

## *Project Enhancing CRISPR-Cas9 Homology Directed Repair in IAL-PiD2 Insect Cells: A Systematic Study of Gene Delivery, Homology Arms, and Cell Cycle Synchronization*

Insect cells have demonstrated exceptional potential in the production of therapeutics. IAL-PiD2 cells could provide a valuable platform for recombinant technology. Targeted gene editing using CRISPR Homology Directed Repair(HDR) can allow for precise genomic integrations, occurring during the S and G2 phases of the cell cycle. We aimed to determine the feasibility of modifying IAL-PiD2 using tools like CRISPR/Cas9.

Herein, we designed constructs with the mNeonGreen protein insert for our DNA template, because these sequences lead to sustained expression of an easily characterizable, green phenotype. IAL-PiD2 cells were seeded in triplicate within a 24 well plate at 50,000 cells/cm2 and reached roughly 65% confluency after 48 hours before transfection with the CRISPR/Cas9 complex with the template.

We first evaluated the effectiveness of three transfection reagents from Mirus Bio® within the IAL-PiD2 cell line and found TransIT®-Insect to be the most efficient via flow cytometry. We then sought to evaluate two homology arm constructs with 50 and 500 base pairs. On Day 7, the 500 base pair homolog arm construct was 44% more efficient. Future work aims to improve integration in IAL-PiD2 by varying the ratios of Cas9 protein to guide RNA, as well as utilizing methods for cell cycle synchronization.

***Presenter(s): Raquel Rodriguez-Flores***
***Faculty: Robert Cousins***

## *Project Impact Of Zinc Deficiency On Zinc-Dependent Enzymes and Lung Inflammation*

Zinc is an essential micronutrient for immune function and overall health. The zinc transporter Zip14 is a key regulator of zinc metabolism and homeostasis. It responds to inflammation of the epithelial cells of the intestine. While Zip14 is highly expressed in lung tissue, its specific role in the lung remains under investigation. This research aims to investigate the effects of ZIP14 deletion in transgenic mice, focusing on ZIP14-related gene and protein expression changes in the lung that influence barrier function and mucin production. Lung samples were from wild-type, knockout, wild-type with LPS, and knockout with LPS mice. LPS (lipopolysaccharide) was used to induce an inflammatory response and demonstrate how inflammation affects zinc regulation. Genotyping using DNA extraction, PCR, and gel electrophoresis was performed. Additionally, RNA extraction, cDNA synthesis, and quantitative PCR (qPCR) were used to quantify ZIP14 expression levels and assess its functional impact. Western blotting will also be used to analyze the expression of Zip14 and other biomarkers. Expanding upon previous research on intestinal epithelial cells, this project analyzes gene and protein expression in lung tissues. As a result, this research will provide insights into how Zip14 influences pulmonary zinc regulation and immune responses.

***Presenter(s): Avery Roe***
***Faculty: Rachel Mallinger***

## *Project Seasonal plant-pollinator interaction networks in the UF Teaching Garden*

Agriculture is a driving factor of climate change and biodiversity loss due to greenhouse gas emissions, pollution, and habitat destruction. Conventional agricultural practices, including the conversion of diverse habitats into monocultures, threaten wild and managed pollinators that provide the essential service of pollination. Polyculture production, the simultaneous cultivation of more than one crop, is a widely proposed alternative system with benefits for sustainable food production and biodiversity conservation. This study uses seasonal plant-pollinator interaction networks, which visualize and quantify pollination dynamics, in a UF campus garden to assess the ability of polycultures to support non-managed pollinators. Interaction networks can also be used to visualize the contribution of pollinators to the reproduction of crop plants, as well as the effects of temperature, weather, and overlapping crop bloom on interactions between managed and wild bees. Overall, when we compare spring and fall plant-pollinator networks, the spring network is more interconnected and nested, with more links per species and greater generality, indicating a more dynamic and diverse interaction network than during the fall bloom period. In both seasons, crop plants are visited primarily by honey bees, with the notable exceptions of blueberry, pepper, and tomato, which are also visited by non-managed wild bees.

***Presenter(s): Allison Roggen***
***Faculty: Eleonora Rossi***

## *Project The Effect of Working Memory on Error Processing in Second Language Learners of English: an EEG study*

Previous studies have found that working memory is a crucial component of sentence processing in monolinguals. A recent electrophysiological (EEG) study from our lab (Nakamura et al. in preparation) has demonstrated that there is a reduction in the P600 ERP component when English monolinguals process sentences under an additional memory load. However, relatively little work has been done looking at the effects of working memory manipulation while processing in a second language. The goal of the proposed study is to replicate the previous study, and manipulate working memory resources while Chinese-English bilinguals process sentences in their L2, English. We hypothesize that there will be an effect of working memory load when processing sentences that contain syntactic and semantic violations. We also will look at the electrophysiological signatures of working memory and error processing through EEG data, and will compare this with previously collected data on monolingual English speakers.

***Presenter(s): Matthew Rojas Abohasen***
***Faculty: Manuela Corti***

***Project RESTORATION OF CARDIAC AND NEUROLOGICAL FUNCTIONS IN FRIEDREICH'S ATAXIA MOUSE MODELS VIA rAAV BASED GENE THERAPY WITH ENDOGENOUS PROMOTERCONTROLLED FRATAXIN EXPRESSION***

Friedreich's ataxia (FA), the most common hereditary ataxia, affects 1 in 50,000 in the US. Caused by GAA repeat expansions in the Frataxin (FXN) gene, FA reduces FXN levels in mitochondria, primarily impacting the heart and nervous system. Symptoms appear between ages 5-15 and worsen over time, leading to early death. Current treatment does not address the underlying genetic defect. Gene therapy using recombinant adeno-associated viral vector (rAAV) with the human FXN gene offers a potential solution.

Our team has developed AAV9-DE7-hFXN, a novel construct regulated by an endogenous promoter, tested in vitro and in vivo in wild-type mice. We aim to evaluate its efficacy in FA cardiac and neurological models. The study includes two aims: testing the construct in cardiac (MCK-Cre) and CNS (Pvalb-Cre) conditional FA mouse models. Assessments include survival analysis, FXN level quantification, echocardiography for cardiac function, and motor function tests for neurological impact. Systemic intraperitoneal (IP) dosing will be conducted in neonatal mice, with tissue analysis via ELISA. Findings will support future grant applications and advance our gene therapy program toward Investigational New Drug (IND) submission, bringing FA treatment closer to clinical application.

***Presenter(s): Diego Roman***
***Faculty: Zhijian Qian***

## *Project The Role of UPF1 in Regulating Cell Survival and Proliferation of Leukemia Cells*

Acute myeloid leukemia (AML) is an aggressive cancer affecting hematopoietic cells in the bone marrow, with high mortality rates despite conventional treatments like chemotherapy and bone marrow transplants. The up-frameshift suppressor 1 (UPF1) gene, involved in mRNA surveillance and nonsense-mediated mRNA decay (NMD), may have a link to AML pathogenesis. MOLM-13, a human leukemia cell line, was transduced with five different shRNAs to knockdown UPF1 via a lentiviral packaging system using HEK293T cells. Knockdown efficiency was quantified using qPCR showing knockdown efficiencies ranging from 40% to 60%. Cell growth was monitored over a 6-day period and flow cytometry was performed to quantify cell death in knockdown cells. Our findings demonstrate successful knockdown of UPF1 in MOLM-13 cells, resulting in significant alterations in cell growth and viability. The decreased growth rate and increased cell death in UPF1 knockdown samples suggest that UPF1 inhibited the growth of leukemia cells. This study provides evidence for the potential importance of UPF1 in AML pathogenesis and its possibility as a therapeutic target for future AML treatments.

***Presenter(s): Liam Rosenfeld***
***Faculty: Jeremiah Blanchard***

## *Project Applying the Lilypad Visual Text Editor in the Classroom*

Lilypad is a new style of editor called a text-based visual code editor. It is designed to build on lessons learned from research on dual-modality and frame-based editing models. Lilypad is a modern text-based code editor that generates visual frames around code structures in real-time and provides various block based affordances when editing. In this poster, we analyze the results of a pseudo-experiment where Lilypad was applied in an introductory programming class.

***Presenter(s): Kai Rubach***
***Faculty: Fan Zhang***

## *Project PAMAM Dendrimers Target M-MDSCs as a Potential Platform for Glioblastoma Immunotherapy*

Glioblastoma is an aggressive primary brain malignancy with a survival rate of under 10%. Despite recent advancements in antiangiogenic therapy and ongoing clinical trials for immunotherapy agents, the blood-brain barrier remains a substantial obstacle in effectively delivering drugs to the tumor site. Polyamidoamine (PAMAM) dendrimers represent a feasible solution, in that they are readily taken up by myeloid cells. Here, we investigate how hydroxyl, amine, and succinic acid-terminated G6 PAMAM dendrimers affects their cellular biodistribution in GL261 and KR158 models of glioblastoma. We demonstrate that monocytic-myeloid derived suppressor cells (M-MDSCs) in the tumor and lymphoid organs effectively endocytose hydroxyl-terminated dendrimers, and that the trafficking of these CCR2+CX3CR1+ M-MDSCs correlate with the deposition of these dendrimers in the tumor. Finally, we outline the next steps in the development of a PAMAM dendrimer drug-delivery platform for use in improving the therapeutic index of previously discounted small-molecule immunotherapy agents.

***Presenter(s): Ashley Rubin***
***Faculty: Rachel Moor***

***Project Multimodality Visualization of Brain Tumors Across Species***

Demonstrates Clear Treatment Effect Following RNA Nanoparticle Therapy Diffuse Midline Glioma (DMG) is an inoperable pediatric brain tumor with insufficient treatment. Our group has developed a novel therapy for this disease and others, using mRNA vaccines consisting of tumor derived antigens in a unique lipid-nanoparticle (RNA NP). Mice, canines, and human patients with primary brain tumors were treated with RNA NP to define immunotherapeutic responses. In a neonatal model of DMG, advanced MR imaging techniques were used to assess treatment effects. In canine glioma trails, tumor enlargement without true disease progression in long-term survivors was observed, supporting the concept of transient lesion growth unrelated to tumor growth. RNA NP therapy for human and canine gliomas revealed features of reactive gliosis and immune infiltration, resembling pseudoprogression but with concurrent neurologic symptoms, which has led us to define a new phenomenon, named paraprogresssion. In DMG-bearing mice, RNA NP therapy resulted in long term survival despite the development of paraprogression. These findings can be rapidly translated to aid clinical decisions for immunotherapy-treated brain tumor patients, and are being utilized in an open clinical trial at this time (NCT06389591). Future studies will focus on mitigating paraprogression while preserving RNA NP therapy benefits.

***Presenter(s): JJ Ruse***
***Faculty: Amy Williams***

## ***Project Lipid Biosignatures in Lava Tubes: Implications for Life Detection on Mars***

The search for life on Mars remains a central question in astrobiology. While surface exploration has yet to yield definitive evidence, Martian subsurface environments, particularly basaltic lava tubes, may offer a more stable niche for life. Craters of the Moon National Monument (CotM) serves as a terrestrial analog, as its basaltic lava tubes host unique microbial communities that precipitate rare salts. However, little research has been done to link these microbes to preserved biosignatures. To address this, CotM samples were analyzed using pyrolysis gas chromatography-mass spectrometry (py-GC-MS) and tetramethylammonium hydroxide (TMAH) thermochemolysis, techniques similar to those employed by the Sample Analysis on Mars (SAM) instrument aboard the Mars Curiosity rover. This study assessed how these methods isolate organic molecules, particularly fatty acid methyl esters (FAMEs) and hydrocarbons. Results indicate that flash pyrolysis is better for liberating organic molecules than ramped pyrolysis. Additionally, these findings are useful in determining the efficacy of Martian samples in relation to preserving biosignatures and the efficiency of techniques used for looking for biosignatures. Understanding the effectiveness of different pyrolysis methods may influence future Mars missions, optimizing strategies for detecting life in the Martian subsurface.

***Presenter(s): Alana Rush***
***Faculty: Jonathan Nations***

## *Project Cranial Morphology Informs Eco-Evolutionary Pathways in Malay Archipelago Shrews*

When mammals get bigger, their skeleton often changes in predictable ways. This covariation between size and shape may channel the morphological evolution of a group into specific shapes, sizes, and ecologies. In the montane forests of the Malay Archipelago, Crocidura shrews have evolved into four main body types: small, medium, and large-bodied species, plus a slender, long-tailed type. Their postcranial skeletons likely reflect differences in movement and function, suggesting a link between form and ecology. Previous research found that postcranial skeleton shape changes in two distinct ways as size increases—either becoming more robust or more slender, but not remaining near the average shape. In this study, we investigate whether jaw shape follows a similar pattern. Using 3D meshes extracted from □CT scans of the mandibles from 36 species and landmark-free geometric morphometrics, we investigate whether mandible shape covaries with size or with skeleton shape. If jaw morphology follows the same two-directional pattern as the skeleton, it could indicate that size and shape constraints influence how these species evolve and partition ecological niches. Our study interrogates traditional views in mammal evolution and questions whether evolutionary or developmental constraints play a key role in shaping ecological diversity in species-rich communities.

***Presenter(s): Gracie Rutz***
***Faculty: Keith Willmott***

## *Project Modeling distributions of Euptychiina butterflies*

Euptychiina, a subtribe of satyrines in the family Nymphalidae, has over 400 described species and is estimated to contain over 500. Despite being widespread throughout the neotropics, the group has been poorly studied until the last couple decades. An improved understanding of their systematics and diversity (Espeland et al. 2023) makes them potentially suitable for testing broad-scale evolutionary and ecological hypotheses, but we have very coarse spatial distribution knowledge (Ballesteros-Mejia et al., 2016). The main goal of this project was to tackle this information deficit by developing distribution maps for each euptychiine species.

Locality data for euptychiines were compiled from museum collections and identified images in iNaturalist. We utilized QGIS to review distribution points and identify outliers, then mapped a buffered minimum convex polygon for each species using Rstudio. Resulting shapefiles were reviewed and edited to include only plausible areas for the model, especially regarding the Andes mountains. Results were uploaded to the Wallace Ecological Modeling App to generate distribution maps using bioclimatic variables. These range maps have applications for studying both the historical biogeography and macroecology of Euptychiina. They will also be a valuable resource for broader studies of Neotropical biogeography, and has applications to investigations of euptychiine evolution.

***Presenter(s): Daniel Sanchez***
***Faculty: Hui Zou***

## *Project Surrealist Geometry in Architecture*

Through his Manifesto of Surrealism, André Breton founded a school of thought that permeated various artistic disciplines, including poetry, painting, sculpture, and film. However, since its inception, surrealism has been largely regarded as being at odds with architecture. This paper seeks to contribute to the discourse led by scholars such as Dalibor Vesely, Bernard Tschumi, and Rem Koolhaas by examining architecture's reflections on surrealism and introducing the design concept of "surrealist geometry." Using Breton's Crisis of the Object as a theoretical framework for understanding public perceptions of the "surrealist object," I argue that his essays left no architectonics for architecture to develop within surrealism, unlike other 1930s avant garde artistic movements that evolved alongside architecture such as Russian Constructivism and German Bauhaus. Breton's initiative surrealist manifestos and their rigid definition parameters imposed on surrealism limited architectural participation to its minimum, leading Surrealism to stylistic motifs and imagery rather than its foundational premise: the unity of dream and reality.

The proposed design concept of "surrealist geometry" in this research offers a framework for translating surrealist thought—especially its theoretical and representational approaches to the dream world—into architectural form and space. This is achieved by exploring the emotive qualities of geometry and its capacity to evoke the unconscious, memory, and dream. This approach provides a critical counterpoint to the monotony of contemporary global architecture. By integrating surrealist principles into the design framework—exemplified by Isamu Noguchi's "playscapes" and the "emotional" structures of Daniel Libeskind—this study addresses the architectural, urban, and practical applications of surrealist geometry by reevaluating surrealism's role in architecture and highlighting its potential as a critical design theory for spatial experimentation and the design process.

***Presenter(s): Kirthana Sane***
***Faculty: Edith Kaan***

## *Project Cognitive Control Adaptation in Code-Switching: An ERP Study*

Among bilinguals, it is common practice to engage in code-switching – using different languages within a single sentence or conversation. We aim to examine whether listening to code switches enhances Spanish-English bilinguals' ability to deal with conflicting information. Previous research suggests that detecting code-switching temporarily enhances cognitive control, improving performance on nonlinguistic tasks such as the flanker task – a measure of attentional and inhibitory control. However, findings have been inconsistent, with some studies showing no effect or even increased difficulty after code-switching. To investigate this, the experiment involves recording brain activity (EEG) from early Spanish-English bilinguals while they listen to either unilingual or code-switched sentences. After each sentence type, participants complete Flanker trials (congruent [>>>>>] or incongruent [>><>>]) by pressing a button to indicate the middle arrow's direction. Two brain wave components were of interest: N2 (linked to conflict monitoring) and P300 (related to inhibition). Preliminary results showed that N2 and P300 amplitudes may be the same or greater for incongruent flanker trials after a switch compared to a unilingual sentence. These findings support theories proposing that code-switching does not uniformly enhance cognitive control with different types of code-switching causing differential adaptations in domain general cognitive control.

***Presenter(s): Sierra Sanne***
***Faculty: Jason Dittmann***

## *Project Applying Convolutional Neural Networks to Detect Low-Abundance Molecules in Exoplanet Atmospheres*

The James Webb Space Telescope (JWST) is the most powerful space-based observatory that allows for detailed observations of exoplanet atmospheres through absorption spectra of the planet's atmosphere in front of its host star. Of particular interest is obtaining a full chemical inventory of exoplanet atmospheres, including low-abundance molecules produced outside of chemical equilibrium. We generated tens of thousands of atmospheric spectra of representative hot Jupiters in high-resolution ($\lambda/\Delta\lambda \sim 10^6$) and binned the spectra to the resolution of JWST in the wavelength range 1.0 to 12.0 μm ($\lambda/\Delta\lambda \sim 100$-1600) . We created a Convolutional Neural Network (CNN) to detect what molecules are present in JWST exoplanet spectra and investigate the accuracy of the CNN in order to analyze JWST's sensitivity to low-abundance signals and to make recommendations for future observing missions.

***Presenter(s): Olivia  Schmeits***
***Faculty: Gabriel Prieto***

## *Project An analysis of the peri-mortem cut sternal elements of non-adult sacrifices at the Pampa La Cruz Archeological site, Huanchaco, North Coast of Peru*

This paper contains a detailed analysis of the osteological remains of the sternums from the child sacrifices at the site of Pampa La Cruz in Huanchaco, North Coast of Peru. These sacrifices were made during the Late Intermediate Period and early Late Horizon period and spanned from approximately 1050 to 1500 C.E. Most of the sacrifices had horizonal cuts across the sternum, presumably the cause of death. The sternums were analyzed to provide a deeper understanding as to why the sacrifices were performed in such a manner. This analysis determined that the 3rd and 4th sternabrae were cut most frequently and the conclusion was drawn that those performing the sacrifices must have had a skilled knowledge of this sacrificial method for such precision to be achieved. Additionally, the number of individuals with sternum cuts was determined to be at minimum 76% of the recovered sacrifices in the mean age range of 5-15, and those in the age range of 13-15 had the highest frequency of cuts.

***Presenter(s): Cianna Scutero***
***Faculty: Carl Denard***

***Project Protease Engineering with Reactant Residence Time Control Proteases are enzymes that break down proteins by cleaving peptide bonds. They***

have significant potential for applications in proteome editing, targeted therapeutics, and building protein circuits. However, most proteases have broad substrate specificity, making it crucial to ensure they are specific to the substrate of interest when developing these methods. Unintended cleavage of incorrect substrates can lead to off-target effects, which limit their potential applications. To address this challenge, we developed a platform for Protease Engineering with Reactant Residence Time Control (PERRC). Unlike previous methods, PERRC allows for the adjustment of counter-selection substrate (CS)and selection substrate (SS) ratios. Since proteases often retain activity on their native substrate, PERRC strengthens selection pressure by adjusting these ratios, promoting the evolution of proteases with greater specificity. Using this platform, we evolved a variant of the Tobacco Etch Virus protease (TEVp) that exhibits a 65-fold preference for a new substrate over its native substrate, despite a single amino acid difference. In future work, we aim to apply the PERRC platform to other disease-relevant proteases to develop more specific variants for protease-based therapeutics and other biotechnological applications.

***Presenter(s): Nyla Searl***
***Faculty: Loic Deleyrolle***

***Project Evaluating the Dichotomous Metabolic Interactions in Human***
Glioblastoma Tumors Using Spatial Proteomics Analysis
Within the glioblastoma (GBM) microenvironment, distinct micro-niches arise from independent cancer cell lineages with unique metabolic needs, classified as Fast Cycling Cells (FCCs) and Slow Cycling Cells (SCCs). FCCs primarily rely on aerobic glycolysis, while treatment-resistant SCCs depend on lipid metabolism. This study examines the molecular and spatial heterogeneity of GBM, emphasizing immune interactions and the metabolic interplay between SCCs and immune cells in human patients. High-plex immunofluorescence imaging was performed using the COMET platform to investigate the immune contexture in human GBM tumors. Formalin-fixed, paraffin-embedded (FFPE) biopsy samples were labeled with fluorescent antibodies targeting FaBP7 to identify SCC-enriched (FaBP7-high) versus non-SCC (FaBP7-low) regions. Regions of interest (ROIs) were defined based on FaBP7 expression, with 40 ROIs analyzed across five tumor sections from different patients. Immune cell populations were labeled using markers such as CD31, CD45, CD68, CD11b, CD4, HLA-DR, FoxP3, CD8, Vimentin, and VISTA. This study reveals a connection between spatial metabolic heterogeneity and immune diversity. SCCs exploit immunosuppressive myeloid-derived cells to support tumor metabolism via lipid transport. Inhibiting lipid transfer disrupts SCC metabolism, remodels the immune microenvironment, delays tumor progression, and improves outcomes. Additionally, sensitivity to lipid-modifying drugs, such as statins, correlates with the SCC phenotype. These findings highlight the metabolic and immune interactions within GBM and suggest therapeutic potential in targeting lipid metabolism to improve patient outcomes.

***Presenter(s): Samuel Sebastian***
***Faculty: Siyao Xu***

## ***Project New turbulent acceleration mechanisms of cosmic rays from first principles***

Cosmic ray (CR) acceleration plays a key role in connecting high-energy electromagnetic radiation and neutrinos in multi-messenger astronomy. Recent gamma-ray and neutrino observations suggest turbulent acceleration as an efficient mechanism accounting for the generation of CRs. However, the traditional theory of turbulent acceleration suffers a long-standing problem in efficiently confining and energizing particles. I report our recent findings on a new acceleration mechanism identified with the state-of-the-art particle-in-cell (PIC) simulations. PIC simulations can track the microscopic kinetic dynamics of individual particles while computing the collective properties of the plasma, providing a powerful framework for studying these mechanisms. This dual capability makes PIC a powerful tool for studying CR acceleration processes by helping to resolve the limitations of traditional turbulent acceleration models. These findings will bring new insight into the century-old problem of CR origin and have important implications on searching for the correlations of high-energy neutrinos and ultra-high energy cosmic rays.

***Presenter(s): Anna Seelhammer***
***Faculty: Zheng Wang***

## *Project Novel Atypical Rhythmical Movement Identified in Middle to Old Aged Autistic Adults using Unified Parkinson's Disease Rating Scale (UPDRS) Assessment*

Autism spectrum disorder (ASD) is lifelong, yet existing research primarily focuses on children, with limited understanding of aging in autistic adults. Several studies found a striking prevalence of Parkinsonism in autistic adults, highlighting the need to comprehensively understand ASD-related neuromotor degenerative processes. To fill this gap, we administered the Unified Parkinson's Disease Rating Scale Part 3 (UPDRS-III) subtasks 3.4-3.8 in 35 autistic adults aged 30-73 and 25 neurotypical controls. During assessment, our team identified a novel behavioral atypicality, termed atypical rhythmic (AR) movement, that differs from other repetitive behaviors in ASD and involves unintentional, rhythmic, small-amplitude movements in non-target body parts during UPDRS-III assessment. We hypothesize that autistic individuals will have higher UPDRS scores than the general population and that the AR behavior will be qualitatively outlined. We found autistic individuals scored significantly higher on UPDRS-III subtasks 3.4b, 3.7b, 3.8a, and 3.8b compared to neurotypical controls. Additionally, AR behaviors were found to manifest contralaterally, ipsilaterally, and centrally across various extremities in autistic adults. Defining this behavior is significant as it may reflect brain connectivity deficits involving corpus callosum circuitry and neural compensation. These deficits are speculated to result in AR behavior, but future fMRI studies are needed for confirmation.

***Presenter(s): Julia Seifer***
***Faculty: Douglas Soltis***

## *Project Path to Food Security: Investigating the Utility of Feral Populations for Brassica Crop Breeding*

Feral plants are valuable, yet underappreciated, genetic resources that could improve the yield of existing crops and increase our understanding of evolutionary processes. Our research works to expand our current knowledge of feral crops through ecological niche modeling (ENM) for Brassica oleracea and Brassica rapa, projecting these onto maps of current and future environmental conditions, enabling us to better understand abiotic limits of species distributions and how this may be impacted by climate change. One challenge in developing ENMs is finding occurrence records that accurately reflect species records. Utilizing artificial intelligence software, we mapped geolocation data based on land use and compared this information with manual categorization findings, ultimately to differentiate between feral, wild, and cultivated collections of Brassica. Niche modeling can point to which feral populations may handle climate change-related stresses (i.e., temperature, salinity, water) best, which can be leveraged for targeted collection of new germplasm. This can then be evaluated for genes associated with pathogen resistance and overall environmental stress tolerance. Overall, we hope our research highlights the pivotal role of digitized natural history collections with georeferenced locality information. These collections, often overlooked, represent an expansive and underutilized reservoir poised to significantly contribute to the development of climate-ready crops.

***Presenter(s): Matthew Self***
***Faculty: John Shea***

## *Project Using Software-Defined Radios to Emulate Communication Path Loss in a Network of Autonomous Vehicles*

Communication between autonomous vehicles (AVs) is becoming an increasingly important area of study, with the emulation of these RF signals in a lab environment being desired. This project involves the integration of USRP Software-Defined Radios, a Channel Attenuation Matrix, and Python scripting to simulate moving vehicles in a 2D plane, navigating towards individual targets. The goal of emulation using physical transceivers is to observe how changing signal attenuation and channel properties impact communication and movement within a group of networked autonomous vehicles. The system has been iterated from using a single-transmitter, multi-receiver setup to a MIMO system that can emulate up to 8 vehicles at a time. Movement algorithms have been developed using an electrostatic potential approach to minimize the isolation of vehicles in the network due to obstacles and distance. Further research and development seeks to introduce simulated obstacles and other channel impairments to the system.

***Presenter(s): Samyukta Senthil***
***Faculty: Aparna Wagle Shukla***

## *Project Long-term Outcomes for Blepharospasm and Meige syndrome with DBS surgery*

Deep brain stimulation (DBS) of the bilateral globus pallidus internus (GPi) improves dystonia symptoms, but long-term data on its effects in blepharospasm and Meige syndrome remain limited, particularly regarding mood, anxiety, and apathy.
Our goal was to evaluate long-term impact of DBS on motor symptoms, mood, and anxiety in patients with blepharospasm and Meige syndrome.
In an IRB-approved study, we analyzed longitudinal data from 19 patients (mean age 57±9 years, 6 males, 13 females), 13 of whom had Meige syndrome. Motor outcomes were assessed using the Unified Dystonia Rating Scale (UDRS), while mood, anxiety, and apathy were measured using the Beck Depression Inventory, Beck Anxiety Inventory, and Apathy Scale, respectively. Assessments were conducted preoperatively and at 1-2 years and 6-9 years post-surgery.
Motor symptoms improved by 47.3% ($p=0.007$) at short-term follow-up and 54.3% ($p=0.005$) at long-term. UDRS eye and face item analysis showed mixed responses between short-term and long-term follow-ups. No significant changes were observed in depression, anxiety, or apathy scores.
GPi-DBS provides significant motor improvement in blepharospasm and Meige syndrome. Mood, anxiety, and apathy remained stable, though a small sample size may have been limiting. These findings necessitate patient counseling and expectation management.

***Presenter(s): Nandita Senthil***
***Faculty: Ashutosh Shukla***

## ***Project A Comparative Analysis on Accuracy of Self-Reported vs. Electronic Health Record acquired Charlson Comorbidity Index among Veterans with Advanced Chronic Kidney Disease (CKD).***

Erroneous or missing diagnosis codes limit the prognostic power of electronic health record-derived comorbidity indices, such as, Charlson Comorbidity Index (EHR-CCI). CCI calculated by patients self-reporting individual comorbidities (SR-CCI) can address these inaccuracies but are subject to patient awareness and recollection bias. The relative accuracy of SR-CCI vs. EHR-CCI has yet to be examined, especially among the US Veteran population with CKD.

Baseline data was derived from the ongoing randomized Trial to Evaluate and Assess the impact of Comprehensive pre-kidney failure education on Home dialysis among Veterans (TEACH-VET) on variety of patient outcomes.

431 Veterans enrolled in TEACH-VET were participants with complete baseline data, including SR-CCI for this analysis. The aggregate CCI score did not differ significantly between the SR-CCI and EHR-CCI, however, there were significant differences in 13 of the 17 individual comorbidities composing CCI (p<0.01). Among the 431 participants, 316 (73.3%) had a higher EHR than SR score, 60 (13.9%) had equal EHR and SR scores, and 55 (12.8%) had a greater SR than EHR score.

Most comorbidities used for CCI are either over or under accounted for by EHR-CCI, raising concerns for its routine use in clinical and epidemiological research. Findings indicate a general overestimation of EHR-CCI or underestimation of SR-CCI scores. Future qualitative or mixed methods studies comparing SR- and EHR-CCI are needed to determine optimal method for reporting CCI and similar comorbidity indices.

***Presenter(s): Kayomi Shah***
***Faculty: Matthew Sarkisian***

## *Project Role of Tumor Cell Primary Cilia in Regulating Galectin-7 Expression in a Mouse Model of Glioblastoma*

Glioblastoma multiforme (GBM) is a highly aggressive brain tumor, typically lethal within 15-18 months. Primary cilia, signaling organelles, play an integral role in the glioma microenvironment, promoting tumorigenesis and resisting current GBM treatment. Primary cilia have been correlated with the expression of Galectin-7 (Gal7), a β-galactoside-binding protein that binds to immune checkpoint receptors and triggers inhibitory pathways, promoting tumor progression. While Gal7 localizes to cilia in kidney epithelial cells and drives skin carcinogenesis, its role in GBM is unknown. We characterized the role of Gal7 in tumor progression in relation to primary cilia. Using the KR158 GBM mouse model, we examined two different genetically modified cell lines that lack cilia and found that they lacked Gal7 mRNA and protein. However, when ciliary proteins were restricted to the tumor cell body but cilia could still form, Gal7 expression remained normal, suggesting its dependence on ciliogenesis. CRISPR/Cas9 depletion of Gal7 in KR158 cells did not affect cilia length but significantly increased the frequency of ciliated tumor cells. These findings suggest that Gal7 is tightly linked to GBM ciliogenesis process. Current studies are examining the mechanism underlying this link, and whether the immune system displays an enhanced response to Gal7-depleted tumor cells.

***Presenter(s): Nadia Shahin***
***Faculty: Ben Lewis***

## *Project Obsessive-Compulsive Disorder as a Mediating Factor in Addiction: Effects on Cravings and Rehabilitation Adherence*

BACKGROUND   Obsessive-compulsive disorder (OCD) is characterized by uncontrollable and recurring thoughts and/or repetitive and excessive compulsive behaviors. OCD is commonly comorbid with substance use disorders (SUDs), but few studies have specifically examined OCD symptomatology in the context of SUD treatment. The current project addresses these questions, employing a quasi-experimental design to interrogate OCD as a causal factor.

METHODS   Data were collected from patients in SUD treatment (N=1,878) at treatment initiation, 30 days, and at discharge. Approximately 10% of the sample reported severe OCD symptomatology (n = 168). Groups were compared across treatment-relevant outcome measures, including craving and early cessation of treatment (dropout). To examine OCD as a causal factor, propensity score matching was applied to create a matched control group (n=336) and analyses were repeated.

RESULTS   The OCD group endorsed higher craving and more frequent dropout (ps<.001). When analyses were confined to the matched samples, these differences persisted.

DISCUSSION   These data are consistent with observations that OCD constitutes a significant challenge to SUD treatment. These data may contribute to both prevention and intervention efforts, as OCD symptoms appear both predictive of worse treatment outcomes and causally related to those outcomes.

***Presenter(s): Rahil Shaik***
***Faculty: Yasumasa Takano***

## *Project Designing a Faraday Magnetometer to Investigate Magnetic Moments of α-RuCl3*

Quantum spin liquids (QSLs) have been of interest to physicists due to their potential to host Majorana fermions which are the basis for topological quantum computers. Although QSLs have not been conclusively found, a promising candidate is α-RuCl3. Theorized to be a Kitaev honeycomb spin liquid, there is research both supporting and refuting this categorization. Measuring the magnetic moments of QSLs at extreme temperatures and magnetic fields could help provide greater evidence whether α-RuCl3 obeys the Kitaev model, as both of these variables seem to be coupled with Kitaev properties. The National High Magnetic Field Laboratory in Tallahassee can create these extreme conditions, however measurement devices have not caught up. Traditional magnetometers fail as they generate significant heat during measurement. Thus, we propose a Faraday magnetometer that circumvents these issues and can operate below 0.1 K and above 8 T. Though not completely novel, it will be the first such device in the United States and along with improved designs such that the device can handle significant torque, access lower temperatures, perform measurements faster, and operate without gradient coils.

***Presenter(s): Maya Shamash***
***Faculty: Amor Menezes***

## *Project In vitro tranexamic acid dosing efficacy against fibrinolysis*

Tranexamic acid (TXA) is an antifibrinolytic treatment that reduces mortality in hemorrhagic trauma patients. Despite research that documents a significant decrease in perioperative blood loss with TXA administration, TXA treatment dosages are varied and non-standard. Here, we quantitatively analyze the effect of TXA dosages on human blood for which we artificially increased clot breakdown propensity, or fibrinolysis. In six donor blood samples each with two technical replicates, we added two concentrations (50 ng/mL and 100 ng/mL) of tissue plasminogen activator (tPA) to artificially induce fibrinolysis. For each tPA concentration, we tested the clot strength change that resulted from adding one of four different TXA concentrations (0.25, 0.5, 1 and 2 μg/mL). We evaluated whole blood clot strength using the viscoelastic measurement of thromboelastography (TEG). We statistically related TXA and tPA concentrations and baseline TEG values. As expected, tPA additions increased TEG curve maximum amplitude and clot lysis after 30 minutes. We found that administering therapeutic TXA in vitro proportionally reduced tPA lysis.

***Presenter(s): Matthew Shapiro***
***Faculty: Amlan Biswas***

## *Project Simulating the formation of electron tunnel junctions in manganite thin films*

Certain hole-doped manganese oxides (manganites) are charge-ordered insulators (COI) at low temperatures (~ 100 K). They undergo a first-order phase transition to a ferromagnetic metallic (FMM) state upon further cooling, during which FMM domains grow and coalesce. It has been shown experimentally that an electric field applied to this mixed-phase state leads to a rearrangement of the FMM regions, a process driven by dielectrophoresis. I have been co-developing a program in C++ which simulates the migration of FMM domains in the presence of a non-uniform electric field. Using the relaxation method, the program models the electric potential on a grid containing two electrodes and a few FMM domains. As the FMM regions move and coalesce onto the electrodes, a metal-insulator-metal junction forms which potentially facilitates spin-dependent electron tunneling. The tunneling current is calculated using a simple barrier penetration model. Properties of the junction, such as the current vs voltage (I-V) behavior, were modeled and used to reproduce experimental measurements from the Biswas lab. I will also perform experimental measurements on (La(1−y)Pry)(1−x)CaxMnO3 (LPCMO) to acquire I-V curves at various temperatures which will be compared with simulation results. Understanding the behavior of these manganite microstructures is important for spintronics applications, which can be used in highly efficient computing technologies such as neuromorphic computing.

***Presenter(s): Jaclyn Shaw***
***Faculty: Rene Opavsky***

## *Project C17ORF58 is Critical for the Maintenance of B-cell Lymphomas and Myeloid Leukemias*

Oncogenes, or genes that can cause cancer, are often the driving force for the development of cancers, notably lymphomas. Peripheral T-cell Lymphoma, Not Otherwise Specified (PTCL-NOS) is a particularly heterogeneous and aggressive form of this cancer. Additionally, its resistance to the conventional CHOP chemotherapy regimen is a problem that necessitated the identification of novel targeted therapies. Through analysis of RNA sequencing data obtained from patient tumors, C17ORF58 was identified to be critical for the proliferation of PTCL-NOS. When knocked down in T-cell malignancies, including lymphomas and leukemias (T8ML-1, Jurkat), cell cycle arrest and apoptosis occur. However, the knockdown of this gene did not impact the growth of normal fibroblast cells (HEK 293T and normal T-cells), making it an ideal candidate for targeted therapy. To further expand upon our knowledge of the role C17ORF58 may play in other hematological malignancies, shRNA knockdown of C17ORF58 in B-lymphoid (RAJI) and myeloid (K562) malignancies was performed via transient transfection. We found a similar phenotype to that of T-cell malignancies shown by the knockdown of C17ORF58 in other hematological malignancies. Consequently, C17ORF58 is critical in the maintenance of various hematological malignancies and should be considered a target for novel targeted treatments of these malignancies.

***Presenter(s): Ryan Sheehan***
***Faculty: Florin Curta***

## *Project Among other benefits: A reappraisal of the Oral Law theory and King Æthelberht's code*

The earliest surviving text from England's transition to literate culture, the law code of King Æthelberht of Kent, continues to generate intense debate regarding its origins and interpretation. Philologists such as Lisi Oliver and historians like Tom Lambert argue that the code reflects pre-literate Anglo-Saxon traditions, while others, including Stefan Jurasinski, propose a continental origin, possibly even a Latin composition.

This paper examines the argument for a mnemonic composition emerging from a traditional class of Kentish law-speakers; this theory, advanced by Oliver and Lambert, will be termed the "Oral Law Theory." While highlighting the strengths of the Oral Law Theory, this paper also contends that the theory has key shortcomings in its ability to account for all available evidence, including the code's stipulations on crimes against Christian clerics and Bede's statement that the code followed "the manner of the Romans." This reassessment addresses the mnemonic and grammatical features emphasized by Oliver and Lambert without relying on tenuous methods originating in the 19th-century historische Schule, which Jurasinski and others have criticized. By incorporating insights from philology, anthropology, and archaeology, this study constructs a more cohesive and methodologically consistent understanding of the transition to a literate Anglo-Saxon culture in the 7th century.

***Presenter(s): Megan Shein***
***Faculty: Megan Mocko***

## *Project AI and Mnemonics in a Business Statistics Classroom*

The aim of this qualitative study was to investigate the use of AI and mnemonic creation in a masters-level business statistics course. The research question was: How do students perceive the difference in mnemonic creation and compilation with using generative AI, such as ChatGPT, versus not using generative AI? There were two treatments: Treatment A and Treatment B. Treatment A created mnemonics for the exam in small teams with no generative AI while Treatment B created mnemonics using generative AI. Both sections of the class completed treatments of A for Exam 1 and treatments of B for Exam 2, and filled out a survey through Qualtrics answering questions regarding mnemonics for both treatments. At the end of the semester, students were asked to complete a reflection assignment about their experience. After coding the qualitative data, we found that mnemonics created solely by humans were preferred for personal connections, but AI-created ones were preferred for time-efficiency. We also learned that creating the mnemonics allowed students to gain a new perspective on the material. Overall, there is some evidence to support our hypothesis that students can increase the retention of material through the creation process of mnemonics.

***Presenter(s): Quinn Shepard***
***Faculty: Terrell Williams***

## ***Project Evaluation and Optimization of Collegiate Emergency Medical***

Service's Patient Handoff Reports to Responding ALS

The quality and consistency of patient handoff reports are critical to effective communication between basic life support (BLS), collegiate emergency medical services (EMS), and responding advanced life support (ALS) units. Miscommunication during handoffs risks omitting vital information, potentially delaying treatment as non-transport units add another layer to patient care. This study evaluates the content and quality of oral patient handoff reports delivered by Gator Emergency Response Unit (GEMRU) leads.

This improvement study first surveyed EMS professionals, including emergency medicine physicians and paramedics, to identify essential components for all patient care reports, as well as specific elements for trauma and medical calls. Subsequently, trauma and medical scenarios were developed to test leads' ability to prioritize critical details and adhere to medical protocols. Recorded handoff reports were analyzed for consistency and inclusion of essential content identified in the professional feedback survey.

Despite professional consensus on critical components, significant variability in report quality was observed, revealing gaps in training and standardization. Thus, findings emphasize the need to standardize collegiate EMS handoffs. EMS professionals' feedback could aid development of checklists or mnemonics tailored to call types. These training protocols could improve long-term handoff consistency, ALS readiness, and ultimately, patient outcomes.

***Presenter(s): Hiral Shukla***
***Faculty: Nicolas Gauthier***

## ***Project Time Series Analysis: Uncovering Medieval Economic Dynamics***

Grain prices have long served as key indicators of economic conditions and agricultural productivity. Historical datasets from 1500-1800 have recorded annual grain prices— converted to silver per liter— for wheat, rye, barley, and oat across various cities in Western and Central Europe. Prior work by economic researchers revealed that events such as the Spanish influx of gold, early industrialization, and plagues played critical roles in market dynamics. Few studies, however, have attempted to retrodict the data to piece together a more accurate picture of socioeconomic events.

This study aims to replicate and extend the analysis through time series modeling, imputation, spatial analysis, exponential decay simulation, and state space modeling. By integrating advanced statistical techniques and machine learning, this research sheds light on the complexities of past market behaviors and provides valuable insights into the drivers and dynamics behind them for scientists, historians, and analysts. These findings offer a deeper comprehension of the interconnected factors influencing agricultural and economic trends over centuries.

***Presenter(s): Aaron Shumer***
***Faculty: Vincent Bindschaedler***

## *Project Leveraging Multi-Sample Data Augmentation for Stronger Membership Inference Attacks*

Under the guidance of Professor Vincent Bindschaedler and PhD student Wenxuan Bao, I am exploring whether membership inference attacks leveraging multi-sample data augmentation (MSDA) for queries can extract more information than conventional queries without MSDA.
Membership inference attacks (MIAs) aim to determine whether a given data point was part of a model's training set. Traditionally, these attacks rely on a model's confidence scores for single queries, but such scores can be noisy and unreliable. By leveraging multi-sample data augmentation, attackers generate multiple perturbed versions of a query, allowing them to observe a distribution of model responses rather than a single-point estimate. We believe this richer set of information can reduce variance, highlight overfitting patterns, and ultimately improve the attack's ability to infer membership.

***Presenter(s): Austin Shute***
***Faculty: Nitya Subrahmanian***

***Project Alpha-synuclein Dyshomeostasis is Exacerbated by Mitochondrial*** Complex I Dysfunction in Models of Parkinson's Disease

Parkinson's Disease (PD) is characterized by the near-selective loss of dopaminergic neurons in the substantia nigra, with many patients exhibiting abnormal aggregation of alpha-synuclein (α-syn). Separately, 30-50% deficits of mitochondrial complex I (CI) - the first component of the electron transport chain - have been observed in the substantia nigra of idiopathic PD brain. Our aim was to determine if mild CI deficits increase susceptibility to α-syn aggregation utilizing cellular models of synucleinopathy.

We generated CI-deficient HEK293 cells and stem cells (iPSCs) via CRISPR-Cas9 and shRNA targeting of the assembly factor NDUFAF2, respectively. This resulted in ~90% loss of protein and ~30% CI deficiency. The effect of CI deficiency on endogenous α-syn levels and aggregation upon seeding with pre-formed fibrils of α-syn (PFFs) were analyzed via immunocytochemistry and immunoblotting.

Our novel findings indicate that mild CI deficit, modeling idiopathic PD, results in a greater propensity for abnormal αSyn aggregation in cellular models. We will continue to investigate if mild CI deficits cause pathological α-syn truncations and determine the mechanism of action. This study will provide crucial information on the role of mitochondrial dysfunction in PD and other neurodegenerative diseases, potentially revealing new therapeutic targets.

***Presenter(s): Sacha Sides***
***Faculty: Valerie DeLeon***

## *Project Comparative Analysis of Aye-aye Incisor Curvature and Morphology in Relation to Rodents and Lagomorphs*

Daubentonia madagascariensis, or the aye-aye, is a lemur that has convergently evolved ever-growing incisors, despite this trait being otherwise absent in primates. Initially, aye-ayes were misclassified as rodents upon their discovery due to the influence of these incisors on their facial skeleton, and previous literature has suggested that Daubentonia shows the highest degree of morphological convergence with squirrels when compared to other rodents. This study uses 3D geometric morphometrics to test the hypothesis that Daubentonia's incisor curvature is most similar to that of squirrels within non-primate Euarchontoglires. Sliding semilandmarks were placed along the mesial buccal edge of each incisor and a generalized Procrustes analysis was performed to compare incisor curvature independent of size. The incisors were then plotted within morphospace using Principal Components Analysis.
We found that Daubentonia's incisor morphology differs dramatically from that of rodents and lagomorphs. Daubentonia's incisors are dorsoventrally flattened, with a large mediolateral expansion that significantly exceeds that of all other species surveyed. Additionally, Daubentonia is distant to Sciurus carolinensis along PC1, suggesting that incisor morphology does not converge between these taxa. Overall, these data raise new questions about the evolutionary dynamics between the ever-growing incisors and the post-canine dentition of the aye-aye.

***Presenter(s): Sukhman Sidhu***
***Faculty: Gary Wang***

## *Project Investigating Suspended Bacterial Aggregates in Commensal Gut Microbiota*

Bacteria are known to exhibit three distinct lifestyles – planktonic (individual cells), surface-attached biofilms, or suspended bacterial aggregates. Suspended bacterial aggregates are similar, but not identical, to surface attached biofilms and seem to be more prevalent in biotic environments. Bacterial aggregates have been reported in Cystic Fibrosis airway infections and chronic wound infections. Formation of aggregates by gut bacteria has been suggested, but studying aggregates in vivo is challenging. In this study we developed a simple method to (1) determine the presence of bacterial aggregates and (2) determine the abundance of bacteria in aggregate and planktonic fractions in mouse gut samples. We discovered that the majority of mouse commensal gut bacteria (mean = 99.70% cfu/mg, n=3) exists as aggregates. Our method can be extended to study the aggregate formation by bacteria that cause gastrointestinal infections, e.g. Clostridioides difficile (CD). In a mouse model of chronic asymptomatic CD infection (CDI), the majority (mean = 94.63% cfu/mg, n=6) of CD was found in aggregates, whereas in a mouse model of acute lethal CDI, majority (mean = 77.49% cfu/mg, n=3) of CD was planktonic. Our data suggests that aggregates may help CD asymptomatic colonization and persistence.

***Presenter(s): Lauren Siegrist***
***Faculty: Lindsey Reisinger***

## *Project Intraspecific behavioral trait variation across slough crayfish (Procambarus fallax) populations*

Recently, behavioral ecologists have demonstrated that behavioral traits can vary across populations of the same species due to differences in environmental conditions or genetics. However, there is limited evidence of this phenomenon and its ecological consequences. Previous work from the Reisinger lab shows that behavioral differences occur across conspecific crayfish populations in the Midwest USA. Here, we investigate whether foraging rate, activity, and aggression differs across slough crayfish (Procambarus fallax) populations, a native Florida crayfish species. Specifically, we collected slough crayfish from 7 populations from the Osceola and Ocala National Forests and tested their behavior under common conditions in the laboratory. We also reared the offspring from 28 families under common conditions and measured their behavioral traits once they reached maturity. We measured an individual crayfish's foraging rate as the total number of frozen chironomids consumed in 20 minutes. We measured the activity level of crayfish in a group assay as the proportion of observations a crayfish was walking, swimming, or fighting. We measured the aggression level of crayfish by measuring the average intensity of agonistic interactions. Here, we will present results of intraspecific variation in foraging rate, activity level, and aggression across populations of slough crayfish collected in the wild and reared under common conditions. We plan to use ANOVA statistical analyses, or non-parametric tests (when applicable) to compare population differences in these behavioral traits.

***Presenter(s): Benjamin Siew***
***Faculty: Amy Williams***

## *Project Lipid Biosignatures in Alkaline Lakes: Implications for Life Detection on Mars*

One of the most robust means of searching for signs of life on nearby planetary bodies is by looking for biogenic organic molecules preserved in rocks, but the ability of rocks to capture and preserve organics over long periods is variable and dependent on mineralogy. Hydrated MgSO4 salts are present in both Mars' Jezero and Gale craters currently being explored by the Perseverance and Curiosity rovers. The Basque Lakes in British Columbia, Canada, have recently garnered attention for their low-temperature, hypersaline Mg+2 and SO4-2 dominated brines, which make them excellent analogues to those found on Mars, Europa and Enceladus. To assess the preservation of biogenic organics within MgSO4 salts, pyrolysis gas chromatography mass spectrometry (py-GC-MS), a technique available on the Sample Analysis at Mars (SAM) instrument aboard the Curiosity rover, was used on Basque lake epsomite samples of varying morphologies. Diverse fatty acid methyl esters and alkanes were observed across the analyzed samples within the range of 0.001-0.45 ng / mg of sample. This shows the Basque Lake epsomite samples to be effective at preserving diverse hydrocarbons at high enough concentrations to be easily observed, and so similar environments on Mars could be viable options for the search of biosignatures.

***Presenter(s): Shedeline Similien***
***Faculty: Jessie Fernandez***

## *Project Characterizing Poly (ADP-Ribose) Polymerase role in Magnaporthe oryzae*

Poly (ADP-Ribose) Polymerase (PARP) plays a key role in human DNA repair and stress regulation, yet its function in fungi, particularly Magnaporthe oryzae, remains understudied. M. oryzae, the rice blast fungus, devastates 10-30% of global rice production. This study investigates the sole PARP protein in M. oryzae and its role in stress mediation and biochemical activities. We hypothesize that PARP is crucial for stress response during infection.
To test this, we will use a split-marker method employing three selectable markers—hygromycin, sulfonylurea, and Basta—to replace targeted PARP sequences, thereby generating targeted gene replacement mutants of PARP. Each marker is split, with one half fused to the upstream PARP region (left flank) and the other to the downstream region (right flank). These constructs are introduced into M. oryzae protoplasts to induce homologous recombination and replace the PARP sequence. PCR and gel electrophoresis confirm sequence deletion, validating base pair sizes against expected results.
This research fills a crucial gap in understanding PARP's biochemical role in fungal DNA repair, stress response, and pathogenicity. By uncovering M. oryzae's cellular mechanisms, we contribute to future strategies for mitigating its impact on rice production and global food security.

***Presenter(s): Victoria Simoni Assuncao***
***Faculty: Heather Stark***

## *Project Internal Displacement and Food Security: Perspectives from Burkina Faso*

Burkina Faso is experiencing one of the largest internal displacement crises in the world. As a landlocked country in the Sahel region of West Africa, porous borders and government instability have heightened violence against civilians by armed groups. Internally displaced persons (IDPs) face increased food insecurity due to disrupted livelihoods. The Un Oeuf study conducted in Burkina Faso (2018-2019) improved infant nutrition through egg consumption using behavioral change interventions, but a follow-up was delayed until 2025 due to conflict. This follow-up study evaluates the impact of conflict and displacement on Un Oeuf participants. Out of 260 original participants, 181 were identified and enrolled. Follow-up data were collected by trained enumerators in a cross-sectional survey format assessing the impact of the primary study and dietary patterns of mother-child dyads. Semi-structured interviews with field data collectors were conducted and analyzed, along with survey responses, through content analysis on displacement impacts and food access conditions. 92.8% of primary caregivers in the follow-up reported having been displaced at least once. Preliminary analysis indicates insecurity as a key driver of displacement and barrier to food access for households. Findings highlight the challenges IDPs face in Burkina Faso, underscoring the need for public health humanitarian aid.

***Presenter(s): Audrey Singletary***
***Faculty: Jing Pan***

***Project Improving Luciferase Enzyme Function with Generative AI Model***
***Title: Improving Luciferase Enzyme Function with Generative AI Model***
***Authors: Audrey Singletary, Leif Holmstrom, Wenting Wang, Mengting Li, Jing Pan*, Wenjun Xie****

Enzyme engineering allows for improvement of enzyme activity and stability, which can be useful in optimizing many bioprocesses including pharmaceutical production or biofuel generation. Traditional methods of protein engineering including directed evolution and rational mutagenesis require broad screening of substantial mutation libraries resulting in high resource consumption. Generative artificial intelligence models could provide an effective solution to these challenges by identifying advantageous mutations through natural protein sequence patterns. Our objective is to demonstrate AI-driven enzyme optimization using luciferase as a model system. Luciferase is a bioluminescent enzyme with applications in bioimaging and biosensing technologies. We compared the relative effectiveness of MaxENT (MSA-based), ProteinMPNN (structure-based), and PLM (MSA-free language model) AI models in identifying point mutations which enhance luciferase activity and stability.

A generative model was trained on natural luciferase sequences to create a focused library of predicted effective single-point mutations. E. Coli was used to express mutant enzymes which were subsequently purified to enable characterization. Enzyme characterization analysis includes steady-state kinetic measurements (kcat/Km), thermal stability assays, and analysis of spectral peak shifts to evaluate emission property changes.

We have established both experimental and computational pipelines for single mutation luciferase variant design. Several beneficial mutations have been identified in the library of AI-designed protein library compared to wild-type luciferase.

***Presenter(s): Cole Smith***
***Faculty: Jorg Peters***

## *Project TIPSLite for iOS: Increasing Accessibility to Lap-Surgery Training*

The Toolkit for Illustration of Procedures in Surgery (TIPS) enables surgeons to create and share interactive, force-feedback surgical simulations for specialized procedures. Originally, interacting with the simulations required expensive haptic devices, limiting accessibility, especially during times of remote work such as the COVID-19 pandemic. To address this, TIPSLite was introduced. TIPSlite leverages the trainee's smartphone as the surgical tool interface, paired via Bluetooth to a thin-client. TIPSlite transmits motion data to a remote server running the simulation, which is displayed in a remote window, replacing expensive hardware.
TIPSlite has the potential to improve surgical education by reducing cost and broadening access to interactive, surgeon-authored training.

This project extends TIPSlite to iOS, as the majority of medical trainees used an iPhone rather than Android based products. The main challenge is the transmission of motion data to the remote server, and its integration within the simulation. My work so far created the iOS application and a working data pipeline. My current efforts focus on integrating motion data within specific drivers, to enable a fully functional feedback experience.

***Presenter(s): Gabriella Smith***
***Faculty: Benjamin Lok***

## *Project Analysis of Pseudo-Lip-Synchronization on Perceived Animacy of Realistic Virtual Humans*

Maintaining the animacy of verbal virtual humans (VHs) throughout user interactions remains a challenge in human-computer interaction. Previously, this technology relied on pre-recorded videos with lip syncing, as dialogue was pre-scripted and could be carefully produced in advance. With recent advancements in AI, there is now the capability to create more personalized user interactions with the real-time generation of text and audio responses. However, the current state of VHs does not allow for real-time lip synchronization often leading to misalignment between the voice and speech systems causing the perceived animacy to falter. In an effort to address this gap, there has been the use of a pseudo lip-sync response featuring a looping pre-recorded video of mouth movements (e.g., "watermelon-cantaloupe") that can be played with the real-time generated audio. This paper analyzes data from three studies examining how both true and pseudo lip-syncing influence the perceived animacy of human-realistic VHs. We discuss key findings, including potential unforeseen factors affecting results, and propose a strategy to sustain animacy in virtual agents when generating real-time audio.

***Presenter(s): Olutimilehin Sobanjo***
***Faculty: Katherine Deliz Quiñones***

## *Project PFAS in Wastewater Treatment Plants: Understanding Aggregation and Its Effect on Removal Processes*

Toxic per- and polyfluoroalkyl substances (PFAS) have emerged as a significant environmental concern across multiple STEM disciplines. Their widespread adoption in commercial and defense manufacturing stems from their exceptional properties including strong C-F bond which confers high chemical stability making them resistance to heat, water, and friction. However, these same characteristics have led to unintended consequences, including environmental persistence, widespread contamination, and bioaccumulation in organisms. The challenge is particularly acute in wastewater treatment, where many facilities lack adequate treatment processes to effectively manage and reduce PFAS contamination. This research addresses this critical gap by investigating PFAS aggregation in water systems, with a specific focus on optimizing parameters that enhance aggregation capabilities. The study targets short-chained PFAS, which present unique challenges due to their lower aggregation propensity compared to longer-chained compounds and their resistance to current treatment technologies. The findings will contribute to our understanding of PFAS aggregation mechanisms and inform the development of more efficient separation technologies, particularly foam fractionation methods.

***Presenter(s): William Sobczak***
***Faculty: Sara Behdad***

## *Project Classification of commercial vessel activity from automatic identification system records*

Automatic Identification System (AIS) data is used in a myriad of applications related to marine vessel activity, including emissions modeling efforts. The classification of a vessel's operating mode (i.e., hotelling, anchorage, maneuvering, and transit) is of relevance to such analyses to accurately estimate emissions but is not reliably provided in the raw data due to human error and thus must be inferred. Previous works have identified vessel operating mode by using supervised machine learning, applying speed and engine load factor corrections, or incorporating external datasets (i.e., shapefiles) to geospatially designate anchorage and hotelling sites. Rather than relying on external datasets, we propose a method to classify vessel activity into operating modes using only the speed, heading, and position features in AIS data. To accomplish this, we leverage a combination of comparative segment-wise tiered filtering and unsupervised machine learning techniques (i.e., K-Means and DBSCAN clustering algorithms). Results at the port level for ocean-going vessels display clear separation between behavior characteristic of each operating mode. Furthermore, the method demonstrates improved accuracy for identifying vessel activities over simply using the AIS-supplied fields or shapefile geofences.

***Presenter(s): Carson Sobolewski***
***Faculty: Ivan Ruchkin***

## *Project Generalizable Image Repair for Robust Visual Autonomous Racing*

Vision-based autonomous racing relies on accurate perception for robust control. However, image distribution changes caused by sensor noise, adverse weather, and dynamic lighting can degrade perception, leading to suboptimal control decisions. Existing approaches, including domain adaptation and adversarial training, improve robustness but struggle to generalize to unseen corruptions while introducing computational overhead. To address this challenge, we propose a real-time image repair module that restores corrupted images before they are used by the controller. Our method leverages generative adversarial models, specifically CycleGAN and pix2pix, for image repair. CycleGAN enables unpaired image-to-image translation to adapt to novel corruptions, while pix2pix exploits paired image data when available to improve the quality. To ensure alignment with control performance, we introduce a control-focused loss function that prioritizes perceptual consistency in repaired images. We evaluated our method in a simulated autonomous racing environment with various visual corruptions. The results show that our approach significantly improves performance compared to baselines, mitigating distribution shift and enhancing controller reliability.

***Presenter(s): Rachel Spear***
***Faculty: Andrew Altieri***

## *Project Quantifying trophic level increase with ontogeny of the Great Barracuda*

The Great Barracuda, (Sphyraena barracuda), exhibits an ontogenetic shift from onshore seagrass and mangrove habitats to offshore reefs. Barracuda can grow to ~2m in length and therefore do not need the protection onshore habitats provide like their smaller, juvenile counterparts. With the loss of other high trophic level fishes, Great Barracuda are now common piscivorous top reef predators across the Florida Keys Reef Tract. Being higher in the food web is associated with an increased isotopic nitrogen concentration. However, it is unclear if their trophic position increases linearly with size and age directly, and how that position shifts as Barracuda age and transition offshore. This study investigates whether size and age both contribute to higher trophic position in Barracuda. This offshore transition may also lead to changes in carbon signatures, as the food web base varies across ecosystems. While results can vary with location, the chosen areas are inshore Florida Bay and offshore Florida Keys Reefs. To address these knowledge gaps, we quantified how Great Barracuda trophic position increases from juveniles to adults (174-525 mm). Stable isotopic analyses were performed on white muscle tissue and subsequent carbon and nitrogen isotopic trends were assessed across size classes and subregions.

***Presenter(s): Emily St. Pierre***
***Faculty: Barry Setlow***

## *Project The Effects of Concurrent Cocaine and Cannabis Use on neural Reward Circuitries*

Polysubstance use (PSU) is the simultaneous ingestion of two separate drugs within a specified timeframe. One of the most common combinations of PSU is chronic cannabis use with binges of cocaine. To gain a deeper understanding of this drug ingestion pattern and its effects on the neural reward mechanisms, we developed a rodent PSU experiment. Young Sprague-Dawley rats of both sexes underwent intravenous jugular catheter surgery and were then assigned to one of three smoke groups (placebo, cannabis, or clean air). These rats were then placed in a smoke chamber where they would be exposed to passive inhalation of their designated smoke condition 5 days a week, with one of those days moving immediately to a cocaine self-administration (SA) chamber. After five weeks of PSU exposure, rats underwent a 30-day abstinence period before being placed back into their SA chambers to test relapse behaviors. Behavioral data indicated that rats initially exposed to cannabis ingested a lower amount of cocaine; however, they displayed heightened relapse behaviors during the reinstatement test. To further investigate how concurrent use of cannabis and cocaine affects the neurobiological processes of reward, we will utilize c-Fos staining to observe neuronal activation in the prelimbic cortex (PrL).

***Presenter(s): Andrew Steiner***
***Faculty: Megan Butala***

## *Project Electrochemical Behavior of V2-xMoO8 for Next-Generation Lithium-Ion Batteries*

As demand for efficient energy storage grows, understanding the structure-property relationships of energy storage materials is essential. V2O5 and Nb3O7F are promising insertion cathode materials for lithium-ion batteries. In previous work, substituting Mo for V in V2O5 led to a ternary phase resembling V2MoO8, which displayed unique electrochemical behavior compared to V2O5 or Nb3O7F. However, its stoichiometry remained unclear, and conventional synthesis methods were costly and time-consuming. Here, we report a solid-state synthesis of phase-pure V2MoO8 and a 5-part compositional series within the V2O5-MoO3 system. Synchrotron X-ray diffraction and neutron diffraction were used to validate the structures. Electrochemical cycling of V2-xMoO8 samples in half-cell and Swagelok-cell batteries revealed insights into their stability and phase changes. Scanning electron microscopy (SEM) and transmission electron microscopy (TEM) visualized the impact of lithiation on morphology and atomic structure. Inductively coupled plasma mass spectrometry (ICP-MS) clarified the stoichiometry of V2MoO8. Our findings confirm the synthesis of phase-pure V2MoO8 and its phase stability boundaries. The cycling behavior of V2-xMoO8 samples highlights distinct discharge-charge profiles across the compositional series. This work enhances the understanding of the relationship between structure and electrochemical behavior in the V2O5-MoO3 system, providing valuable insights for the development of next-generation energy storage materials.

***Presenter(s): Sophia Stenzler***
***Faculty: Hua Yan***

## *Project Identifying Ligands of Olfactory Receptors in Pest Ants and Beetles*

Ants and beetles are significant pests that cause extensive agricultural, monetary, and structural damage through foraging and nest-building. Traditional pest control methods often harm unintended species, like pollinators. An olfactory-based approach targeting specific pest insects offers a more specific solution. This project aims to identify potential odorants for controlling three ant species (Atta sexdens, Atta cephalotes, and Camponotus floridanus) and one beetle species (Tribolium castaneum).

We selected 12 conserved and highly expressed odorant receptor (Or) genes from these pests and created transgenic Drosophila lines that overexpress these Or genes. Using single sensillum recordings (SSRs), we measured neuronal responses to a panel of approximately 40 different odorants. Spontaneous neuronal activity in wild-type Drosophila served as a baseline control. By comparing SSR data from transgenic and control flies, we aim to identify chemicals that activate or inhibit pest-specific Or. The goal is to detect odorants that could be used as attractants or repellents in pest control, offering a more targeted and efficient approach. This method may lead to novel strategies for pest management that are more selective and safer for non-target species, ultimately promoting sustainable pest control.

***Presenter(s): Savannah Stephens***
***Faculty: Adam Watson***

## *Project Printer to Palate*

3D-printed foods represent an innovative intersection of technology and culinary arts, marking a shift in how we conceptualize and produce edibles. This emerging field utilizes specialized 3D printing technology to construct intricate, customizable food structures layer by layer, transforming raw ingredients into novel shapes and textures. Beyond mere gastronomic novelty, 3D-printed foods hold potential for addressing personalized nutrition, food sustainability, logistics, and culinary creativity. The process enables precise control over ingredient composition, catering to specific dietary needs while minimizing waste. As this technology advances, it sparks new possibilities for reshaping traditional culinary landscapes and meeting evolving consumer demands.
This research investigates consumer awareness, intentions, and attitudes toward 3D-printed foods. A survey designed to assess psychological and socio-economic factors influencing consumer acceptance has been deployed at a large multicultural higher education institution. The study aims to provide insights into the interplay of factors affecting the adoption of 3D-printed foods, contributing to a deeper understanding of their potential integration into mainstream culinary practices. The findings are expected to inform industry stakeholders, policymakers, and educators, guiding the development of strategies that align with consumer preferences and encourage widespread acceptance of 3D-printed foods in the future.

***Presenter(s): Savannah Still***
***Faculty: Anthony Gonzalez***

## *Project Refining nature's telescope: Identifying companion structures in gravitational lenses with JWST imaging*

Gravitational lensing is a powerful tool for magnifying the distant Universe. As part of a James Webb Space Telescope (JWST; Program GO 1791) program to understand the properties of the most strongly star-forming galaxies in the early Universe, we are constructing detailed models of the foreground lenses. While a single galaxy is often the main source of magnification, any substructure due to nearby companions can complicate the lensing. The focus of my work is to identify nearby companions by deriving photometric redshift estimates. To estimate photometric redshifts, we fit the Spectral Energy Distribution (SED) for the additional structures near three systems: SPT 0311, 0346, and 0441. Current gravitational lens models for these systems do not account for structures aside from their respective central lenses. We use GALFIT to model the central lens, which would otherwise contaminate the signal from nearby structures within the data. We then model auxiliary structures, extracting model fluxes for each available wavelength. Next, we use the code EAZY-py to estimate photometric redshifts through SED fitting for each structure. Preliminary results indicate that SPT 0441 has multiple associated structures impacting the lensing.

***Presenter(s): Grace Stoker***
***Faculty: Frederick Kates***

## *Project Reducing Emergency Room Overcrowding with an AI Chatbot for Urgent Care Guidance*

Background
Overcrowding in hospital emergency rooms (ERs), often exacerbated by patients' uncertainty about appropriate levels of care needed, is a significant issue. This study proposes the development of an AI chatbot designed to bridge the gap between urgent care and emergency care by providing patients a chatbot to assess whether or not they need to visit an urgent care center or the ER.

Methods
This study utilizes electronic health record (EHR) data from UFHealth to train and test a chatbot that classifies patient-reported symptoms by acuity. Training data originates from Gainesville UFHealth facilities and will be tested at UFHealth Jacksonville. The RE-AIM framework will measure the impact of the implementation of this chatbot.

Results
Chatbot effectiveness will be measured by a change in the mix of high and low acuity patients in the ER.

Conclusions
Implementing our AI chatbot may alleviate ER overcrowding, enhance patient decision-making, and improve efficiency by creating an accessible point for patients to receive a recommendation for urgent or emergent care. This innovation offers a scalable solution to a widespread problem. Challenges include security and data privacy concerns surrounding EHR-based models and generalizability of our model to alternative healthcare systems.

***Presenter(s): Casey Strauss***
***Faculty: Sharon DiFino***

## ***Project Bridging Communication Gaps: Enhancing Language Intervention for Bilingual Children with Autism***

According to the CDC, around 1 in 36 children in America have Autism, and the National Institute of Health further states that 1 in 4 of these children are being raised in bilingual households. The number of bilingual Americans is quickly increasing, especially in children. This means that speech-language pathologists (SLPs) may provide language intervention services to children who both have Autism and are bilingual. Bilingualism and Autism both affect language development in children, but there is a lack of research and understanding about how these two factors coincide. Bilingualism provides benefits in language development for typically developing children, but SLPs and other healthcare professionals have conflicting views on how bilingual exposure will affect children who present with Autism. Some clinicians believe that restricting second language exposure will benefit language development in children who present with Autism, yet others disagree. These differing beliefs combined with a lack of accessibility to bilingual SLPs can be detrimental to the language development of bilingual children who present with Autism. Through the use of Google Scholar and PubMed, this research will address how SLPs can improve language interventions in bilingual children who present with Autism.

***Presenter(s): Jeremy Summers***
***Faculty: Tracy Scheffler***

## *Project Development of a Novel Method to Measure Volatile Lipid Oxidation*

This study sought to develop a novel method for quantifying volatile lipid oxidation in beef steaks without the use of gas chromatography/mass spectrometry. Malondialdehyde (MDA) is one of the most significant secondary products for lipid oxidation and forms an adduct with thiobarbituric acid (TBA). The thiobarbituric acid reactive substances (TBARS) test is one of the most widely used methods of quantifying lipid oxidation products in muscle foods. As lipid oxidation products form, some become volatile during this process, and 2,4-Dinitrophenylhydrozine (DNPH), when prepared as Brady's reagent, readily reacts with carbonyl groups to form a hydrazone product that precipitates out of the solution. To compare these two methods and validate the use of Brady's reagent to measure lipid oxidation volatiles, the stable Longissimus lumborum and unstable psoas major were selected to generate oxidative differences over time in a retail environment. Muscles were suspended over Brady's reagent to allow them to oxidize and react with DNPH. Samples were taken periodically over a two-week period, and reacted DNPH and TBARS were measured using absorbance and fluorescence, respectively. Preliminary results showed a strong correlation between TBAR and DNPH lipid oxidation analyses.

***Presenter(s): Albert Sunny***
***Faculty: Erica Goss***

## *Project Investigating plasmids diversity in X. euvesicatoria pv. perforans population*

Plasmids are key drivers of horizontal gene transfer. These genetic elements promote diversification and rapid adaptation of bacterial populations to changing environments by transferring beneficial traits within and between bacterial species. Xanthomonas euvesicatoria pv. perforans is a devastating plant pathogen that causes bacterial spot disease in tomato and pepper. The objective of this study was to characterize plasmid diversity and gene content, and plasmid distribution in relation to chromosomal phylogeny. Our in silico-based plasmid prediction revealed the presence of diverse plasmids ranging from ~16 kb to ~235 kb. A network approach based on shared k-mer content uncovered ten distinct plasmid cliques. Interestingly, these plasmid cliques were confined to specific phylogenetic clusters suggesting potential incompatibility or restricted plasmid movement between clusters. Some of the predicted plasmids carry virulence genes coding for type III secretion effectors (T3SEs), including transcriptional activator-like effectors (TALEs) and genes related to biocide resistance, such as copper. We also identified gene reshuffling between the plasmids, likely carried out by transposons present within them. Overall, these results provide foundational insights into plasmid diversity in Xanthomonas euvesicatoria pv. perforans with implications for the role of these mobile genetic elements in genome dynamics and pathogen adaptation.

***Presenter(s): Luke Sutor***
***Faculty: Amelia Winger-Bearskin***

## *Project Applications of Adversarial Attacks on Vision-Language Models in Education*

Vision-Language Models (VLMs) have demonstrated impressive capabilities in understanding and reasoning about multimodal content, positioning them as potential tools for automated educational assessment. However, their vulnerability to adversarial attacks raises significant concerns about their reliability in high-stakes applications. This research investigates the susceptibility of state-of-the-art VLMs to projected gradient descent (PGD) attacks specifically designed to manipulate educational content. We present a novel application of adversarial machine learning by perturbing images of multiple-choice questions, creating subtle modifications that induce incorrect answers from targeted models. Our experimental framework systematically evaluates both the effectiveness of these perturbations and their transferability across diverse architectural paradigms. We analyze cross-encoder transferability between models utilizing different vision encoders (e.g., CLIP versus SigLIP) as well as those sharing identical encoders. Additionally, we investigate cross-family generalization between different model families (e.g., Qwen2VL versus LLaVA) and within-family transferability across parameter scales (from Qwen2VL-2B to larger 7B and 72B variants). Preliminary results suggest that carefully crafted perturbations can significantly reduce VLM performance on simple educational assessments. This work contributes to the growing body of research on VLM robustness while highlighting critical considerations for their deployment in educational technology. Furthermore, our findings provide insights into the shared vulnerabilities of VLM architectures, potentially informing more robust model development.

***Presenter(s): Zaid Syed***
***Faculty: Rahma Mkuu***

## *Project The Cultural, Economic, and Social Dimensions of Food Work Among Black Mothers*

Food insecurity remains a critical issue among African American families in the southern United States, with mothers often playing a central role in navigating systemic inequities and ensuring access to healthy food. We conducted in-depth qualitative interviews with Black mothers (n=30) to explore strategies they use to access healthy food. Participants were recruited from predominantly African American neighborhoods in north central Florida. We used reflexive thematic analysis to analyze transcribed interviews. Among the participants, 73% self-reported being at risk of food insecurity. While 86% demonstrated high self-efficacy in managing food needs, 44% reported mild, moderate, or severe levels of food-related anxiety. The three key qualitative themes were: Black women learn from others about strategies to address food insecurity, resource accessibility plays a major role in the access to healthy food, and women prioritize the needs of their children and families by focusing on planning, comparing food prices, or downscaling their emotions. Black women shared that their food access strategies were shaped by their mothers' food strategies. Economic strategies included supplementing personal income with a partner's income or relying on SNAP benefits or food pantries. Understanding the intersection of socio-cultural, economic, and intrinsic strategies can inform interventions to address food insecurity.

***Presenter(s): Jaabir Syed***
***Faculty: Regilda Romero***

## *Project Impact of a 12-week physical fitness program on those with special needs*

Objective: Studies have long demonstrated the physical and mental benefits of physical exercise for the general population. While these are great studies, further research focusing on the physical health of individuals with special/support needs is warranted as existing literature on this topic is scarce. The aims of this study were to demonstrate the measurable performance impacts that a 12-week physical fitness program can have for those with special needs.

Methods: Data from the FITforALL Program, a local Gainesville program, was utilized. Participants, adults with special needs, engaged in the physical fitness program 2-3 times per week; their level of activity was recorded each session. Several measurements including weight, sit and reach, and blood pressure were taken pre-and post-intervention were analyzed.

Results: This study demonstrated marked improvements in several areas of physical health. We recorded marked improvements in cardio fitness based on endurance in cardio exercises such as treadmill, stairs, and ellipticals. We also recorded marked improvements in flexibility, BMI, and strength training.

Conclusion: The results of this study, in conjunction with other studies, demonstrate the importance of physical activity to overall wellness and fitness for those with special needs. Hence, exercise programs should be included in their intervention plans.

***Presenter(s): Mary Tamer***
***Faculty: Frank White***

***Project Mutational analysis of virulence and resistance of Clavibacter***

nebraskensis, the causal agent of Goss's wilt of corn
Clavibacter nebraskensis (Cn) is the causal agent of Goss's bacterial wilt and leaf blight in corn, a disease that has re-emerged as a significant threat in North America. The bacterium colonizes the vascular tissues of the plant, with infections manifesting as water-soaked spots (freckles) on leaves and discolored vascular bundles.

Genetic tools have been developed to study Clavibacter species, providing insights into their biology. However, these techniques remain limited, with lower efficiency compared to those available for other plant pathogens.

Preliminary findings indicate the presence of naturally occurring avirulent strains in C. nebraskensis. Specifically, strains Cn06-1 and Cn7850 exhibit high genomic similarity, differing by only minimal single-nucleotide polymorphisms (SNPs). To investigate virulence factors, we are utilizing a mutant library to screen and characterize virulence-associated genes. Our objective is to identify avirulent and less virulent mutants, which will be further analyzed through whole-genome sequencing.

Our results confirm that multiple mutations can arise within the mutant library. We will discuss the genes affected by these mutations and utilize comparative genomics to characterize their functions.

***Presenter(s): Dylan Tan***
***Faculty: Xiao Fan***

***Project Large language modeling predictions of missense variant pathogenicity***

The clinical genetic testing pipeline has become essential in modern healthcare, allowing for the identification of genetic variants that can impact patient diagnosis and treatment. However, a critical bottleneck exists in the pipeline as determining the clinical relevance of these variants, especially variants of uncertain significance (VUS), remains a significant challenge and impediment to the clinical genetic testing pipeline's efficiency. Our project sets out to address the low-throughput variant interpretation bottleneck in the clinical genetic testing pipeline. Our project utilizes protein-language model embeddings as features to train a multi-layer perceptron model to predict the effect of genetic variants. We created the largest training dataset from PrimateAI-3D and ClinVar consisting of 680,079 variants, with approximately 7% of the variants being pathogenic. The test datasets are from mutagenesis functional assays, including a total of 10,784 variants in BRCA1, TP53, PTEN, and MSH2. Variants in the four genes were excluded from our training dataset. In our project, we compared models built from embeddings generated by ESM2, ESM3, and ESM-C, focusing on different protein properties. We hypothesize that the combination of these models' embeddings will lead to improved performance in predicting genetic variant effect due to their varied focuses on different protein properties.

***Presenter(s): Weihao Tang***
***Faculty: Lei Zhou***

***Project Shared and sex-specific Inflammaging patterns in the Drosophila Brain***

Inflammation associated with aging, inflammaging, plays a critical role in mammalian health, contributing to conditions such as arthritis, diabetes, and cancer. While the role of innate immunity in inflammaging is significant, its precise mechanisms remain largely unknown due to the complex interplay between innate and adaptive immunity in traditional model organisms such as mice and rats. Additionally, these traditional model organisms have prolonged aging processes, thus limiting their utilization for studying inflammaging. As an alternative approach, we utilize Drosophila melanogaster (Dmel), a model organism possessing only innate immunity, to explore the genomic basis of inflammaging. Diverse Dmel strains exhibited whole-body inflammaging patterns, leading to the identification of laboratory's Whole-Body Inflammaging Markers (IMs). To determine which cell type is responsible for inflammaging, we analyzed a single-cell RNA sequencing dataset of 57,000 Dmel brain cells. Our analysis revealed that age-related immune responses became prominent at day 50 (p<0.05), equivalent to approximately 65 years in humans. Brain-specific IMs (padj<0.01) identified for female and male brain show overlap but also clear sexual dimorphism. Furthermore, we found that while plasmatocytes (analogous to microglia) and MBON (Mushroom body output neurons) undergo inflammaging in both sexes, other cell types show sex-specific inflammaging patterns. These findings highlight Dmel as a powerful model organism for understanding the mechanisms governing inflammaging.

***Presenter(s): Avery Teman***
***Faculty: Maximo Marin***

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

Artificial intelligence (AI) has the potential to revolutionize the medical field with machine learning utilization improving patient outcomes. Thrombotic thrombocytopenic purpura (TTP) is a life-threatening, blood clotting disorder which is confirmed by the ADAMTS13 activity assay. This project will result in a decision tree (DT) algorithm, which aims to reduce the improper usage of ADAMTS13, aiding in efficiently diagnosing TTP. The machine learning (ML) support tool will alleviate the challenges posed by resource-waste, and reduce the mortality gap for TTP. In Phase 1, the proprietary ML algorithm produced an accuracy of 81% and high negative predictive value using a dataset of 104 patients. Phase 2 curated a collection of 15,000+ data points from 518 patients using the UF Health electronic health record. In Phase 3, the data will be converted into a binary system for validation of the algorithm. After robust shadow-testing for accuracy and review of the DT ML model's regulatory status, Phase 4 will implement the finalized model into the clinical laboratory setting. The overarching mission of this research is to create the lab of the future where AI-generated decision support tools guide better diagnostic testing to advance patient care and save lives.

***Presenter(s): Aruna Thomas***
***Faculty: Sean Forbes***

## *Project Evaluating MRI Fat Fraction and T2 measures in identifying lower extremity disease progression in CMT participants.*

Charcot-Marie-Tooth disease type 4J (CMT4J) is a rare autosomal recessive neuromuscular disorder caused by mutations in the Factor-Induced Gene 4 (FIG4). The purpose of this study was to utilize MRI of skeletal muscles to better understand the disease pathology. MRI was used to evaluate skeletal muscle fat fraction (FF) via Dixon imaging and T2 using a spin echo sequence in four CMT4J participants (age: 15-31 years). Six lower leg and eleven upper leg muscles were analyzed (3 slices/muscle), and comparisons among muscles were made using one-way ANOVA with post-hoc analyses. Of the six lower leg muscles evaluated, FF and T2 measures showed, on average, the highest involvement in the peroneal muscle (FF: 0.14±0.04, range: 0.09-0.19; T2: 43.9±4.1 ms; range 40.0-47.7 ms), with peroneal FF significantly greater (p<0.05) than gastrocnemius muscles. Of the eleven upper leg muscles analyzed, the FF and T2 values were highest for the sartorius muscle (FF: 0.15 ± 0.05, range 0.11-0.21; T2: 56.5±21.6 ms, range 40.5-88.4 ms), with sartoruis FF and T2 significantly greater (p<0.05) than quadriceps, hamstring, and abductor muscles. Our findings show variability in disease involvement among muscles in CMT4J. Furthermore, the study shows feasibility of acquiring skeletal muscle MRI data in CMT4J participants.


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***Presenter(s): Naya Thompson***
***Faculty: Lisa Scott***

## *Project Investigating Face and Object Processing Using ERPs*

Face and object processing are highly important functions that allow individuals to effectively interact with their environment. These abilities provide the foundation for social interactions and forming connections with others, as well as performing daily tasks and traversing society. In this study, electroencephalography (EEG) was used to measure visual processing, and compare visual brain responses between object and face processing. EEG was recorded while showing images of faces and objects to adult participants. From the EEG, event-related potentials (ERPs) were analyzed to assess the extent to which processing for faces and novel objects differs. Preliminary analyses suggest greater visuocortical processing for face stimuli relative to novel object stimuli. These results highlight the importance of face processing and the significance it may have over object processing when it comes to navigating the world.

***Presenter(s): Macaulay Tomdio***
***Faculty: Maryam Rahman***

## *Project Characterizing Optical Heterogeneity in Brain Tumors via Small-Angle Light Scattering (SALS)*

Laser interstitial thermotherapy (LITT) is a promising treatment for brain tumors, but predicting heat transfer and tissue response remains a challenge. This study employs small-angle light scattering (SALS) to analyze the optical properties of glioblastoma (GBM) tumor tissue and surrounding healthy tissue. Our findings suggest that SALS effectively distinguishes tissue scattering profiles, providing a potential adjunct for histopathological assessment and LITT precision.

***Presenter(s): Grace Tompkins***
***Faculty: Craig Smith***

## *Project The Lens of Representation: Constructing a Visual Archive*

The use of a visual, photographic archive in establishing communal records has been a long-standing practice. Specifically in the context of government institutions, historical collections, and most recently published for view online. Considering the representation of a large community, what is the most effective way to produce these archives? How do these archives function not only in current society, but in the past? Through research into the archives available now, how can their representative quality of each city's population be compared to other archives? The resulting process is to find what photographic archive techniques are useful for photographing communities in a visual archive format. The processes that were investigated include individual interviews at residences and photographing individuals in community settings. Additionally, Further research was conducted on how much information should be gathered on the subject, in contrast to having the photographic be present in archival form. Results include samples of photographs of the people of Lake City, Florida, as well as observations of historic archives and the process of documentation. This research presents viable methods for historic archives that have greater representation of communities. In this, the individual can not only be shown but be presented in an ethical manner.

***Presenter(s): Sarah Toomey***
***Faculty: Hannah Treadway***

## *Project Perceived Accent Affects Code-switching in Spanish-English Bilinguals*

Code-switching (CS) is the process bilinguals utilize to shift between different languages within the same sentence or conversation. CS is not an independent neurological process, but is affected by social factors, like the recognition that both the speaker and listener can understand both languages utilized (Kaan et. al., 2020). A perceived accent can affect the ease with which this process occurs as cultural conceptions of CS may result in CS production modifications. In this study, the effect that perceived accent has on Spanish-English bilinguals' ability to adapt predictions for upcoming CS structure was analyzed.

Early Spanish-English bilinguals (current n=55; total expected n=72) participated in an eye-tracking study where they listened to a speaker announce the name of one of two objects appearing on the screen using a determiner-noun code-switch in which the English noun either matched or did not match with the Spanish determiner. The accent of the speakers varied between L2 (Spanish is a second language), Caribbean, or Peninsular Spanish. While data collection is still ongoing, initial results reveal speaker accent differentially modulates speakers' expectations of upcoming CS structures. Caribbean accent induces prediction patterns that best align with documented CS asymmetries, a result of its close tie with CS.

***Presenter(s): Brianey Torres***
***Faculty: Christopher Smith***

## *Project Between Waifu and Besto Friendo: Parasocial Relationships and Anime Fans*

Anime has captivated pop culture animation fans, opening a space for fans to cultivate parasocial interactions with their favorite characters. Its increased popularity gives fans a space to have passionate relationships with the medium. These relationships have reached their sociological extreme in the form of parasocial relationships and interactions. The term parasocial interactions, coined by sociologists Donald Horton and R. Richard Wohl, describes one-sided relationships that give someone a sense of platonic or romantic friendships with media figures, creating the illusion of interpersonal relationships. Parasocial relationships with anime characters remain understudied. There tend to be variations in the intensity of parasocial relationships regarding anime characters. Anecdotal stories on social media reveal such differences, spanning from platonic to romantic. The overall negative perception of these parasocial interactions as the sensationalized sexualization of anime characters complicates the general understanding of parasocial relationships. This paper intends to analyze the relationships of the fanbases surrounding anime and their contributing factors, specifically how the adaptation of anime into live-action can disrupt these relationships by changing the aesthetic of the animes. Through understanding the history and usage of parasocial relationships in anime one can see the positive and negative impacts of parasocial relationships on anime audiences.

***Presenter(s): Nhat Huy Tran***
***Faculty: Gabriel Birzu***

## *Project Traveling waves for bacterial chemotaxis with growth*

Bacteria navigate their environment through sensing gradients. This process, known as chemotaxis, along with growth promote the expansion of bacteria into unoccupied territories. Despite numerous experimental and theoretical studies, this classical topic is not well understood quantitatively. In this work, we provide an analytical study that quantitatively explain bacterial expansion. We provide analytical predictions that accurately describe the chemotactic drift velocity. Our predictions were compared to finite element numerical simulations. Our work provides a mathematical framework that analytically describes the role of taxis in ecological systems.

***Presenter(s): Nguyen Thanh Tri***
***Faculty: Chalermchai Khemtong***

## *Project Studying Liver Metabolism Using Carbon-13 Tracers in Precision-Cut Liver Slices*

Metabolic dysfunction-associated steatotic liver disease (MASLD) is a common chronic health burden in which excessive fat accumulates in the liver and is strongly associated with metabolic disorders. These include issues related to energy production by alterations to the Tricarboxylic Acid (TCA) cycle, and carbon inputs from glycolysis and the Pentose Phosphate Pathway (PPP). The long-term goal of our study is to investigate whether glucose metabolism via the PPP is altered in MASLD. Here, we investigated whether the PPP metabolism of glucose can be detected in cultured precision-cut liver slices (PCLS) using stable isotope 13C-tracer and gas chromatography-mass spectrometry (GC-MS). Rat PCLS were divided into three groups: one treated with uniformly labeled glucose ([U-13C6]glucose), one treated with glucose labeled at the 1 and 2 positions ([1,2-13C2]glucose), and one treated with both [1,2-13C2]glucose and a PPP inhibitor 6-aminonicotinamide (6AN). These groups were collectively incubated for 3 hours with a carbogen purging period after every 1.5 hours interval. GC-MS analyses clearly showed active glucose metabolism via the PPP and glycolysis through the detection of M+1 and M+2 of lactate, respectively. Additionally, the presence of lactate M+2 confirmed metabolic activity via glycolysis. However, the analysis of lactate M+1 isotopologue suggested that the inhibitory effect 6AN on the PPP in PCLS was not significant under these study conditions.

***Presenter(s): Shivi Tripathi***
***Faculty: Kate Fogarty***

## *Project The Behavioral Impact of Media-Driven Vaping Advertisements on Florida Teens: A Multivariate Statistical Study*

U.S. teenagers' e-cigarette use increased by 1800% from 2011 to 2019, when more than 25% of high schoolers reported vaping. Although trends are declining, 2.1 million students still vaped in 2023. In Florida, teen vaping increased by 410% since 2011. The exponential increase in teen e-cigarette usage is due to the easy availability of vaping products and heavy advertising.

Student-reported exposures to vaping product advertisements was correlated with vaping behavior, using the 2022 Florida Youth Tobacco Survey data to study the relationships between the two variables in various demographics and locations (rural/urban) to identify at-risk adolescents. Logistic regression analyses were conducted to model the relationship between teen vaping behavior and the independent variables.

Advertisements have the strongest association with vaping behavior, nearly doubling the odds of use. Significant positive correlations between exposure to e-cigarette advertising and vaping among adolescents were indicated, with stronger associations for females and middle schoolers in urban counties, and for Black and Hispanic students in rural counties.

Advertising addictive substances such as tobacco vaping products has potential to exploit adolescents' socioemotional and biological vulnerability. The results of this study will inform policymakers to create teen vaping prevention policies and restrict adolescent-targeted media advertising.

***Presenter(s): Travis Truong***
***Faculty: Whitney Stoppel***

## *Project Chemical crosslinking density and linker length tune time-dependent silk fibroin hydrogel mechanical properties*

Silk fibroin-based hydrogels, derived from Bombyx mori (Bm), are a promising class of biomaterial used in various biomedical applications. Attributes including tunable crosslinking and degradation make silk a favorable biopolymer for hydrogels. Previous work showed that silk hydrogels exhibit time dependent stiffening due to physical crosslinking of β-sheet structures. Multiple variables are hypothesized to impact the rate of stiffening, including molecular weight and concentration. We seek to find alternative parameters associated with the chemical crosslinking of a silk fibroin network to tune the rate and extent of physical crosslinking and dynamic stiffening. We hypothesize that increased chemical crosslinking can reduce the amount of β-sheet formation of the hydrogels and create a more elastic gel with slower stiffening times. Multiple chemistries with varying crosslinker lengths can be used to covalently link the silk fibroin. Chemical crosslinking density can be modulated by increasing the number of photocrosslinking sites by adding amine groups to tyrosine residues. We investigate chemical crosslinker length, crosslinking density and molecular weight of the silk on mechanical properties including storage modulus, elastic modulus, and stress-relaxation half-life over 2 weeks. With this increased control of the time-dependent properties, silk hydrogels can serve as in vitro dynamic stiffening disease models.

***Presenter(s): Levy Truong***
***Faculty: Jing Pan***

## *Project Human Bone Marrow Organoids: Their Role in Hematopoiesis and the Development of Sepsis*

Sepsis is a life-threatening inflammation of vital organs following a dysfunctional immune response to infection, with high mortality rates. While it is known that an uncontrolled influx of pro-inflammatory cytokines like tumor necrosis factor-alpha (TNF-α) plays a significant role in the systemic inflammatory response typical of sepsis, the bone marrow response to septic shock is less explored, especially with human models. In normal conditions, bone marrow activates the proliferation and differentiation of hematopoietic stem cells (HSC) into immune cells. Septic shock disrupts this process and leads to hematopoietic dysfunction, characterized by a disruption of production of erythrocytes, leukocytes, and platelets. In this study, we synthesized cultures of bone marrow organoids from induced pluripotent stem cells (iPSC), which can mature into various immune cells depending on external stimuli. By optimizing the organoid differentiation procedure and minimizing contamination, we aim to solidify a model that will allow for future biomarker identification, anti-inflammatory therapies, and investigation on underlying mechanisms of hematopoiesis. Additionally, we are incorporating 3D printing technologies to study the effects of different vessel shapes on organoid differentiation. Our research is important to understand the immunopathology of sepsis development and to facilitate future therapeutic interventions for patients suffering from septic shock.

***Presenter(s): Yu Ju Tseng***
***Faculty: Linda Bloom***

## *Project Investigating the protein-protein interaction of the Escherichia coli DinG helicase with single-stranded DNA binding protein (SSB)*

Helicases are essential enzymes involved in DNA damage repair by unwinding double-stranded DNA and facilitating repair processes. The DinG helicase found in Escherichia coli plays a crucial role in the recombinational DNA repair mechanism. DinG is known for having stable protein-protein interaction with Escherichia coli single-stranded DNA binding protein (SSB). However, the specific contribution of individual residues within the SSB-binding region of DinG to its activity remains poorly characterized. To better understand how protein-protein interactions influence DinG's activity, we used structural predictions from AlphaFold to identify key binding sites between DinG and SSB and make mutations. We selected a single amino acid mutation at position 40 of DinG, where lysine was substituted with alanine (K40A) to investigate its impact on DinG-SSB interaction based on confidence levels in the predicted structural regions. The mutant DinG was expressed, purified, and analyzed using ATPase and DNA unwinding assays. ATPase activity remained comparable between the mutant and wild-type DinG without SSB. Fluorescence resonance energy transfer (FRET)-based DNA unwinding assays revealed that the K40A mutant exhibited a reduced unwinding rate in the presence of SSB compared to the wild-type. These findings suggest that the K40A mutation alters DinG’s interaction with SSB, potentially disrupting its helicase function.

***Presenter(s): Sophia Uhlyar***
***Faculty: Sara Burke***

## ***Project A Cyclic Ketogenic Diet as a Potential Therapeutic for Age-Related Cognitive Decline***

Age-related cognitive decline is linked to impaired brain glucose utilization. Previous data have shown that this decline can be alleviated with a high-fat, low-carbohydrate ketogenic diet (KD), that switches metabolism from glucose to ketone bodies as a primary energy source. Due to the difficulty of maintaining a KD, this study looked at the potential of rotating on and off the KD weekly, known as a cyclic KD. This was done using a rat model where young (4 months) and aged (20 months) rats were separated into three diet groups: control, long-term KD, or cyclic KD. The cyclic KD group alternated weekly between a high-carb control and high-fat, low-carb KD. Weekly blood measurements of glucose and β-hydroxybutyrate (BHB) were taken to monitor metabolic state, with tests for insulin tolerance, and cognitive function (via the Morris Water Maze task) also being performed. The blood test results indicated rapid metabolic shifting, highlighting the potential of a cyclic diet. Moreover, the rats on the cyclic KD performed significantly better on the water maze test of spatial learning and memory, indicating that the cyclic KD could lead to cognitive improvements.

***Presenter(s): Sandra Ukah***
***Faculty: Sharon Austin***

***Project WALKING THE WALK:ARE K-12 CIVIC EDUCATION REQUIREMENTS IN U.S. STATES LEADING TO GREATER YOUTH POLITICAL PARTIPICATION***

In recent years, experts, politicians, and policy leaders have struggled with what they feel is a critical lack in civic educational proficiency and disappointing levels of youth participation in politics. The rise of hyper political polarization contested electoral outcomes, and the spread of misinformation online has prompted a reinvigoration of efforts to promote civic education in schools to produce more civically active youth. Understanding the practical success of these efforts towards their desired goals is significant if we are to understand the best ways to address the gaps in the relationship between young Americans and their system of government. Particularly in an election year which is shaping to be another highly contested and narrow race, I feel it is important to visit how, or if, young people are connecting what they learn about government in school to their actions as citizens. The objective of this project is to see if civic educational programs implemented in different states leads to higher engagement in politics by the youth in these states.

***Presenter(s): Isabella Valdes***
***Faculty: Eleni Bozia***

## *Project Digital Preservation of Greek Inscriptions*

The Digital Epigraphy and Archaeology project pioneers a transformative approach to preserving and revitalizing ancient inscriptions, unlocking new possibilities for scholarly exploration and public engagement. In this presentation, the DEA team will demonstrate the methodologies employed, showcase preliminary results from ongoing efforts, and discuss future implications for epigraphy.

Currently, the DEA is working on digitizing inscriptions from Thasos in collaboration with the University of Lyon and the Athenian Agora through the Krateros Project. These inscriptions, rich with historical narratives, offer profound insights into the dynamics of ancient societies, emphasizing the urgent need for their preservation against physical degradation.

Through imaging technology and digital archiving, the project significantly enhances the preservation, accessibility, legibility, and analytical potential of these ancient texts. Digitization not only safeguards these irreplaceable cultural assets from loss but also democratizes access, fosters global participation and interdisciplinary collaboration, fuels innovative research methodologies, and promotes a wider public understanding of archaeological heritage. The growing interest in classical archaeology continues to enrich the field and inspire a new generation of scholars, ensuring its enduring relevance in academia. Through digital technology, the project redefines the boundaries of archaeological scholarship, ensuring the lasting impact of these inscriptions for future generations.

***Presenter(s): Michael Valuta***
***Faculty: Lindsey Rodriguez***

***Project Feeding the Mind: The Emotional and Attitudinal Pathways Linking Binge Eating to Body Image.***

Previous research has shown that college students who binge eat show higher self-image inadequacy (Nicoli & Liberatore Junior, 2011). However, less is known about what factors mediate this relationship. The present study examines whether college students who binge eat have a poorer perception of their bodies and explores mediating factors, including eating attitudes and emotional regulation difficulties. We hypothesized that binge eating would be associated with worse body shape perception. We also expected that eating attitudes regarding dieting, food preoccupation, and non-acceptance of emotional responses would significantly mediate this relationship. Data was collected from a sample of college students (N = 542) through a Qualtrics Survey. Our results show that binge eating is significantly (p < 0.001) associated with worse body shape perception, eating attitudes, and emotional regulation. Eating attitudes related to dieting (p = 0.000) and food preoccupation (p = 0.010), as well as non-acceptance of emotional responses (0.002), are significantly associated with worse body shape perception.. These findings have implications for understanding the stigma surrounding binge eating and the role of eating attitudes and emotional regulation in shaping body perception. However, directionality remains unclear, as poor body image may also contribute to increased binge eating.

***Presenter(s): Chloe Van Horn***
***Faculty: Dominick Lemas***

## *Project Microbe-Derived Plasma Metabolites: Regulators of Cytotrophoblast Function and Resulting Health Implications*

The gut microbiome has been increasingly linked to diverse health outcomes, including Intestinal Bowel Diseases (IBDs), Non-Alcoholic Fatty Liver Disease (NAFLD), and pregnancy-related disorders such as preeclampsia. Microbial metabolites produced in the gut can enter systemic circulation through blood plasma, influencing cellular functions in distant organs, including the placenta. This study aims to elucidate how gut microbiome-derived metabolites impact plasma composition and placental function.

We identified 3-Hydroxyphenyl Acetic Acid (3-HPAA) as a target metabolite from clinical blood plasma samples. Placental cells were treated with varying concentrations of 3-HPAA for 72 hours, after which cells and culture media were collected for analysis. Gene expression was assessed using qPCR to identify potential changes in regulatory pathways. We hypothesize that genes crucial for placental function will exhibit significant alterations in expression.

The findings from this study will provide insights into the mechanisms by which the gut microbiome contributes to pregnancy-related disorders, broadening our understanding of host-microbe interactions and their implications for maternal health.

***Presenter(s): Makena Vargo***
***Faculty: Craig Smith***

## ***Project Examining the Immersive Intersection Between Sculpture and Photography***

Immersive works of art, specifically ones that are temporary installations or the creation of environments to submerse a viewer, can be done in a variety of ways. Both the mediums of sculpture and photography have different approaches to this type of work. Sculpture has been used throughout history in the production of life sized pieces; while photography has grown in popularity of capturing moments since its birth in the 1830s. These mediums, no matter their diverging paths, do intersect in a myriad of ways within the art world when it comes to immersion.

In my USP research for 2024-2025, research and material exploration was done in order to text some of these connections in a physical manner. One of the methods was the use of photographs in a sculptural manner. Printed pictures took on the physical form of a sculpture— in turn, becoming a three dimensional object as well as photographs of the object. This duality further connects with the viewer and their perception of the art object. This exploration, as well as others, has shown just how interconnected photography and sculpture can be and how their different alignments with immersing a viewer can bring about a different interaction when fused together.

***Presenter(s): Aniruth Venkedesh***
***Faculty: Brandon Zielinski***

## *Project Streamlining Autism Diagnostics: A Machine Learning Approach to Simplifying the ADOS-2 for Accessible ASD Assessment*

The Autism Diagnostic Observation Schedule-2 (ADOS-2) is a widely used tool for diagnosing Autism Spectrum Disorder (ASD), but its complexity, cost, and resource-intensive nature create barriers to timely diagnosis, particularly in underserved areas. With ASD prevalence rising, improving accessibility to early diagnosis is critical. This study aims to streamline the ADOS-2 by identifying key predictive items that maintain diagnostic accuracy while reducing assessment burden.

Using data from 108 children (50 non-autistic, 58 with ASD), a recursive feature elimination (RFE) algorithm identified the most impactful ADOS-2 features. A multivariate linear regression model tested the predictive validity of the six most relevant features, ensuring generalizability by avoiding overfitting.

Results showed six key features—echolalia, quality response, stereotyped words, conversation, eye contact, and quality of rapport—strongly correlated with ASD severity (Pearson's r > 0.9). These features alone reliably predicted ADOS-2 scores, suggesting a simplified assessment could improve accessibility without compromising accuracy.

A reduced ADOS-2 assessment could lower costs and expand diagnostic availability, but further research is needed to validate findings in larger populations and explore integration into clinical practice.

***Presenter(s): Esly Villeda Castillo***
***Faculty: Anna Peterson***

## *Project Thoughts and Prayers: The Role of Religion in the Aftermath of School Shootings*

Since the 1999 Columbine massacre, there have been over 390 school shootings resulting in the deaths of hundreds of students and educators. However, they seem to have become commonplace and almost normalized in American society, no longer drawing the same kind of shock and attention from the wider public as before. Responses to school shootings are wide and varied, but one of the phrases that has been commonly used in the aftermath of these events is "Thoughts and Prayers". While the notion of "thoughts" is interpersonal and can be construed as a secular sentiment, the word "prayers" suggests a connection to a non-human being and is strongly connotated to religion. The popularity of this phrase leads to a question of how religious activity and prayer might mobilize religion in the wake of a tragedy.Religion is evoked for a multitude of reasons in different contexts, including providing comfort, meaning, or support. Simultaneously, it is employed in political arguments related to gun violence, and has an influential role in movements fighting for and against gun control. Religion's multifaceted nature, which includes influence and contradiction, make it so it both helps and hinders social changes surrounding school shootings.

***Presenter(s): Elysia Vivanco***
***Faculty: Joseph Sullivan***

## *Project Determining the role of OMV-associated bacterial sphingolipids in modulating murine norovirus infection in macrophages*

Human norovirus is the primary cause of acute gastroenteritis globally. Despite its ubiquity, preventative therapeutics have not yet been developed against it. Both human and murine noroviruses (MNV) directly engage with intestinal commensal bacteria, altering bacterial gene expression. We have previously shown that the commensal bacterium Bacteroides thetaiotaomicron increases production of outer membrane vesicles (OMVs) in response to this bacterial-noroviral interaction. Murine-derived macrophages exhibit heightened immunity against MNV when exposed to these OMVs; however, the specific component(s) within the OMVs that contributes to this immune response is unknown. In this study, we investigated the ability of B. thetaiotaomicron OMV-associated sphingolipids—a class of lipids with immune-signaling capabilities—to suppress MNV replication in murine macrophages. Macrophages were co-inoculated with MNV and OMVs generated from wild-type B. thetaiotaomicron or Δspt mutant B. thetaiotaomicron, which lacks sphingolipids. Quantification of viral replication using RT-qPCR revealed that significantly more MNV replication occurred in samples treated with Δspt OMVs compared to wild-type OMVs. Notably, neither wild-type nor Δspt OMVs substantially limited viral replication in KO-TLR4 macrophages. Analysis of mRNA expression via RT-qPCR has shown that a few genes involved in innate immunity (mcp1, isg15, and ifnb1) are reduced in expression in Δspt OMV-treated cells compared to wild-type OMV-treated cells. Together, these findings demonstrate that OMVs containing sphingolipids play a role in modulating norovirus infection, with a dependence on the TLR-4 signaling pathway. Understanding which component contributes to the induction of the immunologic response against norovirus can potentially aid in the development of novel therapeutics to treat or prevent human norovirus infection.

***Presenter(s): Allison Vollmer***
***Faculty: Ben Lewis***

## ***Project Addiction and Patient Care: Assessing Insight among Impaired Healthcare Professionals***

BACKGROUND: Workplace impairment among healthcare professionals (HCPs) is associated with potentially life-threatening consequences. Lack of insight regarding substance-associated consequences are likely to compound patient risk, while gain of insight is considered a crucial outcome in the treatment of HCPs with substance use disorders (SUD).
METHODS: Data were collected using a novel measure, the Patient Care Impact (PCI) questionnaire, which included 8 items querying workplace consequences of use. Data were collected from HCPs (N=183) at treatment initiation, after 30 days, and at discharge. Longitudinal mixed models were employed to interrogate changes over time.
RESULTS: At entry, HCPs reported relatively low impacts (mean = 3.44/10). Endorsements increased substantially in the first month of treatment (mean = 5.57/10, p<.001) and again by treatment discharge (mean = 6.35/10, p<.001). Physicians reported less impact than other HCPs (p=.009). Interestingly, length of sobriety prior to treatment entry had no effect on scores.
CONCLUSION: These data suggests that impaired HCPs have diminished capacity to evaluate the consequences of their use, specifically including risk to patients. Importantly, this capacity appeared to improve substantively across treatment. Moreover, length of pre-treatment sobriety had no impact on this change, suggesting that treatment (as opposed to abstinence), was responsible for this change.

***Presenter(s): Marina Waisenberg***
***Faculty: Barry Setlow***

***Project The Effects of Chronic Delta-9-Tetrahydrocannabinol (THC) Administration on Intertemporal Choice in Aged Rats***

As cannabis use among older adults rises, understanding its effects on the aging brain is crucial. Chronic THC exposure affects reward processing and behavioral control, but its impact on intertemporal choices remains unexplored. We investigated how chronic THC affects intertemporal choices in aged rats (n=17, 9F, 8M). Rats were trained to choose between a lever delivering a small reward immediately and another delivering a large reward after varying delays. After stabilizing performance, they were habituated to consume gelatin (3.5g) with ethanol (100 µl/kg). Once habituated, control rats (4F, 3M) continued consuming plain ethanol gelatin, while experimental rats (5F, 5M) received gelatin containing THC (1.0 mg/kg). Testing lasted four weeks, with behavioral testing each morning and gelatin consumption each afternoon to avoid acute THC effects. All rats preferred the large reward less as delay increased (Main effect of Delay: F(4,52) = 88.53, p < 0.001). Control rats showed stable choices across weeks, whereas THC-exposed rats reduced their preference for the larger reward (Week × Delay × Drug interaction: F(4,52) = 2.84, p = 0.033), indicating increased discounting of delayed rewards. These findings suggest chronic THC use may heighten impulsivity in aging populations, underscoring the need for further research.

***Presenter(s): Cameron Wallace***
***Faculty: Erin Patrick***

## ***Project Design Support for Novel Electrode Interfaces in Peripheral Nerve Prostheses***

Bidirectional control of prosthetic limbs, which would allow for the prosthetic to receive motor commands from the user to move and send sensory feedback back to the user, is the ultimate goal to better serve the demands of the amputee population. To achieve this, more information channels are needed to provide motor control and sensory feedback. As such, the drive to increase the number of information channels has led towards novel designs for peripheral nerve interfaces. The primary goal of this work is to provide insight on the stimulation efficacy of small-scale, injectable peripheral nerve interfaces via computational modeling of nerve fiber excitation.

***Presenter(s): Yooseong Wang***
***Faculty: Xiaofei Bai***

## *Project Genetic correction of the defective embryogenesis associated with de novo fatty acid synthesis*

Proper de novo fatty acid synthesis is critical to operating the healthy physiology in living organisms. Fatty acid synthase is a step-limit enzyme during de novo lipogenesis. A commonality found in cancer cells is an elevated expression of FASN gene due to its essential role in lipid metabolism. Although multiple FASN-specific antagonists have been identified to inhibit cancer progression, the genetic suppressors of FASN remain elusive. Here, we used the nematode model Caenorhabditis elegans to identify genetic suppressors of fasn-1, the single ortholog of human FASN. Our previous studies identified a temperature-sensitive mutation fasn-1(g43ts), which caused embryonic lethality at the non-permissive temperature while not affecting the viability at the permissive temperature. The embryonic lethality in the ts mutant provides a facile readout for conducting forward genetic screens.
To identify the genetic suppressors of fasn-1(g43ts), we conducted chemical mutagen-mediated forward genetic screens to identify candidate lines that could significantly alleviate the embryonic lethality caused by the ts mutant. We isolated 21 independent suppressor lines with significant restoration of viability with the presence of the original mutation . We then performed whole-genome sequencing and used a machine-learning-based bioinformatic pipeline to narrow the candidate lists to six genes from over 2000 mutations induced by the chemical mutagens. We are conducting a RNA interference screen to validate whether the knock-down of these candidate genes could restore the embryonic viability in the mutant. Once we confirm the suppression of the candidate genes, we will use CRISPR/Cas9 gene editing to generate the clean suppressor alleles in the mutant to confirm their suppressions.

***Presenter(s): Queenie Wang***
***Faculty: Matthew Gentry***

## *Project Evaluation of a novel brain-targeting therapeutic for the treatment of multiple neurological Glycogen Storage Diseases*

Neurological Glycogen Storage Diseases (n-GSDs) are rare autosomal recessive metabolic disorders characterized by aberrant brain glycogen metabolism, leading to progressive neurological and systemic dysfunction. Among the most severe are Pompe Disease and Lafora Disease (LD), both involving abnormal glycogen accumulation with distinct pathophysiological mechanisms. Pompe results from a deficiency in the lysosomal alpha-glucosidase GAA, causing glycogen buildup mainly in skeletal muscle, but also in other organs, including the brain. Contrarily, LD is marked by the formation of Lafora bodies—abnormal glycogen aggregates—in neuronal tissue, contributing to epilepsy, cognitive decline, and early mortality. As current therapies for Pompe Disease fail to cross the blood-brain barrier (BBB), a brain-penetrant antibody-GAA fusion targeting the transferrin receptor (TfR) was recently developed. We decided to evaluate its efficacy to cross the BBB and reduce glycogen content in Pompe mice, as well as in a murine model of LD, for which no treatment is currently available. Anti-TfR-GAA fusion was administered biweekly over four weeks in n-GSDs mice and glycogen content, as well as metabolism, was evaluated. This study provides valuable insight in developing efficient therapeutic applications for n-GSDs.

***Presenter(s): Aiden Ward***
***Faculty: Dave Fuller***

## *Project Subacute Spinal Cord Microvasculature Following Cervical Hemisection or Contusion Injury*

Cervical spinal cord injuries (SCI) result in lifelong complications and oftentimes shortened lifespans. Furthermore, the vasculature is significantly disrupted at the spinal lesion with further damage extending rostrally and caudally. Despite concerns related to uncontrolled bleeding, blood pressure regulation, and maintaining homeostatic oxygen saturation when treating acute SCI; little research has characterized the microvasculature in the acute and subacute phases of SCI. We quantitatively assessed microvascular density in two cervical SCI models in adult male Sprague Dawley rats. The C4 contusion is a blunt impact injury that destroys the local microvasculature and some of the phrenic motor neurons. In contrast, C2 hemisection is a transection of the spinal cord with a less severe impact on the local vasculature and preserving phrenic motor neurons but removing some bulbospinal synaptic inputs. Tissues were collected at 10 days post injury and thin sections of the spinal cord were stained to identify endothelial cells, cell nuclei, and astrocytes at the lesion and rostral and caudal to the lesion. We hypothesize that the greatest reductions in microvascular density will occur at the lesion in both injury models with further reductions rostral and caudal to the injury in the contusion model but not the hemisection model.

***Presenter(s): Rachel Warren***
***Faculty: Nicole Gravina***

## *Project Evaluating the generalization of improved ergonomic positioning following the provision of video feedback using an artificial intelligence-powered app*

Approximately 1.7 billion people suffer from musculoskeletal disorders due to repetitive movements, force, or awkward positioning (Cieza et. al, 2021). Often, these injuries are caused or exacerbated by work conditions, including environments requiring prolonged static or risky posture. Artificial intelligence technology can measure and analyze ergonomic risk levels using computer vision, providing quick, accurate, and practical feedback on body positioning. Espericueta Luna et. al (2025) demonstrated that video feedback provided with an AI-powered app can improve and maintain low-risk neck positioning for an analog work task. Though these results are promising, these studies examine postural behavior within the context of a single analog work task. The current study replicates and extends Espericueta Luna et. al (2025) by investigating generalization of improved ergonomic positioning across another two tasks. Results yielded mixed findings, with four out of seven participants demonstrating generalization across directed analog work tasks and one out of seven participants demonstrating generalization during the break task. This suggests that generalization of improved ergonomic positioning may occur across directed work tasks, but not reliably in all individuals. Further directions should investigate generalization across other work tasks and environments, including in applied settings.

***Presenter(s): Kaila Weflen***
***Faculty: John Stanton***

## *Project Expanding the Density Diagnostic for Excited States Treated with Equation-of-Motion Coupled Cluster Theory*

When dealing with calculations, one can usually verify the accuracy of the results by direct comparison with experimental results. However, for many cases where experimental measures do not exist, computational chemists look for a different measure of accuracy. The T1 and T2 diagnostics have been in place for some time as a good measure of the typical difficulty one can expect while dealing with different molecular systems. The non-Hermiticity of coupled cluster (CC) theory has been recently utilized as a diagnostic indicator of the accuracy of a
wavefunction in a truncated space short of the full CI limit. The diagnostic measures the degree of asymmetry of the one-electron reduced density as an indicator of "how far off" the current wavefunction is from the full CI wavefunction. The diagnostic has been implemented for the ground state CC wavefunctions. The excited states of molecular systems, by contrast, are more difficult to treat accurately. As an extension to the initial implementation of the diagnostic, excited states are considered with equation-of-motion coupled cluster theory.

***Presenter(s): Yu Wei***
***Faculty: Shifeng Wang***

## *Project Development of Tumor-targeting Vector Plasmids of Salmonella*

Salmonella, known for its facultative anaerobic nature to replicate in tumors and ability to deliver foreign genes into tumors, is a promising candidate for anticancer therapies. However, clinical trials showed that the targeting ability needs to be strengthened. This study focuses on developing tumor-targeting Salmonella vectors. Plasmids carrying targeting peptides were generated through a systematic approach involving vector enzyme digestion, PCR amplification of target fragments, agarose gel electrophoresis, DNA extraction, DNA quantification, Gibson assembly of the vector and target fragment, preparation of electrocompetent cells, bacterial transformation, recombinant plasmid screening, and plasmid verification using PCR and sequencing. The plasmids also have a gene encoding GFP. As a reporter gene, it presents as an operon fusion with the target peptide, both of them are under the control of the same Ptrc promoter. The 12 different peptides that target either ovarian cancer or melanoma were generated. Sequencing confirmed the presence of the correct DNA fragments within the constructed plasmids. Currently, these plasmids have been transformed into suitable Salmonella strains. Future steps will assess the ability of these plasmids to target and interact with specific cancer cells. This research represents a novel approach to bacterial-mediated cancer therapy, offering potential breakthroughs in targeted treatment strategies.

***Presenter(s): Cajun Weisheimer***
***Faculty: Lindsey Rodriguez***

## ***Project Entitled to Success: Goal Pursuit Mediates the Association Between Psychological Entitlement and Life Satisfaction***

Psychological entitlement is described as a consistent, exaggerated sense of deservingness, often without consideration of one's own contributions (Harvey & Martinko, 2009). There is a distinct lack of research on entitlement and how it relates to goal pursuit or life satisfaction, and the current literature is inconsistent in describing these relationships (Żemojtel-Piotrowska et al., 2015). The present study examined the association between psychological entitlement and satisfaction with life. We hypothesized a significant positive association between entitlement and satisfaction with life, with goal pursuit explaining this relationship through mediation. Undergraduate students (N=511) completed a cross-sectional Qualtrics survey, which included the Psychological Entitlement Scale (Campbell et al., 2004), Satisfaction with Life Scale (Diener et al., 1985), and items measuring goal pursuit as a happiness-enhancing strategy (Tkach & Lyubomirsky, 2006). Regression and mediation models were conducted in SPSS. Results revealed a significant positive association between entitlement and satisfaction with life (p=.029), fully mediated by goal pursuit (ab=.0215, 95% CI [.002 .045]). These findings suggest that entitlement may contribute to life satisfaction when individuals actively pursue goals that enhance their well-being. Future research should examine how entitlement compares to other personality traits in influencing motivation for goal pursuit and overall life satisfaction.

***Presenter(s): Hailey Werner***
***Faculty: Dr. Carol Mathews***

## *Project Examining the comorbidity of posttraumatic stress disorder in obsessive compulsive disorder and hoarding disorder*

Obsessive Compulsive Disorder (OCD) is a neuropsychiatric condition characterized by intrusive thoughts and repetitive behaviors. Commonly comorbid with OCD, Hoarding Disorder (HD) is characterized by persistent difficulty discarding possessions resulting in clutter. Both disorders are marked with interference in daily functioning, and their presence may be influenced by traumatic or adverse events. Posttraumatic Stress Disorder (PTSD) is a condition that develops after exposure to a traumatic event. While research has shown that PTSD often co-occurs with Generalized Anxiety Disorder (GAD) and Major Depressive Disorder (MDD), its comorbidity with OCD and HD remains understudied. Understanding manifestation rates of PTSD in OCD and HD can lead to improvements in treatment and early interventions. This study explores comorbidity patterns of PTSD in OCD and HD, and we hypothesized that the highest comorbidity rate was between PTSD and OCD. We collected diagnostic data from 654 participants and, while not mutually exclusive, 166 met criteria for OCD, 254 for HD, 315 for MDD, and 213 for GAD. Comorbidity rates with PTSD were assessed using chi-squared tests and logistic regression analyses. We found a higher prevalence of PTSD in GAD (29%), MDD (27%), and OCD (27%) compared to HD (20%). Identifying comorbidity patterns of OCD and HD with PTSD will encourage more informed treatment approaches.

***Presenter(s): Jillian Wessel***
***Faculty: Spike Gildea***

## *Project Relationships Between the Language Reclamation & the Linguistic Landscape of the Chickasaw Nation*

The Chickasaw language (Chikashshanompa’) is a critically endangered language from the Muskogean language family of North America. The declining population of speakers has been a motivating factor in the language revitalization efforts of the Chickasaw Nation Department of Language. To combat a lack of language visibility, many reservations and tribal communities implement their languages in public spaces through signage, place names, and graphic designs. I believe that increased public visibility of Chikashshanompa’ can have lasting benefits for language revitalization efforts. It can encourage the use of words in the Chickasaw language and reclaim physical space, connecting Chickasaw land back to the language. It can also promote cultural cohesion and identity. To test this three-pronged hypothesis, I am proposing a questionnaire study that would take place at the Chickasaw Cultural Center in Sulphur, Oklahoma. The collected data would then be analyzed to find trends in how the linguistic landscape is perceived and interacted with. My poster includes the details of my project proposal and an in-depth literature review of previous findings that support the hypotheses. Once this study is applied to the Chickasaw tribe, it can serve as a basis for further linguistic landscape research to benefit other communities.

***Presenter(s): Illeana West***
***Faculty: Catherine Flores***

## *Project Radial Glial Cells are Source Antigen for Adoptive Cellular Therapy in Glioblastoma*

Glioblastoma (GBM) is a devastating brain cancer with a five-year survival rate of just 9.8%, and mortality rates have remained stagnant for two decades. Current immunotherapies show promise but are often limited by their reliance on tumor tissue, excluding patients with inoperable tumors or poor performance status from participation. Additionally, tumor heterogeneity complicates the identification of effective immunotherapy targets.

Radial glial cells (RGCs) are an early neurodevelopmental progenitor that are typically only found in embryogenesis. They expressed some shared markers, such as Sox2, Gdf10, and S100b, with glioma stem cells (GSC), and exhibit characteristic behaviors similar to those of invasive cancers including asymmetric division, mitotic somal translocation, and proliferation guidance. This makes them compelling candidates for exploration as immunotherapy targets in GBM. We hypothesized that RGCs harbor antigens overlapping with GBM tumor populations and that targeting these antigens through a renewable antigen library could improve outcomes in preclinical GBM models.

Previous data from our lab has demonstrated that our ACT platform, incorporating ex vivo expanded T cells, hematopoietic stem cells (HSCs), and dendritic cell (DC) vaccines, enhances survival in GBM models. Using single-cell RNA sequencing, we identified shared immunogenic antigens between RGCs and GBM cells, enabling the creation of an antigen library that eliminates the need for tumor tissue samples to retrieve RNA. In preliminary studies, T cells expanded to target RGC antigens exhibited specificity and released Type 1 cytokines in response to GBM tumor cells. When incorporated into our ACT platform, RGC-specific T cells increased survival in GBM mouse models, with efficacy comparable to positive controls with total tumor RNA (ttRNA). In conclusion, RGC-derived antigens offer a novel, renewable, tumor tissue-independent strategy for immunotherapy development. This approach addresses challenges related to target identification and patient ineligibility, representing a significant advancement towards more accessible and effective immunotherapy treatments for GBM.

***Presenter(s): Kaelin Williams***
***Faculty: Jeneé Duncan***

## *Project The Association of Sociocultural Factors with Coparenting Dynamics and Child-rearing Practices Among Latinx Adolescent Parents*

While adolescent pregnancy rates have decreased over time, the U.S. continues to have one of the highest adolescent pregnancy rates in comparison to other industrialized nations. Research on parenting experiences often centers on Eurocentric, adult couples, overlooking the diverse realities of parenting. Latinx adolescent parents, a population with one of the highest rates of adolescent parenting, remain underrepresented in academic research. This study broadens understanding by exploring the sociocultural factors- such as close family connections and dimensions of respect- that influence co-parenting behavior, parental involvement, and conflict resolution among Latinx adolescent co-parents. Challenging the stigma surrounding adolescent parenting, this research adopts a strength-based approach to highlight protective factors rooted in cultural values and gender role attitudes. Using a correlational design and data from a larger study, the sample includes 587 pregnant or parenting Latinx adolescents who participated in a school-based intervention program promoting healthy co-parenting relationships and life skills. Findings will inform culturally relevant interventions aimed at enhancing co-parenting dynamics and child-rearing practices in this community.

***Presenter(s): Samuel Williams***
***Faculty: Jim Vogl***

### *Project Petrology and Age of Eclogites of the Southern Brooks Rage, Northern Alaska*

The Brooks Range is a >600 km-long mountain belt that stretches across remote northern Alaska and has a tectonic history that is poorly understood. The most deeply buried metamorphic rocks in the Brooks Range are mostly blueschist-/greenschist-facies rocks that occur as a continuous belt referred to as the Schist belt (SB) and lies adjacent to the lower pressure greenschist facies Central belt (CB). The SB contains two eclogite bodies that have been identified and sampled. A structural, petrologic, and geochronologic interpretation of the SB is critical for understanding the tectonics of the Brooks Range orogeny. However, the age of high-pressure metamorphism of the SB is currently unclear with current interpretations ranging from >170 Ma to 130 Ma. To enhance our understanding of the role high-P metamorphism in evolution of the Brooks Range, we present (1) mineralogical and petrologic textural analyses of two eclogite bodies in the Schist Belt and (2) in-situ U-Pb dating of zircon, rutile, and titanite. The data collected in this study will provide timing constraints on the age of high-pressure metamorphism, test models for the high-pressure metamorphism, and aid in the understanding of the Brooks Range orogeny.

***Presenter(s): Aidan Winney***
***Faculty: Yixin Wen***

## ***Project Symbolic Deep Learning in Meteorology: Distilling Physical Laws from Massive Sensing and Simulation Data***

Symbolic regression is a machine learning (ML) technique that discovers explicit mathematical expressions through equations that are interpretable to humans. In this study, a symbolic regression model was built to predict precipitation rates from Geostationary Operational Environmental Satellite (GOES) data, which remotely senses various aspects of the Earth's atmosphere through different wavelength bands. The specific model that I am utilizing is known as Physical Symbolic Optimization (PhySO). For my model, the input data is a selection of the satellite's infrared bands (bands 7-16) measured in Kelvin, while the output is the precipitation rate measured in millimeters/hour. To test the predicted precipitation rates, Multi-Radar Multi-Sensor System (MRMS) data is used as the ground truth. To determine the specific GOES bands to use as input, a correlation matrix heatmap was generated for the difference between each band and band 14, a band known to be a strong precipitation predictor. The three lowest correlations from the heatmap were then selected for the model. Through this statistical analysis, the bands chosen were band 7 minus 16, band 13 minus 16, and band 9 minus 13. I will soon be running those input bands through the PhySO model to obtain preliminary results.

***Presenter(s): Arianna Wittkorn***
***Faculty: Taylor McElroy***

***Project  Investigating the role of nonsense-mediated mRNA decay in regulating healthspan and lifespan using an in vivo C. elegans model***

The nonsense-mediated mRNA decay (NMD) pathway is a cellular mechanism that maintains the accuracy of mRNA by degrading both aberrant and endogenous transcripts containing premature stop codons. With aging in C. elegans, NMD is decreased in various tissues. However, NMD's role in maintaining healthspan and regulating gene expression of stress pathways remains undetermined. To investigate, we compared the smg-2 mutant strain with nonfunctional NMD with control N2 worms. Motility assays and confocal imaging were used to assess healthspan and tissue morphology across lifespan.  smg-2  worms, lacking an upstream central component of NMD, had a decreased lifespan, speed, and swimming behavior. GABA motoneurons exhibited increased axonal beading in smg-2 along with increased disorganization of muscle myofilaments. Next, we assessed the impacts of NMD loss on mitochondrial homeostasis, which play key roles in regulating healthspan and lifespan. We used hsp-6::GFP  as a reporter for the mitochondrial unfolded protein response (mitoUPR). smg-2 worms showed an increase in mitoUPR which was abrogated by knocking down the transcription factor atfs-1 and its upstream regulator let-363/TOR. In summary, our finding suggests that NMD depletion decreases overall healthspan and lifespan. We propose loss of NMD may affect age-related morphological and motility decline by disrupting the mTOR-ATFS-1 pathway.

***Presenter(s): Jackson Wolfe***
***Faculty: Diego Guarin***

## ***Project Age and Sex Related Differences in Finger Tapping via Marker-less Motion Capture Analysis***

Parkinson’s Disease (PD) is a common age-related neurodegenerative disorder affecting movement. PD is characterized by motor impairments such as bradykinesia (slowness of movement) and hypokinesia (reduced movement amplitude), linked to neurodegeneration in the basal ganglia. Aging and PD share overlapping degenerative processes, making it important to study motor function in aging populations. Marker-less motion capture (e.g., VisionMD) offers a cost-effective way to assess motor performance from video recordings. This study analyzed finger tapping (FT) performance in 72 healthy adults (33 males, 39 females, ages 49–80) to examine age and sex-related differences.

Results showed no significant decline in movement amplitude or speed with age in the overall sample, though trends were observed. However, females demonstrated significant declines in both measures, while males did not. These findings align with prior research but highlight potential sex-specific differences in aging-related motor decline. Further research is needed to explore underlying mechanisms, such as hormonal and neurobiological factors, to improve diagnostic and therapeutic strategies for neurodegenerative conditions.

***Presenter(s): Ellie Wolpert***
***Faculty: Yousong Ding***

## *Project n Vitro Reconstruction of the biosynthesis of Cytotoxic Lactacystin*

Lactacystin is a potent 20S proteasome inhibitor originally isolated from Streptomyces lacticystinicus. Due to its distinctive structure and biological significance, lactacystin has gained considerable attention in medicinal chemistry. Structure-activity relationship studies indicate that the hydroxyl group of the leucine moiety is crucial for lactacystin's bioactivity. While the biosynthesis of lactacystin was recently reported, the detailed characterization remains lacking, which is essential for developing new lactacystin analogues with improved bioactivity and therapeutic applications. Here we aim to systematically investigate the biosynthesis of lactacystin through in vitro reconstruction. To facilitate the biosynthesis of novel lactacystin derivatives, we plan to explore the incorporation of methylmalonyl-semialdehyde analogue substrates into the ACP2 module of polyketide synthase (PKS). We successfully cloned key biosynthetic genes, lctD, lctB, lctE, and lctA_ACP2, into a pET28a expression vector to achieve these objectives. These constructs were introduced into Escherichia coli for heterologous expression. Through these steps, we produced and analyzed key biosynthetic intermediates under optimized conditions. Currently, biochemical assays are ongoing, and further optimization is required. This strategy enables us to expand the structural diversity of lactacystin and explore potential analogues with enhanced pharmacological properties.

***Presenter(s): Alvin Wong***
***Faculty: Xiang Yan***

## *Project A Machine Learning Framework for Travel Mode Classification from Sparse GPS Data*

Real-world GPS trajectories are often sparse, with large time differences between location points, making it challenging to classify transportation modes. Although dense trajectories have been studied widely, sparse trajectories are underutilized despite constituting the majority of real world data due to difficulties in analysis. Therefore, we have proposed a machine learning framework designed to utilize sparse GPS trajectories with unique features to extract additional information from limited data.

Our approach starts by down sampling publicly accessible labeled datasets to match the time resolution of an unlabeled target dataset. Using standard machine learning algorithms, we train models to classify trips as non-motorized, driving, or bus transit trips. After training our models on the labeled dataset, we then apply them to the unlabeled dataset. We validate our results by comparing the predicted travel mode distribution to the real world distribution.

Our results indicate that our machine learning framework effectively classifies transportation modes using only sparse GPS trajectories. Our work offers a practical solution for urban planners to see where and how residents travel without requiring collection of their own dense data.

***Presenter(s): Makena Woolet-Stockton***
***Faculty: Gilbert Upchurch***

## *Project Non-Professional Phagocytes have Divergent Roles in Abdominal Aortic Aneurysm Formation*

Introduction: Aortic wall cell death can lead to accumulation of apoptotic cells and promote inflammation during abdominal aortic aneurysm (AAA) formation. We hypothesize that dysregulation of MerTK receptor-mediated efferocytosis by endothelial cells and vascular smooth muscle cells, both considered non-professional phagocytes, significantly contributes to vascular remodeling during AAA pathogenesis.

Methods: MerTK expression was assessed via western blot and immunofluorescence in aortas, VSMCs, and ECs. RNA sequencing of murine AAAs was evaluated via Seurat and SCPA. Efferocytosis pathways were curated using MSigDB then tested on VSMCs and ECs using SCPA and ssGSEA. VSMCs and ECs underwent fluorescent staining and were evaluated for efferocytosis via confocal microscopy. Murine models were analyzed on postoperative day 14 for aortic diameter. Values are shown as mean +/- SE and statistical analyses were performed by Mann-Whitney.

Results: Human AAA tissue displayed an increase in total MerTK protein compared to controls. Aortic ECs and VSMCs expressed a 100kDa band on western blot for MerTK expression. In immunofluorescence staining, MerTK expression localized in membranes of cultured primary VSMCs and ECs, but absent in controls. MerTK(+) ECs and VSMCs had significant enrichment in pathways related to inflammation and phagocytosis compared to MerTK(-) counterparts. Pharmacologic inhibition of MerTK attenuated EC and VSMC-mediated efferocytosis of apoptotic VSMCs. MerTK(+) VSMCs, but not MerTK(+) ECs, also had significant enrichment in apoptotic and necrotic pathways. EC-specific MerTK-/- mice had a significant increase in aortic diameter compared to littermate controls on day 14. In contrast, VSMC-specific MerTK-/- mice had a significant decrease in aortic diameter compared to littermate controls.

Conclusion: Our results indicate non-professional phagocyte-mediated efferocytosis by ECs and VSMCs exhibits divergent cell-specific roles in AAA formation, which should be considered when maximizing the effects of efferocytosis-modulating drugs.

***Presenter(s): Elizabeth Wright***
***Faculty: Paola Giusti Rodriguez***

## ***Project Machine learning methods to analyze single-cell 3D genome data from mouse models of psychiatric copy number variants.***

Genome-wide association studies for psychiatric disorders have identified several copy number variants (CNVs) that span across coding and non-coding regions of the genome. Psychiatric CNVs have been mainly characterized using bulk RNA-sequencing, failing to capture cell-type specific changes. Chromatin conformation capture methods shed light on 3D organization of chromatin and facilitate the disentanglement of regulatory relationships between enhancers and their target genes. Mouse models for CNVs have been developed, however, there is limited knowledge on the genome-wide impacts of psychiatric CNVs. We implemented a single-cell approach and bioinformatics methods to examine the 3D-genome across mouse models of psychiatric CNVs in a cell-type specific manner. The recently developed scSPRITE approach will allow us to generate single-cell 3D-genome data from the brain cortex of five mouse models of psychiatric CNVs. Data analysis will be done using the original SPRITE pipeline, enabling us to call A/B compartments, topologically associated domains (TADs), and chromatin loops in single-cells. Afterwards, we will examine changes in 3D-genome organization across these hierarchies in a cell-type specific manner. Findings will help us unravel the relationship between the 3D-genome and gene expression in a cell-type specific manner and identify shared/discrete biological processes across five psychiatric CNV mouse models. Findings will significantly increase knowledge of chromatin organization in the cortex of mouse models of human psychiatric CNVs and provide critical information about how these genetic disruptions can result in a diversity of psychiatric phenotypes.

***Presenter(s): Sarah Wutzler***
***Faculty: Lindsey Rodriguez***

## ***Project Love, Identity, and Rumination: How Sexual Orientation Shapes the Link Between Rumination and Partner Inclusion***

Prior research has shown that rumination can influence emotional well-being, but less is known about how sexual orientation might moderate this effect within the context of romantic relationships (McIntosh & Martin, 2000). This study examines how sexual orientation moderates the relationship between relationship-specific rumination and the inclusion of others in the self. Using the Relationship-Specific Rumination Scale (RSR) and the Inclusion of Other in Self (IOS) scale, 314 college students (% woman, % sexual minority) were surveyed. We hypothesized that the association between relationship-specific rumination and inclusion of other in self would be stronger for people holding marginalized sexual identities. Results showed that for LGBTQ+ participants, the association was positive but not statistically significant, whereas for heterosexual participants, the association was negative and significant. These findings suggest that heterosexual-identifying people may be less likely to integrate their partner into their self-concept when experiencing frequent rumination, while LGBTQ+ individuals may exhibit the opposite tendency, though future research is needed to confirm. The research contributes to literature related to rumination and the ways that sexual orientation may shape relationship- and self-perception dynamics. Future research should be conducted to more fully understand the role that relationship-specific rumination plays in both LGBTQ+ and heterosexual romantic relationships.

***Presenter(s): Zhiheng Xu***
***Faculty: Douglas Soltis***

## *Project Molecular Investigation of the Newly Discovered Populations of Tragopogon (Asteraceae) from Idaho State*

Hybridization among three alien diploid (2n = 12) species of the flowering plant genus Tragopogon (sunflower family; Asteraceae)—T. dubius, T. pratensis, and T. porrifolius—has led to the recent formation (last 100 years) of two new allotetraploid (2n = 24) species, T. mirus (T. dubius × T. porrifolius) and T. miscellus (T. dubius × T. pratensis), in the Palouse region of Washington and Idaho. This case represents one of the best-known models of plant speciation in nature. Using ITS (nuclear) and rpL16 (plastid) markers, we investigated the origins of four newly discovered populations of T. miscellus from Idaho, near the towns of Princeton, Worley, Plummer, and Troy. Our findings indicate that these populations are not genetically identical. The maternal parent of T. miscellus collected near Plummer, Worley, and Troy is T. pratensis, but the Princeton population includes plants with different maternal parents (some T. dubius, some T. pratensis). In all populations, the expected maternal parent was T. pratensis; thus, the data suggests potential backcrossing of T. miscellus to T. dubius in Princeton. Additionally, plants of T. dubius from Troy possess a unique plastid genotype among the investigated populations. Dispersal from neighboring areas may help explain the patterns observed.

***Presenter(s): jianing xue***
***Faculty: jiangeng xue***

## ***Project Plasmonic Au Nanoparticles for Building-Integrated Transparent Photovoltaics***

Developing novel building-integrated photovoltaics (BIPVs) is a critical topic in today's renewable energy research. BIPVs are a more aesthetic and visually cohesive alternative to traditional solar panels in residential homes and commercial properties. Until recently, windows as BIPVs have been underexplored due to challenges with balancing window functionality with photovoltaic ability. To create building-integrated solar windows, our methodology focuses on using thin films of plasmonic Au nanoparticles for light scattering. We aim to create a 6x6 inch solar window and report on its optical and electrical figures of merit by using various experimental tools. This is accomplished by depositing thin films of nanoparticles onto glass substrates using a doctor-blading setup and attaching silicon solar cells to the edges of the sample to generate and collect power. Results will show reflectance and transmittance values across visible and infrared light wavelengths, variations of film uniformity, and current-voltage measurements. Discussion will include data and analysis regarding optical and electronic properties of our sample and an evaluation of our experimental setup. This research impresses upon us the significance of improving methods of harvesting solar energy, and we hope it leads to further advances in transparent photovoltaics.

***Presenter(s): Qingyu Yang***
***Faculty: Benjamin Johnson***

## *Project Interacting With AI-Powered Chatbots: How Gain-Loss Frames and Privacy Policy Disclosures Influence Consumers' Voluntary Sharing of Personal Information*

The rise of AI-powered chatbots in customer service has enhanced personalization and real-time support but also raised privacy concerns, affecting consumer trust and data-sharing behaviors. This study examines how gain-loss message framing and privacy policy disclosures influence consumers' willingness to share personal information with chatbots. Grounded in privacy calculus and communication privacy management theories, it explores how consumers weigh personalization benefits against privacy risks. Using a 2×2 between-subjects factorial experimental design, the study manipulates message framing (gain vs. loss) and privacy policy disclosure (present vs. absent) to assess their effects on perceived privacy concerns, disclosure intentions, and trust toward chatbots. Participants are randomly assigned to one of four conditions before answering survey questions. In the conditions, they are shown chatbot communication interfaces reflecting different levels of gain-loss framing and privacy disclosure. Findings will offer insights into the interaction between transparency and persuasive messaging, guiding businesses in designing chatbot interactions that enhance trust while addressing privacy concerns. This research contributes to the AI ethics and consumer behavior literatures by providing empirical evidence on effective privacy communication strategies. It will offer practical implications for companies aiming to optimize chatbot engagement while ensuring responsible data practices.

***Presenter(s): Runzhe Yao***
***Faculty: Wendy Dahl***

## *Project The effect of yeast mannans on the fecal water content and microbiota composition*

Yeast mannans are comprised of mannooligosaccharides, mannoproteins, and beta-glucan fiber derived from yeast cell walls. Yeast mannans are potentially prebiotic. Therefore, it is important to assess the impact of yeast mannans on stool consistency and fecal microbiota composition. The aim of this study was to compare the fecal water content of the stools before and after intervention with yeast mannans and to explore the relationship between microbiota composition and fecal water content and pH. An open-label study was conducted on 20 adults (71.4±11.0 y) with a one-week baseline and a two-week intervention of daily oral intakes of 15g yeast mannans. Stool samples were collected at the end of the baseline and intervention. Fecal water content was assessed by measuring fecal weight pre- and post-drying in an oven. Fecal pH was assessed by making a 10% w/v slurry and using a pH meter. Fecal microbiota composition using 16S rRNA gene sequencing of the V3V4 region. Beta diversity of the baseline and intervention was assessed using robust Aitchison distance and PERMANOVA with restricted permutations. No significant changes were found in fecal water content ($p=0.354$) or pH ($p=0.651$) before and after intervention. There was a significant difference in the beta diversity between baseline and intervention ($p=0.0003$). Further analysis is needed to explore the relationship between microbiota composition and fecal water content.

***Presenter(s): Trevor Yates***
***Faculty: Patrick Musgrave***

## *Project A modular, soft, freely-swimming robot to study the kinematics of carangiform swimming*

Undulatory propulsion offers certain potential benefits over conventional aquatic propulsion, including improved energy efficiency, maneuverability, and reduced acoustic noise. It is being studied for applications in coastal monitoring for scientific, defense, and maritime industry, and is being considered for deep water monitoring due to the incompressibility of a fully soft-body swimmer. To develop these applications, a more complete understanding of the kinematics of undulatory swimmers is needed.

The interaction between swimmer body parameters and midline kinematics has been studied extensively with tethered robotic swimmers. However, freely-swimming propulsors have primarily been either studied for applications or actuated with rigid mechanisms which are unable to emulate elastic kinematics of an undulatory swimmer's body. This freely-swimming propulsor has been developed with a modular elastic body and interchangeable hydraulic soft actuators, which enables the study of the influence of a wide variety of body parameters on both midline and rigid body swimming kinematics.

In the present study, which is ongoing, the swimmer is used to examine the influence of a varying peduncle stiffness on the development of swimming kinematics, focusing particularly on lateral motion, which cannot be observed with fixed propulsors but is coupled to the forward motion for free swimmers.

***Presenter(s): Charles Ye***
***Faculty: Nancy Padilla-Coreano***

## ***Project Differential role of dopamine in the medial prefrontal cortex and nucleus accumbens during social competition and reward learning in mice.***

Dopamine (DA), a critical neuromodulator, plays a key role in learning, motivation, and social dominance behaviors. Research suggests that higher DA levels in the medial prefrontal cortex (mPFC) and nucleus accumbens (NAc) correlate with dominance in rodents (Couppis et al., 2008; Lozano-Montes et al., 2019). The mPFC is key in reward processing, aiding in maintaining or updating cue–reward associations (Ellwood et al., 2017). Additionally, DA decreases for expected events and spikes upon detection (Melugin et al., 2024). The NAc, linked to conditioned stimuli, shows increased DA responses during reward learning (Klawonn et al., 2019). While past studies have explored DA's role in reward learning and its link in dominance, DA-modulated responses in competitive social interactions and potential contributions to dominance behaviors remain understudied.

To examine DA's role in reward learning and competition, fiber photometry with dLight1.3b recorded in-vivo DA transients in the mPFC and NAc of C57BL6 mice. Mice learned to associate a tone with a reward before competing for it with a cagemate. Preliminary findings confirm NAc’s involvement in reward learning, while DA responses in both regions vary with competitive success. These findings enhance our understanding of how dopamine’s role in reward processing is modulated by social competition.

***Presenter(s): Quinn Yuan***
***Faculty: Joshua Wong***

## *Project One dose fits all? An analysis of the levodopa equivalent dose over time in Parkinson's disease*

Parkinson's disease (PD) is a common neurodegenerative disorder characterized by motor symptoms like tremor, rigidity, and bradykinesia. Levodopa is the first-line treatment for motor symptoms in PD, but its dosage management can be challenging. Neurologists must frequently adjust the Levodopa Equivalent Daily Dose (LEDD) to balance benefits and side effects as the disease progresses, requiring personalized adjustments to adapt to the patient's evolving condition. We sought to develop an AI algorithm to automate this process while considering patient-specific disease characteristics. Using 731 patients' data from the Parkinson's Progression Markers Initiative, we incorporated variables such as time since diagnosis, weight, gender, motor subtype, age, and Movement Disorders Society Unified Parkinson's Disease Rating Scale (MDS-UPDRS) scores. We implemented a Random Forest regression model, validated with five-fold cross-validation and tested on a hold-out dataset to ensure generalizability. The model achieved a Root Mean Square Error of 273.39, $R^2$ of 0.54, and a Pearson correlation of 0.74, demonstrating high predictive accuracy. Feature importance analysis identified months since diagnosis, weight, and MDS-UPDRS scores as key contributors. Our findings highlight the potential of machine learning in personalized PD treatment, offering a data-driven approach to optimizing LEDD adjustments and improving patient outcomes.

***Presenter(s): Kelly Yuan***
***Faculty: Ramon Alain Miranda Quintana***

## *Project Clustering Infinite Molecules*

In an era where vast amounts of data are generated daily, optimizing analysis algorithms is essential. Particularly in drug design, increasingly massive molecular libraries must be processed. A popular approach for analysis is clustering, but many often use pairwise comparisons that expensively scale quadratically in memory and time.

The key focus is to develop, optimize, and test a novel clustering algorithm that allows processing extremely large datasets. My team's implementation of BIRCH (Balanced Iterative Reducing and Clustering using Hierarchies), scales linearly with input size. Building on the linear scaling algorithm and integrating novel data structures, my contributions focus on further optimizations via a C++ implementation and a new global clustering feature.

The motive for a C++ version stems from its generally superior speed compared to Python, the language of the original implementation. I utilized the xtensor C++ library to seamlessly carry out operations of multi-dimensional array expressions during development. I also implemented KMeans and hierarchical clustering to group BIRCH's Clustering Features, leveraging its summarization to reduce computational costs. Results show that preprocessing with BIRCH increased clustering speeds by 88% for hierarchical, and 6% for KMeans. Future work includes optimizing the C++ implementation to reflect the original implementation's efficiency advantages.

***Presenter(s): Alessandra Zanardi***
***Faculty: Moulay Sounny-Slitine***

## *Project Assessing the Urban Heat Island Effect and Vegetation Correlation in Jacksonville, Florida Using Landsat Data*

Urbanization alters land surface characteristics, leading to localized temperature increases, known as the Urban Heat Island (UHI) effect. This study investigates the relationship between land surface temperature (LST) and vegetation density in Jacksonville, Florida, using satellite-derived data. Previous research has established that vegetation plays a crucial role in mitigating UHIs, but localized analyses are necessary to identify specific urban areas most affected by extreme temperatures.

Using Landsat 8 imagery processed in Google Earth Engine, this study calculated Normalized Land Surface Temperature (LST) and Enhanced Vegetation Index (EVI). Statistical analysis was conducted to assess the correlation between LST and EVI values across different land-use types. A strong inverse relationship between LST and EVI, indicates that areas with higher vegetation cover exhibit lower surface temperatures, while densely built environments experience intensified heat effects.

This research highlights the need for targeted urban greening efforts to reduce heat stress in vulnerable neighborhoods. By integrating remote sensing techniques with urban planning strategies, cities can enhance climate resilience and mitigate rising temperatures. This study contributes to the broader discourse on sustainable urban development and provides a geospatial framework for identifying priority areas for vegetation-based cooling strategies.

***Presenter(s): Elijah Zarsadias***
***Faculty: Eleonora Rossi***
***Project Analyzing Changes in Voice-Onset-Time during Short-Term L2 Learning in Aging***

It is widely assumed that older adults far beyond the Critical Period are unable to learn additional languages. This study aims to counter this notion by showcasing older adults' pronunciation progress in Spanish and early contrastive influence of learning Spanish for 30 days on their English L1. Standard Spanish word-initial voiceless stops, /p,t,k/, are normatively produced with short-lag Voice-Onset-Time (VOT), while, in Standard English, these are always produced with long-lag. Current literature attests that the L2 influences the L1 and vice-versa; thus, due to the bidirectional influence of an individual's languages' phonological systems, L1 production should yield marks of L2 interference, even in the early stages of learning the L2. In this pilot study, seven English monolingual older adults learned Spanish using Rosetta Stone for 36 days while a control group watched scientific informative videos. Spanish and English Verbal Fluency Task results for the Rosetta Stone group and only English Verbal Fluency Task results for the control group were recorded before and after the interventions. We hypothesize that due to the exposure to the Spanish phonological system in learning, the Rosetta Stone group will produce English word-initial /p,t,k/ with a shorter-lag VOT than the control group after language training period.

***Presenter(s): Gabriel Zhang***
***Faculty: Julie Maupin-Furlow***

## ***Project Δpat2 mutant carbon-source dependent flocculation phenotype in Haloferax volcanii***

Haloferax volcanii is an obligate halophile originating from the Dead Sea, commonly used as a model organism for studying archaeal cell biology. An interest in glycerol metabolism has created avenues for H. volcanii into applications in biotechnology. This project investigates the impact of the GNAT family enzyme, Pat2, on glycerol metabolism in H. volcanii. Through growth curve analysis, we show that the absence of pat2 (Δpat2) results in impaired growth of H. volcanii cells compared to cell growth of the parent strain when grown in minimal media supplemented with glycerol but not with fructose or glucose. Additionally, cells transformed with the plasmid expressing pat2 in-trans (pJAM4017), demonstrate that the mutation can be successfully complemented to restore cell growth similar to the parent strain. We also utilized growth curve analysis to identify residues that may serve in the catalytic activity of Pat2, as its removal resulted in the flocculation phenotype similar to the absence of pat2. Additionally, we monitored levels of Pat2 with immunoblotting to show that Pat2 abundance is higher in cells when grown in glycerol than in fructose and glucose. The results provide insight on potential roles of GNAT family proteins in metabolism of abundant carbons sources, like glycerol.

***Presenter(s): David Zhang***
***Faculty: Dr. Heather Vincent***

## *Project Epidemiology of Ankle-Related Basketball Injuries Treated in Emergency Departments during 2014-2023*

Basketball players are at high risk for lower-extremity injuries, with ankle sprains accounting for ~25% of basketball-related injuries requiring emergency department (ED) care. This study aimed to determine differences by sex and age in basketball-related ankle injuries treated in the ED from 2014-2023, focusing on high school (13-18 years), collegiate (19-24 years), and post-collegiate (25-35 years) athletes. A retrospective analysis using NEISS data identified 21,522 relevant ED visits after exclusions. Demographics, injury type, and mechanisms were extracted. Chi-square and regression analyses assessed sex- and age-based differences in injury prevalence and type, while logistic regression determined Odds Ratios (OR) for various injuries. Significance was set at α=0.05.
Results showed significant sex- and age-related differences (p<.001). Males constituted 84.7% of cases, with a higher prevalence of ankle fractures (8.1% vs. 4.8%) and dislocations, among those aged 25-35 years (p<.05). Females had 33% higher odds of sprains/strains (OR=1.33) and more injuries from falls and being pushed, particularly in the 13-18 age group. Conversely, younger athletes exhibited increased ankle rolling and poor landings. In conclusion, males and older athletes more frequently experienced fractures and dislocations, whereas females and younger players sustained more sprains/strains and falls, suggesting tailored prevention strategies may reduce ankle injury risk.

***Presenter(s): Alice Zhang***
***Faculty: Cory Brunson***

## *Project ripserr: Enhancing R for Efficient Topological Data Analysis*

{ripserr} is an R package for topological data analysis that leverages the ripser C++ library for efficient computation of Vietoris–Rips filtration, a key tool for persistent homology. This package will integrate the latest version of ripser with tools to retrieve representative cycles and cocycles while enhancing functionality and usability within R. The introduction of a vector input format and refined R interface to handle data type conversions will bypass distance matrix computations in C++, increase efficiency and afford more flexible distance measures implemented in other R packages.
To achieve these upgrades, we are employing two parallel approaches: one involving updating the existing ripser backend within the current version of {ripserr}, the other adapting the latest ripser implementation to align with {ripserr}'s structure. This will enable us to validate performance improvements and ensure compatibility. We are coordinating our efforts with collaborators of companion packages for topological data analysis and an ongoing study of texture analysis to predict progression of sarcoidosis from CT scans, utilizing {ripserr} as a computational engine. {ripserr} will provide greater flexibility in data input formats, competitive feature sets, and a more user-friendly experience for persistent homology applications in R.

***Presenter(s): Hannah Zheng***
***Faculty: Catalin Voiniciuc***

## ***Project The effects of homologous CSLA genes in rescuing seed mucilage beta-mannans***

In the aim to creating an eco-friendly world, plants serve as key models. Understanding the hemicelluloses found in plant cell walls can reveal important information about various plant functions. CELLULOSE SYNTHASE-LIKE A (CSLA) is an enzyme critical to the biosynthesis of beta-mannans, a type of hemicellulose. These enzymes are essential to the elongation of beta-mannans which affects the accumulation, composition, and adherence of seed mucilage - a viscous polysaccharide layer released upon contact with water. Understanding seed mucilage presents opportunities to enhance bioenergy, tailor plant biomass, and improve seed performance for resilience and productivity. This study will use the Arabidopsis thaliana plant where the lack of csla2 results in a thinner mucilage capsule. Previous studies with the yeast species Pichia pastoris have proved successful enzyme functions in producing beta-mannans using homologous CSLA genes from various plants and CSLKs from algae. Taking the best enzymes from yeast, we have replicated them into mutant csla2 to rescue the seed mucilage defect. Additionally, the pTBA2 promoter will be used to ensure the highest expression levels without adverse consequences in plant growth and development. Whether or not the phenotype is rescued, the analysis of monosaccharide content and physiological effects, such as germination, can reveal underlying factors contributing to their success. Understanding the function of individual CSLAs is a step towards maximizing the uses of beta-mannans in industrial, agricultural, and environmental concerns.

***Presenter(s): Kayli Zimmerman***
***Faculty: Piyush Jain***

## *Project Multiplexing of Cas Orthologs Detection of Infectious Diseases*

Various diseases display similar symptoms, but typically, CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) diagnostics and more traditional forms of diagnostics only test for the presence of a single type of pathogen. Due to the prevalence of HCV in the US, we determined there was a need for a single diagnostic test that could differentiate between HCV subtypes, specifically 1a and 1b. We explored the feasibility of combining multiple Cas (CRISPR-associated protein) orthologs and Cas predecessors based on temperature of trans-cleavage activity, allowing for the detection of up to four targets, without the need for expensive equipment such as a thermocycler or multiple fluorescent channels. To limit cross-over activity and widen the threshold between positive and negative samples, we also incorporated RNA thermometers, such as HSP17, that could block cleavage activity at lower temperatures. With the increasing threat of emergent pathogens, we believe that the multiplexing of Cas orthologs for disease detection can have a broad impact on diagnostics for human health as well as diagnostics of plant and animal pathogens within the agricultural industry.

***Presenter(s): Izabela Zmirska***
***Faculty: Christine Schmidt***

## *Project In Vitro Models of Spinal Cord Injury at Acute and Chronic Timepoints*

There are more than 300,000 Americans living with spinal cord injury (SCI), a life-altering and debilitating central nervous system injury. The current standard of care is palliative treatment through acute steroid administration. Here, we propose a method for creating temporal in vitro models of acute and chronic stages of SCI with special considerations of the chondroitin sulfate proteoglycan (CSPG) populations at these timepoints. CSPGs are a major component of spinal cord tissue and play an essential role in the microenvironment of SCI. These models will allow us to test our localized and targeted therapeutic for SCI featuring a fused protein of Indoleamine 2,3- dioxygenase (IDO) and Galectin-3 (Gal3). IDO is a promising regulator of the immune response in SCI due to its ability to both reduce pro-inflammatory potentiation and induce pro-regenerative immune cell phenotypes. When functionalized with Gal3, local tissue retention is increased through glycosaminoglycan binding with CSPGs. In this presentation, we quantify the CSPG levels in Sprague Dawley rodents at the acute and chronic stages of SCI. Furthermore, we recapitulate these conditions in vitro, which enables us to test the release kinetics of our therapeutic and determine the optimal timepoint to administer the therapeutic in vivo.

**Presenter(s): Samyukta Senthil**
**Faculty: Aparna Wagle Shukla**
**Additional Authors: Pam Zeilman**

## ***Twists and Turns of the Neck in Cervical Dystonia and the Impact on Cervical Spine***

This study aimed to assess the risk of cervical spine pathology in patients with cervical dystonia (CD), a neurological disorder causing involuntary neck muscle twisting and tremors.
Cervical spine complications, such as the degeneration of bones and discs, can naturally occur with aging or may develop due to the continuous strain caused by CD.
A retrospective review of 320 CD patients at UF Health identified 17 (5.3%) with cervical stenosis, myelopathy, radiculopathy, or atlantoaxial dislocation. These patients also underwent procedures like discectomy, laminectomy, posterior fusion, etc. Among them, 58.8% developed complications within five years, including spinal stenosis (n=10), radiculopathy (n=5), and myelopathy (n=4). Surgical interventions included discectomy (n=4), posterior fusion (n=1), ACDF (n=3) and laminectomy (n =3). Pain management involved procedures like medial branch blocks (n=5), epidural steroid injections (n=8) and radiofrequency ablation (n =2). Interestingly, all 17 patients were prescribed opioids alongside botulinum injections and muscle relaxants.
We found that CD can be associated with cervical spine complications in 5.3% of cases, necessitating surgical interventions, pain management procedures, and opioid therapy. These complications highlight a need for careful monitoring during the long-term follow-up of CD patients.

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*Your commitment to fostering curiosity, critical thinking, and innovation has not only enhanced their research experience but has also contributed to the advancement of knowledge across disciplines. The impact of your guidance extends far beyond the symposium, leaving a lasting impression on the next generation of scholars.*

*Thank you for your invaluable contributions, for believing in our students, and for inspiring them to reach new heights in their research endeavors. This symposium is a testament to your dedication and the incredible work you do in shaping the future of research and discovery.*

With heartfelt appreciation,
**The Center for Undergraduate Research**

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