OURI Annual Summer Student Showcase
August 14th, 2025, 8:30am – 10:15am
Sean Stein Pavilion

Analyzing Spatial Position and Visual Field Dynamics in Schooling Blacktip Sharks (*Carcharhinus limbatus*)
Authors: **Brynne Alcorta Ordonez**, Darien Satterfield, Ashkaan Fahimipour
Faculty Mentor: *Marianne Porter, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

Blacktip sharks (*Carcharhinus limbatus*) are a notable exception to the solitary nature of sharks, showing up in large aggregations along Florida's east coast from January to March. This behavior enables access to visual cues from neighbors, yet in other animal groups, visual information varies with group size, spatial arrangement, and stimulus direction. Here, we leverage modern drone and AI-based animal detection technologies to remotely track blacktip shark swimming trajectories and reconstruct visual fields to estimate how many conspecifics each focal individual can see based on its position in the school. We find that sharks swimming on the periphery perceive roughly half as many neighbors as those in central positions. These findings indicate that an individual's spatial position significantly influences access to social information, with potential implications for individual decision-making, group coordination, and the ecological function of schooling behavior.

Executive Gender and Financial Reporting Manipulation: Evidence from Benford's Law
Author: **Nosheen Ali**
Faculty Mentor: *Joseph R. Rakestraw, College of Business*
Funded by: LEARN

Over the past decade, women's representation in corporate leadership has grown significantly, with evidence suggesting female executives enhance productivity, collaboration, ethical standards, and transparency. Despite this progress, systemic barriers remain. The evolving role of women in leadership has prompted critical examination of gender's impact on financial reporting. Historical milestones like Title VII and the Sarbanes-Oxley Act have reshaped corporate ethics and diversity. Scholars argue that female executives, being more risk-averse, may promote more ethical financial practices. However, whether these behaviors stem from inherent gender traits or social conditioning remains debated. This study applies Benford's Law to public corporations' financial statements to assess manipulation. Results indicate that firms led by female executives exhibit less financial manipulation, though this effect weakens in high-tech and regulated industries. These findings suggest industry context moderates the relationship between executive gender and financial reporting behavior, highlighting the nuanced interplay between leadership, ethics, and institutional environment.

Standing On Pins and Needles: A Study of the Relationship Between Calcium Oxalate Crystals in Plants and Soil-Calcium
Author: **Adam Bloom**
Faculty Mentor: *Jacob Francis, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

Raphides are needle-like calcium oxalate (CaOx) crystals commonly found in vegetative tissues of many plant species. We observed raphides in both vegetative and reproductive tissues of the invasive plant *Richardia grandiflora*. To investigate their potential roles—including calcium sequestration, herbivore defense, and light

modulation—we collected plant and soil samples across Florida, where soil calcium levels vary widely. We quantified and measured raphides in vegetative tissues (e.g., leaves) and reproductive structures (e.g., bracts and stigmas). Florida provides a natural gradient for testing calcium-related hypotheses, while *R. grandiflora* serves as an ideal study species due to its widespread distribution across this gradient. Our findings may provide insight into the ecological function of CaOx crystals and their role in the success of invasive plant species.

Analysis of Storm-induced Subaerial Beach Sedimentology Change Using Sediment Cores to Evaluate Overwash and Recovery on Southwest Florida Barrier Islands
Authors: **Alondra Calderon**, Kayla O'Brien, Tiffany Roberts Briggs
Faculty Mentor: *Tiffany Roberts Briggs, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

Sandy beaches are among the most important coastal environments for supporting human populations, providing habitat for various species, and protecting coastal communities from storm impacts. The objective of this study is to evaluate subaerial beach stratigraphy after two years of major storm impacts to quantify the geological conditions of the beaches and explore whether certain areas are more vulnerable based on the sedimentological signatures captured. This study evaluates changes in the sedimentology resulting from recently storm-impacted southwest Florida barrier islands through granulometric analysis, sedimentology, and lithology of core samples. Comparisons between environments on developed and undeveloped barrier islands can show variability in the organic content, substrate sediment characteristics, and preservation potential of overwash. The results of this study have the potential to help future management efforts in understanding whether certain regions of them are more vulnerable to storm impacts.

Combination of Alpha-santalol and Curcumin as a Potential Therapeutic Regimen against Human Melanoma Skin Cancer Development
Author: **Victoria Cescato**
Faculty Mentor: *Ajay Bommareddy, Charles E. Schmidt College of Medicine*
Funded by: Office of Undergraduate Research and Inquiry

Previous studies have shown that Alpha-santalol, a naturally occurring compound from sandalwood oil, and curcumin, an active component of turmeric to be effective against development of various cancers. However, the combination of these two phytochemicals have never been explored for their anti-tumor potential. In this study we investigated their effects by employing human melanoma SK-MEL2 skin cancer cells. CCK-8, migration assay and DCFH-DA assays were employed to assess cell viability, wound-healing ability and generation of reactive oxygen species respectively. Results suggest that alpha-santalol reduces cell viability, migration and ROS generation more effectively when compared to curcumin. The combination regimen is still being explored, and a clear synergistic or additive relationship has not yet been confirmed. These preliminary findings suggest that alpha-santalol and curcumin when used alone or in combination could serve as a potential treatment option for melanoma and warrants further studies to fully understand their relationship in combination therapy.

Wave Energy Converter Optimization
Author: **Marcos Correa Lopez**
Faculty Mentor: *James VanZwieten, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

This project focuses on the hardware integration and system reliability improvements of a Wave Energy Converter (WEC) developed at Florida Atlantic University. Key objectives included implementing a main power switch for system safety and manually soldering electronic cables to ensure durable and secure electrical connections. The project also involved installing and waterproofing Inertial Measurement Units (IMUs) using epoxy within custom aluminum enclosures to monitor wing motion during wave energy harvesting. A leak detection system was developed using SOS Leak Sensors connected to the Jetson Nano's GPIO pins, alongside a Python-based program to log and alert leak events in real-time. Extensive voltage testing and troubleshooting were conducted to verify stable power delivery throughout the system. These hardware enhancements contribute to the WEC's operational reliability and establish a foundation for future deployments and sensor integrations in marine environments.

Infant Salivary Cortisol and Internalizing Behaviors
Authors: **Sophia Ferreira**, Camila Saldias-Manieu
Faculty Mentor: *Nancy Aaron Jones, Charles E. Schmidt College of Science*
Funded by: Office of Undergraduate Research and Inquiry

Our study aims to (1) explore the relationship between maternal and infant cortisol levels, and (2) examine the association between infant cortisol and stress regulation during development. We hypothesize that higher maternal cortisol will be associated with elevated infant cortisol, which relates to greater difficulty managing stress. This research is part of a NIMH-funded project examining infant temperament, responses to novelty, and mother-infant interactions. For this study, we collected saliva samples from mothers and infants three times daily over three days, administered a stress inventory to mothers and examined the associations between infant cortisol and behavioral indicators of stress regulation. Infants are between 8- and 24-months old, a developmental window when reactivity to novelty increases and influences infant and maternal stress. Early stress exposure can disrupt emotional development and neuroendocrine function. Identifying how maternal stress can shape infant stress physiology, we endeavor to inform interventions that support adaptive outcomes.

Robust Visual Inertial Navigation System for Autonomous Robotic Surveillance
Authors: **Daniel Granda**, **Vladimir Gnunichev**
Faculty Mentor: *Pratik Mukherjee, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

Robust and accurate navigation is critical for robotic surveillance in challenging environments like power stations. This research presents the successful development and validation of a Visual Inertial Navigation (VIN) system designed for a differential drive robot. Our system integrates a ZED X stereo camera on a Clearpath Husky A200 platform, all operating within the ROS2 framework. The core of our approach is a stereo visual odometry pipeline that provides real-time pose estimation in environments with variable lighting and terrain. We validated our working VIN system's accuracy against a high-precision motion capture system while executing paths using a PD controller. The resulting odometry drift graphs confirm the system's high fidelity, showing minimal deviation between the estimated and ground-truth positions. This work provides a crucial foundation for autonomous robotic surveillance. Future efforts will focus on implementing more sophisticated controllers for enhanced path tracking performance.

Preserving Voices: An Oral History of the Venetian Ghetto and the Jewish Community's Legacy
Author: **Reeselyn Haring**
Faculty Mentor: *Ilaria Serra, Dorothy F. Schmidt College of Arts and Letters*
Funded by: Office of Undergraduate Research and Inquiry

This project focuses on uncovering and preserving the diverse stories of the Venetian Ghetto, the first ever Jewish ghetto established in 1516 in Venice, Italy. Through historical research and multimedia storytelling, the project seeks to highlight the resilience and cultural contributions of a community that endured centuries of marginalization and oppression. Despite its rich history, the narratives of the Venetian Ghetto in our days remain unfamiliar to many, and this project seeks to share the stories of this quiet community that suffers the same problems of the dying city of Venice. By collaborating with Dr. Ilaria Serra, this SURF research aims to bring greater visibility to these untold stories through journalistic and digital media approaches. The goal is not only to document this important history but also to present it in a compelling and accessible way, emphasizing the relevance of the ghetto's legacy in today's conversations about identity, resistance and cultural memory.

Chemical and Morphological Analysis of Black Goo: A Persistent Clogging Material in Landfill Infrastructure.
Author: **Sebastian S. Hernandez**
Faculty Mentor: *Yalan Liu, College of Engineering & Computer Science*
Funded by: College of Engineering and Computer Science

Landfills worldwide have experienced a persistent and poorly understood type of clogging in leachate collection systems, characterized by the presence of a mysterious black, sticky, gel-like material often referred to as "black goo." The blockages can completely obstruct flow through pipes, leading to substantial operational and financial challenges for landfills. The proposed research aims to investigate the chemical and physical characteristics of black goo using a combination of analytical techniques, including Fourier Transform Infrared Spectroscopy (FTIR), Scanning Electron Microscopy (SEM) with Energy Dispersive X-ray Spectroscopy (EDS), Thermogravimetric Analysis (TGA), and per- and polyfluoroalkyl substances (PFAS) analysis via Combustion Ion Chromatography (CIC). In addition to black goo, other clogging materials will be analyzed to compare their composition and behavior.

Passports to Fantasy: Tourist Worlds in Contemporary South Korea
Author: **Xander Hickman**
Faculty Mentor: *Jacqueline Fewkes, Harriet L. Wilkes Honors College*
Funded by: Office of Undergraduate Research and Inquiry

This project explores how tourism in South Korea produces affective experiences through curated spaces, cultural symbolism, and interpersonal encounters. Conducted through firsthand site visits, note-taking, and informal observations, I participated in a range of tours, from natural heritage sites like Nami Island and the Garden of Morning Calm to culturally branded experiences such as a BTS ARMY tour. My goal was to understand how tourist spaces engage different audiences, offer diverse attractions, and cater to international visitors while constructing narratives of identity, nostalgia, and belonging. This research highlights how emotion, fandom, and place-making intersect in contemporary Korean tourism. While my analysis is limited by the short duration of site visits and language barriers, it reflects my personal experiences and critical reflections as both a participant and observer. This study contributes to broader discussions in anthropology and cultural studies on the politics of tourism, media influence, and transnational cultural flows.

Tailor-Made Adsorbent Materials for Air Revitalization in Submarines, Spacecraft, and Lunar Habitats
Author: **Marc Hicks**
Faculty Mentor: *Masoud Jahandar Lashaki, College of Engineering and Computer Science*

Funded by: Office of Undergraduate Research and Inquiry

High levels of CO_2 exposure can cause various adverse health effects such as nausea, dizziness, elevated blood pressure and heart rate. Air revitalization is a solution to high CO_2 levels for long-term human habitation in enclosed environments such as submarines, spacecraft, and lunar habitats. NASA's current multi-step Carbon Dioxide Removal Assembly (CDRA) rely on 5A zeolites, which suffer from low CO_2 uptake (<4 wt.%) and high energy requirements for regeneration. The proposed research aims to develop amine-modified silica materials (aminosilica) capable of concurrently removing CO_2 and water vapor in a single stage. Unlike (5A) zeolites, aminosilicas exhibit higher CO_2 capacities (>6 wt.%) and improved performance in humid environments while requiring lower regeneration temperatures (<120 °C) than zeolites (200 °C). This research supports NASA's Artemis program and long-term exploration goals by enabling more efficient, sustainable life-support systems. Future collaboration with the Kennedy Space Center will facilitate material testing and further advancement.

The Crosstalk Between O-GlcNAcylation and Phosphorylation of Tau Protein in Neurodegenerative Disorders

Author: **Vanessa Illanez**
Faculty Mentor: *Mare Cudic, Charles E. Schmidt College of Science*
Funded by: Charles E. Schmidt College of Science

Neurodegenerative disorders, including Alzheimer's disease (AD), are debilitating conditions affecting millions globally with no current cure halting disease progression. A main pathological feature of AD is the abnormally phosphorylated tau protein resulting in formation of aggregates which form neurofibrillary tangles. On the other hand, reduced O-GlcNAcylation of tau might suggest a potential neuroprotective role for this modification. This proposal is built upon the central hypothesis that changes in protein O-GlcNAcylation and phosphorylation may play a crucial role in neurodegeneration. To test this hypothesis, we proposed to synthesize modified tau fragments using solid-phase peptide synthesis and assess the structural and aggregative effects of these modifications using circular dichroism (CD). The findings from this research will help understand the impact of these PTMs on tau biology and may reveal novel targets for therapeutic intervention in AD and related neurodegenerative diseases.

Automated Analysis of Cell Electro-deformation: From Cell Images to Bioelectromechanical Properties

Authors: **Maria Largaespada**, Sarah (E) Du, Liliana Ponkratova, Hongyuan Xu
Faculty Mentor: *Sarah (E) Du, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

Various blood disorders are characterized by reduced red blood cell (RBC) deformability. Electro-deformation spectroscopy (EDS) is a novel technology capable of measuring single-cell deformation over electrical frequencies in a microfluidic device. Mechanical and electrical cell properties are extracted simultaneously through spectra previously obtained by time-consuming semi-manual cell analysis in ImageJ. To automate this process, a Mask R-CNN deep learning model workflow was developed in python. A dataset composed of 63 EDS microscopy images was manually annotated and further tiled into ~1000 images for automated cell segmentation training. The algorithm fits detected RBCs with ellipses using OpenCV to extract key metrics such as area, perimeter, and axis diameters. Elliptical Shape Factor (ESF), which quantifies RBC deformation, is calculated automatically and recorded. Automatization through machine learning enhances the efficiency of EDS by rapidly assessing biophysical markers of cell pathophysiology, allowing us to better understand disease progression and how effective certain medical treatments are.

UV-Vis Spectroscopic Studies on Porphyrin to G-quadruplex Binding
Author: **Ladji Lebrun**
Faculty Mentor: *Andrew Terentis, Charles E. Schmidt College of Science*
Funded by: Office of Undergraduate Research and Inquiry

This study aims to evaluate the binding interaction between porphyrins and DNA to determine how efficient porphyrin is at stabilizing G-quadruplexes. This was done by performing titration experiments using DNA such as HT, c-KIT, and VEGF and titrating it into porphyrin such as TMPyP4, TMAP, and berberine chloride. Prior to the experiment, the DNA sample was annealed and scanned using a Circular Dichroism (CD) machine to make sure it is properly folded. After each titration, a scan was performed using a UV-Vis spectrometer and the absorbance was recorded. This data was then analyzed using Origin and the binding coefficient was calculated. The impact of this research could lead to the development of anticancer drugs as formation and stabilization of G-quadruplexes can inhibit telomerase from interacting with the telomeres in our DNA.

Relationship Between Mode of Transportation, Social Isolation or Loneliness, and Dementia Risk in an Underserved Cohort
Author: **Sarah M. Lievano**
Faculty Mentor: *Lisa Kirk Wiese, Christine E. Lynn College of Nursing*
Funded by: Office of Undergraduate Research and Inquiry

Rural older adults often experience all 14 potentially modifiable risks of Alzheimer's disease and related dementias (Livingston et al., 2024). These contributors include social isolation and loneliness, which are exacerbated by limited transportation options (Wiese et al., 2023). However, there remains a gap in the literature examining transportation as a factor in social isolation. Guided by the Community Nurse Practice Model (CNPM), which emphasizes personhood, community interconnection, and access, a mixed-methods study is analyzing both secondary and primary data to determine if transportation access significantly moderates the relationship between the level of social isolation or loneliness and dementia risk in middle-aged to older adults in a rural Florida community. Ultimately, the results from this research will inform local intervention, practice, and policy development aimed at protecting residents in rural communities from the adverse health outcomes of transportation barriers.

The Many Meanings of Career Success
Author: **Luisa Lucigniani**
Faculty Mentor: *Michael Harari, College of Business*
Funded by: Office of Undergraduate Research and Inquiry

It is important to have a successful career. Yet, what exactly does it mean for a career to be successful? Historically, financial progression was widely assumed to be the answer. Yet, over the past decade, several multi-dimensional career success frameworks have emerged in the literature, each defining career success in different ways. What are the major dimensions of career success, and which ones do people care about the most? To address these issues, we administered multi-dimensional career success scales to a nationally representative sample, asking participants to rate the importance they placed on each component of career success. A factor analysis revealed eight dimensions of career success. Further, participants placed the greatest importance on the "financial security," "work-life balance," and "intrinsic interest" dimensions, with "financial progression" ranking much lower.

Freshwater Mussel Glochidia Dispersal and Interaction
Authors: **Lorena Martins**, Ines Haberle, Valery Forbes
Faculty Mentor: *Valery Forbes, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

Freshwater mussels are among the most endangered taxa in North America due to their complex life cycle. Their parasitic larvae (glochidia) must attach to fish hosts for dispersal, a step critical to recruitment and population stability. Glochidia dispersal is influenced by infection strategy and host specificity. We developed an agent-based model to simulate fish movement, glochidia dispersal, attachment and metamorphosis events, and juvenile settlement for two mussel species: *Actinonaias ligamentina* (broadcasting generalist) and *Villosa iris* (luring specialist). Host-specific attachment and metamorphosis probabilities were derived from empirical data, enabling evaluation of how infection strategy affects dispersal and recruitment. A major achievement of this work is a functional model capable of simulating host movement, glochidia attachment, metamorphosis, and juvenile settlement. Preliminary runs tracked attachment attempts, successful attachments, and recruitment, while visualizing dispersal. Future simulations and refinements will enable meaningful infection strategy comparisons and inform conservation by linking life-history traits to recruitment outcomes.

Electro-Deformation Spectroscopy of Blood Cell Deformability in Sepsis
Author: **Joshua Masturzo**
Faculty Mentor: *Sarah Du, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

Effects of Fighting Conch (*Strombus alatus*) Grazing on Rhizosphere Microbiome of Shoal Grass *(Halodule wrightii)*
Author: **Nazela Mohamed**
Faculty Mentor: *Vanessa Moreira C. Fernandes, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

The rhizosphere microbiome of shoal grass, *Halodule wrightii,* plays a pivotal role in nutrient cycling, sediment stabilization, and plant resilience. While plant–microbe interactions are well studied, the influence of benthic grazers such as the fighting conch, *Strombus alatus*, on microbial community dynamics remains poorly understood. To establish a baseline for future long-term studies, rhizosphere samples were collected immediately before conch introduction and again after 24 hours of grazing. Microbial communities were analyzed using 16S rRNA sequencing. We expect alpha diversity to remain largely unchanged, where early differences in beta diversity may suggest subtle shifts in microbial composition resulting from conch activity. These preliminary findings enhance our understanding of grazer–microbe interactions in seagrass ecosystems and may support the development of restoration strategies that incorporate rhizosphere microbiome resilience as a key component of habitat recovery.

Creation of a Structural Database for Nitrogen-Based Aromatic Bicyclic Small Molecules Interacting with 1×1 RNA Internal Loops
Author: **Nicholas Ndreca**
Faculty Mentor: *Ilyas Yildirim, Charles E. Schmidt College of Science*
Funded by: Charles E. Schmidt College of Science

The 3D folded structure of pre-mRNA can influence the binding of nuclear ribonucleoproteins, allowing for regulatory control over splicing events in coding RNAs.1 Dynamic Docking (DynaD) is a physics-based approach that provides a robust framework for investigating the interactions of small molecules with and how they target potentially "druggable", dynamic RNA binding sites.2 We investigate the binding properties of 26 hetero-bicyclic small molecules to 1x1 RNA internal loop motifs (UU, AA, GG, CC, AC, etc.) using the dynamic docking (DynaD) approach. For this purpose, we employ a model RNA sequence, r(5'-CCGGXCCGG-3'/5'-CCGGYCCGG-3'), with X-Y representing the non-canonical 1x1 internal loops. The RNA molecules are represented using an AMBER force field incorporating the revised χ4 and α/γ3 torsional angle parameters to accurately model RNA molecules. The Generalized Amber Force Field (GAFF)5 is utilized to describe the small molecules after the RESP protocol6-7 is followed to calculate the RESP charges. This process involves geometry optimization followed by electrostatic potential calculations using Gaussian 09 at the HF/6-31G* level of theory.

Health Hero - Testing an Interactive Chat-Based Health App to Support Treatment Adherence
Author: **Gianna Parente**
Faculty Mentor: *Elan Barenholtz, Charles E. Schmidt College of Science*
Funded by: Charles E. Schmidt College of Science

HealthHero is an AI chatbot designed to assist individuals in achieving their health goals, particularly when consistency presents a challenge. By communicating though natural language via text message, HealthHero delivers customizable reminders and motivational messages directly to users' phones, enhancing accessibility and engagement. Unlike standard reminder apps, HealthHero not only stores user data and treatment schedules but actively learns about individual health conditions, adherence challenges, and preferences, tailoring its messages and reminders accordingly. This study aims to evaluate the effectiveness of HealthHero by investigating user participation and compliance. This will be measured using a survey that is completed by research participants before and after the study. Participants will complete two phases—two weeks with HealthHero and two weeks without—to assess differences in adherence, engagement, and overall experience. Findings will help determine the efficacy of an AI-based health assistant and identify user profiles most likely to benefit from such support.

Ionophore-based Organosilicon Nanoparticles for Cellular Calcium Ion Sensing
Author(s): **Franky Petion**, Zhiyu Tang
Faculty Mentor: *Renjie Wang, Charles E. Schmidt College of Science*
Funded by: Charles E. Schmidt College of Science

This study investigates the use of organosilicon nanoparticles as optical sensors for detecting calcium ions (Ca^{2+}), a key signaling molecule in biological systems. The nanoparticles were synthesized using a surfactant-assisted method, forming amino-functionalized silica (SiO_2-NH_2) particles. These were purified and functionalized with three sensing components: chromoionophore III , calcium-selective ionophore Ca I and the ion exchanger KTFPB. The final sensor formulation was prepared in Tris-HCl buffer (pH 7.4) and tested using UV-Vis and fluorescence spectroscopy. Results showed a decrease in absorption intensity around 650 nm with increasing Ca^{2+} concentration, confirming that the nanoparticles effectively respond to calcium. These findings demonstrate the potential of this system for sensitive and tunable ion detection. Ongoing work includes adapting the nanoparticles for live-cell imaging, expanding selectivity to other biologically relevant ions such as sodium and potassium, and exploring their integration into portable diagnostic tools for real-time ion monitoring in biological and clinical settings.

Reclaiming Context: Teaching Collections, Machine Gaze, and Curatorial Justice
Authors: **Daniela Rivera**, Véronique Côté

Faculty Mentor: *Véronique Côté, Dorothy F. Schmidt College of Arts and Letters*
Funded by: Office of Undergraduate Research and Inquiry

In 2024, FAU initiated the digital cataloging of its collections to improve access, accuracy, and stewardship using Artwork Archive. Driven by institutional failures to preserve contextual integrity, this research harnesses artificial intelligence to identify gaps in metadata and address misattributions from reductive acquisition practices. The central case-study includes over seventy sculptures from Papua New Guinea and Africa previously labeled in culturally nonspecific terms. To support ongoing efforts toward accessibility and informed curation, we tested an AI art recognition tool to assess whether it could identify works' regional origins through stylistic analysis. While the software provided limited insights (approximately 15% accurate), most conclusions were reached through qualitative research and expert consultation. Our results highlight the potential for AI to support, rather than replace, human-centered curatorial research. The University Galleries remain committed to the ethical use of technology in provenance research, positioning the museum as a dynamic learning space that fosters accessible, context-rich collections for students, scholars, and the public.

Children's Early Language Interactions: A Literature Review Focusing on LENA (Language Environment Analysis) Technology
Author: **Sarah Rivera-Aguirre**
Faculty Mentor: *Irem Korucu, Charles E. Schmidt College of Science*
Funded by: Charles E. Schmidt College of Science

Early language learning environments are foundational for children's language skills and cognitive development, yet prior research shows substantial variability in language exposure even before school entry. By age 4, children from higher SES households hear 30 million more words than those from lower-SES homes. Preschool settings can add an additional 2 million words per year, further contributing to disparities in language exposure. Yet, few studies have examined how home and classroom environments jointly shape early development. This literature review focuses on studies using LENA (Language Environment Analysis) devices, which provide objective measures of children's auditory environments. Findings show variability in language input across age, SES, and racial/ethnic groups, with differences linked to caregiver interactions and contextual factors. A pilot study using LENA will be conducted in Fall 2025 to examine language environments in diverse home and classroom settings. Findings will inform interventions to support development in early childhood.

Effects of Beak Size and Temperature on Territorial Behavior in Bachman's Sparrows
Authors: **Lily Roberge**, Lauren Dawson-Scully, Rindy Anderson
Faculty Mentor: *Rindy Anderson, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

Increasing global temperatures and more frequent heat waves are causing thermoregulatory stress in wild songbirds, leading to behavioral changes. Birds' highly vascularized beaks and legs serve as thermal windows, enabling temperature regulation through heat radiation. Larger beaks and legs facilitate greater blood flow to these areas, improving thermoregulation efficiency. Previous research has shown that Bachman's sparrows with larger beaks sang and flew more frequently during territorial intrusions, sustaining these behaviors for longer durations. This study tests the hypotheses that bill size influences behavior primarily under heat stress. This research aims to enhance our understanding of how rising temperatures may negatively affect songbird social behavior, potentially reducing their fitness in the wild.

The Role of the Drosophila Attractin Homolog in Glucose Homeostasis
Author: **Fernanda Salomão Del Bianco**
Faculty Mentor: *Tanja Godenschwege, Charles E. Schmidt College of Science*
Funded by: Charles E. Schmidt College of Science

The Drosophila homolog of Attractin (ATRN), Distracted (Dsd), is a transmembrane protein involved in regulating G-protein coupled receptors (GPCRs). Loss of function of this protein has been linked to metabolic and sleep disorders as well as neurodegeneration. In humans, the incretin peptide, GLP-1 (Ozempic®), is used to treat type 2 diabetes, and obesity. Prior work indicates Dsd's role in modulating the excitability of Insulin Producing Cells (IPCs) through regulation of GPCRs. Glucose ingestion amplifies IPC input activity similar to the incretin-like effect in humans. Glucose ingestion also promotes Dsd protein expression and its endolysosomal trafficking in the CNS and IPCs, suggesting regulation by a Drosophila-like incretin. The aim of this study is to determine how NPF injections affect Dsd expression and endolysosomal trafficking, furthering understanding of the potential long- and short-term effects of Ozempic® as well as the influence of ATRN in neurodegeneration and metabolic disorders.

Design and Implementation of a VR-Based Fitness Training with Interactive Robot Guidance
Author: **Alexandra Sanzare**
Faculty Mentor: *Zhen Ni, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

Virtual reality development is an advancing field in computer science that focuses on how users interact with digital environments for education, wellness, and entertainment. The proposed research is aimed to explore how VR technology can be used to increase user motivation and engagement in fitness routines. Using the Unity game engine, a digitally recreated gym environment was created alongside interactive workout features and animated robot trainers. A working prototype was developed and tested on the Meta Quest platform, using XR integration and custom scripting. Future updates will include voice integration to increase accessibility options as well as AI integration that can give users a more customized workout routine. The findings from this research will showcase the design of future VR health technologies and contribute to the understanding of how interactive environments can encourage physical activity.

New Approaches to Coding Infant-Parent Movement Synchrony During Free Play
Authors: **Sonia Sohail**, Jacqueline Hammack, Mahmoud Seifallahi
Faculty Mentors: *Teresa Wilcox, Charles E. Schimdt College of Science; Dr. Behnaz Ghoraani, College of Engineering and Computer Science*
Funded by: Charles E. Schmidt College of Science

Interpersonal movement synchrony—the spontaneous, rhythmic coordination of body movements between individuals—supports the development of social and cognitive skills in infants. Traditional methods of measuring synchrony rely on manual video coding, which is time-intensive, requires domain knowledge, and is vulnerable to subjective bias. To address these limitations, this project explores the use of pose estimation algorithms to automate movement synchrony analysis in infant–parent dyads during free play sessions. Dyads were provided with a basket of toys and instructed to play as they would at home. Two state-of-the-art models, OpenPose and MeTRAbs, were evaluated for their effectiveness in extracting joint keypoint data from these sessions. MeTRAbs consistently outperformed OpenPose in robustness to occlusion, accuracy in detecting postures, and overall reliability in capturing dynamic interactions. A semi-automated pipeline for keypoint extraction and postprocessing has been established, laying the groundwork for an objective analysis of movement synchrony in early developmental research.

Standardized Landfall Tropical Cyclone Intensity Changes in Florida and Texas
Author: **Gabe Spanbroek**
Faculty Mentor: *Yijie Zhu, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

This study examines tropical cyclone (TC) intensity changes during the 24-hour period before and after landfall in Florida and Texas from 1980 to 2024. Using the International Best Track Archive for Climate Stewardship (IBTrACS) data, each landfalling storm was manually verified, with particular attention to cases involving multiple landfalls. For storms crossing small islands, the final mainland landfall was used as the reference point when multiple landfalls occurred within a 6-hour window. To enable comparison, storm intensities were standardized relative to the landfall point, setting intensity at landfall to zero, with positive values representing pre-landfall strengthening and negative values representing post-landfall decay. Visualizations of these standardized intensities show that TCs making landfall in Florida exhibit slower post-landfall decay than those impacting Texas, suggesting greater inland damage potential. Building on this pilot study, the next phase will analyze environmental composites during landfall to better understand the mechanisms driving these regional differences.

Understanding Ocean Floor Temperatures on the Miami Terrace for use with Underwater Data Facilities
Author: **Simon Trax**
Faculty Mentor: *James VanZwieten, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

Ocean temperatures generally decrease with increasing depth, with bottom waters along the Miami Terrace maintaining a relatively stable range between 5–10 °C. This research aimed to assess the feasibility of using deep ocean water to cool and operate underwater data facilities. Temperature data were collected from Acoustic Doppler Current Profilers (ADCPs) equipped with temperature sensors, deployed at ten locations over varying time periods between 2009 - 2017. Using software such as MATLAB, recorded data was processed, analyzed, and visualized to identify spatial and temporal trends. This analysis formed a baseline dataset for evaluating the suitability of different sites along the Miami Terrace. The results determined whether current locations exhibit sufficiently stable thermal profiles for data center operations. Additionally, the findings suggest the need for further studies to identify areas with more consistent or optimal temperature characteristics to support the development of energy-efficient underwater data infrastructure.

Retrieval of Chlorophyll-a Concentration by Drone-Hyperspectral Imaging of St. Lucie River
Author: **Ellen Vance**
Faculty Mentor: *Tucker Hindle, College of Education*
Funded by: Office of Undergraduate Research and Inquiry

Chlorophyll-a is a photosynthetic pigment in phytoplankton. It can be a helpful indicator for harmful algal blooms (HABs), caused by extensive nutrient levels in water bodies. The detection of chlorophyll-a in water bodies is possible through remote sensing. Spaceborne imaging spectrometers for ocean color, namely MODIS or PACE, produce standard data products for chlorophyll-a concentration. However, 1-kilometer spatial resolution presents challenges for analyzing small water bodies. This study integrated the Resonon Pika XC2 sensor on the Inspired Flight IF1200A drone and collected georectified hyperspectral imagery for segments of the St. Lucie River and Wahoo Bay of South Florida. Researchers post-processed the images at sub-meter spatial resolution with 231

spectral channels in the visible and near-infrared wavelengths 400nm to 1,000nm. Normalized difference chlorophyll index was calculated and compared to chlorophyll-a in mcg/L collected by FAU Harbor Branch's water stations. Chlorophyll concentration was visualized on geographical maps through the software ArcGIS Pro.

Intracellular Calcium Response to Dehydration-Induced Stress in 3T3 Fibroblasts
Author: **Natalie Vaz-Ayes**
Faculty Mentor: *Qi Zhang, Charles E. Schmidt College of Science*
Funded by: Charles E. Schmidt College of Science

Environmental challenges like oxidative stress and osmotic challenges are major causative factors for age-associated disorders as well as normal aging. Quantification of cellular responses is crucial for a mechanistic study. Here, we have developed a simple and reliable measurement to simulate environmental stresses and evaluate cellular response. 3T3 fibroblast cells were cultured on glass coverslips and loaded with the calcium-sensitive dye Fluo-4AM. Dehydration is known to cause a variety of stresses, like oxidative radicals and acid-base imbalance. Cells were air-dried for different time periods and rehydrated for calcium imaging. 100 μM ATP, a universal stimulus for intracellular calcium response, was applied to evaluate the condition of surviving cells. Calcium dynamics were analyzed to probe cellular changes. This measurement provides valuable insight into the mechanisms by which environmental stressors impact intracellular signaling pathways, including those associated with normal and pathological aging. Since dysregulated calcium signaling is a hallmark of Alzheimer's pathology, these findings may help inform how cellular stress responses contribute to brain cell loss.

Comparative Evaluation of Three Fecal Diagnostic Methods for Detecting *Pachysentis canicola*
Author: **Alexandra Veras**
Faculty Mentor: *Oscar Alejandro Aleuy Young, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

The acanthocephalan parasite Pachysentis canicola infects multiple North American mammal species and was first detected in San Miguel Island foxes (SMIF) on California's Channel Islands in 2012, where it likely contributed to the population's subsequent decline. Fecal flotation—which uses a dense solution to buoy parasite eggs for detection—is the standard diagnostic method in wildlife surveys. However, the dense eggs of P. canicola often resist flotation, leading to false negatives. By contrast, diagnostic methods based on egg sedimentation should theoretically recover these dense eggs more effectively, but its performance for acanthocephalans has yet to be formally tested. Using 25 fecal samples from SMIF, I compared three different protocols for fecal diagnosis: mini-flotac with specific gravity (S.G) 1.27 solution (flotation), mini-flotac with S.G 1.40 solution (floatation with altered solution), or sedimentation (Childress 2023). These findings give great relevance to accurately determine prevalence and intensity of acanthocephalan eggs in San Miguel island foxes and other wildlife and domestic species.

Scoping Review of Behavioral Parent Training Programs or Interventions for Relative and Non-relative Foster Caregivers
Author: **Emprisse M. Walker**
Faculty Mentor: *Morgan Cooley, College of Social Work & Criminal Justice*
Funded by: Office of Community Engagement

Foster caregivers (licensed) support roughly 350,000 children in the welfare system, which majority of them have endured severe trauma and/or neglect and present complex behavioral health concerns.

Evidence-based behavioral parent training (BPT) effectively equips foster caregivers with skills to manage these said abnormal child behaviors, reduce stress, and promote placement stability. This systematic review aims to (a) identify the types of BPT available to non-relative and relative foster caregivers, (b) summarize their integration of core BPT components, and (c) critique the clarity of evidence-based BPT use. Peer-reviewed studies evaluating programs such as Parent-Child Interaction Therapy and KEEP that focused on traditional and kinship foster caregivers were included; treatment foster care was excluded. Most programs incorporated positive reinforcement, consequences, skill practice, and functional analysis, though reporting of BPT strategies varied. These findings reveal inconsistencies in both the integration and transparency of evidence-based components, emphasizing the importance of more detailed program descriptions and reliable implementation.

Crown Ether-Functionalized NF Membranes for Selective Retention of Essential Mineral Ions in Water Filtration
Authors: **Ryan Watach**, Leon Roberts
Faculty Mentor: *Myeongsub Kim, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

This project investigates a novel nanofiltration (NF) membrane modified with crown ethers and 2,2′-bipyridine to selectively retain essential mineral ions such as calcium, magnesium, and potassium during water purification. Discriminate ion rejection is a problematic area with both NF and Reverse Osmosis conventionally, leading to demineralized water with potential health risks, especially in space missions or remote field operations. Combined institution of ion-binding selectivity of 15-crown-5, 18-crown-6, and 2,2′-bipyridine will allow the modified membrane to selectively retain beneficial electrolytes while rejecting harmful contaminants such as PFAS, heavy metals, and pathogens. This approach reduces the need for post-filtration remineralization, lowers system complexity, and supports closed-loop sustainability. Through membrane surface functionalization and bench-scale filtration trials, we will assess ion selectivity and stability. The work addresses a critical gap in membrane science and offers scalable applications in aerospace, emergency response, and off-grid water treatment.

Sharks in Formation: The Biomechanical Trade-offs of Aggregated vs. Isolated Locomotion
Authors: **Selena Weathers**, Ashkaan Fahimipour, Marianne Porter, Darien Satterfield
Faculty Mentor: *Marianne Porter & Darien Satterfield, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

A school of predators creates intense competition for prey, but the energetic demands of this increased competition may be offset by the locomotor efficiency gained by swimming in groups. While some lab studies have found reduced locomotor effort required to swim in schools for small-bodied fish species, there are gaps in the current understanding of how social context affects swimming energetics in a large-bodied predator *in situ*. While easily accessible aggregations of predators are rare, blacktip sharks (*Carcharhinus limbatus*) form large collective schools off the coast of eastern Florida from January to March. We took advantage of nearshore schools, as well as modern drone technology and AI animal detection software to track swimming remotely. We measured the average swimming velocity, tailbeat frequency, tailbeat amplitude, stride length, and Strouhal number (a measure of energetic efficiency of locomotion) in schooling sharks. We compared our estimates to previously recorded estimates for sharks swimming in isolation using Z-statistics. We found that in schools, the average swimming velocity is slower, tailbeat frequency is lower, tailbeat amplitude is similar, stride length is longer, and Strouhal number is smaller than in isolation. These findings indicate that schooling offers locomotor efficiency where in

schools sharks use less kinematic effort (less tailbeats, slower velocity) and achieve greater locomotor gain (greater stride length, lower Strouhal number).

Taking a Free Ride – Exploring the Hydrodynamics of a Bio-inspired Vessel Swimming Behind an Obstacle
Authors: **Erik White**, Oscar M. Curet
Faculty Mentor: *Oscar M. Curet, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

Experiments and numerical models have shown that fish can take advantage of vortex sheds from other swimmers or obstacle. Bio-inspired vessels could exploit similar hydrodynamics interactions to minimize energy and enhance maneuvering. In this work, we used a 40% scale down model of a bio-inspired underwater robotic to study the hydrodynamics when position behind an obstacle. The physical model -- composed of an ellipsoidal body and a fixed ventral fin, was tested in a recirculating flume. The model was attached through the flat plate, perpendicular to the flow, using fishing line. The dynamics of the vessel were recorded for different flat plate widths and flow speeds while releasing the vessel from different distance relative to the obstacle. In addition, Particle Image Velocimetry was used to measure the flow field between the flat plate and the vessel. Through these experiments we found that the flat plate creates a specific region behind it where the model oscillates with the formations of the von Karman Vortex Street and at certain distances even accelerates into the plate. These hydrodynamics interaction could be exploit by single or group of underwater robotics enhance efficiency or even find stable configurations between them.

Not Presenting Today

Evaluating the Impact of Cold-Water Pipe Length Variation on the Cost of Energy in Ocean Thermal Energy Conversion (OTEC)
Author: **Marina DaSilva**
Faculty Mentor: *James VanZwieten, College of Engineering and Computer Science*
Funded by: College of Engineering and Computer Science

Structural and Carbohydrate Binding Properties of Odorranalectin-Based Cyclic Peptide Lectinomimics
Author: **Jade Little**
Faculty Mentor: *Predrag Cudic, Charles E. Schmidt College of Science*
Funded by: Charles E. Schmidt College of Science

AI Use in Identifying Gopher Tortoises and Burrowing Owls from Video Data
Author: **Bailey McCormack**
Faculty Mentor: *Evelyn Frazier, Charles E. Schmidt College of Science*
Funded by: School of Environmental, Coastal, and Ocean Sustainability

Evaluation of Dried Human Bloodstain Skeletonization Rates on Multiple Substrates
Author: **Tzipporah Wodinsky**
Faculty Mentor: *Patrick McLaughlin, College of Social Work & Criminal Justice*
Funded by: Office of Undergraduate Research and Inquiry