Florida Academy of Sciences

88th ANNUAL MEETING

Florida Institute of Technology
Melbourne, Florida

March 21, 2025

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2024-2025

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Science Teaching: Dr. Tom Arnold, Lake Erie College of Osteopathic
Social Sciences: Dr. Jennifer Wortham, University of Tampa

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PLENARY ADDRESS

FRIDAY 2:00 p.m.
SESHA SRINIVASAN, FAS PRESIDENT, presiding

2:00 p.m. PLE-01 **Where Innovations Begin.** Randy Avent, 2024 Florida Academy of Sciences Medalist and Founding President of Florida Polytechnic University.

AGR = AGRICULTURAL AND NATURAL RESOURCE SCIENCES

(Meeting with GEO)

FRIDAY 09:00 a.m. – 09:15 a.m.
JULIE BOSWELL, INDIAN RIVER STATE COLLEGE, presiding

09:00 a.m. AGR-01 **Classification of Agricultural Crops using Satellite Imagery and Crop Data Layer: A Case Study on Navajo Nation.** Varatharajaperumal Thangavel[(1)] , Sudhagar Nagarajan[(1)] , Madasamy Arockiasamy[(1)] , Md. Tarique Hasan Khan[(2)] , George Sklivanitis[(1)] . [(1)]Florida Atlantic University, 777 Glades Rd, Boca Raton, FL 33431, [(2)] Navajo Technical University, Lowerpoint Road, State Hwy 371 Crownpoint, NM 87313. The agricultural industry is the primary source of food, goods, and commodity services. Despite advancements in technology, predicting crop yield and productivity remains a significant challenge. Accurate predictions largely depend on effective crop monitoring and optimizing resources such as fertilizers, water, and pesticides. In the United States, crop classification primarily relies on open-source data specifically the Crop Data Layer (CDL). This project demonstrates crop classification in the Navajo Nation region using high-confidence pixels from the CDL. The study utilized 80% of the data for training and 20% for validation, along with Sentinel-2 satellite data and the Random Forest Classification Model. High-confidence pixels with values exceeding 95% were selected, and monthly composite medians were calculated from the Sentinel data for ensuring the accuracy of the results for further process of computation of spectral indices. The computed spectral indices, including the Normalized Difference Vegetation Index (NDVI), Enhanced Vegetation Index (EVI), Green Chlorophyll Vegetation Index (GCVI), and Land Surface Water Index (LSWI), to differentiate crops more precisely. The results compare the accuracy of crop classification techniques with and without high-confidence pixels from the CDL layer. The accuracy of the classification was validated against independent ground truth data and the CDL layer. This research results will provide actionable insights to Navajo Nation farmers, supporting better decision-making in crop monitoring and resource management. The study contributes to

the advancement of precision agriculture and remote sensing applications in challenging agricultural environments.

Keywords: Agriculture; Remote Sensing; Crop Mapping; Crop Data Layer

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AGR Posters – 3:00 p.m.-6:00 p.m. Friday

AGR-P01 **FKBP Gene Annotation in Asian Citrus Psyllid.** Lisvet Ramirez-Barrera[(1)] , Surya Saha Ph.D.[(2)] , and Tom D'Elia, Ph.D.[(1)] . [(1)]Indian River State College, Fort Pierce, Florida; [(2)]Boyce Thompson Institute, Ithaca, New York.
Huanglongbing (HLB), commonly known as citrus greening disease, has been affecting the citrus industry significantly since 2005. *Diaphorina citri* (D. citri), known as Asian citrus psyllid, has been the common carrier of this disease in Florida. When infected with HLB, the leaves of the tree become blotchy, the shoots turn yellow, and the fruits grow smaller and lopsided. As the disease progresses, the whole tree eventually dies. There is currently no cure for HLB. *D.citri's* genome has been manually annotated to identify and characterize its different gene families. The goal of this project is to identify and annotate any potential FKBP genes in the *D.citri* genome. FKBPs are members of the peptidylprolyl cis-trans isomerase family of enzymes which are involved in the regulation of calcium ions within the intracellular membrane system. A total of four possible FKBP genes were identified in the *D.citri* genome. A BLAST analysis was conducted and found that only three of these genes have a FKBP domain. When these three genes were compared to other insects, their amino acid lengths, percent identity, and query coverage comparison, supported the identification of being FKBP. A phylogenetic analysis tree was constructed to further support this finding. These FKBP gene annotations can help with developing treatments to help control citrus greening disease.

Keywords: Citrus Greening, Genome annotation, *Diaphorina citri*, FKBP gene

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AGR-P02 **Comparative Analyses of Soil Properties in Burned Versus Unburned Upland Habitats.** T. Kennedy[(1)] , E. Sharpe[(1)] , A. Church[(1)] , E. Eversole[(2)] , and M. D. Horton[(1)] . [(1)]Southeastern University, 1000 Longfellow Blvd., Lakeland, FL 33801. [(2)]Circle B Bar Reserve, 4399 Winter Lake

Rd., Lakeland, FL 33803. Soil plays a critical role in Earth's ecosystems, supporting diverse life processes. Its properties, such as texture, composition, pH, and nutrient content determine its suitability for sustaining life. In Florida, sandy soils are common and are known for their efficient water drainage and low acidity, characteristics ideal for many organisms. Controlled burning, a common land management practice, is often used to rejuvenate soil and improve nutrient availability, though its impacts on specific soil properties remain underexplored. This study examines and compares the physical and chemical properties of soil in burned and unburned upland habitats within the Circle B Bar Reserve in Lakeland, Florida with the null hypothesis indicating no significant difference between the two areas. Results indicate significant differences between burned and unburned soils. Burned habitats exhibited higher soil temperatures, likely due to the recent controlled burn, as well as higher nitrogen levels, attributed to decaying organic matter. Conversely, unburned soils contained more silt in the upper horizons and had a denser composition across all layers. No significant differences in phosphorus levels were observed, though burned soils contained slightly more medium-range phosphorus. Both habitats shared a sandy soil composition, with sand exceeding 60% at deeper layers. These findings suggest that controlled burning alters soil properties, particularly temperature, texture, and nutrient levels. In conclusion, the null hypothesis is not supported, as controlled burning significantly impacts soil properties. These results underscore the importance of understanding soil dynamics and the impact of controlled burning to optimize land management practices in upland habitats.

Keywords: Controlled burning, Upland habitat, Soil properties, Silt, Sandy

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AGR-P03 **Anatomical Adaptations of Aquatic Plants.** Darius Fuell, Khanyisile Tshabalala, Hyun J Cho, Anna Ponce. Bethune Cookman University, 640 Dr Mary McLeod Blvd., Daytona Beach, Florida, 32114.
While terrestrial plant anatomy was extensively studied, aquatic plants seem to be much less understood. There may be numerous reasons for such imbalance, i.e. aquatic plants may be perceived as of lower commercial importance, and sample collection and preparation pose unique challenges. This study creates an alignment between aquatic plant ecology and morphology, and their anatomy. The samples were collected from numerous water bodies in Volusia County, including freshwater, saltwater, and estuarine habitats. Hand sections were observed and photographed using a Zeiss compound microscope. Plant material was fixed in glycerol and 95% (1:1) for two weeks. Each sample was dehydrated in ethanol concentrations: 50%, 70%, 90%, 100%, and 100% (15 minutes each),

toluene (3x15 minutes), then placed in paraffin (55°C, 30 and 60 minutes), and embedded in paraffin. Next, the samples were sectioned using a rotary Leica microtome (5-10 µm thick), attached to the slides (50°C 60 minutes or more), dewaxed with toluene 3x15 minutes, and hydrated in ethanol gradient: 100%, 90%, 70%, and 50% (five minutes each) before PAS staining. Stained sections were dehydrated in graded ethanol: 70%, 90%, 100%, and 100% (1-2 minutes each) and mounted in Permount. This project's goal is to create a collection of microscopic photographs of selected aquatic plants, together with their description and ecological adaptations. The poster presents a sample of these photographs.

Keywords: terrestrial, paraffin, estuarine habitats, vascular

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AGR-P04 **Optimizing Anatomical Sectioning Protocols for Aquatic Plants: Addressing Challenges of Aerenchyma and Tissue Preservation.**
K. Tshabalala, D. Fuell, H.J. Cho, and A.B. Ponce. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd., Daytona Beach, FL 32114.

Anatomical sectioning remains a cornerstone of plant structural studies, yet most existing protocols are tailored for terrestrial plants. Aquatic plants present unique challenges, particularly due to their extensive aerenchyma, which complicates paraffin infiltration and tissue preservation. Developing an effective embedding protocol is essential for advancing research into aquatic plant physiology, evolutionary adaptations, and ecological contributions. This study aimed to optimize paraffin embedding and sectioning protocols to improve tissue integrity and clarity. Two fixative solutions were tested: 95% ethanol:glycerol (1:1) and 95% ethanol:acetone:water (5:3:2), fixation lasted at least seven days, to enhance preservation. Floating and emergent plants with extensive aerenchyma required the use of a vacuum to remove trapped air, facilitating infiltration. Dehydration was carried out through a graded ethanol series (50%, 70%, 90%, 100%, 100%), with exposure times ranging from 0.5 to 24 hours, depending on species and sample size. Embedding involved an intermediary agent (toluene) three times 15 minutes, and a three-step paraffin infiltration process at 55°C to prevent tissue damage and detachment (30, 60, and 60 minutes) before the final embedding. Thin sections (5-10 µm) were obtained using a rotary microtome. Further methods included wax removal (toluene), hydration in ethanol series, staining with the Periodic Acid-Schiff (PAS) method and toluidine blue (optional), and ethanol dehydration before mounting in Permount. This optimized protocol reduced tissue damage, improved paraffin infiltration, and enhanced sectioning

quality. These findings refine anatomical studies of aquatic plants, supporting further research on plant adaptations, wetland ecology, and ecosystem dynamics.
Keywords: aquatic plants. Anatomical sectioning, tissue preservation

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AGR-P05 **Water Quality and Anatomy of Selected Plant Species Growing at Tomoka State Park and Riverbend Nature Park, Volusia County.** J'Deja Evans, Mackenzi Thompson, Phara Jean Baptiste, and Anna Ponce. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd., Daytona Beach, FL 32114. Coastal freshwater habitats are increasingly affected by anthropogenic pollutants and salinity changes. This study investigates water quality differences between two sites along the Tomoka River: 1) an urbanized site (Tomoka Oaks, Riverbend Nature Park) and a preserved site, but closer to the brackish waters of the Halifax River (Tomoka State Park). The project investigates the impact of different water quality on the anatomy of selected aquatic or shoreline plants. Water quality parameters were assessed at the two sites, and three plant species growing at both sites (five specimens per species, per site) will be collected. Collected samples were fixed (glycerol: 95% ethanol: 1:1), dehydrated (ethanol series), embedded (toluene, paraffin at 55 °C) in paraffin, sectioned on a rotary microtome (10 µm), stained (PAS), and mounted (Permount). Vascular bundle diameter and density, epidermis thickness, and vessel element diameter will be measured, and photo documentation will be collected. Preliminary results include only several examples, as the project is still ongoing. The dimensions of vascular bundles and vessel elements observed in the first sections suggest there is a correlation between these parameters and the levels of salinity, but the amount of data collected at that moment is not enough for statistical analysis. The results will enhance understanding of how varying salinity levels impact plant anatomy, which is of special importance as many coastal habitats experience increasing levels of salinity caused by climate change. Identifying sensitive species as bioindicators and tolerant species for restoration is crucial for effective ecosystem management planning.

Keywords: anthropogenic pollutants, salinity, Tomoka River, vascular bundles, and bioindicators

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ANT = ANTHROPOLOGICAL SCIENCES

(Meeting with BIO)

FRIDAY 11:30 a.m. - 11:45 a.m.

DAVID KARLEN, ENVIRONMENTAL PROTECTION COMMISSION OF HILLSBOROUGH COUNTY, presiding

11:30 a.m. ANT-01 **Grave detection and excavation research in forensic archaeology during the last four decades.** Kelly C. McGehee[(1)] and John J. Schultz [(1,2)] . (1) Department of Anthropology, University of Central Florida, Orlando, FL 32816. (2) National Center for Forensic Science, University of Central Florida, Orlando, FL 32816.
Forensic archaeologists serve a crucial role in the detection and excavation of graves in forensic contexts. Consequently, forensic anthropologists/archaeologists conduct research focusing on the improvement of detection and excavation methods. Therefore, to gain a comprehensive understanding of the development of grave detection and excavation research trends in forensic archaeology, a content analysis was performed of articles published between 1970 and 2024 in the Journal of Forensic Sciences (JFS), Forensic Science International (FSI), and Forensic Anthropology (FA). The year 1970 was selected as it marks the emergence of forensic archaeology as a distinct field. Additionally, the journals were selected because JFS and FSI are prominent forensic science journals within the field, whereas FA is a more recent journal focusing on forensic anthropology/archaeology research. The overarching goals of this content analysis were to (1) examine grave detection and excavation research trends over time, (2) assess the detection, excavation, and mapping methods utilized as well as the use of human vs. non-human remains, and (3) evaluate potential gaps in current research. A total of 56 articles met the study criteria and were analyzed to assess their research materials and methods. Topics examined included search and excavation methods, mapping methods, geographical region of research, burial context, and experimental grave materials. The results demonstrate a strong emphasis on grave detection, while less research focused on grave excavation. We discuss the development of forensic archaeology research on grave detection and excavation overtime and provide recommendations for future forensic archaeological research directions.

Keywords: Forensic Archaeology, Content Analysis, Research Trends, Grave Detection, Grave Excavation

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AOS = ATMOSPHERIC AND OCEANOGRAPHIC SCIENCES

FRIDAY 8:30 a.m. – 9:45 a.m.
MICHAEL ROBINSON, BARRY UNIVERSITY AND DAVID KARLEN, ENVIRONMENTAL PROTECTION COMMISSION OF HILLSBOROUGH COUNTY, presiding

08:30 a.m. AOS-01 **The Effects of Pressure on Biofilms and Incipient Fouling.** Geligne Franklin, Kelli Hunsucker, Geoffrey Swain, Natasha Dickenson, Thomas Ramotowski. Florida Institute of Technology Biofouling is a costly problem for the marine industry, with untreated growth causing functional and financial problems to marine vessels as well as instruments and equipment. There is a substantial amount of research surrounding the effects of biofouling occurring on surfaces immersed near the surface as well as effective management and control techniques. However, there is less data on fouling rates at depth and how changes in hydrostatic pressure can alter community composition on established fouling. This study serves as an initial investigation to determine the effects of deep-sea pressure on biofilm and incipient (newly settled) fouling, in the context of submarines and other deeper ocean vessels and instruments. A total of 16 panels (15 x 27.5 in; 38.1 x 67.31 cm) were immersed at a tropical harbor for approximately 6 months. The panels were removed, photographed and the fouling assessed. Panels (n=4) were submerged at two different depths at an offshore location near the harbor: shallow (~300 m/984 ft/426 psi) and deep (~1,000 m/3,280 ft/1,422 psi) for 1 hour or 4-hour increments. Visual assessments, chlorophyll a, XTT, quantum yield, and microscope analysis were all completed to measure the change in health of biofilms before and after the pressure exposure. There were significant changes in the health of biofilms and fouling that were exposed to the deeper depth for hours. This study revealed that significant differences in biofilm health depends on not only the depth, but also the length of time that the biofilms are exposed to that pressure.

Keywords: Biofilms, biofouling, depth, pressure

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08:45 a.m. AOS-02 **Influence of UVC Dose on Marine Biofilm Adhesion Strength and Community Composition** Tenzin Yeshi, Kelli Hunsucker. Center for Corrosion and Biofouling Control, Florida Institute of Technology 150 W. University Blvd. Melbourne, FL 32901 Biofilm, a conglomeration of cells, water and excreted substances, is a problem in the marine environment. The settlement can significantly reduce a ship hull's performance by increasing drag and

fuel inefficiency. The use of ultraviolet (UVC) light is of interest as an antifouling treatment in the marine environment to prevent biofilm and is being used in synergy with marine ship hull coatings. Previous studies have shown that biofilm growth on marine substrates is not fully eliminated and adhesion strength is altered after UVC treatment. A project was designed to assess how varying doses of UVC can alter both the community composition of biofilm and also the adhesion strength to marine ship hull coatings. This project employed three varying doses of UVC output on two silicone-based fouling release ship hull coatings: HL 120 (Severn Marine Technologies, LLC) and Intersleek 1100 SR (International Marine Coatings). The objective was to study the attachment strength of biofilm for cleanability purposes. The adhesion test was performed using a waterjet pressure system with increasing pressures of 20 psi until test panels were clear of fouling. Biofilm percent cover and thickness were measured before each adhesion test. Biofilm samples were collected and analyzed for species identification with a microscope. This presentation will discuss the changes in adhesion strength between the coatings and UVC doses, as well as the changes observed in the biofilm community, with respect to the dominant diatom species.

Keywords: Biofilms, ultraviolet light, antifouling treatments

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09:00 a.m. AOS-03 **Spatial and temporal patterns of Enterococci bacteria concentrations at Dade County recreational beaches.** Meling Chung, Mark Chiappone, Luis Labiste, Ankita Adhikari, Erick Argueta, Jessica Ortiz, Jadal Rajapaul. Department of Math and Science, Miami Dade College, 500 College Terrace, Homestead, FL 33030. The bacterial Genus *Enterococcus* is a gram-positive group of cocci bacteria present in the intestinal tract and feces of humans and other animals. These bacteria are also found in soil, plants, insects, invertebrates, and water. Because a strong correlation has been observed between *Enterococcus* colony cell concentrations and illnesses (e.g. bacteremia, endocarditis, and urinary tract infections) associated with recreational waters, the U.S. Environmental Protection Agency has in place minimum protective *Enterococci* standards. These standards were adopted by the State of Florida through its Healthy Beaches Program via the Water Programs of the Florida Department of Health and locally via the Dade County Department of Health. The Healthy Beaches Program monitors beaches by collecting weekly water samples, analyzing *Enterococcus* bacteria, and providing online data on the concentrations of colony forming units (CFUs) per 100 mL of seawater as follows: Good (0-35), Moderate (36-70), and Poor (71+). Public notifications include results entered on the Healthy

Beaches Website, swim advisories posted at beaches, media notification, and informing local government officials. Health advisories are not lifted until samples collected show acceptable standards. From July 2023 to late January 2025, data for *Enterococcus* concentrations at 16 sites along the Miami-Dade County coastline, supplemented by additional data collected by our research group, were analyzed. During this period, 1,226 samples were collected in Dade County. For all sites aggregated, ~85% of samples were rated as good, 7% as moderate, and ~8% as poor and no swim advisories were issued. An average of 5.8 ± 1.1 (mean ± 1 SE) poor ratings and 5.4 ± 0.8 moderate ratings occurred across all sites during this period, but the spatial distribution of bacterial CFU densities was particularly elevated at just four of the 16 locations, which may be due to human visitation intensity, circulation patterns, or some other factor(s).

Keywords: *Entercocci,* bacteria, health, environmental, beaches

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09:15 a.m. AOS-04 **A Preliminary Investigation into The Seasonal Distribution of the Nudibranch Sea Slug *Polycera hummi* in Tampa Bay.** Abigail Wilson, Grace Ferguson, Anja Hagenson. University of Tampa, 401 W Kennedy Blvd, Tampa, FL 33606. Nudibranch sea slugs are a group of shell-less gastropod mollusks and are frequently specialist predators, feeding on only one or a few closely related prey items. Despite their bright colors and ecological significance, many species of nudibranchs are significantly under-represented in scientific literature. One such understudied species is *Polycera hummi*, which inhabits the east coast of the United States in temperate to subtropical waters. While *P. hummi* has been previously recorded in Florida, little is known about the nudibranch's population structure, feeding habits, and reproductive behavior. The goal of this study is to assess the seasonal distribution of *Polycera hummi* and gather ecological data on its diet, with a focus on its proposed prey, the colonial bryozoan *Bugula neritina*. Sampling is being conducted monthly, starting in May 2024, in a seagrass bed in Tampa Bay to describe the population abundance of *P. hummi* and *B. neritina*. Collected specimens of *P. hummi* are examined and measured to record their size. Preliminary data suggests a correlation between the abundance of *Polycera hummi* and *Bugula neritina* populations. For example, in May, 30 *P. hummi* individuals were collected, along with 848 individual colonies of *Bugula* sp. However, by September and November sampling, both *P. hummi* and *B. neritina* were absent from the collection site. This indicates a significant decline in the population of *P. hummi* from summer to fall, corresponding with the decrease in *B. neritina* abundance. A better understanding of the population dynamics and ecology of *Polycera hummi* will provide a baseline for this species' life history and ecological role, paving the way for future research on this nudibranch.

Keywords: Nudibranch, Bryozoan, Tampa Bay

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09:30 a.m. AOS-05 **Analysis of Peracarid Crustacean Populations in a Mixed *Caulerpa* and *Halodule S*eagrass Bed.** Grace A. Ferguson, Abigail R. Wilson, Anja E. Hagenson, Louis J. Ambrosio, Susan S. Bell, Michael L. Middlebrooks. University of Tampa, 401 W Kennedy Blvd, Tampa, FL 33606. Seagrass meadows provide vital ecosystems for marine biodiversity, hosting diverse macro-invertebrate communities that are integral to the health and functioning of coastal environments. However, seagrass beds are increasingly threatened by anthropogenic activities leading to widespread declines in their extent and health. In recent years, some areas of Tampa Bay have had a decline in seagrass cover. In some of those areas the macroalgae *Caulerpa prolifera* has been observed colonizing these empty spaces left by dying seagrass, potentially altering the ecology of these seagrass beds. This study investigates the differences in macro-invertebrate communities associated with the green macroalgae *C. prolifera* and the seagrass *Halodule wrightii* in an effort to compare their ecological roles and the diversity they support. Through field surveys and sampling, macro-invertebrates were collected from both habitat types from the same seagrass bed in Old Tampa Bay in January 2023. Preliminary results comparing peracarid crustacean populations show variation in species composition, abundance, and diversity between the two habitat types. Patches of *H. wrightii* display a higher density of all peracarid crustaceans than *C. prolifera* but both have a similar diversity. In areas where *Caulerpa* becomes the dominant form of submerged vegetation in Tampa Bay, it becomes crucial to gain a thorough understanding of how this alga is being utilized by various species. Due to *Caulerpa* supporting species diversity comparable to that of *Halodule*, this suggests the transition from *Halodule*-dominated meadows to *Caulerpa*-dominated habitats is not resulting in a loss of diversity. Although species richness may not be at risk, there is a concern for the decreased abundance of macroinvertebrate taxa in *Caulerpa* compared to *Halodule*. More research is required to determine patterns of species richness and abundance between *Halodule* and *Caulerpa.*

Keywords: Tampa Bay, seagrass, *Halodule, Caulerpa*, crustaceans

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09:45 a.m. AOS-06 **Benthic Community Responses to Living Shoreline Restoration.** Mara Skadden[1&2] , Emily Ralston[1] . [1]Florida Institute of Technology, [2]Marine Resources Council. Florida's coastline is experiencing significant erosion due to sea level rise, coastal development, deforestation, and strong storms. Coastal erosion and shoreline armoring impacts native plant and animal species and reduces coastal ecosystem services. Living shoreline restoration has become increasingly popular with coastal homeowners, municipalities, communities, and organizations due to its increased effectiveness and lower maintenance costs than shoreline armoring. Kars Park, located in the Banana River Lagoon basin of the Indian River Lagoon (IRL), underwent shoreline restoration efforts in 2022. This study examines the benthic community of Kars Park and how it responded to restoration efforts using benthic infauna as biological indicators of disturbance and restoration success. Post-restoration results indicate improved sediment health, biological diversity, and benthic community functionality.
Keywords: Shoreline Restoration, Benthic Infauna, Indian River Lagoon, Coastal Resilience.

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AOS Posters – 3:00 p.m.-6:00 p.m. Friday

AOS-P01 **Assessing the correlation between chlorophyll a levels in biofilm and the water column in the Indian River Lagoon.**
Madison Tate and Kelli Hunsucker. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901.

Biofilm forms when microorganisms such as bacteria and algae adhere to submerged surfaces, forming a matrix that ensures survival even in harsh environmental conditions. While biofilm is a natural process, it creates significant challenges, especially in the maritime industry, where its accumulation on ship hulls increases drag and fuel consumption. This causes an increase in the cost of operation which totals millions of dollars in extra expenses. Despite continuing advancements in antifouling coatings, there is limited research on how environmental parameters influence biofilm development, making prevention difficult. This study investigates the correlation between chlorophyll a levels in the water column and adjacent biofilm communities to assess whether water conditions can predict biofilm growth. Biofilms were allowed to accumulate on test panels

placed within a in situ flow channel located along the Indian River Lagoon. The panels were removed after one week of immersion and the biofilm was sampled and accessed for percent cover, thickness, chlorophyll a, and diatom counts. Water samples were collected at the same time and accessed in a similar manner. In addition, temperature, salinity, and chlorophyll a measurements were downloaded from a nearby water quality sensor. The presentation will discuss temporal changes in the growth and relationships between the biofilm and water column. This research aims to develop a framework for predicting biofilm formation based on water parameters, such as chlorophyll a, aiding in the development of more effective or targeted antifouling strategies.

Keywords: Biofilm, chlorophyll, microfouling, antifouling strategies

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AOS-P02 **Analysis of commercially available and laboratory-grown diets in marine sponge aquaculture.** Samantha Pringle and Emily Ralston. Florida Institute of Technology, 150 West University Blvd. Melbourne, FL 32901. Despite their ability to provide vital ecosystem services, the impacts of marine sponges on the ecosystems they inhabit remain understudied. While it has been shown that sponges are capable of critical processes such as water filtration, particle retention, carbon and nitrogen cycling, habitat creation, and mitigation of harmful algal bloom species, marine sponge populations are notoriously difficult to grow and maintain in laboratory conditions. This study aimed to compare the growth of marine sponge fragments fed different diets over a three-month experimental period. *Suberites aurantiacus* fragments were collected from the Indian River Lagoon and housed in two-liter cubes with constant flow in a recirculating system. Twice a week, flow to the cubes was paused for approximately six hours, and each cube was dosed with one of the diet treatments. These diets included a commercially available coral diet consisting of dried plankton, an algal blend of *Nannochloropsis* sp. and *Isochrysis* sp. in saltwater obtained from an aquarium store, Marine Broth 2216, and the algal blend maintained in the laboratory in Marine Broth 2216. Each sponge was photographed from the top down every two weeks for the duration of the study. The surface area of the sponges was analyzed from the photographs using the image processing software Image J. By determining which diet produced the most growth, this study aims to improve sponge husbandry methods, improving their survivability and candidacy for laboratory-based experiments.

Keywords: marine sponges, aquaculture, invertebrate husbandry

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AOS-P03 **Benthic Infaunal Responses to Mangrove Restoration.** Jessica Cline. Marine Resources Council; Florida Institute of Technology. Benthic infauna are small animals that live in sediments beneath bodies of water like the Indian River Lagoon. Taxa include polychaete worms, nematodes, mollusks, and arthropods, which provide the estuary with valuable ecosystem services such as water filtration, sediment bioturbation, and nutrient cycling. They act as primary consumers at the base of many benthic food webs. This study focuses on an experimental shoreline installation located in Palm Bay, Florida, and seeks to use the community dynamics of infaunal species to evaluate the restoration success of various hybrid and living shoreline techniques. The 400 ft. site includes deployments of red mangroves, concrete breakwaters, combinations of the two, and blank control areas for comparison. The study's goals are to curb local coastal erosion issues, assess the biotic responses to restoration, monitor local changes in the estuarine sediments, and assess the effectiveness of living shoreline techniques in comparison to other shoreline hardening methods.

Keywords: living shorelines, benthic infauna, mangroves, sediment health, coastal resilience

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AOS-P04 **A Study on The Ecology & Morphology of Howellidae in the Gulf of Mexico.** Patton Horton, Jon Moore, Tracy Sutton, Luke Berg. Harriet L. Wilkes Honors College Florida Atlantic University, Jupiter, FL. This study examines the ecology and morphological characteristics of the family Howellidae, basslet-like midwater fishes, found in the Gulf of Mexico. The two main species of interest are *Howella atlantica* and *Bathysphyraenops simplex*, the latter being a novel record for the region. Most of the specimens were obtained via the DEEP-END project, an initiative to document biodiversity and damages in midwater and deep-sea Gulf flora and fauna from the B.P. Oil Spill. Some specimens are being acquired via other collections. Through morphometrics and general observation, the two species are being analyzed for developmental changes and differences in morphology. Each species is being compared to similar species found globally, including *Howella sherborni*, *Howella zina*, and *Bathysphyraenops simplex* to check identifications. Several of the specimens were dissected to observe the stomach contents for dietary analysis. Both species are predating mostly crustaceans, with some evidence of other soft-bodied invertebrates, such as chaetognaths, as well. The capture data was also analyzed to determine vertical migration patterns of *H. atlantica* based on capture depth and time.

Keywords: fish, ecology, deep-sea, *Howella*, *Bathysphyraenops*

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AOS-P05 **A Pathological Investigation of Cetacean Respiratory Disease: Examining Strandings along the Southeastern Florida Coast.** Ava Pitts, Annie Page-Karjian, Wendy Marks, Nicole Pegg. Harriet L. Wilkes Honors College Florida Atlantic University, Jupiter, FL. Stranded cetaceans frequently present respiratory abnormalities at necropsy. The purpose of this study was to investigate the respiratory pathology of 47 cases of stranded cetaceans along the southeastern coast of Florida from 2013 to 2024. Complete necropsies were performed on all dead cetacean strandings, and histopathology was conducted to examine tissues microscopically. Of the 47 strandings, 32 (68%) had at least one type of respiratory pathology. Out of these strandings, the most common respiratory pathologies found were pulmonary edema (48.4%), fibrosis (44.68%), and atelectasis (40.43%). This study included 10 pygmy sperm whales (*Kogia breviceps*), four dwarf sperm whales (*Kogia sima*), 20 Atlantic bottlenose dolphins (*Tursiops truncatus*), one Blainville's beaked whale (*Mesoplodon densirostris*), three Gervais' beaked whales (*Mesoplodon europaeus*), three melon-headed whales (*Peponocephala electra*), three sperm whales (*Physeter macrocephalus*), two pantropical spotted dolphins (*Stenella attenuata*), and one Risso's dolphin (*Grampus griseus*). Fisher exact tests were utilized to analyze the data. Comparing the strandings between adults and non-adults, the p values suggest that congestion (p=0.0117) and fibrosis (p=0.0185) were more commonly found in adults. Looking at the respiratory pathology from strandings from the Atlantic versus the Indian River Lagoon, results conclude that lung parasites (p=0.003), pneumonia (p=0.0047), lymphadenopathy (p=0.0036), and fibrosis (p=0.0036) were more prevalent in cetacean strandings from the Indian River Lagoon. Understanding the respiratory pathology from these strandings may aid in conservation efforts, as they provide greater insight to the overall health of these populations and their ecosystems.

Keywords: Stranding, pathology, respiratory, cetacean, necropsy

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BIO = BIOLOGICAL SCIENCES

FRIDAY 09:00 a.m. – 11:30 a.m.

KYM ROUSE HOLZWART, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT AND MELBA HORTON, SOUTHEASTERN UNIVERSITY, presiding

09:00 a.m. BIO-01 **Local Electric Fields Dictate Reactivity Trends in α-Ketoglutarate Dependent Non-Heme Iron Enzymes.** Terence Oscar-Okpala, David Kastner, Clorice Reinhardt. Bethune-Cookman University, Daytona, FL. Enzymes are versatile non-toxic biodegradable catalysts that can be tuned to perform non-native reactivities. α-ketoglutarate dependent non-heme iron enzymes (αKG-NHIEs) are of particular interest due to their ability to activate inert C–H bonds in a diverse range of accessible substrates that are key industrial products such as the antibiotic, vancomycin, which is synthesized by the VioC. Additionally, αKG-NHIEs are characterized by a highly conserved coordination environment defined by a 2His-1Asp/Glu facial triad. However, the molecular mechanism by which substrate specificity is dictated in αKG-NHIEs is poorly understood. One mechanism that has been proposed to guide reactivity is local electric fields. In this work, we performed electric field calculations across all crystallographic αKG-NHIE structures in the Protein Data Bank that contained both a substrate and co-factor. We found strong negative local electric fields to be very specific to the target C–H bond. Moreover, TauD exhibited the strongest negative electric field of all tested αKG-NHIEs. We also found the trends to be consistent across all reaction types exhibited within the subset of αKG-NHIEs. Additionally, we tested two different functionals and found the electric fields to be insensitive. Lastly, we tested if the electric field trends were different in the unreactive αKG-state compared to the reactive succinate-oxo state and found the electric fields to be consistent. Our results suggest that electric fields of αKG-NHIEs may play a vital role in the activation of inert C–H bonds and could be tuned for selectively functionalizing non-native C–H bonds.

Keywords: Electric Fields, QM Calculations, Non-heme Iron Enzymes, Computational Modelling, Hydrogen Atom Transfer

Corresponding Author: Terence Oscar-Okpala, terence.s.okpala@students.cookman.edu

09:15 a.m. BIO-02 **Isolation and genomic characterization of *Agrobacterium* phage SE2.** Samuel Eastmond, Indian River State College, Port Saint Lucie, FL. *Agrobacterium tumefaciens* is a well-known plant pathogen that is responsible for crown gall disease. *Agrobacterium* is also closely related to the citrus greening disease pathogen *Candidatus Liberibacter asiaticus* (CLas), and of-

ten serves as a culturable analog to CLas for the screening of potential therapeutics. Phage therapy, and bacteriotoxic genes derived from phages, may offer promising alternative strategies for managing CLas. Additionally, bacteriophages could provide valuable insights into the molecular biology of *Agrobacterium*, CLas and other significant agricultural pathogens. To investigate the diversity of *A. tumefaciens* bacteriophages, soil samples were collected from multiple locations on the Indian River State College campus in Fort Pierce, Florida. Out of sixteen soil samples screened, two tested positive for phages that produced turbid plaques with irregular morphology. A third phage was isolated which formed larger, clearer plaques. This phage, *Agrobacterium* phage SE2, was sequenced using Illumina MiSeq with 150 bp single reads, generating 442,869 reads that were quality filtered with FASTQC and used to assemble the complete genome. The final genome was 44,269 bp and 75 genes were predicted. Annotation and analysis of the genome identified four potential genes which could serve as biocontrol agents. These genes are being evaluated through a cell-free expression assay to determine the antimicrobial potential. The characterization of phage SE2 and its genome provides the groundwork for advancing applications that utilize phages and phage-derived proteins to combat bacterial diseases in plants.

Keywords: Phage therapy, Genomics, *Agrobacterium*

Corresponding Author: Samuel Eastmond, eastmondsn@mail.irsc.edu

09:30 a.m. BIO-03 **Conditional Sterility in Transgenic *Aedes aegypti* Males: A Novel Approach for Reducing Mosquito Fertility.** Michael Futo[(1)] , Mathieu Zamy[(1)] , Vivian Petersen[(2)] , Micael Santana[(3)] , Maria Karina-Costa[(3)] , Julia Jardim Nachbar[(3)] , Margareth Capurro[(3)] , Zach N. Adelman[(2)] , and Bianca C. Burini[(1)] . [(1)] Florida Medical Entomology Laboratory, University of Florida, Vero Beach, FL 32962, USA. [(2)] Department of Entomology and Agrilife Research, Texas A&M University, College Station, TX 77843, USA.[(3)] Departamento de Parasitologia, Instituto de Ciências Biomédicas, Universidade de São Paulo, São Paulo 05508-000, Brazil. *Aedes aegypti* is the primary vector of dengue, Zika, chikungunya, and yellow fever, posing major global health risks. Traditional control methods, such as insecticides, are becoming less effective due to resistance. Genetic control techniques, including the Sterile Insect Technique (SIT) and the Release of Insects carrying a Dominant Lethal (RIDL) gene, offer promising alternatives for population suppression. This study generated transgenic *Aedes aegypti* male's using the I-Ppol nuclease gene to induce sterility by disrupting DNA in the testes. Transgenic males were crossed with wild type females for the experiment cross. The control reciprocal cross included transgenic females crossed with wild-type males. Fertility was assessed across four crosses. Female fertility was reduced by 70% in the first two crosses, with minimal impact

on fecundity. The third cross showed a 78% fertility reduction, while the fourth showed a 48% reduction. These results indicate that double-transgenic males significantly reduce female fertility, supporting their potential use in mosquito population control.

Keywords: *Aedes aegypti*, transgenic males, fertility suppression, vector control

Corresponding Author: Michael Futo, mfuto@ufl.edu

09:45 a.m. BIO-04 **BMAA effects on the visual-motor system in adult zebrafish.** Dani Hamilton and Sherri Emer. Florida Gulf Coast University, 10501 FGCU Boulevard South Fort Myers, Florida 33965. Beta-N-methylamino-L-alanine, or BMAA, is a neurotoxin produced by cyanobacteria, which can reproduce rapidly resulting in harmful blue-green algae blooms that may negatively affect aquatic and terrestrial life, including humans. While many environmental toxins are well studied in developing animal models, particularly zebrafish embryos and larvae, studies in adult fish are limited. Thus, our goal was to use adult zebrafish to test the hypothesis that BMAA exposure negatively affects the central nervous system during adulthood. We previously observed in BMAA-exposed fish significantly decreased locomotion during swimming tests and elevated apoptosis in brain regions that function in visual processing. To further understand these effects, we used immunochemistry, electroretinography (ERG), and behavior preference testing in exposed fish. Specifically, we evaluated the eyes and brains of fish for neuroplasticity, locomotion, and apoptosis using antibodies for brain-derived neurotrophic factor (BDNF), dopamine receptor, and caspase, respectively. Suggestive of neuroplasticity, we observed BDNF and caspase labeling in the brains of BMAA-exposed fish. Further, increased dopamine receptor labeling in the brains of high-treated fish suggests compensation for neural injury. Treated fish also exhibited reduced electrical activity in response to a visual stimulus, which possibly impacted performance in the visual preference test. Collectively, these results provide details regarding the effects of a common environmental neurotoxin on visual-motor pathways in the central nervous system in an adult animal model that is capable of neural repair following damage. Importantly, this can provide information in the determination of safe exposure limits that impact the environment and ultimately, wildlife and human health.

Keywords: locomotion, neuroplasticity, ERG, behavior, cyanotoxin

Corresponding Author: Dani Hamilton, djhamilton0462@eagle.fgcu.edu

10:00 a.m. BREAK

10:15 a.m. BIO-05 **Competition or Coexistence? Investigating Dietary Overlap Between Two Sympatric Pipefish in the Indian River Lagoon, FL.** Nicholas Davis. Bethune-Cookman University. 640 Dr, Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. *Syngnathus louisianae* (chain pipefish) and *Syngnathus scovelli* (gulf pipefish) coexist in the Indian River Lagoon (IRL), where they rely on similar prey resources within shared habitats. Environmental disturbances such as harmful algal blooms (HABs) have led to persistent seagrass decline, which may reduce prey availability and diversity, and potentially intensify interspecific competition. This study assesses dietary overlap between these sympatric species by analyzing gut contents to quantify the frequency and volume of prey consumed by individuals from both species, collected in shared habitats in the IRL. By examining dietary composition, we aim to determine the extent of resource partitioning and the potential of interspecific competition between these two species.

Keywords: pipefish, diet, competition, Indian River Lagoon

Corresponding Author: Nicholas Davis, nicholas.w.davis@students.cookman.edu

10:30 a.m. BIO-06 **A regime shift is reflected in the fish community structure of the Indian River Lagoon (IRL).** Arthur C. Jones, Andrew J. Pyryt, Dr. M. Toufiq Reza, Dr. Vincent J. Lovko, Dr. Ralph G. Turingan. Florida Institute of Technology, Melbourne, FL. In 2011, the IRL underwent a regime shift because of an intense harmful algae bloom (HAB) that fundamentally changed ecosystem conditions to favor phytoplankton over seagrass. We wanted to determine if this regime shift is reflected in fish community dynamics, including mass mortality events, in the IRL. We analyzed long-term data sets of fish kills and of population fluctuations of 10 fish species of interest. HAB events correlate with the frequency of fish mortality events, perhaps caused by hypoxia and exposure to toxins produced by certain algal species. It is conceivable that the 2011 regime shift may coincide with a decline in young-of-the-year (YOY) abundance and distribution for the fish species of interest, perhaps due to the loss of essential nursery habitat because of the regime shift. This situation underscores the impacts of human activity on the IRL and the importance of proactive environmental management to protect this vital ecosystem.

Keywords: Indian River Lagoon, harmful algal blooms, HABs, fish kills, fish community dynamics, regime shift

Corresponding Author: Arthur Jones, arthur2024@my.fit.edu

10:45 a.m. BIO-07 **Comparing the parasite fauna of cane toads (*Rhinella horribilis*) originating from Central and Southwestern Florida.** Connor J. McCowan, Dr. Christina Anaya. Florida Gulf Coast University, Department of Biology, 10501 FGCU Blvd, Fort Myers, Florida 33965. When non-native species enter a new ecosystem, they often transport their natural parasites. Many of these transported parasite species will fail to become established in the invaded ecosystem. However, a small number of the transported parasite species will become established. Once established in the invasive host, certain parasite species may be able to transmit into a novel native host, known as spill-over. The cane toad, *Rhinella horribilis*, an invasive species in Florida ecosystems and hosts a diverse range of helminthic parasites. In this study, we explore the parasite diversity of cane toads in two distinct geographic regions of Florida, with each region representing a different temporal duration of host establishment. We partnered with local homeowners and contractors to receive euthanized toads from each region. A necropsy was performed to remove the lungs and digestive tract of each specimen. The internal contents of each organ were examined under a stereoscopic microscope for the presence of helminthic parasites. Any parasites found were extracted and identified. This process was completed for cane toads originating from central Florida and southwest Florida. A comparison of parasite species present in the two regions was then conducted. Cane toads from each region share many of the same helminthic parasite species, including one respiratory one nematode (*Rhabdias pseudosphaerocephala*), possibly two gastrointestinal nematodes, and gastrointestinal one trematode. In addition, one respiratory trematode species was only present in central Florida. Studying the parasites of invasive species is critical due to the ecological damage the parasites of introduced species can cause through spill-over.

Keywords: cane toads, invasive species, helminthic parasites

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11:00 a.m. BIO-08 **Late Holocene human related ENSO signal amplification from the lowlands of Western Ecuador.** Julian Beltran and Mark Bush. Florida Institute of Technology. Neotropical Paleoecology Research Group. 150 W University Blvd, Melbourne, FL 32901. ENSO positive and negative phases are associated with strong socio-economic and ecological impacts on South America often triggering and/or intensifying droughts and floods. These extreme events can increase tree mortality, forest fragmentation and favor erosion in the

landscape. Similar effects can be also attributed to human activities, for example, agriculture. Paleoecological studies are used to infer the past frequency and strength of paleo-ENSO events (i.e. those of the last 10,000 years). A study in Amazonia, where ENSO is weakly expressed revealed that ENSO was only detectable in the paleoecological record when its signal was amplified by pre-Columbian farming activity. However, in a region where the ENSO signal should be strong, does human activity still amplify the ENSO signal? Here, by analyzing fossil charcoal, pollen and X-ray fluorescence from a 5000-year-old sedimentary sequence from Lake Cube in coastal Ecuador, we investigated whether past human activities amplified the ENSO signal. We found the characteristic ENSO periodicity of 2 to 8 years indicating that the setting was influenced by ENSO climate variability regardless of human presence. However, a phase of increased maize cultivation and heightened erosion between 2700 and 2400 years ago did amplify the ENSO signal, increasing the apparent frequency and scale of the events. Our results highlight the importance of tracking human histories in paleoecological records due to their possible impact on the landscapes.

Keywords: Paleoecology, ENSO, Paleo-ENSO, human paleoecology, Holocene, paleoclimate

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11:15 a.m. BIO-09 **Human occupation in the last 2000 cal BP in a Lake at Northwestern Amazon (Zancudococha Lake, Ecuador).** Bianca T. Gomes[(1)] , Crystal N. H. McMichael[(2)] , Nina Witteveen[(2)] , Kiara Martel[(2)] , Cathelijn Kool[(2)] , Susann C. Aguilera[(1)] , Lawrence Petersen[(3)] , Susana L. Yánez[(4)] , Mark B. Bush[(1)] . [(1)]Florida Institute of Technology, Institute for Global Ecology, 150, University Blvd, 32901, Melbourne, Florida, USA; [(2)]Department of Ecosystem and Landscape Dynamics, Institute for Biodiversity and Ecosystem Dynamics, University of Amsterdam, Science Park 904, Amsterdam, Netherlands; [(3)]Rosenstiel School of Marine, Atmospheric, and Earth Science, Maine Geosciences, University of Miami, Miami FL 33149; [(4)]Escuela de Ciencias Biológicas, Pontificia Universidad Católica del Ecuador, Quito, Ecuador. Human history and how people have responded to past climatic change are relatively unexplored in the hyperdiverse northwestern Amazonian rainforests. We aimed to assess whether drier conditions within the late Holocene were more favorable for human occupation than wetter periods. We analyzed pollen, phytoliths, charcoal, XRF, and loss-on-ignition data from the sediments of Lake Zancudococha in Ecuador to reconstruct human presence and climatic changes, and we also estimated changes in forest cover for the last 2000 years. Humans have been present in the area since the onset of the study period, and burning, deforestation of the lake shore, and maize culti-

vation peaked ca. 1000 CE during the dry conditions of the early Medieval Climate Anomaly (950-1100 CE). An abandonment phase occurred between 1360 and c.1630 CE, and the lake was later reoccupied, with small-scale clearances associated with the Jesuit (1680 to 1890 AD) and Rubber Boom (1890 to 1925 CE) times. Periods of occupation and abandonment characterized human history near Lake Zancudococha, and drier conditions were more likely to have supported fire and agriculture in the area.

Keywords: Late Holocene, Northwestern Amazon, human occupation, Medieval Climate Anomaly, cultivation

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BIO Posters – 3:00 p.m.-6:00 p.m. Friday

BIO-P01 **Microbial Biohydrogen Production: The Role of TM1070 in Carbohydrate Processing.** Kezia Dentley and Brandon Vernier. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd., Daytona, FL. The utilization of microorganisms for biohydrogen production offers a sustainable path toward clean energy. Hydrogen, a zero-carbon fuel, is a promising candidate for future energy systems. Biological methods, particularly dark fermentation by thermophilic bacteria such as *Thermotoga maritima*, provide an efficient and scalable hydrogen production strategy. These bacteria thrive in high-temperature environments and ferment diverse carbohydrates, making them ideal for industrial applications. A critical aspect of biohydrogen production is carbohydrate metabolism, where structural insights into key proteins enhance process efficiency. TM1070, a carbohydrate-processing protein in *T. maritima*, features carbohydrate-binding domains (CBDs) and β-sandwich motifs, suggesting its role in polysaccharide degradation. Homology modeling and sequence analysis reveal similarities with known xylan-degrading proteins, indicating TM1070's involvement in complex sugar breakdown. Experimental studies on TM1070's binding affinity to various polysaccharides could confirm its substrate specificity, providing a deeper understanding of its function. These insights offer significant implications for biohydrogen production. Enhancing the enzymatic activity of TM1070 or its homologs through protein engineering could improve carbohydrate conversion efficiency, increasing hydrogen yields. Additionally, leveraging TM1070 in metabolic engineering strategies may optimize microbial fermentation pathways, reducing waste accumulation and improving process sustainability. By integrating structural and functional protein analyses, targeted biotechnological advancements can drive

more efficient and scalable biohydrogen production, contributing to a viable renewable energy future.

Keywords: *Thermotoga,* biohydrogen, TM1070

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BIO-P02 **Decoding Magnesium Transport in *Plasmodium falciparum*: A Genomic Approach to Identifying and Characterizing Putative Magnesium Transport.** Carol Pereira Silva, Mikailie Carabin, Romain Ledan, Axel Mendez, Angie Hendy, Julianne Rosado, Donna Edwin Chelliah, Yennifer Garzon Hernandez, Samantha Clarke, Amara Genera, Christopher Campbell, Ph.D. AdventHealth University. *Plasmodium falciparum*, the primary causative agent of severe malaria, relies on efficient nutrient acquisition to sustain its intracellular parasitic lifestyle. Magnesium (Mg2+) is essential, involved in numerous cellular processes, including protein synthesis, energy metabolism, and signal transduction. While several putative Mg2+ transporters have been identified in the *P. falciparum* genome, their precise roles and mechanisms of action remain largely unexplored. This computational study aims to gain a deeper understanding of the role of Mg2+ in *P. falciparum* pathogenesis by investigating the function of specific, uncharacterized putative Mg2+ transporters. We hypothesized that these proteins play critical roles in Mg2+ uptake and homeostasis, and their inhibition could provide a novel therapeutic strategy against malaria. We employed homology modeling and protein structure prediction algorithms to generate accurate three-dimensional models of the target proteins. These models provided insights into their potential substrate-binding sites, ion transport mechanisms, and protein-protein interaction interfaces. We conducted comprehensive sequence analysis to identify conserved domains and motifs associated with function and used this information to infer functional properties and potential regulatory mechanisms. Utilizing protein-protein interaction prediction tools we were also able to elucidate their role in cellular signaling pathways and regulatory networks. From this investigation we determined that *Plasmodium falciparum* relies on a collection of magnesium transporters to maintain a stable intracellular balance required for successful pathogenesis. The ability to target the products of these genes will significantly impair the parasite's ability to grow within a susceptible host.

Keywords: *Plasmodium falciparum,* magnesium transport, malaria

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BIO-P03 **Drowning in a SEA of Cluster E phages.** Michael Tracey, Isabell Colon, Estrella Hernandez, Miranda Galaviz, and Dalia Morales. Saint Leo University, Department of Natural Sciences, 33701 County Road 52, St. Leo, FL 33574. Saint Leo University joined the HHMI SEA-PHAGES program in 2018 as part of the 11th Cohort, focusing on the discovery and genomic analysis of novel bacteriophages. Employing Actinobacteria as hosts, the SEA-PHAGES program has currently discovered 28,000 novel phages with just over 5,000 of those having their genomes sequenced and annotated. Using *Microbacterium foliorum* as a host, Saint Leo University has isolated bacteriophages from soil samples, contributing 77 unique phages to the collection at the University of Pittsburgh, with 15 genomes sequenced, annotated, and published. Despite originating from similar topographies and sharing the same host, the phages exhibit both shared cluster similarities and considerable genomic diversity. Genomic sequencing was performed using bioinformatics tools, and additional analyses such as restriction fragment length polymorphism (RFLP), transmission electron microscopy, and host specificity assays with 27 actinobacteria were conducted. The annotated phages belong to clusters EB, EE, EF, and EK1. This study presents an analysis of the phage genomes and their morphological features, highlighting both their commonalities and diversity. Support for this work was provided by Saint Leo University, the Department of Natural Sciences, the HHMI SEA-PHAGES (Science Education Alliance-Phage Hunters Advancing Genomics and Evolutionary Science) Program, the Hatfull Lab at the University of Pittsburgh, the ARS Culture Collection (NRRL) and the Transmission Electron Microscopy Facility at the University of South Florida (USF).

Keywords: SEA-PHAGES, bacteriophage, *Microbacterium foliorum*

Corresponding Author: Michael Tracey, michael.tracey@saintleo.edu

BIO-P04 **Spatial and temporal distribution of harmful algal bloom organisms and red tide events in Florida coastal waters.** Katelyn Baiza, Mark Chiappone, Luis Labiste, Erick Argueta, Meling Chung, Jay Hernandez, Jessica Ortiz, Viviana Tinoco. Miami Dade College, Department of Math and Science, 500 College Terrace, Homestead, FL 33030. Phytoplankton under certain conditions can form harmful algal blooms (HABs). One dinoflagellate species, *Karenia brevis*, is primarily responsible for red tide outbreaks in Florida. Such HABs typically occur from October to April along the coastline, particularly the west coast from Tampa Bay south to the lower Florida Keys but are less frequent along the east coast. HABs can affect both human health and marine life. Cell densities

>100,000/100 mL may result in respiratory irritation, shellfish harvesting closures, and probable fish kills. The Florida Fish and Wildlife Conservation Commission (FWCC), Florida Wildlife Research Institute (FWRI), continues to coordinate a statewide community scientist effort to collect water samples and water quality data. At each site, 175-mL seawater samples are collected and preserved in Lugol's solution. Samples are sent within 24-48 hrs. to FWRI to determined cell densities using the Utermöhl method. Status reports and maps are published on an 8- day basis to provide cell density data on a scale ranging from: not-present/background (ND to < 1,000 cells/100 mL), very low (> 1,000-10,000), low (> 10,000-100,000), medium (> 100,000-1 million), and high (> 1 million). During mid-November 2023 through late January 2025, we supplemented the current FWC/FWRI effort by adding 22 coastal sites (0.4-4.5 m depth) spanning ~86 km from central Miami-Dade County to the upper Florida Keys. Surface phytoplankton samples during 48 missions were collected, along with measurements of water quality. During the sampling period, means (±1 SE) and ranges for temperature (26.6 ± 0.2 °C), 17.8-34.6), salinity (29.8 ± 0.4 ppt, 0.8-40.5), and dissolved oxygen concentration (7.2 ± 0.1 mg/L, 1.2-15.1) showed considerable variation, but *K. brevis* densities were not detected for all 339 samples. Continuing research and monitoring will help determine the conditions for HAB formation between for the Gulf of Mexico and the Atlantic Ocean.

Keywords: coastal, HAB, phytoplankton, red tide

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BIO-P05 **Anti-infective potential of lipid extracts from *Chlamydomonas* algae grown under laboratory conditions.** Anna Church, Courtney Bueford, Hannah Goodrich. Southeastern University, 1000 Longfellow Blvd, Lakeland, FL 33801. The genus *Chlamydomonas* algae is a green alga heavily studied as a model organism in molecular biology. *Chlamydomonas* can grow photosynthetically or on a carbon source and thus is a highly versatile organism. Microalgae such as *Chlamydomonas* are known to produce antimicrobial metabolites both antibacterial and antifungal in nature. This is of interest as many pathogenic microbes have experienced a drastic increase in resistance to traditional antimicrobials. As such, it would be incredibly valuable to utilize microalgae for their potential in creating novel pharmaceutical antibiotics and antifungals. This study aimed to determine 1) the effects of elevated levels of potassium phosphate on the lipid and phenol extract yield from *Chlamydomonas*, 2) the efficacy of antimicrobial and antifungal activity of *Chlamydomonas* extracts specifically on *Staphylococcus aureus* and *Candida albicans*, respectively and 3) possible correlation between the growth of *Chlamydomonas* cells and the pH changes of the culture medium after six weeks under laboratory conditions. Agar diffusion assays

were conducted against bacterial and fungal species such as *S. aureus* and *C. albicans* using the standard antimicrobial and antifungal treatments compared to the experimental treatments. *Chlamydomonas* extract from the experimental treatment was 48.5% as effective as oxacillin (the standard antibiotic treatment for *S. aureus*) while extract from the Control treatment was only 37% as effective. *Chlamydomonas* extract from the Experimental treatment was 42.6% as effective as miconazole (the standard antifungal treatment for *C. albicans*) compared to the Control treatment at only 37.7% efficacy relative to miconazole. These findings highlight *Chlamydomonas* lipid extract as a promising source of bioactive compounds for combating drug-resistant pathogens.

Keywords: *Chlamydomonas*, Anti-fungal, Anti-bacterial, Microalgae, Pathogen

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BIO-P06 **Analyzing *Chlamydomonas reinhardtii* strains to characterize a potential eukaryotic quorum sensing mechanism.** L. E. Turner[(1)] , K. Cutshaw[(1)] , E. Soyke[(3)] , M. Taylor[(4)] , J. Ahrens[(1)] , J. Labishak[(4)] , B. Lee[(3)] , R. Quick[(3)] , T. Mellow[(1)] , and A. Palmer[(1,4)] . Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. [(1)]Departments of Ocean Engineering and Marine Sciences, [(2)]Chemistry and Chemical Engineering, [(3)]Biomedical Engineering and Sciences, [(4)]Aerospace, Physics, and Space Sciences. Quorum sensing (QS) is a density-dependent cell-cell communication method involved in processes such as virulence, regulation of the human microbiome, spoilage of food, harmful algal blooms, plant growth promoting bacteria in agriculture, bioremediation, and producing fermented food and beverages. Although QS is predominantly found and studied in prokaryotes, QS-like behaviors can be found in eukaryotes. One such eukaryote is *Chlamydomonas reinhardtii*, a unicellular alga that is a prominent model organism in photosynthesis and ciliary disease research. At high cell densities, the *C. reinhardtii* lab strain cc124 displays a QS-like phenotypic switch by swimming faster than cells at low density. In this study, we screened environmental isolates of *C. reinhardtii* for the presence or absence of the QS phenotype observed in the lab strain CC124. Identifying QS-negative strains from these isolates will provide tools for the further identification of the molecular elements associated with this phenomenon in *C. reinhardtii*. Understanding QS in this model organism will provide insight into eukaryotic QS – insight that can be applied to the many processes in which QS is involved.

Keywords: Quorum sensing, algae, cell-cell communication, phenotype, swim speed

Corresponding author: Lucy Turner, turnerl2021@my.fit.edu

BIO-P07 **Investigating Direct Feeding Competition of Two Sympatric Pipefish Species Using High-Speed Video.** Nicholas Davis. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. The chain pipefish (*Syngnathus louisianae*) and gulf pipefish (*Syngnathus scovelli*) coexist in the Indian River Lagoon (IRL), relying on similar prey resources within shared habitats. However, persistent environmental disturbances, such as seagrass decline, threaten prey availability and diversity, potentially intensifying interspecific competition between them. This study utilizes high-speed videography to investigate the rapid feeding mechanisms and performance of both species by analyzing key kinematic variables, such as mouth gape and strike speed, during solo feeding events and direct interactions. By assessing their feeding performance under potential direct competition, we aim to elucidate the nature of their interactions and determine which species may hold a competitive advantage under these conditions.

Keywords: pipefish, feeding kinematics, Indian River Lagoon

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BIO-P08 **Investigating the effects of a standard aquatic vertebrate animal anesthetic.** Anna Whelan, Dani Hamilton and Sherri A. Emer. Florida Gulf Coast University 10501 FGCU Boulevard South Fort Myers, Florida 33965. Tricaine methanesulfonate (MS-222) is a standard anesthetic used in aquatic organisms. It is valuable because of the rapid onset of sedation and recovery, dose-dependent effects based on concentration and exposure time, and reduction in handling stress. Its use is common and particularly useful in aquatic vertebrate animal models such as zebrafish. Due to their significant genetic similarity to humans, rapid development, and genetic manipulability, zebrafish are broadly utilized in research to study human diseases, drug development, and complex biological processes in vertebrates in general. Sedation of zebrafish with MS-222 is required to perform a variety of procedures including but not limited to electroretinogram (ERG), electroencephalogram (EEG), and even morphological measurement acquisition. Despite its widespread use as an anesthetic, data related to the consequences of MS-222 exposure are limited to behavioral assays. We observed high levels of apoptosis in a previous experiment that combined MS-222 anesthesia with electroretinography (ERG) and immunohistochemical evaluation of cell death within the brains of the experimental zebrafish. Given these results, we repeated the experiment with anesthesia exposure alone, without the ERG procedure, to test the hypothesis that apoptosis in the brain was the result of MS-222

exposure and not induced stress from the primary procedure (ERG). Apoptosis in the brains of fish exposed to MS-222 through both immersion and intubation are reported. These findings can provide insight into the use of MS-222 as an anesthetic and its subsequent effects on physiological results that can impact reliability of scientific outcomes.

Keywords: zebrafish, apoptosis, anesthetic, MS-222, tricaine

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BIO-P09 **Development of an in-house health monitoring program for a small-scale zebrafish research colony.** Valerie Saborio and Sherri A. Emer. Florida Gulf Coast University, 10501 FGCU Boulevard South Fort Myers, Florida 33965. The use of zebrafish as a model organism has become prevalent over the past decade and produced important findings related to physiological processes and disease. Health monitoring of zebrafish research subjects is critical for maintaining an adequate level of biosecurity that minimizes variation resulting from pathogens within a research colony. A colony whose health is unmonitored can produce unreliable research results and cause adverse effects on the welfare of the animals. The goal of this project is to develop regular health monitoring that emphasizes preventative care and accommodates a small program using scaled-down, established standard protocols. The components of the program utilize several health assessments including microbiological, gross anatomical, and histological evaluation of fish samples. Gram staining and selective media tests were utilized with the skin surface and coelomic swabs to categorize bacteria common or unexpected in zebrafish colonies. Additionally, organ tissue processing with hematoxylin and eosin staining was used for microscopic comparison to normal histological atlases. Frequency of monitoring, sample size, and unexpected outcomes are also discussed. The program also emphasizes training animal use personnel to recognize possible signs of distress and disease, such as external abnormalities, and execute biosecurity practices that minimize the introduction of unwanted pathogens within the facility. Importantly, this health monitoring program is flexible for program size and budget allowing for scaling-up, ensures the health and welfare of zebrafish, and enhances reliability and reproducibility of the research results from ongoing projects.

Keywords: colony, welfare, biosecurity, preventative care

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BIO-P10 **Zebrafish as a model to understand behavioral and physiological underpinnings of autism spectrum disorder (ASD).** Yael Leyva Flores and Dani Hamilton. Florida Gulf Coast University, 10501 FGCU Boulevard South Fort Myers, Florida 33965. Autism spectrum disorder (ASD) is a neurodevelopmental condition marked by challenges in social communication and interaction, as well as restricted and repetitive behaviors, as defined in the DSM-5. Its manifestations stem from genetic, environmental, and neurological factors. For example, previous research indicates correlations between ASD and low levels of the neurotransmitters oxytocin and dopamine. Dopamine's function in motor coordination and sensory integration may explain the challenges of stimulating environments observed in ASD and ADHD, which is often comorbid with ASD. Additionally, oxytocin is essential for social behaviors, and its dysfunction contributes to social deficits observed in ASD. That said, we aimed to further the understanding of the biological underpinnings of the disorder and the pathways affected during development using a zebrafish model. To test the hypothesis that dopamine and oxytocin receptor are differentially expressed in ASD models and that behavioral tests can effectively predict receptor expression differences, we assessed brain and behavioral differences between control (wild-type) fish and ASD model fish with a deletion in the SHANK3 gene. Here, we describe the results from startle tests, visual preference tests, and social preference tests. We also report the distribution of dopamine and oxytocin receptor distribution using immunohistochemical analysis of the brains of control and genetically modified fish. Findings from this study can provide valuable insights into the biological basis of ASD, which may inform the development of evolving treatment methods.

Keywords: behavior, SHANK3, oxytocin, dopamine, brain

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BIO-P11 **First Report of Horsehair Worms (Phylum Nematomorpha) from Plethodontid Salamanders in North America.** Nina Haag, Tyler Brock, Christina Anaya. Florida Gulf Coast University, 10501 FGCU Boulevard South Fort Myers, Florida 33965. The Plethodontidae family are a lungless salamander group that are mostly found in the Western Hemisphere. They play a significant ecological role consuming terrestrial invertebrates and are a food source to many small mammals and other invertebrates. Horsehair worms are parasites with a complex life cycle that use larval aquatic invertebrates and terrestrial arthropods to complete their life cycle. Previously published reports in other salamander families have identified the presence of the cyst stage of nematomorphs but it is unclear whether salamanders play a role in the life cycle of the Nemato-

morpha. The purpose of this study was to examine horsehair worm cysts in lungless salamanders and determine how common they were. Larval salamanders were collected from various sites in Northern Georgia, stored in 70% ethanol, and stored in a -20°C freezer until examined. Upon necropsy, the salamanders were measured snout to vent (mm) and, only the integument and the inner layer of muscles was examined for horsehair worms. The ventral and dorsal sections were examined for cysts by placing tissue on a microscope slide with coverslip and applying gentle pressure to flatten the tissue. The sections were then examined under an Olympus BX-51 compound microscope, at 100-400× magnification. Some samples had other sections examined (i.e., toes, head, and tail). We found 21/81 (30%) of salamanders contained horsehair worm cysts and had a mean intensity of 97.52 ± 225.3 (range 1-696). Because terrestrial insects are not likely to consume salamanders as prey, we suggest the Plethodontidae are accidental infections. To the best of our knowledge, this study is the first to identify horsehair worm cysts in the family Plethodontidae.

Keywords: cysts, hairworm, Plethodontidae, North America

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BIO-P12 **A Comparison of Parasites in Native and Invasive Snakes in South Florida.** L. Niemann*, C. Anaya. Florida Gulf Coast University, 10501 FGCU Blvd S Fort Myers, FL 33965. The Burmese python (*Python bivittatus*) is an invasive snake that arrived through the illegal pet trade and subsequent release by pet owners but is now established in South Florida. Due to their booming population and no natural predators, they have become a major environmental concern due to their impact on native wildlife. Not only have they preyed on the native species inhabiting southern Florida, but they could potentially introduce new parasites into the ecosystem that could impact native snake species. The objective of this study was to compare the diversity, prevalence, and intensity between native and invasive snake species. We found the diversity of python parasites was lower when compared to parasite diversity in native snakes. Two parasite species were found in pythons including a nematode (prevalence =67.86%) and a pentastome (prevalence = 4%). The Eastern mud snake (*Farancia abacura*) had 100% prevalence of nematodes, 66.67% prevalence trematodes, 50% prevalence cestodes and 33.33% prevalence pentastomes. Additionally, pythons had lower intensities of parasites than the native species. The python's overall nematode mean intensity was 18.21(±26.18) versus the Eastern rat snake (*Pantherophis alleghaniensis*) which had an overall nematode mean intensity of 31.25(±44.87). Knowing the parasites of invasive species has implications for land management and the potential for invasive species control. It is also vital to understand the

effects of parasite spillover and spillback since factors contributing to these processes are present in this ecosystem due to the disruption caused by the invasive python species. Our future studies will determine parasites to species level using DNA barcoding.

Keywords: Burmese python, invasive species, parasites,

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BIO-P13 **Nematode counts and Differentiation in the upper small Intestine of *Iguana iguana*.** Marisa Manning and Christina Anaya. Florida Gulf Coast University, 10501 FGCU Blvd, Fort Myers, FL 33965. Invasive species are affecting native species of South Florida by not only competing for resources with native species but potentially passing their non-native parasites to native species. These parasites may be harmful to native species causing disease and mortality because they may not have the natural defenses to fight a parasitic infection. While previous studies have examined the impact of invasive species within Florida ecosystems, fewer studies have examined the parasites they carry. The objective of this study was to examine and identify the parasites of the upper small intestine of green iguanas in Southwest Florida. Thirty iguanas were captured and euthanized by local contractors and stored in a -20°C freezer until necropsy. During necropsy, the upper small intestine was removed and examined for parasites. When parasites were found, they were stored in 70% ethanol vials in the freezer until measurement and imaging. Three different species of nematode and one trematode species were found in the upper small intestine of five male and three female iguanas. Infected males and females averaged at 1.04 and 1.53 kilograms, respectively. We found a correlation between host size and parasite size, suggesting that a larger body size of a host is favorable for parasites. Infected male iguanas had a significantly higher mean intensity of parasites compared to infected females. 21.4% of infected males contained large and smaller nematodes, and 12.5% of females contained smaller nematodes. The presence of long nematodes and green trematodes were noted as well. This study adds to our knowledge of *Iguana iguana* symbionts and provides insight into the parasites that may infect native species of Southwest Florida.

Keywords: parasites, invasive species, iguanas

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BIO-P14 **Basal taxa associations in environmental DNA alignments.** Teresa Lacan and Daniel Lancifort. Indian River State College, 3209 Virginia Avenue Fort Pierce, Florida 34981. Multiple environmental DNA (eDNA) samples gathered from Florida terrestrial and marine sources contain sequences which align to reported genome sequences from a basal Avian taxon, the genus *Apteryx* which appears to be a common false association. The hypothesis tested here is if damaged DNA tends to produce alignment patterns that skew towards basal taxa, due to stochastic but more frequent matching to a common ancestor for multiple species (e.g., Kiwi matching DNA from several birds). Two approaches, one in-silica and one empirical are used to test this hypothesis. 1) Alignments are compared between likely and unlikely DNA sources for an Indian River Lagoon Sample to see if the probable sources align more accurately than such unlikely taxa as *Apteryx*. 2) Damaged and undamaged DNA from three avian sources are compared in their individual and collective associations with other species including those of the genus *Apteryx*. This work aims to inform investigations where damaged DNA is used such in with eDNA and ancient DNA sequencing.

Keywords: genome sequencing ancient environmental paleoecology

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BIO-P15 **Vegetation response to land management changes in northwestern Amazonia over the last 2200 years.** Lina Cabrera Saenz, Crystal McMichael, Meghan O'Connor, Nina Witteveen, Larry Peterson, Mark Bush. Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901. The extent to which indigenous land-use, both pre- and post-Columbian, has influenced modern Amazonian forest composition remains actively debated. Pre-Columbian societies in Amazonia cultivated crops and managed forests, leaving ecological legacies such as the enrichment of forests with useful species. Although evidence of past occupation often correlates with a high proportion of useful species, attributing these legacies solely to pre-Columbian land management overlooks the potential impacts of post-Columbian activities. This research explores how different land management practices during the pre- and post-Columbian periods altered the vegetation around Añangucocha and to what extent modern forest composition reflects these past activities. We performed a 2240-year high-resolution analysis of paleoecological proxies (fossil pollen, charcoal, phytoliths, and geochemical analyses) from Lake Añangucocha in the Ecuadorian Amazon. We identified five distinct phases of land management spanning both the pre- and post-Columbian periods, and reflecting changes in cultivation practices, fire regimes, and forest cover. Pre-Columbian land use involved small-scale, fire- free cultivation with *Zea mays*, leaving relatively subtle ecological footprints while maintaining high

forest cover (60- 80%). Post-Columbian activities, however, established fire as a dominant tool for land management after c. 1600 CE, leading to declines in mature forest taxa and a proliferation of early successional and disturbance-adapted species, transforming forest composition and setting back successional processes. Fire- driven land management stopped between 1900- 1950, though the forest continues to exhibit signs of successional recovery. Our findings highlight the transformative role of post-Columbian land management, particularly fire, to shape modern forest composition. The ecological impacts of colonial practices were more profound and enduring than those of pre-Columbian activities, leaving stronger legacy effects on the forest structure. These results provide insights into the anthropogenic drivers of ecological change, emphasizing the lasting consequences of historical fire use on Amazonian forest and ecosystem dynamics.

Keywords: Amazonia, paleoecology, land management, fire regimes, ecological legacies.

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BIO-P16 **Bug brains: Are discoid cockroach (*Blaberus discoidalis*) substrate preferences fixed or plastic?** L. Lewis and D. Proctor. Florida Institute of Technology, Psychology Dept., 150 W. University Blvd., Melbourne, FL 32901. Cockroaches are one of the most prevalent animal groups on the planet. There are over 4,500 species, they inhabit all continents other than Antarctica and thrive in essentially all types of ecosystems. They play critical roles as detritivores and contribute to microbiome function and health. Yet, despite their prevalence and importance, we know remarkably little about their behavior and cognitive abilities. For example, we do not know how cockroaches select specific locations in which to aggregate. Therefore, as a first step toward understanding this, we tested lab-housed discoid cockroaches on a four-choice preference test with different substrates (pine shavings, soil, baked soil, leaves) and measured how long individual cockroaches spent in contact with each substrate. The cockroaches showed a strong preference for pine shavings. However, this is also the substrate used in their lab enclosures which caused researchers to wonder if this was an artifact of familiarity. Therefore, in a second experiment we reared cockroaches in either pine bedding or coconut fiber bedding and then conducted a two-choice preference test to determine whether cockroaches prefer familiar substrate (e.g., those raised in coconut fiber will prefer coconut fiber) or whether there is a true preference for pine shavings regardless of their rearing history. These findings may illustrate the extent to which discoid cockroach substrate preferences are

plastic or fixed and therefore offer insights into the mechanisms by which invertebrates, such as the highly adaptable cockroach, use environmental information to guide decision-making in dynamic and challenging habitats.

Keywords: substrate preferences, behavior,

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CMS = COMPUTER/MATHEMATICAL SCIENCES

RICARDO JIMENEZ, BARRY UNIVERSITY, presiding

CMS Posters – 3:00 p.m.-6:00 p.m. Friday

CMS-P01 **Using video games as a paradigmatic platform for studying cognition in normative and clinical neurosurgical populations.** Ryan Schlossman, Candela Zampini, Adam Acker, Arel Marsh, Sara Smith, Domenic Tosi, Srithvik Ellanki, Dylan Santiago, Genesis Arietta. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. A core facet of the human experience involves making critical decisions, especially under conditions of increasing cognitive load, such as stress and pressure. For instance, do you decide to approach or to avoid a stranger that is quickly arriving on the sidewalk? Does your accuracy and effectiveness change if you are stressed, rushed, anxious, or managing several things in mind at the same time (e.g. cognitive load)? Most empirical studies of decision making have focused on isolating single variables while holding constant other extraneous variables, but these artificial environments lack external validity. Such studies have provided useful, but incomplete understanding. Moreover, how the brain manages such delicate complexities in real time remains elusive. The present study sought to bridge this gap of knowledge by building upon prior work that integrated the rich complexities of decisions made in video game platforms such as Pacman and Tetris into clinical studies of neurosurgical patients undergoing continuous intracranial EEG monitoring for epileptic resections. The present study built a behavioral testing platform for moment to moment fluctuations in decision making during video games in order to provide a rich set of normative data in healthy young adults as controls for clinical neurosurgical monitoring patients. Results from methodological development provided novel psychometric instruments for measuring game play history, to understand mediating factors that can interact with decision making results. This platform can

serve as critical foundations for future research on the real-world complexities of decision making under cognitive load in clinical and normative populations.

Keywords: Decision making, EEG, cognitive load
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CMS-P02 **Smart Study Planner.** Justin Grant and Juan Caulderon. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. The Smart Study Planner is a Java-based application that seeks to improve student performance in academics through better time management. The tool combines both scheduling, dynamic prioritizing of tasks, and progress tracking-all in one-to equip the student with everything necessary to reach their academic objectives. Users input course information, assignment type, deadlines, and preferences, for which the system returns an optimized study plan. It also includes an adaptive scheduler that dynamically updates the plan in case of incomplete tasks or new priorities. The Smart Study Planner would be intuitive to handle academic workloads by taking advantage of the object-oriented programming capabilities of Java and embedding user-friendly interfaces using either JavaFX or Swing, for instance. The prioritization of tasks within the application is based on deadlines and importance levels set by the user. Besides, data persistence has been implemented to save and retrieve user information for continuity in planning. Smart Study Planner also includes a progress tracker that visually indicates the completion of tasks, motivating and keeping students on track. In the future, this may include the integration of cloud services to synchronize devices and the use of machine learning algorithms for the analysis of study habits with recommendations for optimized schedules. The Smart Study Planner responds to the rising demand for time management tools in academia with an efficient, customizable solution that helps students succeed. This project illustrates the potential of software engineering in crafting effective tools to address real-world challenges.

Keywords: Smart Study Planner, academic productivity, task prioritization, adaptive scheduling, time management

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CMS-P03 **Real-Time Beach Monitoring Using AI and Computer Vision for Environmental and Safety Applications.** Kisha Mulenga and Cho Hyun. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. This study introduces an innovative surveillance system

for Florida's beaches, utilizing strategically deployed IP cameras along the coastline to address critical environmental and safety needs. The system employs advanced computer vision technologies to achieve two core objectives. First, it supports environmental research by analyzing wave patterns and tidal heights throughout the day, offering valuable insights for marine scientists studying ocean behavior and forecasting risks such as flooding and sea-level rise. Second, it improves beach safety through real-time detection and tracking of individuals, vehicles, and animals, enabling rapid identification of hazards and immediate communication with authorities or rescue teams during emergencies. By integrating cutting-edge computer vision methods, this system effectively bridges environmental monitoring with public safety, contributing to sustainable coastal management and enhancing the security of beach visitors. The presented methodologies and results highlight the transformative potential of intelligent surveillance systems in addressing critical coastal challenges.

Keywords: Intelligent Surveillance, Computer Vision, Coastal Monitoring, Beach Safety, Environmental Research

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CMS-P04 **Educational and Research Platform for Autonomous Electric Vehicles.** Tianna Brown. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. Over the last decade, the automotive industry has embraced a transformative shift toward electric vehicles, positioning them as a cornerstone of future mobility. This transition from gasoline-powered cars to electric alternatives has opened new opportunities for the advancement of autonomous driving systems, integrating sustainability with innovative technology. This project centers on the creation of a 1:10 scale electric vehicle platform, designed to incorporate a range of sensors and advanced computing systems. It pursues three key goals: (1) developing a scalable platform to simulate autonomous vehicle capabilities, (2) exploring cutting-edge artificial intelligence and computer vision algorithms, and (3) supporting academic instruction in autonomous vehicle technology. The platform mirrors essential autonomous vehicle functionalities by including electric motors, batteries, and critical sensors such as RGB cameras, LiDAR, depth sensors, and radar. A dedicated onboard computing system facilitates the testing and development of AI-driven algorithms for navigation, sensor data processing, and real-time decision-making in a controlled environment. In addition to technical advancements, this project emphasizes educational impact by creating resources and tools for undergraduate students. The scaled vehicle provides a practical, hands-on learning platform, en-

abling students to bridge theoretical concepts with practical applications in autonomous systems, AI, and computer vision. This interdisciplinary initiative aims to prepare the next generation of engineers and researchers for leadership roles in the growing field of autonomous electric vehicles.

Keywords: Electric Vehicles, Autonomous Driving, Artificial Intelligence, Computer Vision, Scaled Vehicle Platform

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CMS-P05 **Viola-Jones Algorithm Integration for Face Detection and Recognition in Autonomous Vehicles.** Buchizya Mwase and Bongiwe Sandi. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. As autonomous vehicle technology continues to evolve, the development of advanced safety systems has become a priority. This project explores the integration of face detection and recognition technologies to enhance the safety and functionality of autonomous cars. Using the Viola-Jones algorithm, widely recognized for its real-time detection capabilities, the project aims to deliver reliable performance in diverse driving scenarios. The system is designed to detect individuals within the vehicle and accurately identify the driver, enabling features such as driver authentication and monitoring. By improving detection speed and recognition precision, this innovation supports key objectives like accident prevention, enhanced security, and theft deterrence. The project's initial phase has successfully implemented a face detection module based on the Viola-Jones algorithm, achieving robust results across varying environmental and lighting conditions. Future development will focus on refining the system's ability to differentiate between individuals, laying the groundwork for personalized vehicle settings and improved safety measures. This work seeks to establish a new standard in autonomous vehicle safety by showcasing the practical applications of facial recognition technology. By combining innovation with real-world utility, the project aims to contribute to safer and more secure transportation systems for the future.

Keywords: Autonomous Vehicles, Face Recognition, Driver Monitoring, Viola-Jones Algorithm, Road Safety

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CMS-P06 **Lane Detection in Self-Driving Cars: A Neural Network Approach to Accuracy and Speed.** Aldridge Kalenga and Buchizya Mwase. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. This study explores the use of Artificial Neural Networks (ANNs) to enhance lane detection systems in self-driving cars. By training the network on a comprehensive dataset that incorporates diverse road scenarios, including varying lighting conditions and road markings, the research aims to advance the vehicle's perception capabilities. Extensive testing highlights the model's strong performance in real-world conditions, underscoring its potential to drive progress in autonomous driving technology. Departing from traditional pixel-based segmentation methods, this innovative approach reimagines lane detection by treating it as an anchor-driven ordinal classification task inspired by human visual perception. By leveraging global features and a sparse row-anchor-driven representation, the method effectively mitigates challenges related to efficiency and localization errors. The results demonstrate state-of-the-art performance in both speed and accuracy, offering a highly efficient and reliable solution for lane detection across a wide range of real-world scenarios. This work represents a significant step forward in developing robust, real-time perception systems for autonomous vehicles.

Keywords: Artificial Neural Networks, Lane Detection, Self-Driving Cars, Autonomous Vehicles, Perception Systems

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CMS-P07 **DriveSense: Intelligent Driver Assistance for Enhanced Road Safety.** Bongiwe Sandi and Aldridge Kaenga. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. This project aims to develop an advanced driver assistance system leveraging cutting-edge computer vision and artificial intelligence technologies to enhance road safety. The system continuously monitors the driver, analyzing emotional states such as anger, fear, or sadness to mitigate accident risks linked to emotional factors. It also identifies distractions and hazardous behaviors, including lack of focus on the road, signs of fatigue, and episodes of microsleep. In response to such risks, the system delivers timely interventions, alerting the driver and recommending corrective actions, such as taking a break or refocusing attention. By integrating real-time emotional assessment with behavior monitoring, this solution offers a proactive approach to accident prevention, addressing human factors and contributing to safer driving conditions. This innovative project represents a significant advancement in reducing road accidents through intelligent, adaptive technology.

Keywords: Advanced Driver Assistance, Computer Vision, Artificial Intelligence, Road Safety, Emotion Monitoring

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ENG = ENGINEERING SCIENCES

SESSION A – ENVIRONMENTAL ENGINEERING

FRIDAY 08:30 a.m. - 12:00 p.m.
SESHA SRINIVASAN, AND MUHAMMAD ULLAH, FLORIDA POLYTECHNIC UNIVERSITY**,** presiding

08:30 a.m. ENG-01 **Accelerating Parameter Optimization for Quantum Machine Learning using Field-Programmable Gate Arrays.** Fnu Pratibha and Naveed Mahmud. Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901. Quantum computing presents a potential scenario where machine learning (ML) algorithms are enhanced through novel data representations and accelerated computations, thus establishing the field of Quantum Machine Learning (QML). Despite its promise, QML faces significant challenges, particularly in hybrid quantum-classical systems where the exponential data growth for training quantum-classical ML algorithms imposes substantial resource demands on conventional processors. Addressing these challenges, this paper proposes a heterogeneous framework integrating Quantum Processing with Field-Programmable Gate Array (FPGA) based hardware acceleration. The proposed framework delegates computationally intensive optimization tasks in QML algorithms to the FPGA, capitalizing on its parallel processing and dataflow capabilities. This strategic distribution of tasks enhances resource efficiency, leveraging the inherent strengths of quantum and classical processors, and ultimately improves training performance in QML applications. We present simulation results that demonstrate an average speed up of 100x with respect to baseline executions on a conventional CPU for QML tasks.

Keywords: Quantum Computing , Quantum Machine Learning, Field-Programmable Gate Array

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08:45 a.m. ENG-02 **Minimizing error of ship maneuvering simulations.** A. Milgram and T. Hunsucker. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. This work develops a methodology to minimize discrepancies between ship maneuvering simulations and real-world vessel behavior. High-fidelity models are key for numerous applications such as naval training, port design, and autopilot systems. These models simulate vessel dynamics in diverse environments, but their use relies on how closely they replicate the physical ship's response. To achieve this, a tuning process is introduced that optimizes hydrodynamic force coefficients directly based on maneuvering trial results (turning circles, zig-zag maneuvers). This can be accomplished by minimizing the weighted difference of each indices across all trials. However, this method can lead to sub-optimal models due to the variability of trial data from external factors such as wind and waves. This is addressed by optimizing and comparing hydrodynamic force coefficients per-trial to reveal outliers and trends.

Keywords: Ship maneuvering, MMG, Ship simulation, Sea trial

Corresponding author: Alex Milgram, Amilgram2020@my.fit.edu

09:00 a.m. ENG-03 **A review of nature-based solutions for coastal flood mitigation.** Kiara Meggitt-Goff [(1)] , S.C. Medeiros [(1)] , S. Parida [(1)] , M.V. Bilskie [(2)] . [(1)] Embry-Riddle Aeronautical University, Department of Civil Engineering, 1 Aerospace Blvd., Daytona Beach, FL 32119; [(2)] University of Georgia, School of Environmental, Civil, Agricultural, and Mechanical Engineering, 597 DW Brooks Drive, Athens, GA 30602. Coastal communities are experiencing rising sea levels and higher intensity storm events. Research is actively underway to develop and test innovative, cost-effective solutions to coastal flooding. Nature-Based Solutions (NBS) such as dunes, constructed wetlands (CWs), and living shorelines have become a viable alternative to traditional grey infrastructure such as dikes, seawalls, and breakwaters. While a relatively new topic in the literature, there have been several studies done to determine the effects NBS have on the coastline. This paper discusses the different types of NBS in use for for coastal flood mitigation, as well as several hybrid solutions that combine both NBS and grey infrastructure, such as concrete reef structures, living seawalls, geotubes, and Microbially Induced Catbonate Precipitation (MICP). This paper also categorizes NBS by their function in flood mitigation ecosystem services: barrier, buffer, energy dissipator, or shoreline stabilization. We found that most NBS are multifunctional and provide coastal flood mitigation along multiple dimensions, such as vegetated dunes acting both as a barrier and stabilization measure.

Keywords: nature-based solutions, dunes, constructed wetlands, living shorelines, hybrid solutions

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09:15 a.m. ENG-04 **Adaptive Reinforcement Learning based on Hyperdimensional Gradient Ascent Mechanism for Water Quality Predictions.** Ni-Bin Chang and Rohan Gudla. University of Central Florida, 4000 Central Florida Blvd. Orlando, FL. Water quality monitoring with distributed water quality probes in a water filtration system is crucial for public health and environmental protection in an urban region. But it oftentimes ended up with handing a big data for performance predictions of a water treatment process with complex dynamic patterns. AI-powered adaptive forecasting scheme is valuable for predicting water quality parameters with complex nonlinear and nonstationary nature influenced by environmental, physicochemical, and microbiological factors in a water filtration system. We designed an AI-powered Adaptive Gradient Ascent and Hierarchical Bidirectional Long Short Term Memory (BiLSTM) model to help automatic predictions of a water filtration system. The model simultaneously integrates multiple modular datasets, including water quality parameters, microbial species data, and weather data collected from a field-scale water filtration system. The policy gradient module in an adaptive reinforcement learning model was used as a pivotal tool to dynamically tune a set of hyperparameters in a multi-dimensional space for a better BiLSTM structure in the context of deep learning for more efficient predictions. This new machine learning scheme showcases transdisciplinary frontiers in complex adaptive system with innovative machine intelligence. It ultimately contributes to better sustainable design and dynamic control strategies of any engineering systems.

Keywords: Reinforcement learning, Adaptive deep learning, Pattern recognition, Machine intelligence, Big data analytics

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09:30 a.m. ENG-05 **Harmful Algal Bloom Remediation via Poly-aluminum Chloride Modified Biochar.** Robert Cheatham, Vince Lovko, Toufiq Reza. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. Water is one of the most valuable resources in the world, providing a life sustaining environment in which for plants, animals, and humans to thrive. In recent years, coastal waters have been threatened by harmful algal blooms (HABs), negatively impacting marine environments and devastating both the fish and tourism industries. This has led to the widespread search for a solution to remediate HAB from the environment. In this study, an environmentally friendly modified biochar

was made using lob-lolly pine (LP) and polyaluminum chloride (PAC) to remediate *Karenia*. Three distinct methods were used to create modified biochar: and pre-impregnation, post-impregnation, and physical mixing. Before being activated at 600 degrees Celsius for half an hour, raw biomass, LP, was impregnated with PAC at biomass-to-PAC ratios of 1:2, 1:5, and 1:10, to create the pre-impregnated samples. Biochar was impregnated with PAC at 1:2, 1:5, and 1:10 ratios to create post-impregnation. Biochar and PAC were physically combined at 1:2, 1:5, and 1:10 ratios to create physically mixed samples. To analyze the characteristics of the different modified biochars, a variety of characterizations were used. surface porosity quantification was done through the use of N2 adsorption-desorption, scanning electron microscopy for morphology appearance analysis, energy dispersive X-ray to observe the elemental surface mapping, X-ray powder diffraction for crystallinity analysis, proximate and ultimate analysis for detailed chemical composition analysis, and zeta potential to determine the surface ionization properties as well as the particle size distribution. It was observed in preliminary studies that the physical mixing was the most practical in remediating the *Karenia*, removing about 67% of the HAB from the solution.

Keywords: Biochar, *Karenia*, Coagulation, Harmful Algal Blooms

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09:45 a.m. ENG-06 **Hydrothermal co-liquefaction of sargassum and simulated food waste: Effects of temperature and mass fraction on biocrude.** Md Mostafizur Rahman and Toufiq Reza. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. The excessive growth of aquatic biomass poses significant environmental challenges in coastal areas. While these biomass can be utilized as a feedstock for biofuel production, its biochemical composition, characterized by low protein and lipid content, often results in lower biocrude yields. Co-liquefaction with feedstocks richer in proteins and lipids offers a promising strategy to enhance both the yield and quality of biocrude, addressing these limitations effectively. This study investigates the hydrothermal co-liquefaction (CoHTL) of Sargassum (SG), an aquatic biomass, with simulated food waste (SFW) within a temperature range of 300°C to 350°C and SFW mass percentage between 5 to 15 wt%. CoHTL with 5 wt% SFW resulted in the highest biocrude yield of ~45.6 wt% which is ~27.6 wt% and ~2.1 wt% higher compared to the individual yields of SG and SFW, respectively, indicating significant synergies. However, the synergistic effect was found to be less pronounced at higher temperature and higher SFW percentage. CoHTL process at 300°C also led to a ~9 wt% improvement in the carbon content of the biocrude compared to the individual HTL of both feedstocks. The higher heating value (HHV) of the biocrude

ranged between 34.4 and 37.3 MJ/kg in all CoHTL conditions which is significantly higher than the HHV of the raw feedstocks and similar to individual HTL. However, slightly reduced light oil fraction was observed in the biocrude after CoHTL at a particular temperature. The chemical composition of the biocrude primarily consisted of oxygenated compounds, including cyclic ketones and phenolic derivatives, which were similar to the individual HTL of SG, suggesting minimal alterations in compound distribution after CoHTL process.

Keywords: aquatic biomass, hydrothermal co-liquefaction, biocrude yield and quality, reaction conditions

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10:00 a.m. BREAK

10:15 a.m. ENG-07 **Biofuel Synthesis from Food Waste by Two-stage Hydrothermal Liquefaction.** S.M Nafiz Ahmed and Toufiq Reza. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. Globally, about 1.3 billion tons of food waste are generated annually. Converting this waste into biofuel helps manage it and offers a renewable alternative to scarce and harmful fossil fuels. Due to its high moisture content, food waste is unsuitable for thermochemical methods like pyrolysis and gasification. Hydrothermal liquefaction (HTL) mixes carbon-rich waste with water at high temperatures and pressures, breaking down large molecules into smaller hydrocarbons yielding a crude oil like liquid called biocrude. So, HTL is a suitable route for valorizing this massive reserve of biogenic waste. But one of the major obstacles in commercialization of HTL technology is the cost of manufacturing and operating a large-scale high pressure-high temperature reactor. An economically viable solution to this problem would be the reduction of feedstock volume for HTL by performing it in two stages. The objective of this study was to perform HTL of simulated food waste in two stages and compare the obtained products and their characteristics with the products from single stage HTL. The first stage HTL (HTL-1) was performed at three different temperatures, 160°C, 180°C and 200°C and the wet solids obtained from each temperature went through the second stage HTL (HTL-2), again at three different temperatures, 300°C, 325°C and 350°C. The highest biocrude yields (around 58 wt%) were obtained using HTL-1 at 160°C followed by HTL-2 at 350 °C. In the biocrude, diesel was the most abundant fraction, which was increased by about 10 wt % for the two-stage HTL biocrude compared to single stage biocrude. Amides were found to be the most abundant group of compounds in both the single stage and two-stage biocrude. So, the results prove that two-

stage HTL not only solves the reactor problem but also yields products with better distribution and quality.

Keywords: Waste valorization, Biofuel, Hydrothermal liquefaction, Two-stage HTL, Biocrude,

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10:30 a.m. ENG-08 **Hydrothermal Carbonization of Muck and its Application as a Soil Amendment.** Savannah Madairy, Robert Cheatham, Toufiq Reza. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. In recent years an accumulation of muck, a thick layer of organic matter created from things such as decaying vegetation and land runoff, has jeopardized the safety of the Florida lagoons by threatening to destroy necessary plants and entire ecosystems. The removal of muck has become not just a discussion but a necessity, thus leading to the dilemma of what to do with all of the recovered muck. Therefore, in this study, it was desired to create an environmentally friendly hydrochar from the muck to enhance the growing capacity of soil. This process began with muck being processed via the use of hydrothermal carbonization (HTC) at 180, 220, and 260ºC to create a hydrochar. The produced hydrochar was characterized by N2 adsorption-desorption for surface porosity quantification, scanning electron microscopy for morphology appearance analysis, X-ray powder diffraction for crystallinity analysis, proximate and ultimate analysis for detailed chemical composition analysis, and Fourier transform infrared to observe the functionality of the hydrochar. Zeta potential was conducted to observe the surface ion properties, and inductively coupled plasma spectroscopy was performed to observe the heavy metal and inorganic properties. Finally, a grow-out study was implemented to observe the soil amendment properties of the hydrochar in comparison to commercially available soil and locally sourced Florida soil. It was seen that the hydrochar performed considerably better than the locally sourced Florida soil, leading to the conclusion that the muck-derived hydrochar can be offered as a suitable soil amendment for promoting crop growth.

Keywords: Muck, Hydrochar, Soil Amendment

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10:45 a.m. ENG-09 **Solvothermal synthesis of carbon quantum dots from waste low-density polyethylene.** Brandon Naumann, Toufiq Reza, and Jaden Howell. Department of Chemistry and Chemical Engineering, Florida Institute of Technology, Melbourne, FL 32901, USA. The creation of novel fluorescent carbon quantum dots (CQDs) was synthesized from low-density polyethylene (LDPE) using a solvothermal method. CQDs are semiconducting nanoparticles ranging from 0.1-10 nm. Through proper size constraints, photoactive properties arise, transitioning LDPE from a well-known insulator into a semiconductor. This transformation allows for the CQDs to absorb and re-emit photonic energy at a lower energy wavelength; a concept known as quantum confinement. In this study, five different solvents—toluene, ethanol, xylene, tetrahydrofuran (THF), and water—reacted with LDPE in a stainless-steel reactor at 180°C for 8 hours. These solvents were then evaluated for their efficiency in converting LDPE into fluorescent CQDs. From the tested solvents, toluene represented the highest material conversion (100%) of particles within the 0.1-2.0 nm range, with a quantum yield (QY) of 55.3%. On the other hand, ethanol produced a QY of 69.8% with only an 11.07% material yield between 0.1-2 nm. These results demonstrate how both toluene and ethanol represent the most optimal results, indicating the significant influence solvent selection has on CQD synthesis. Through proper solvent selection, CQDs can be precisely synthesized for unique applications and precise tunability.

Keywords: Carbon quantum dots, polyethylene, LDPE

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11:00 a.m. ENG-10 **Extraction and Separation of Er(III), Nd(III), Sm(III), and Pr(III) from Water Samples Using Hydrophobic Deep Eutectic Solvents.** Laura Fronchetti Guidugli and Toufiq Reza. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. Rare earth elements (REEs) are increasingly recognized as essential for driving a green and sustainable economy due to their distinctive physicochemical properties and subtle differences in ionic radii. Their growing global demand, fueled by their use in advanced technologies like wind turbines, electric vehicles, and computers, highlights the importance of efficient extraction and recovery methods. This study evaluated the extraction of five rare earth elements—praseodymium (Pr), neodymium (Nd), europium (Eu), dysprosium (Dy), and erbium (Er)—from aqueous solutions using hydrophobic deep eutectic solvents (HDES). These HDES were formulated with stearic acid as the hydrogen bond donor (HBD) and menthol, thymol, tetraoctylammonium bromide, or trioctylphosphine oxide as the hydrogen bond acceptors (HBAs). The solvents' hydrophobicity, solid-liquid equilibria (SLE), σ-surface, σ-profile, and chemical bonding were analyzed using the Conductor-like

Screening Model for Real Solvents (COSMO-RS). Results indicated that the HDES predominantly consist of nonpolar regions, with smaller peaks corresponding to hydrogen bond donor and acceptor sites. Additionally, the solvents' density and viscosity were measured, revealing densities between 861 and 903 kg/m³ and viscosities ranging from 0.34 to 0.35 Pa·s. The study also explored the role of hydrophobicity in REE extraction performance and investigated the removal mechanisms for each solvent. The effect of the lanthanide contraction was examined as well. Among the HDES tested, the combination of TOPO and stearic acid (xTOPO = 0.59) demonstrated the highest extraction efficiency, achieving a removal rate of 72.23 ± 1.29% in a 0.01 M REE solution.

Keywords: critical minerals; deep eutectic solvents; liquid-liquid extraction

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11:15 a.m. ENG-11 **Thermochromic Materials for Outdoor Applications: Production, Degradation, Protection via Micro-Encapsulation.** Sesha Srinivasan, Sushant M. Nagare, Abdullatif Hakami, Prasanta K. Biswas, Elias K. Stefanakos. USPTO, Lakeland FL. Increasing global warming is one of the results of the Urban heat island effect. The reduction of green vegetation around the cities and increasing in the construction of buildings with the cutting of forests around city areas have vastly affected the thermal energy distribution around the urban cities. The Urban Heating Island Effect (UHI) may be shown by drawing an arc from one end of a city to the other and visually charting the temperature shift from the rural to the urban environment and back again. [1] Regional atmospheric conditions and geographic alignment are one of the most important factors that affect the UHI effect [2]. For example, consider nighttime, when the emissivity of pavement and heat emitted into the atmosphere are the most significant contributors to ambient temperature and decrease the temperature within an urban canyon.[2] Urban heat island has a major effect on the energy consumption of buildings. For example, with the increase in the heat in the environment, the energy load on the cooling device also increases. Thereby the cooling energy requirement of some urban cities will double with the increase in the temperature. UHI is also affected by wind velocity, sky view factors, humidity, and cloud cover. The combination of tall buildings and narrow layouts entrap more heat and reduces the airflow thereby increasing the temperature [3,4]. The researchers found many ways to overcome this problem of UHI by using cool pavement, green roofing, harnessing the heat in small thermocouples, increasing the use of phase change materials, and photovoltaic pavements to increase the supply of electric energy and thermochromic materials. [5]. Organic thermochromic materials are used in building paints and dyes as an energy-saving tool. Organic thermochromic material undergoes a reversible color change which depends on the

temperature change. The organic thermochromic material consists of 3 component systems: 1. Dye 2. Color developer 3. Solvent. [6] Karlessi, T., et al. carried out several experiments on thermochromic material concerning photodegradation. The organic thermochromic polymer easily gets degraded under sunlight [7]. The photooxidation process results in the photodegradation of the organic thermochromic polymer [8]. When the organic thermochromic polymer material (OTPM) is exposed to sunlight, the polymer chains break, resulting in altered chemical and mechanical properties. The photodegraded organic thermochromic losses the properties of reversibility. [9,10,11]. Karlessi, T., et al. further carried out a series of experiments to improve the thermochromic coating using the UV filter and optical filter. The study showed the different spectrums of light wavelength and effects on the organic thermochromic dye. The red dye was least degraded when a red optical filter was used. [12]. Hakami, Abdullatif, et al. showed the micro-encapsulation of Organic thermochromic material (OPTCM) with metal oxides such as Titanium dioxide (TiO2) and Silicon dioxide (SiO2). The metal oxide layer can be used to protect from UV rays of sunlight. [13,14]. This paper deals with the microencapsulation of different metal oxides and the study of photodegradation.

Keywords: Photodegradation, Microencapsulation, multiple encapsulations, Solar Irradiation, Thermochromic material

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11:30 a.m. ENG-12 **Influence of Zeolite on Hydrothermal Carbonization of Loblolly Pine and Its Role in Carbon Capture.** Swarna Saha and Toufiq Reza. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. The increasing release of CO_2 is a critical contributor to global warming and associated natural disasters, underscoring the urgent need for efficient carbon capture solutions. This study investigates the potential of zeolite-modified hydrochar composites (HZCs) derived from loblolly pine (LP) as environmentally friendly adsorbents for enhanced CO_2 sequestration. Loblolly pine was subjected to systematic hydrothermal carbonization (HTC) at temperatures ranging from 200°C to 260°C with zeolite loadings of 0 to 10 wt.%. The HZCs produced were subsequently superactivated using KOH (2:1 ratio) at 800°C to create ultraporous superactivated zeolite composites. The inclusion of zeolite during HTC significantly improved the carbonization process, yielding thermally stable composites with higher surface area and micropore volume compared to controls without zeolite. The 5% zeolite composites exhibited the best CO_2 capture performance, with adsorption capacities nearly doubling those of the controls, ranging from 12.194 to 13.244 mmol/g at 4 bar. The H260 T8 5%Z sample achieved the highest CO_2 uptake of 13.244 mmol/g, attributed to an optimal balance of surface area

(646.27 m^2/g) and micropore volume (0.412 cm^3/g). In contrast, 10% zeolite composites exhibited reduced CO_2 adsorption (5.83–9.93 mmol/g), likely due to excessive zeolite loading causing pore collapse and diminished surface area. Adsorption isotherm modeling confirmed that the Freundlich model provided the best fit, highlighting multilayer adsorption on heterogeneous surfaces. These findings underscore the catalytic role of zeolite in enhancing porosity and adsorption functionality, identifying 5% zeolite-modified composites as promising, cost-effective materials for industrial CO_2 sequestration, with significant implications for mitigating climate change.

Keywords: carbon capture, activated carbon, adsorption, zeolite

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11:45 a.m. ENG-13 **Sustainable Waste-to-Resource Conversion in Space: Process Modeling of Oxygen and Methane Production.** Russell Smith, Lexi Lueger, Annie Meier. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. The establishment of a lunar colony presents numerous challenges, particularly in managing the waste generated by its inhabitants. This study proposes an innovative process for converting astronaut waste into valuable gasses, specifically oxygen and methane, using Aspen Plus for process modeling. The waste stream comprises food packaging, adhered food, towels, hygiene products, urine, and feces. This study investigates the optimal waste-to-feces ratio and compares two waste processing methods: combustion and gasification. The system is designed to accommodate a colony of 100 astronauts, generating approximately 534 pounds of waste per day. In the proposed process, solid astronaut waste is fed into a reactor, where it undergoes either combustion or gasification to produce syngas and water. The resulting syngas is then passed through a Sabatier reactor along with carbon dioxide collected from astronaut exhalation, where it reacts with lunar regolith to produce additional methane and water. The water produced along with the excess water produced from the purification of astronaut urine is subsequently electrolyzed to produce oxygen and hydrogen. Hydrogen is recycled back into the Sabatier reactor for further methane production. The methane generated can be used for fuel, power generation, or heating, while the oxygen supports life support systems or can be reintroduced into the reactors. The byproducts of the process can also be repurposed as soil enhancers, contributing to the sustainability of the lunar colony. This study outlines a promising pathway for the efficient recycling of astronaut waste, converting it into essential resources and minimizing waste in a closed-loop ecosystem. These findings support the development of sustainable waste management systems for future lunar colonies and long-duration space missions.

Keywords: Sustainability, Syngas, Waste management, Aspen Plus, Process modeling

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ENG = ENGINEERING SCIENCES
SESSION B – BIOMEDICAL ENGINEERING

FRIDAY 08:30 a.m. – 11:30 a.m.
SESHA SRINIVASAN, AND MUHAMMAD ULLAH, FLORIDA POLY-TECHNIC UNIVERSITY**,** presiding

08:30 a.m. ENG-14 **Passive Brain Computer Interface with Wearable Textile-based Electroencephalography.** Alec Anzalone, Emily Acampora, Careesa Chang Liu, Sujoy Ghosh Hajra. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Passive brain computer interfaces (pBCI) combining electroencephalography (EEG) and machine learning (ML) have shown promise in monitoring spontaneous neural dynamics for evaluation of cognitive state, mental fatigue, attention, and performance monitoring. Recent advances in pBCI have largely relied upon the use of full head EEG systems with metal electrodes that have limited utility outside of laboratory settings (e.g. military, aviation). Advances in smart-textile technology overcome many of the challenges of traditional EEG. However, to our knowledge, no study has evaluated whether textile EEG systems can be used for pBCI applications. EEG data were recorded using both a dry-electrode and textile-based system under eyes open and eyes closed conditions. Data were denoised and signal power in canonical frequency bands were extracted. Statistical comparisons were used to assess the differences in frequency band across conditions. A linear support vector machine (lSVM) was used to differentiate between eyes open and eyes closed conditions. As expected, statistically significant EEG signal power changes, especially in the alpha band ($p=0.0227$), were observed between the two conditions, with negligible differences between systems ($p>0.05$). The lSVM successfully differentiated between eyes open and closed conditions (accuracy > 90%). Our results provide the first demonstration of using textile-based EEG for pBCI applications, particularly for cognitive state monitoring. The well-established differences in neurocognitive mechanism between eyes open and closed conditions, and resulting changes in EEG signal power, are well suited for

a preliminary demonstration of this application. These results provide the foundational evidence necessary for further development of textile-EEG based pBCI for more advanced cognitive state monitoring applications.

Keywords: Brain-Computer Interface, Electroencephalography, Textile-Based Electrode, Congnitive State Monitoring, Machine Learning

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08:45 a.m. ENG-15 **Characterizing novel measure of orientation brain function.** Jalen Houston, Sujoy Ghosh Hajra, Careesa Liu. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Orientation cognitive function is defined as our tuning with our current situation (e.g. knowledge of current day of the week). Orientation assessments are among the first tests undertaken in cases of suspected brain dysfunction, and our group has recently developed a novel electroencephalography (EEG)-based neural marker of this key function. As a new measure of brain function, it is vital to characterize the measurement characteristics of this brain function and this study focuses on the assessment of left/right hemisphere laterality. It was hypothesized that since the orientation function is right lateralized, EEG recordings with left vs. right reference locations would capture the orientation function differentially. As controls, EEG-based measures of auditory sensation (bilateral) and language processing (left lateralized) were also undertaken with the same left and right reference conditions. Preliminary results using data from 4 right-handed participants collected using a portable EEG with a short 5-minute test show high correlation coefficients (Rho>0.91) between left and right reference derived event-related potentials (ERPs)indexing auditory sensation; an expected result as this brain function is known to be bilateral. The same is not true of language and orientation function related ERPs, both were considerably lower and had a greater range of values. The correlation coefficients between left and right references for language ERPs lie between 0.35 and 0.6, while orientation ERPs lie between 0.34 and 0.86. Preliminary results corroborate the hypothesis that there is an identifiable difference in ERPs indexing lateralized brain functions when comparing left and right references. Furthermore, this study demonstrates the ability to capture objective, EEG-based measures of orientation and confirms the expected laterality of the measure.

Keywords: EEG, Orientation, Lateralization, Event Related Potentials

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09:00 a.m. ENG-16 **Advancing Neurochemical Analysis: Simultaneous Multi-Analyte Detection with a Four-Bore Electrochemical Sensor**. Navoda Udawaththa, Gene Koifman, Noel Manring, and Pavithra Pathirathna. Department of Chemistry and Chemical Engineering, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL, 32901, USA. The number of patients diagnosed with neurodegenerative diseases is rapidly increasing, despite the introduction of numerous pharmaceutical drugs. This disparity may result from the largely unexplored multifactorial origins of these diseases. While aging has been extensively studied, the impact of environmental factors, such as toxic metals, remains under-investigated. In this study, we developed a novel electrochemical sensing system capable of simultaneously detecting four analytes, two neurotransmitters and two toxic metal ions using carbon fiber microelectrodes and fast-scan cyclic voltammetry (FSCV). Our innovative four-bore system was engineered by embedding four single carbon fibers into a glass capillary with isolated bores, precisely trimming the fibers with a laser to maintain separation. The system was tested using artificial cerebrospinal fluid spiked with dopamine, serotonin, copper, and cadmium. While signals from the four-bore electrode system were less distinct than those from single-analyte solutions with single-bore electrodes, we successfully constructed calibration curves to determine the analytical parameters for each analyte. This four-bore FSCV-based system achieved a millisecond temporal resolution and demonstrated its capability to simultaneously detect multiple analytes in complex matrices. To the best of our knowledge, this is the first report of a multi-bore FSCV system for the simultaneous detection of neurotransmitters and toxic metal ions, showcasing its potential for in vivo monitoring applications.

Keywords: carbon fiber, fast-scan cyclic voltammetry, neurotransmitters, toxic metal

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09:15 a.m. ENG-17 **Test-retest reliability of blink-related brainwaves as a marker of cognitive processing.** Britney Ming, Miguel Hernandez-Viera, Sujoy Ghosh Hajra, Careesa Chang Liu. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Blink-related oscillations (BROs) are neurophysiological brainwave responses measured using electroencephalography (EEG), and correspond to information processing in the brain after a blink. Prior studies have reported BRO responses across multiple task states, demonstrating its potential as a biomarker of cognition. However, reliability with repeated testing is an important requirement for brain function assessment tools, which has not been demonstrated for BRO

responses. In this study, we conducted the first investigation of test-retest reliability and stability of BRO responses using publicly available EEG data from 28 healthy adults (age 26.1 ± 3.5, 17 female) during the performance of an N-back working memory task. The task contained 3 levels of difficulty, with 3 repeated runs for each level. We extracted BRO responses from the Pz and POz electrodes corresponding to the precuneus brain region known to be a generator of BRO responses. Our results showed that BRO responses are present across all task difficulty levels and runs, with characteristic features consistent with prior literature. BRO responses in both time and frequency domains also showed significant high intraclass correlation between repeated runs (p<0.001), indicating that response morphology was also highly consistent across runs. Additionally, individual-level BRO response features in the time domain exhibited significant high correlations (p<0.05), suggesting measurement stability across repeated runs at the at the individual level. These results suggest that BRO responses are consistent and reliable with repeated testing and provide important new evidence supporting the use of blink-related brainwaves as a potential biomarker for brain function assessments.

Keywords: Electroencephalography, Test-retest, reliability, BROs, N-back

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09:30 a.m. ENG-18 **Blinking and sleep: Detecting brain changes following sleep deprivation using blink-related brainwaves.** Quinn Peters, Emily Acampora, Sujoy Ghosh Hajra, Careesa Chang Liu. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Sleep is an important part of maintaining overall health, and sleep deprivation is known to impair many aspects of cognitive function such as attention and memory. Assessing the impact of sleep on brain function often utilizes tests that examine performance on various cognitive tasks (e.g. reaction time and accuracy), but these tests do not provide direct information about brain function. Blink-related oscillations (BROs) are brainwave responses measured using electroencephalography (EEG), which correspond to sensory and cognitive processes that occur in the brain following blinking. BRO responses have been shown to detect a variety of conditions such as concussion and aging, but their ability to detect sleep deprivation has not yet been examined. This study investigated BRO effects under sleep deprivation compared to normal sleep in 71 healthy adults (ages 17-23, 34 female) using publicly available EEG data. The dataset contains 5 minutes of eyes-open resting state EEG, collected using a within-subject design both before and after 24-30 hours of sleep deprivation. Results showed that frequency-domain BRO responses exhibited increased spectral power in the

beta/gamma band during the first 300 ms after blink for sleep deprivation compared to normal sleep (p<0.05), and the effects were observed bilaterally across the frontal and parietal regions. This early beta/gamma effect corresponds to visual sensory processing as the brain evaluates new visual information that appears after the eyes re-open following a blink, and the results suggest that sleep deprivation leads to increased neural effort as the brain processes blink-related visual information compared to normal sleep. These findings provide importance initial evidence towards the ability of blink-related brainwaves to detect brain changes due to sleep deprivation.

Keywords: Sleep deprivation, EEG, blinking, blink-related oscillations (BROs)

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09:45 a.m. ENG-19 **Blink-related brainwaves as a marker of cognition during verbal fluency**. Lexine C. Sibert-Jolissaint, Sujoy Ghosh Hajra, and Careesa Chang Liu. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Blink-related oscillations (BROs) are neurophysiological responses observed in electroencephalography (EEG) following spontaneous blinking, reflecting the brain processing of new visual information appearing after a blink. Prior research has demonstrated BRO responses across various cognitive states, such as resting, cognitive loading, and sensory stimulation, highlighting their potential as a non-invasive biomarker of brain function. We conducted the first investigation of BRO responses during a verbal fluency (VF) task, which is a complex, dynamic task state combining memory, visual perception, executive function, and language processing. Using publicly available EEG data from 22 healthy adults, we measured BRO responses over the left anterior frontal region corresponding to Broca's area for language production, as well as the corresponding location on the right hemisphere. Results showed that BRO responses are present across both resting and VF tasks, and the time-domain peak amplitudes and latencies are correlated at the individual level between the rest and VF conditions (p<0.05). These results indicate that BRO responses are present under VF conditions, and the time-domain response features do not differ between VF and resting. The findings suggest that blink-related brainwaves can be detected under dynamic, complex task conditions like VF, and that despite its complexity and cognitive demand on the brain, the VF task did not significantly modulate time-domain BRO responses. The findings of this study support the potential utility of BRO responses as a reliable marker of cognition that can be applicable across a variety of task states.

Keywords: blinking, blink-related oscillations (BROs), verbal fluency, brain function assessment

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10:00 a.m. BREAK

10:15 a.m. ENG-20 **Insights into the Aging Brain: Using Blink-Related Brainwaves to Better Predict Brain Health in Aging.** Madhu Preethi Kakarla Venkata, Sujoy Ghosh Hajra, Careesa Chang Liu. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Alzheimer's disease (AD) is an aging-related disorder in which brain degeneration begins long before the onset of clinical symptoms such as memory loss. Early detection is crucial to effective clinical management, as this enables timely interventions that could delay disease progression. However, existing tools, such as the Mini-Mental State Exam (MMSE), lack sensitivity in detecting early brain pathology in AD. Blink-related oscillations (BRO) are newly discovered brainwave responses associated with spontaneous blinking and engage the precuneus brain regions known to be among the earliest to be impacted by AD pathology. This study investigated individual-level BRO effects in aging in order to determine the ability of BRO responses to predict brain changes in healthy aging. Utilizing data from the Cambridge Centre for Ageing and Neuroscience (Cam-CAN) repository (ages 18-88, N=457, 1:1 gender ratio), a hierarchical linear regression model was employed to predict individual age using information from a variety of factors spanning demographic (e.g., education), biological (e.g., body mass index), behavioral (e.g., standard neuropsychological testing), and neurophysiological domains (e.g., BRO). Results showed that incorporating BRO measurements improved model performance in predicting individual age compared to other factors alone (R = 0.804, p < 0.001). These results suggest that brainwave responses associated with blinking can provide important information about brain health in aging, underscoring the potential utility of BRO responses as indicators of brain changes in aging.

Keywords: Alzheimer's disease, blink-related oscillations, brain health

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10:30 a.m. ENG-21 **Evaluating and Validating Computational Fluid Dynamics (CFD) - Predicted Flow Heterogeneity using Angiographic Parameter.** R. E. White*, E. Smith*, G. Mras*, E. Vanderbilt, S.V. Setlur Nagesh, C. Ionita, S. Rudin, V.K. Chivukula. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901.
Cerebral aneurysms involve a localized dilation of a blood vessel in the brain. Endovascular therapy is a form of treatment for cerebral aneurysms, which involves diverting the blood flow away from the aneurysm. Neurointerventionalists use limited quantitative hemodynamic data during treatment as they only have access to qualitative angiographic image sequences. Our goal was to correlate valuable quantitative hemodynamic data to angiographic imaging markers in a patient-specific approach. Computational fluid dynamics (CFD) was used to generate simulated angiograms (SA) on seven patients, from which clinically-relevant angiographic imaging markers were extracted. Because CFD is infeasible in the clinic due to computational requirements, it is essential for these results to be compared to patient-specific experimental runs. 3D-printed aneurysm phantoms were injected with blood-mimicking fluid and contrast to obtain the experimental angiographic images. The patient-specific aneurysm phantom imaging was done with a CdTe photon-counting detector (Aries, Varex). 1000 frames per second High-Speed Angiography (HSA) was used for high-temporal visualization and evaluation of the blood flow patterns and velocity distributions. The SA and experimental runs were analyzed using Time density curves (TDC) and Angiographic Parameter Imaging (API) to quantify and compare simulated and experimental angiography by characterizing the nature of hemodynamic patterns. These methods allow us to assess heterogeneity in blood flow patterns through cerebral aneurysms. We compared seven patient-specific aneurysms and their correlating APIs. Overall, the SA and experimental angiographic indicators were similar for all cases. We found the hemodynamic parameters were similar between the virtual and experimental runs. In both experimental and simulated cases, we found that the contrast agent resides longer in aneurysm domes with larger aneurysms compared to the smaller aneurysms, indicating flow stagnation and recirculation. We found the time for the contrast agent to fill the aneurysms was between 0.25 and 1.75 seconds, depending on the aneurysm size and morphology.

Keywords: Computational Fluid Dynamics, Blood flow, Cerebral Aneurysms, Angiography, Medical Imaging

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10:45 a.m. ENG-22 **Evaluating the Quality of fNIRS Data and Analyzing Hemodynamic Response Function in the Motor Cortex Using Short-Separation Channels.** Vinh Huynh Mai Tran, Jalen Houston, Alex Willams, Careesa Chang Liu, Sujoy Ghosh Hajra. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Functional near-infrared spectroscopy (fNIRS) is a non-invasive technique in neuroimaging used to measure the activity of the brain by monitoring the changes in deoxygenated hemoglobin (HbR) and oxygenated hemoglobin (HbO). A challenge in utilizing fNIRS for brain function assessment is its susceptibility to motion, peripheral physiology and other artefactual sources of data contamination. A common approach to resolving the artefactual sources is the use of short-separation channels (SSC), and this study evaluates the impact of SSCs on data quality. fNIRS data from the motor cortex were collected using 8 source-detector sets, along with either 2-channels of SSC or 8-channels of SSC. Participants completed a finger tapping task with 30-second alternating blocks of tapping and rest for a total duration of 270-seconds. The data with 8 SSC channels demonstrates the expected pattern of task-related elevations in hemodynamic response function (HRF) reflective of increased oxygen demand in the motor cortex. Correlational analysis between the HRF and SSC signals demonstrated a non-significant and low relationship ($R2= -0.0544$, $p=0.4178$). In contrast, the data with 2 SSC channels failed to capture the expected pattern of task-related changes in HRF and there was a significant and moderate correlation between HRF and SSC ($R2=-0.3564$, $p=4.1e-08$) indicating contamination of the fNIRS signal. Together, these results highlight the role of SSCs in enhancing the quality of fNIRS data by removing superficial noises, and suggests that increased SSC channels enable better characterization and removal of artefactual contamination allowing for good quality fNIRS data to be collected.

Keywords: fNIRS, HRF, Motor Cortex

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11:00 a.m. ENG-23 **Optimizing Video Length for Accurate Heart Rate Estimation Using Imaging Photoplesmography.** Sujoy Ghosh Hajra, Ava Dorow, Careesa Liu. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Imaging Photoplesmography (iPPG) enables the extraction of color signals from video to estimate vital signs such as heart rate (HR). For healthcare applications, accuracy and near-real time assessments are crucial for providing quick and reliable vital sign measurements. Typical iPPG assessments rely upon long video captures followed by intensive offline and manual processing steps. This study aims to create an

automated processing capable of near real-time analysis and evaluate performance on short-duration videos. This study analyzed the UBFC dataset using custom code for automated processing from signal extraction to calculated HR and compared the iPPG-derived HR to the ground truth using varying video lengths: 15 seconds, 30 seconds, 45 seconds, and the full video (averaging 65 seconds per video). The results revealed accuracy did not directly correlate with video length, though increased data generally improved alignment with ground truth. The accuracy rates for 15 seconds, 30 seconds, 45 seconds, and full video were 52.29%, 52.12%, 72.57%, and 87.09% respectively. Similarly, the mean absolute error (MAE) decreased as video length increased, with average MAE values of 9.33, 5.87, 4.76, and 1.69 for 15 seconds, 30 seconds, 45 seconds, and full-length video, respectively. The processing times averaged for the 15 seconds, 30 seconds, 45 seconds, and full video were 0.77 minutes, 1.35 minutes, 1.94 minutes, and 2.76 minutes, respectively. These findings suggest longer video segments provide greater accuracy but require more processing time. Future work will focus on optimizing the pipeline to improve processing efficiency while maintaining the ability to process the full 60 seconds of data.

Keywords: Imaging Photoplesmography, Real time Vital signs, Contactless sensing

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11:15 a.m. ENG-24 **Improving the Quality of ECG Signals Using Noise Cancellation Techniques.** Hasnain Ahamad Ziad, Muhammad Sana Ullah. Florida Polytechnic University, Lakeland, FL. Electrocardiogram (ECG) signals play a pivotal role in cardiovascular diagnostics by providing a detailed representation of the heart's electrical activity. These signals, typically characterized by a low voltage range of 0.0001 to 0.003 volts and a frequency spectrum of 0.05 to 100 Hz, are often affected by various noise sources, such as baseline wander, powerline interference, electromyographic (EMG) noise, and electrode motion artifacts. The presence of these interferences poses significant challenges to accurate ECG interpretation. Addressing these issues is critical for ensuring high-quality signal acquisition and interpretation in clinical applications. This study presents a systematic approach to noise mitigation in ECG signals, focusing on adaptive sequential filtering. Furthermore, we analyze existing filtering methods, such as frequency domain filtering, wavelet transformation, and adaptive filtering comparatively. While these methods have shown promise, they often fail to meet modern electrocardiographic standards in terms of noise resilience and precise identification of signal regions. By contrast, the adaptive sequential filtering technique

aligns with these standards, offering a robust and simple solution for noise suppression. Our proposed techniques involve a combination of high-pass filtering for baseline wander removal, band-stop filtering to eliminate powerline interference, and additional adaptive strategies for handling residual noise artifacts. By tailoring the filtering processes to the specific characteristics of ECG signals, these methods aim to improve signal fidelity while minimizing the loss of critical information. Simulation results confirm the efficacy of the proposed techniques, showcasing their ability to attenuate noise while preserving the critical morphological features of ECG signals which illustrate the improvement in signal quality achieved through the proposed method.

Keywords: Electrocardiogram (ECG), interference, cardiovascular diagnostics

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ENG Posters – 3:00 p.m.-6:00 p.m. Friday

ENG-P01 **Developing the R/V Melville scale model as a research and learning tool for open water deployment.** J. Clendenin, C. Bogar, A. Milgram, and J. T. Hunsucker. Florida Institute of Technology, 150 W University Blvd, Melbourne, FL, 32901. A self-propelled 1/23rd scale model of the R/V Melville is on loan to Florida Tech from the Naval Surface Warfare Center Carderock Division. The model is being used as a research and educational tool. Deployments occur in the open waters of the Indian River Lagoon and Crane Creek. The development of the model includes 1) instrumentation installation, 2) inclining experiments, 3) ballastings, 4) calm-water powering and maneuvering, and 5) seakeeping tests. A GNSS receiver with an integrated inertial navigation system was installed to measure the position and movement of the model. Real-time data from the rudders, propellers, and INS are transmitted using radio communication. Inclining experiments were performed to determine initial stability properties such as center of gravity and metacentric height. The model was ballasted to match the full-scale properties of the R/V Melville using Froude scaling. ITTC recommended guidelines were followed for calm-water powering and maneuvering tests where turning circle and spiral tests were performed. Seakeeping tests are planned to measure the ship's response to real-world waves and periods in the Indian River Lagoon. As a result of the experiments, the sea-keeping of the model with various payloads can be simulated for future research deployments. The model will serve as a learning and research tool for the Department of Ocean Engineering and Marine Sciences. Real-time data allows students to perform hands-on tests and see a

ship's response, both visually and mathematically. Future development for an autopilot using live navigation and inertial data will allow the vessel to serve as a fully unmanned surface vessel for future research deployments.

Keywords: Unmanned, Research, Scale-model, Seakeeping, Ship

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ENG-P02 **Ship speed through the water uncertainty analysis using oceanographic model data.** Corbin Freeland and Travis Hunsucker. Florida Institute of Technology 150 West University Boulevard Melbourne, Florida 32901. This study investigates the uncertainty in ship speed through the water (STW) by comparing STW measured by the ship with model calculated STW. Model calculated values are derived from ship performance data acquired from three passenger vessels, each with four years of data, and ocean current model data. Ocean current data were extracted from the Hybrid Coordinate Ocean Model (HYCOM), which provide high-resolution u and v current components. Ship speed over ground (SOG) u and v components were calculated and combined with HYCOM currents to produce a STW Calculated Model. The modeled STW was then compared to ship measured STW. Uncertainty sources include potential measuring errors in reading current components perpendicular to the ship's direction, biofouling affecting the ship measured STW accuracy, and random variability in STW calculation. This work explores the accuracy of shipboard STW measurements and aims to increase attention on the performance analysis of ships during their voyage.

Keywords: Ship speed, STW uncertainty, HYCOM, Ocean currents

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ENG-P03 **Assessing blink-related brainwaves using portable EEG system.** Isabela Perdomo, Alec Anzalone, Conner Weaver, Sujoy Ghosh Hajra, Careesa Chang Liu. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Blink-related oscillations (BROs) are brainwave responses occurring after blinking, and recent research has demonstrated that these responses can serve as a valuable marker of brain function and awareness. While previous studies have validated BRO detection using high-density electroencephalography (EEG) systems that are restricted to research lab settings, the clinical utility of this marker would be significantly

enhanced if the responses were also measurable using portable, low-density EEG systems. This pilot study investigates the feasibility of capturing and analyzing BROs using an 8-channel LiveAmp system (Brain Products) with Lab Streaming Layer (LSL) integration for stimulus synchronization. The investigation builds upon established findings of observable differences in both resting state and auditory oddball paradigms. Methods: We employ a portable 8-channel EEG system to record neural activity, with LSL implementation ensuring alignment of stimuli and neural responses. Results: Based on existing literature and our technical framework, we anticipate that our low-density configuration will effectively capture BRO responses. Conclusion: This study provides initial validation for the use of an 8-channel portable EEG system in BRO detection, suggesting the potential for more accessible and mobile brain function assessment tools. These findings contribute to the ongoing development of practical, bedside-compatible neurological assessment methods.

Keywords: electroencephalography, EEG

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ENG-P04 **Perfusion Based System Incorporating Bioprinted Vascularized Tissue for Drug Delivery Applications.** Isabela Perdomo, Brian Billings, Kunal Mitra. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Recent advancements in 3D cell culture models offer significant benefits over 2D models, such as improved cell morphology, proliferation, drug response, and gene expression. 3D bioprinting enhances these models with greater reproducibility and efficiency, enabling the creation of human tissues in microfluidic chips as alternatives to animal testing. These devices incorporate structural complexity, fluid dynamics, and mechanical stimulation, addressing the limitations of animal models, where over 90% of drugs fail in human trials due to physiological differences. This integration advances pharmaceutical research in drug development, delivery, and toxicology testing while enabling customizable medical applications. In this study, a protocol was developed to print perfusable vascular channels using sacrificial ink (Pluronic F127), with the intent of cellularizing the constructs with endothelial cells. Channels with a diameter of 400 μm were printed at 23.5°C under 40-90 kPa pressures and removed by cooling to 4°C to liquefy the ink for flushing. The inner surfaces were coated with fibrinogen to enhance cell attachment, and preparations for endothelial cell seeding, such as with HUVECs, were carried out to simulate vascular structures. Continuous media perfusion is to be maintained using a sterile, closed-loop system that has been designed comprising a VasKit device, media reservoir, and peristaltic pump to support long-term culture and vascular function. Cell viability and maturation are to be assessed using the LIVE/DEAD® Viability

assay. This bioprinting approach successfully created perfusable channels with controlled structural and microfluidic properties. Current work focuses on optimizing cell viability and maturation under perfusion to establish robust vascular tissue models. These engineered models have significant applications in biomedical engineering, offering promising tools for drug testing, disease modeling, and personalized medicine. This work highlights the potential of 3D bioprinting in advancing tissue engineering and developing perfusable models for biomedical engineering applications.

Keywords: bioprinting, vascular channels, cellular response

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ENG-P05 **Impact of Microgravity Environment on Bioprinted Tissue Constructs.** Sampada Koirala, Isabela Perdomo, Caroline Moore, Dylan Welch, Roshan Vijayakumar, Kunal Mitra. Dept. of Biomedical Engineering and Science, Florida Institute of Technology, 150 W Univ. Blvd. Melbourne, FL 32901. Microgravity significantly impacts cellular functions and physiological systems, leading to oxidative stress and cellular dysfunction. This study investigated the effects of simulated microgravity on bioprinted vascular tissue constructs made with human skin fibroblast cells encapsulated in GelMA-based bioink. A CellInk BioX6 3D Bioprinter was used to fabricate the constructs in a rectilinear grid pattern with perfusable channels. A CellInk LumenX 3D Bioprinter was used to fabricate the constructs with perfusable channels following a serpentine pattern. The bioprinting parameters were optimized to obtain tissue constructs with high structural integrity and cellular viability. Cellular viability remained high despite some cell death, likely caused by shear stress during bioprinting or limited nutrient availability while maintaining the samples in a bioreactor. The samples were stained with DHE solution to characterize the oxidative stress and imaged using a confocal microscope. Preliminary data revealed that oxidative stress, quantified by ROS levels, increased significantly after 48 hours of simulated microgravity exposure via an RPM. While cells were initially able to adapt to microgravity, prolonged exposure disrupted oxidative balance, impairing mitochondrial function, protein folding, and DNA repair. The study is being expanded to use bioreactors instead of slide flasks for housing the constructs, allowing for better control over culture conditions while reducing overall media consumption. These findings highlight the need for targeted strategies, such as incorporating antioxidants or mitochondria into the bioinks and dynamic culture systems, to mitigate the effects of microgravity-induced oxidative stress.

Keywords: Microgravity, 3D Bioprinting, Oxidative Stress, Cellular Viability

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ENG-P06 **Enhanced Pellet Durability through the Synergistic Blending of Hydrochar with Corn Stover.** Russell Smith, Jordan Klinger, Nepu Saha. Florida Institute of Technology 150 West University Boulevard Melbourne, Florida 32901. Corn stover has considerable potential to contribute to the bioenergy portfolio with proper feedstock handling and preprocessing. Air classification (AC) is an economical preprocessing technology adapted from its traditional applications in agricultural processing and mining industries. This technology separates corn stover into two distinct fractions: a low ash fraction (LAF), which is deemed suitable as a feedstock for biorefinery operations, and a high ash fraction (HAF). One of the critical challenges biorefineries are encountering is transportation/feeding to the reactor, primarily due to the inherently low bulk density of herbaceous biomass types such as corn stover. Densification practices, such as pelletization, are a potential solution that turns low-density biomass feedstocks into high-density pellets. Nonetheless, the resulting pellet quality may not consistently meet the requisite standards. In this study, the HAF stream was further upgraded using an advanced thermochemical preprocessing technique, hydrothermal carbonization (HTC), to synthesize hydrochar (HC). This HC was then employed as a binder during the pelletization process. The results show that the integration of HAF-derived HC with LAF not only enhances the durability of the resultant pellets but also reduces the energy requirements and improves throughput during the pelletization process.

Keywords: Preprocessing, Densification, Biorefinery, Bioenergy, Pelletization

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ENV = ENVIRONMENTAL CHEMISTRY AND CHEMICAL SCIENCES

FRIDAY 9:30 a.m.- 11:45 a.m.
JEROME WILLIAMS, ST. LEO UNIVERSITY, presiding

09:30 a.m. ENV-01 **Florida Resident Water Survey: Engagement, Perceptions, and Knowledge** Derek S. Reiners and Stefan Carpenter. Florida Gulf

Coast University. This article reports the results of a 2023 survey of Florida residents regarding water and water management issues, including recreational and utilitarian water use, assessments and concerns regarding various water entities, knowledge of water management concepts, and involvement in water management activities. The survey included a total of 54 measures from a combination of compound (4) and single-answer (19) questions. Overall, the survey found that Florida's water resources are held in high regard, and there is strong interest in protecting them across key demographic categories, including political ideology. This level of public attention and support may represent an opportunity for Florida's legislators and resources managers to respond assertively. Notable highlights include the following. First, females and more liberal and/or progressive respondents were consistently (but only slightly – usually not significant statistically) more engaged and/or concerned with water issues than their male and conservative counterparts. Second, the geographic location of residents did not appear to matter, as there were almost no statistical differences between the responses of North Florida and South Florida residents. Third, climate change, which appeared only once, was the most divisive concept in the survey and saw significant splits along the predictable categories, such as gender and political ideology.

Keywords: water management, Florida

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09:45 a.m. ENV-02 **Metabolomics Studies on the Eastern Oysters (*Crassostrea virginica*) exposure to the *Vibrio* toxin, cholera.** Saeedeh Babaee and Bo Wang. 150 W University Blvd, Melbourne, Florida 32901. Anthropogenic changes to the water column, sediments, and seagrass beds may increase the prevalence of vibriosis in humans caused by infection with *Vibrio vulnficus or V. parahaemolyticus*, which can cause severe cases, including permanent disability or death. The severe condition has become one of the emerging priority problems in coastal areas worldwide. Oysters are filter-feeders that bioaccumulate high levels of bacteria including *Vibrio*. However, the vibrio and its toxin influence on oysters are rarely studied. Metabolomics is a cutting-edge technology that can systematically study the metabolic level changes of animals in response to environmental exposures. In this study, NMR metabolomics was applied to investigate the metabolic level response of Eastern Oysters to Cholera, a type of toxin extracted from *Vibrio*. Eastern oysters were exposed to three relatively low-level concentrations of cholera toxin (1, 10, and 20 ng/ml) for three days. Both Liquor and tissues from

the gill and mantle were analyzed to study the early-stage responses. Our results indicated that Eastern Oysters have potential metabolic level perturbation to Cholera in the gill and mantle tissue while the liquor metabolites changes are relatively low. Our metabolic profiling investigation showed a pioneering study on the Oyster response to *Vibrio* and will contribute to the future prediction of *Vibrio's* impact on Oysters in Florida.

Keywords: Metabolomics, Oysters, Cholera, *Vibrio* toxin, Data Analysis

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10:00 a.m. ENV-03 **Characterization of the F1-F3 Generations of Hemp Plants Grown with Submerged Roots.** Kate Calvin and Shane Jinx. South Florida State College, 600 West College Drive, Avon Park, FL 33825. Florida is the third most populous state in the country and development required to support the population is taking a toll on the state's freshwater lakes and waterways. HABs, or harmful algal blooms, have become a statewide health concern. According to the Florida DEP Algal Bloom Dashboard, the state currently has 4,421 algal bloom sites statewide. Large amounts of nitrogen and phosphorus from fertilizer, animal feed, phosphate mine events and human waste are major contributors to this decline. Industrial hemp (*Cannabis sativa*) has been shown to remove pollutants such as heavy metals and radioactive chemicals from polluted soil and this project is testing the effectiveness of industrial hemp in removing nitrogen and phosphorus from polluted water. Using established EPA methods for segmented flow analysis of Total Kjeldahl Nitrogen (TKN), and Total Kjeldahl Phosphorus (TKP) in the water, we have previously shown that over a period of 36 days and 12 samplings, five plant setups with submerged roots removed a total of 49.4% of the phosphorus provided and 53.0% of the nitrogen provided. Net contributions by the plants alone accounted for 62% of the TKN removed and 73% of the TKP removed. Clones performed even better. We allowed the plants to reproduce by changing the light from 19 hours to 12 hours per day, while still providing vegetative growth nutrients. In this study, we planted five different batches of seeds spanning the F1-F3 generations and characterized their growth. Our data regarding vertical growth rates, morphology and nutrient uptake are presented here.

Keywords: Industrial hemp, phytoremediation, *Cannabis sativa*, water quality, F1-F3 characterization

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10:15 a.m. ENV-04 **Enhancing Carbon Sequestration in Soil: Comparative Analysis of Hydrochar and Biochar from Dairy Manure.** Bilash Devnath, M. Toufiq Reza. Florida Institute of Technology, Melbourne, FL. According to NASA's Goddard Institute for Space Studies, the average global temperature on Earth has increased by at least 1.1°C since 1880, with most of this warming occurring since 1975. Reducing atmospheric carbon through soil carbon sequestration in croplands through soil amendments like Hydrochar and Biochar can solve this problem. In this study, hydrochar and biochar were produced from dairy manure through hydrothermal carbonization (HTC) at three different temperatures (180,220,260°C) and pyrolysis at three different temperatures (400, 600, and 800°C), respectively. Properties such as carbon content, ultimate and proximate analysis, H/C ratio, O/C ratio, and the R50 recalcitrance index were determined to evaluate and compare the stability and carbon sequestration potential of hydrochar and biochar. The yield of hydrochar decreased from 46.34% to 36.75% as the HTC temperature increased from 180°C to 260°C, while the biochar yield ranged from 56.88% at 400°C to 45.56% at 800°C. The hydrogen to carbon (H/C) and oxygen to carbon (O/C) ratios declined with increasing temperature, indicating higher aromaticity and stability with increasing temperature. The FTIR analysis further supported these findings, showing a shift in functional groups toward more aromatic structures. The R50 recalcitrance index, used to asses long-term carbon stability, increased with temperature, reaching 0.51 for biochar at 800°C and 0.43 for hydrochar at 260°C. The carbon sequestration potential was higher in biochar (highest 32.79% at 400°C) than in hydrochar (highest 22.11% at 180°C), suggesting biochar's better potential for long-term carbon storage than hydrochar. In conclusion, hydrochar retains more yield, but biochar at higher pyrolysis temperatures offers more stability and lesser carbon sequestration potential. Pyrolysis of dairy manure at low temperatures would be a more effective strategy for mitigating atmospheric carbon and improving soil carbon storage.

Keywords: Hydrochar, Biochar, Carbon sequestration

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10:30 a.m. **BREAK**

10:45 a.m. ENV-05 **Temperature-activated acidity for regeneration of a carbon dioxide sorbent.** Melyse Laud [(1)] , Osamah Alghazwat[(2)] , and Yi Liao[(1)]

. [(1)] Department of Chemistry and Chemical Engineering, Florida Institute of Technology, Melbourne, FL 32901, USA; [(2)] School of Arts and Sciences, American International University, Saad Al Abdullah, East of Naseem Block 3, Aljahra, Kuwait. This research was supported by the US Dept. of Energy, Office of Science, Office of Basic Energy Sciences, Chemical Sciences, Geosciences, and Biosciences Division, Separation Sciences. under Contract No. AC05-00OR22725. The most energy-consuming process of carbon dioxide capture is thermal regeneration. Our research introduces a novel approach for inducing the thermal release of carbon dioxide from a sorbent using an additive with a very low acidity at room temperature, but a significantly enhanced acidity at elevated temperature. Our sample containing an aqueous mixture of morpholine, and m-cresol revealed that the weakly acidic m-cresol did not affect the amine's reactivity in the formation of carbamate. At ~ 70 °C the acidity increased based on the Van't Hoff's equation. The increase in the sample's acidity promoted carbon dioxide release higher than the release from the control aqueous solution merely containing morpholine. This practical and economical approach of using m-cresol or its derivatives could be advantageous in the future of carbon dioxide -capturing technology.

Keywords: Carbon dioxide capture; sorbent regeneration; thermal acidity; Van't Hoff's equation

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11:00 a.m. ENV-06 **Smart Electrochemical Detection: Integrating AI with ITIES-Based Sensors for Metal Ion Analysis.** M.M.N. Ahmed[(1)] , P. Ganeriwala[(2)] , A. Savvidou[(1)] , N. Breen[(1)] , P. Pathirathna[(1)] , S. Bhattacharyya[(2)] . [(1)] Department of Chemistry and Chemical Engineering, [(2)] Department of Electrical Engineering and Computer Science, Florida Institute of Technology, Melbourne, FL 32901. This study presents a novel approach integrating artificial intelligence (AI) with ion transfer between two immiscible electrolyte systems (ITIES) for AI-enhanced metal ion detection. While ITIES offers advantages over conventional electrochemical techniques through simple ion transfer mechanisms, the interpretation of cyclic voltammograms (CVs) remains challenging when differentiating signals with similar half wave potentials, especially for non-experts. We developed an AI-based method combining Convolutional Neural Networks (CNNs) and Artificial Neural Networks (ANNs) to address this limitation. The CNN model uses a two-step approach to successfully differentiate between Cd(II) and Cu(II) responses with 99.15% accuracy, while also identifying different types of faulty measurements with over 95% accuracy. The ANN component achieves precise concentration predictions with mean absolute errors of 0.0158 and 0.0127 for Cd(II) and Cu(II), respectively. This integrated approach not only automates data

analysis but also enhances the accessibility of ITIES-based sensors for routine environmental monitoring by making it more user-friendly. The system demonstrates particular effectiveness in distinguishing between metal ions with similar half-wave potentials, offering a more reliable alternative to traditional analytical methods. This work represents the first implementation of AI for analyzing ITIES-based sensor responses, providing a foundation for developing more user-friendly electrochemical detection systems.

Keywords: AI enhanced sensors, Metal ion detection, ITIES- electrochemical sensors

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11:15 a.m. ENV-07 **Ultrafast Electrochemical Detection of Hexavalent Chromium Using Carbon Fiber Microelectrode.** Pavithra Pathirathna and Gene Koifman. Department of Chemistry and Chemical Engineering, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL, 32901, USA. Detection of chromium ions in the environment and biological samples is critical not only on Earth but also for future Mars missions. Early studies suggest that chromium exists on the Martian surface, posing significant health risks to astronauts. Hexavalent chromium (Cr6+) is significantly more toxic than its trivalent form (Cr3+), making selective detection of Cr6+ essential. Compared to other non-electrochemical detection methods, electrochemical techniques are superior for detecting toxic metal ions due to their ability to preserve speciation through non-invasive sample preparation and detection protocols. In this study, we developed a novel, ultrafast electrochemical technique for detecting Cr6+ using carbon fiber microelectrodes and fast-scan cyclic voltammetry in complex matrices containing various cations and anions. By optimizing the electrochemical parameters, we generated a unique cyclic voltammogram for Cr6+ with a temporal resolution of 100 ms. We further analyzed the solution chemistry using a geochemical model, PHREEQCi, to understand chromium speciation under varying experimental conditions. The sensor's selectivity and stability were also evaluated. To our knowledge, this is the first report of such rapid electrochemical detection of Cr6+. Our promising results demonstrate the potential to adapt this sensor for detecting Cr6+ in diverse matrices, including Martian soil.

Keywords: Chromium, carbon fiber, fast-scan cyclic voltammetry, geochemical model

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11:30 a.m. ENV-08 **Biodegradation and Biotransformation of Thiazolium Ionic Liquids.** Stephen Cronin, Emily Rapacz, Alexander Zaborek, Ronald Freeze, Patrick Hillesheim. Ave Maria University, 5050 Ave Maria Boulevard, Ave Maria, FL 34142. The utility of synthetic chemicals depends in part on their toxicity and biodegradability. Chemicals that are less toxic and more easily degraded can be used in larger quantities and in more applications. Ionic liquids (ILs) are chemical compounds that are liquids below 100º C consisting of a positively charged organic molecule and a negatively charged atom or organic molecule. Because ILs are non-volatile and thermally stabile they are considered more friendly than volatile solvents that can escape into the atmosphere. However, any chemical can be spilled or released into the environment. Accordingly, the toxicity and biodegradability of the compounds become relevant. We are investigating the biological properties of thiazolium ionic liquids consisting of a thiazolium ring modified with 2, 4, 6, or 8, carbon alkyl chains. We hypothesized that these thiazolium ILs would be more easily degraded than more studied imidazolium ionic liquids. We assessed the biodegradability of the thiazolium ionic liquids by incubating them in sewage sludge and measuring the remaining ionic liquids and degradation products by liquid chromatography mass spectrometry. Our data indicates some thiazolium ILs are biodegradable by sewage sludge microorganisms.

Keywords: Biodegradation, ionic liquids, environment

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ENV Posters – 3:00 p.m.- 6:00 p.m. Friday

ENV-P01 CANCELLED

ENV-P02 **Ecological observations in aquatic habitats: floodplain swamp vs restoration marsh.** Rachel Southmayd[(1)], Sophie Mistretta[(1)], Madilyn Monroe[(1)], Anna Church[(1)], Eric Eversole[(2)], and Melba D. Horton[(1)]. [(1)]Southeastern University 1000 Longfellow Blvd Lakeland, FL 33801. [(2)]Circle B Bar Reserve 4399 Winter Laken Rd, Lakeland, FL 33803. Restoration of aquatic habitats relies on a strong understanding of the components and parameters that comprise overall water quality and habitat health. Because of phytoplankton's significant role at the foundation of the aquatic food web, the biomass of

phytoplankton communities often serves as one of the factors that indicates the overall health of the habitat. This study investigated and compared water quality parameters in two aquatic habitats at Circle B Bar Reserve: a floodplain swamp and a restoration marsh. the study's null hypothesis assumes no significant difference between the two habitats. Indicators of restoration efforts were evaluated through assessments of temperature, dissolved oxygen, biological oxygen demand, pH, nitrate, phosphate, turbidity, amount of phytoplankton, and chlorophyll a concentration. Although a few of the parameters did not show variation between the two sites, significant differences between the floodplain swamp and restoration marsh were notably observed. For example, the restoration marsh exhibited elevated pH, temperature, phosphate levels, and phytoplankton concentration in comparison to the floodplain swamp. Additionally, the marsh was found to be much less turbid and contained lower concentration of chlorophyll a than the floodplain swamp, likely due to an excess of nutrient or species composition of phytoplankton. Overall, results showed a significant difference between the two habitats and therefore the null hypothesis is not supported. Long term monitoring is recommended to establish a thorough understanding of the dynamics occurring in floodplain swamps and restoration marshes to help improve proper management of aquatic ecosystems.

Keywords: Words Phytoplankton, Aquatic Habitats, Restoration Marsh, Floodplain Swamp

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ENV-P03 **Electrochemical water remediation using mixed metal oxides synthesized via a sequential solvothermal-annealing approach.** Takiul Islam and Xiang He. Department of Mechanical and Civil Engineering, Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901. It is of critical importance to explore effective and sustainable approaches to remediate aquatic ecosystems by removing diverse organic pollutants, such as tetracycline, which is a typical antibiotic being widely used and increasingly recognized as a significant organic pollutant in water, posing growing challenges to both the ecological system and public health. Among many avenues to remove tetracycline from water, the electrochemical oxidation technique is standing out as a promising solution, which is, however, still at an early stage in the quest for cost-effective anode materials. Herein, mixed metal oxides were synthesized using a sequential solvothermal-annealing approach and used as the anodes for the electrochemical oxidation of tetracycline in water. The as-synthesized mixed metal oxides were investigated in detail to understand the physical and chemical properties (e.g.,

crystal structure, microscale morphology, and electrochemical behaviors). When the resultant materials were used as the anodes, a thorough examination was conducted by modulating influencing factors during electrochemical oxidation, where the applied potentials were controlled from 1.0 to 1.5V, and initial tetracycline concentrations were tailored from 25 to 100 mg/L. The primary focus was placed on the effects of these variables on the reaction kinetics during tetracycline degradation. The results showed that the mixed metal oxide synthesized at an elevated temperature of 900°C demonstrated better effectiveness in destroying tetracycline, outperforming those synthesized at lower annealing temperatures. Furthermore, the results also indicated that the rate of tetracycline removal decreases as the initial tetracycline concentration and the applied voltage increase.

Keywords: mixed metal oxides, electrochemical oxidation, tetracycline, degradation

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ENV-P04 **Synthesis and Implications of Toxic Dopamine Metabolite 3,4-Dihydroxyphenylacetaldehyde (DOPAL) in Parkinson's Disease.** Savannah Page, Timothy Davis, Joven Jose, Ralph N. Salvatore. Southeastern University, 1000 Longfellow Blvd, Lakeland FL 33803. Parkinson's Disease (PD) is one of the most common neurodegenerative disorders affecting almost 2% of individuals over the age of 65. The cause of PD is idiopathic, but the main progenitor of the disease is the loss of dopaminergic nerve cells that occur within the substantia nigra. The substantia nigra is the area of the brain that controls muscle and skeletal fluidity. With the loss of the brain region an individual is succumbed to the classical signs of PD, that being bradykinesia, tremors, and postural rigidity. The true cause of PD is still relatively unknown; however, a hypothesis is believed that catechol metabolites play a sort of "stepping block" in the neurodegenerative process of PD. DOPAL (3,4-dihydroxyphenylacetaldehyde), a metabolite of dopamine, has a direct linkage to neurotoxicity and PD. Destroys nigrostriatal dopamine terminals and promotes dopamine deficiencies, the hallmark of PD. In an early reported synthesis, DOPAL was isolated in four steps, three chromatographic separations, and proceeded with an overall yield of about 4%. Two different routes are used in this research project to synthesize DOPAL using Epinephrine/Adrenaline and vanillin respectively as a starting compound. This is an innovative technique in biochemical research. The synthesized DOPAL showed the decomposition with air and the results were obtained using NMR and Western Blotting. The first route includes the use of the protecting group (THP) followed by the Witting reaction. The THP protecting group is used in order to provide

stability to the molecule so reduction to the aldehyde may be pursued. The second route uses the reduction of vanillin to vanillyl alcohol and further formation of 2-(4-hydroxy-3-methoxyphenyl)acetaldehyde. The overall yield is expected to be higher than our past results. In order to characterize DOPAL and all steps in the reaction, IR, NMR and Western Blotting analysis were carried out to elucidate the structure of the intermediates and DOPAL

Keywords: Parkinson's Disease, Neurotoxin, DOPAL, Dopamine metabolite

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ENV-P05 **Antibacterial *Scenedesmus* Extracts: Potential Treatment for Gastrointestinal Dysbiosis.** Joven Jose, Rocco Vargas, Hannah Goodrich, Dr. Brittany McConchie. Southeastern University, 1000 Longfellow Blvd, Lakeland FL 33803. *Scenedesmus* are photosynthetic freshwater coenobium algae that exhibit antibacterial activity against few pathogenic bacteria. However, less information is available on the selectivity of these antimicrobial compounds. Gastrointestinal dysbiosis is the imbalance in the composition and metabolic activities of gut microbiota which are commonly caused by consumption of excess antibiotics. Investigating potential bioactive compounds that promote the growth of common gut microbiota while inhibiting pathogenic bacteria is exigent. Given the native eutrophic conditions of Florida lakes, this study explores the correlation between high phosphate concentration and accumulation of antibacterial compounds within *Scenedesmus*. This study aims to explore the antibacterial potential of lipid and organic extracts obtained from *Scenedesmus* at high phosphate concentrations. Kirby-Bauer disk diffusion method and IR analysis were performed against native and pathogenic gut bacteria for the lipid and methanol Scenedesmus extracts. A statistically significant increase in the selective antibacterial activity of experimental extracts were observed compared to the control. Extracts exhibited no growth inhibition on *Lactobacillus acidophilus* and *Enterococcus faecalis* while inhibiting the growth of pathogenic bacteria such as *Salmonella typhimurium*, *Shigella flexneri* and *Pseudomonas aeruginosa*. The IR spectrum of lipid extracts indicated the presence of unsaturated hydrocarbons, aromatic and thiol groups. Chloramphenicol, Streptomycin and Novobiocin were used as positive control and exhibited high levels of inhibition on both native and pathogenic gut bacteria suggesting non-selectivity of antibiotics to gut microbiome. This research is able to provide the incipience of the potential selective antibacterial activity of bioactive compounds from *Scenedesmus* under high phosphate concentration. It points out the potential for a novel approach to treat gastrointestinal dysbiosis through organic sources. This research contributes to our understanding of

Scenedesmus and its bioactive potential which holds promise for innovative solutions addressing gastrointestinal dysbiosis and the intertwine between human health and ecological well-being.

Keywords: Microalgae, phosphate, dysbiosis, antibiotics

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ENV-P06 **Synthesis and Sensing Analysis of C-S-C Bridged Diphenylaminopyridinophane.** Matthew Pensenstadler. Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901. Hydrazine has been commonly used by the aerospace industry as a hypergolic monopropellant, however, exposure to the fuel through inhalation has severe consequences for human health such as an increased risk of lung, liver, and skin cancers. Methods of passive, reusable hydrazine leak detection remain rather limited, so the development of a sensor capable of detecting the toxin at concentrations lower than the safety limit of 1 ppm has been a key focus for our group. Previously, T. Gibson synthesized and tested a carbazole-pyridine based sensor that could detect hydrazine derivatives within protic and aprotic solutions below the desired safety limit. This synthesis proved to be both challenging and expensive, so alternative sensors have been proposed to ease the synthetic limitations, including a diphenylamine-pyridine based sensor. A. Hernberg pioneered this total synthesis, and with her findings, this work was done to optimize the process of the total synthesis, decreasing the overall production time while maintaining the yield of each reaction step. The diphenylaminopyridinophane in a protic solution was subjected to hydrazine derivatives to determine if the new sensor produced comparable responses to those observed with Gibson's carbazolopyridinophane.

Keywords: Sensors, Organic Synthesis, Hydrazine, Optimization, Fluorescence

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ENV-P07 **Mild and Efficient Cs2CO3-Promoted Synthesis of Silyl Carbonates and Silyl Carbamates.** Phillip L. Gray III, Colby J. Lavigne and Ralph N. Salvatore*. Department of Natural Sciences, Southeastern University; Department of Chemistry, University of South Florida. Silyl carbamates/dithiocarbamates and carbonates/dithiocarbonates are ubiquitous compounds that hold

a wide array of use as pesticides, serve as novel protecting groups, and possess interesting medicinal applications as peptidomimetics. Their biological applications include an introduction into partial structures of drugs to improve their efficiencies. A novel phosgene-free method and environmentally benign synthesis of silyl (dithio-)carbonates and silyl (dithio-)carbamates were developed via a three-component coupling of an amine or alcohol, carbon dioxide (carbon disulfide), and a trialkyl or triarylsilyl halide. Cesium carbonate promoted not only successful carbonylations of alcohols and carbamations of amines, but also suppressed common side reactions traditionally seen using existing protocols. Various alcohols and amines were examined, using a wide array of trialkyl-, triaryl halides, or sulfonates, respectively. In the future, a solid phase synthesis of the title compounds will also be investigated.

Keywords: Silyl carbamates, CS_2CO_3

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ENV-P08 **Preparation and Synthesis of Monobridged Carbazolopyridinophane Intermediates.** Supriya Bera, Brenden J. Schmeltz, Andrew J. Link, Matthew V. Pensenstadler, Alan B. Brown. Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901. Hydrazine, a commonly used rocket propellant and known carcinogen, poses toxicity at levels lower than detectable by odor. Current sensors are limited by irreversible chemical reactions, undesirable response times, and thresholds above advised safety recommendations. Carbazolopyridinophane is a reusable chemical sensor capable of detecting hydrazine at a threshold of 100 ppb. However, there remains a need for a reusable chemical sensor with a detection threshold to fit current safety recommendations of 10 ppb. This work aims to synthesize a monobridged carbazolopyridinophane sensor capable of detection within the recommended range, fulfilling the targets of a real-time, reusable sensor at low concentrations. Initial steps include a Hardwig-Buchwald reaction to synthesize the carbazole structure, followed by an Åkermark cyclization. Previous works noted difficulties isolating the target compound from starting materials after the cyclization. This was remedied with the use of prep plates, where eluting the plates three times created enough separation to isolate the target intermediate at high purity.

Keywords: Carbazolopyridinophane, Hydrazine, reusable sensors

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ENV-P09 **Study of Fast Switching Metastable State Photoacids.** Rana S. Abbood, Pavithra Liyanage, and Yi Liao. Department of Chemistry, Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901, USA. This research was supported by the US Dept. of Energy, Office of Science, Office of Basic Energy Sciences, Chemical Sciences, Geosciences, and Biosciences Division, Separation Sciences. under Contract No. AC05-00OR22725.Designing metastable-state photoacids (mPAHs) with faster reverse reactions has become an important goal in developing photo-responsive materials and photo-driven processes to increase temporal control. Current mPAHs, such as merocyanine and indazole derivatives, have significant limitations, including slow thermal recovery and suboptimal control of $[H^+]$ in fast-switching systems. This study aims to develop mPAHs that can produce high $[H^+]$ under light and assure rapid reverse reaction upon cessation of irradiation. The design of the mPAHs is presented. The absorption bands, photoreaction, and relaxation kinetics of the mPAHs were studied by UV-Vis absorption spectroscopy. By contrast to conventional merocyanine-based mPAHs possessing a reverse reaction rate constant of 0.000209 s-1, the new photoacid exhibits a reverse reaction rate constant larger than 0.120 s^{-1} in Methanol, which is 5*102 times faster. By comparing the results of a series of fast-reversing mPAHs, the mechanism that leads to the fast switching was identified. The results point to mPAHs synthesis with a significantly faster reverse reaction and provide a way to develop photo-responsive materials with improved temporal control.

Keywords: Photoacids merocyanine, Fast switching

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ENV-P10 **Mechanism for creating polyethylene quantum dots through solvothermal synthesis.** Jaden Howell, Brandon Naumann, Toufiq Reza, and Titus Mills. Department of Chemistry and Chemical Engineering, Florida Institute of Technology, Melbourne, FL, 32901, USA. Carbon quantum dots (CQDs) are semiconductive nanoparticles that are tunable for photonic absorption and emission. This study proposes a mechanism that can accurately depict the solvothermal synthesis of CQDs derived from polyethylene. To implement CQDs into modern applications, this mechanism can offer insight as to how their structure influences their behavior as a semiconductor. This process directly converts it into a material capable of absorbing and emitting photonic energy. When the starting materials are solvothermally reacted, a nanoparticle colloid was produced

exhibiting visible photoluminescence under the presence of ultraviolet (UV) light–indicative of the synthesis of CQDs. Toluene is used as a medium to allow the polyethylene to break down under high pressure and high temperature to produce nanoscale quantum material. The solvent is reacted with polyethylene at 180°C for 8 hours, where it is 100% converted to CQDs 0.1-2 nm in diameter, dispersed within toluene. Through the utilization of the selected solvent, the quantum yield of the product provides a notable absorbance to emittance, which is demonstrated by the Quantum Confinement effect. The proposed mechanism allows for further study on CQDs for future applications.

Keywords: Carbon quantum dots, nanoparticles

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GEO = GEOSCIENCES

(Meeting with AGR)

FRIDAY 08:30 a.m. - 09:00 a.m.

AL KARLIN, DEWBERRY AND BRUCE NOCITA, S&ME, INC., presiding

08:30 a.m. GEO-01 **Topobathymetric Mapping along the Gulf Coast of Florida.** Alvan Karlin and Emily Klipp. Dewberry Engineers, 1000 N. Ashley Drive, Suite 801, Tampa Florida 33602. In 2023 the Florida Department of Environmental Protection/Office of Resilience and Coastal Protection (FDEP/OCRP) engaged in the Florida Seafloor Mapping Initiative (FSMI). The FSMI program received federal funding through the American Rescue Plan Act (ARPA), that was invested in mapping the seafloor of Florida to the 200-meter isobath. This ambitious project started collecting data during the late summer of 2023 and is scheduled to be completed by December 2025. All data products will be completed and available to the public by 30 August 2026. The methodological design for the project includes mapping the 0- 20m isobath zone with topobathymetric lidar and the 20 – 200m isobath zone with MultiBeam Echo Soundings (MBES). Multiple commercial contractors were engaged to perform the mapping; Dewberry was assigned to use the Coastal Zone Mapping and Imaging Lidar (CZMIL) sensor to map the Gulf Coast of Florida to the 20-meter isobath; Fugro was assigned to use the Rapid Airborne Multibeam Mapping System (RAMMS sensor) to map the Atlantic Coast of Florida, and Woolpert, Inc. was contracted to use the Riegl- VQ880G and Leica-Chiroptera sensor to map the Florida Keys.

This paper describes the technology used, the progress to-date and some of the lessons learned by Dewberry during this project.

Keywords: Seafloor Mapping, Topobathymetry, FSMI

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08:45 a.m. GEO-02 **UAS-Based Coastal Monitoring and Management: An Integrated Approach for Shoreline Erosion and Vegetation Classification at Jupiter Inlet Lighthouse Outstanding Natural Area.** Nithish Manikkavasagam[(1)] , Sudhagar Nagarajan[(1)] , Tucker Hindle[(1)] , Peter De Witt[(2)] . [(1)]Florida Atlantic University; [(2)]Bureau of Land Management. The Jupiter Inlet Lighthouse Outstanding Natural Area, a dynamic coastal landscape, experiencing significant shoreline retreat and ecosystem changes due to environmental, atmospheric, and anthropogenic factors. This study integrates shoreline erosion analysis and vegetation classification using Unmanned Aerial System (UAS)-based remote sensing techniques to provide a comprehensive coastal management strategy. The shoreline erosion analysis focuses on the impact of atmospheric and ocean parameters, including tidal range, wind speed, significant wave height, wave period, rainfall, sea level pressure, and sea surface temperature, on shoreline change rates from 2017 to 2023. Conditional entropy is employed to quantify the influence of these factors, while partial correlation identifies significant factors driving erosion and accretion trends. Findings reveal a substantial negative correlation (coefficient = -1.20, $p = 0.012$) between tidal range and erosion rates, whereas wave period exhibits a positive correlation (coefficient = 1.61, $p = 0.019$) with accretion. In parallel, vegetation classification efforts aim to assess the spatial distribution of native, special-status, and invasive plant species within the ONA to support conservation initiatives. With the Bureau of Land Management (BLM) reporting nine special-status plant species at risk and the Florida Exotic Pest Plant Council identifying thirty-eight invasive species, efficient monitoring methods are essential. Traditional manual methods are labor-intensive and time-consuming; therefore, UAS-based hyperspectral imaging offers a viable alternative. A Resonon hyperspectral sensor, capturing 447 bands with a bandwidth of 1.9 nm over a spectral range of 400-1000 nm, was deployed to improve species separability compared to multispectral data. Results demonstrate the feasibility of hyperspectral UAS for effective mapping and monitoring of coastal vegetation, offering insights into sustainable management strategies.

Keywords: Unmanned Aerial System (UAS), coastal erosion, monitoring

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MED = MEDICAL SCIENCES

FRIDAY 8:30 a.m. - 11:30 a.m.
MELISSA BORGEN , FLORIDA INSTITUTE OF TECHNOLOGY, presiding

08:30 a.m. MED-01 **A Novel Non-Redox Electrochemical Approach for Adrenaline Detection Using Glass Nanopipets.** Ralph J. Page, Gene Koifman, Noel Manring, and Pavithra Pathirathna. Department of Chemistry and Chemical Engineering, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. The accurate detection of adrenaline (Adr) is vital for understanding physiological functions and managing clinical conditions. This study presents a novel glass nanocapillary sensor utilizing a non-redox ion transfer mechanism at the interface of two immiscible electrolyte solutions (ITIES). Two ionophores, dibenzo-24-crown-8 ether (DB24C8) and dibenzo-18-crown-6 ether (DB18C6), were assessed for their ability to mediate Adr transfer across the aqueous/dichloroethane interface. DB24C8 demonstrated enhanced stability and sensitivity due to its larger ring structure and stronger interaction with Adr molecules. The sensor was evaluated in various media, including KCl, deionized water, and Tris buffer, with calibration curves generated based on peak potential shifts. Detection limits of 5 pM for DB24C8 and 50 pM for DB18C6 were obtained, both far below physiological Adr concentrations. The effects of pH and ionic strength on detection were also examined, showing a more pronounced influence of pH. This ITIES-based sensing platform offers ease of fabrication, high robustness, and potential for real-time, in vivo applications in clinical settings.

Keywords: Adrenaline, non-redox, glass nanopipets, ion-transfer

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08:45 a.m. MED-02 **Nafion-Modified Double-Bore Carbon-Fiber Microelectrodes for Simultaneous Detection of Dopamine and Serotonin via Fast-Scan Cyclic Voltammetry.** Ashley Parker, and Pavithra Pathirathna. Department of Chemistry and Chemical Engineering, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL, 32901, USA. Neurodegenerative

diseases, such as Parkinson's disease, have seen a significant rise in prevalence, and neurotransmitters like dopamine and serotonin are critical to understanding their pathology. Traditionally, Parkinson's disease is diagnosed once motor symptoms appear, but a decrease in dopamine and serotonin levels occurs earlier. Early detection of these neurotransmitter changes is crucial, but traditional fast-scan cyclic voltammetry struggles with serotonin due to its high oxidation potential and electrode fouling. Nafion, a sulfonated fluoropolymer, improves sensitivity and reduces fouling by enhancing conductivity for positively charged ions like serotonin. While Nafion modifications have been successfully applied to single carbon-fiber microelectrodes (CFMs), our group pioneered the development of double-bore CFMs for simultaneous detection of multiple neurotransmitters. In this study, we are the first to modify double-bore CFMs with Nafion while preserving the gap between the electrodes, which allows for improved sensitivity to serotonin. This modification enhanced the ability to detect both dopamine and serotonin simultaneously, even with overlapping oxidation signals. All experiments were conducted in a buffer solution mimicking artificial cerebellum fluid, ensuring physiological relevance and potential future in vivo applications. Our findings demonstrate that Nafion-modified double-bore CFMs provide a novel, effective approach for simultaneous neurotransmitter monitoring, offering new insights into neurotransmitter dynamics for neurodegenerative disease research and early diagnosis.

Keywords: neurotransmitters, carbon-fiber, cyclic voltammetry

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09:00 a.m. MED-03 **Mitophagy inhibition and degeneration are exacerbated by RPM-1 in a *Caenorhabditis elegans* neurodegeneration model.**
Aidan Anderson. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Tauopathies are present in the brains of patients suffering from many neurodegenerative human diseases including but not limited to; Alzheimer's Disease (AD), Parkinson's Disease (PD), Amyotrophic Lateral Sclerosis (ALS), and Fronto-temporal Dementia (FTD). Tauopathies are characteristic of accumulation of intracellular defective tau protein resulting in cellular dysfunction and homeostatic collapse. Tauopathy associated autophagy defects have been shown to contribute greatly to disease progression. Here we investigate how the E3 ubiquitin ligase RPM-1 regulates disease associated mitophagy defects and neurodegeneration in a *Caenorhabditis elegans* tauopathy model. Previous and current work indicates a deleterious role for RPM-1 in neurodegenerative disease states and acute injury. Our work suggests that metabolic and homeostatic decline

may be regulated through RPM-1 by direct or indirect mitochondrial copy number regulation. These insights provide a mechanism for damage response inhibition presenting as loss of mitochondria and neuron death in this disease model. Future work aims to elucidate the specific role of RPM-1 in tauopathy associated mitophagy inhibition.

Keywords: Tauopathy, Neurodegeneration, RPM-1, E3 Ubiquitin Ligase, mitophagy

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09:15 a.m. MED-04 **Development of Neurophysiology Based Rapid Assessment for Cognitive Health Monitoring.** Alex Williams, Ella Lephart, Careesa Liu and Sujoy Ghosh Hajra. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Several evaluative modalities are currently used to gauge conscious states during neurophysiological decline, such as is found in Alzheimer's Disease (AD), or after a traumatic brain injury (TBI). Questionnaire assessments such as the Montreal Cognitive Assessment (MoCA) and the Mini-Mental State Examination (MMSE) have been notable in detecting early states of mild cognitive impairment and deteriorating mental acuity. However, the utilization of these assessments depends on subjective responses and are unable to directly assess brain processing. There would be an interest in relying on objective, physiologically defined metrics that could detect these underlying cognitive mechanisms. Previous reports have utilized electroencephalography (EEG)-derived techniques to identify event-related potential (ERP)-defined cognitive measures evoked within the domains of auditory sensation, attention and language processing. Further research has also looked into identifying neural markers relevant to the domain of mental orientation due to its association with cognitive decline and impairment. In this study, we present a neurophysiological rapid assessment test protocol that applies a stimulus sequence to elicit brain signals specific to the domains of attention, language, sensory perception and mental orientation to determine differences between neurocognitive states. A novel auditory stimulus sequence paradigm was used to produce N1 (sensation), P3 (attention) and N4 (Language) and N4-like (Orientation) ERP markers across a set of healthy participants. Using a 64-channel EEG system, current preliminary data suggests successful elicitation of neuromarkers specific to sensation, attention, language and mental orientation. Future directions would look into validating our preliminary findings through increasing the sample size of healthy participants and implementing our assessment protocol within conditions found during neurocognitive decline (e.g., TBI, post-stroke).

Keywords: EEG, Cognition, Orientation, Neuropathology, Neurophysiology

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09:30 a.m. MED-05 **Understanding Chemo Brain with Neuroimaging and Neuropsychological Assessments.** Sujoy Hajra, Nirvaan Dalal, Careesa Liu. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Cancer-induced cognitive decline (CICD), commonly called chemo brain or chemo-fog, impacts up to 75% of cancer patients. Despite this high prevalence, there are no standardized approaches for assessment or management of these patients. Furthermore, no objective, neurophysiology-based measure of CICD currently exists despite the clear benefit that such a measure would provide. This study aims to review and summarize the investigations using neuroimaging, neuro-sensing, and neuropsychological tests (NPT) based approaches of CICD within the last 10 years. PubMed, Google Scholar, and Web of Science databases were searched using combinations of the terms ‘chemo brain’, ‘neuroimaging’, and ‘cancer-induced cognitive decline’, with the searches yielding 17,471 results. Following a review for suitability using a combination of factors (e.g. papers written in English, published in the past 10 years, and being a clinical trial), 65 papers were included in the final review. The vast majority of papers utilized the NPT approach (73%), followed by MRI (20%), and EEG/diffusion tensor imaging (7%). The most common cognitive domains impacted by CICD are memory, attention, processing speed, executive function, verbal fluency, and visuospatial skills. Structural changes in white and gray matter are also frequently reported by the MRI modality. The primary finding of the EEG modality was decreased amplitude of canonical frequencies. Altogether these results suggest that the NPT modality is most prevalent in studies to show a connection between chemotherapy and cognitive decline, followed by neuroimaging and neurosensing modalities. Both structural brain changes affecting white and gray matter and functional domain changes are present. These findings provide more objective evidence of the prevalence of chemo-brain and provide avenues for future development of novel technology-enabled solutions for rapid assessment of the impacted cognitive domains.

Keywords: Chemo brain, cognitive decline

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09:45 a.m. MED-06 **Characterizing the sleep-wake-related dynamics of protein kinase A.** Fapianey Alexandre and Elizabeth Tilden, University of Flor-

ida, 1149 Newell Drive, Gainesville, FL. Sleep is a fundamental biological process with diverse functions, including but not limited to bolstering immunity, regulating metabolism, and supporting cognition. Sleep is comprised of three states: Rapid Eye Movement (REM), Non-Rapid Eye Movement (NREM), and wakefulness. These states are defined by distinct neurochemical and electrical signatures. However, the underlying mechanisms by which these signatures confer sleep's various effects on the body is unknown. Notably, protein kinase A (PKA) is an enzyme that integrates input from neurochemical and electrical extracellular signals. Previous experiments have shown that PKA activity is predictable as a function of sleep-wake states in hippocampal excitatory cells. Thus, understanding whether sleep-wake associated PKA dynamics are conserved or vary across the brain can provide insight into how PKA could play a role in the diverse functions of sleep. This study investigates PKA dynamics in the motor cortex (M1), visual cortex (V1), and both excitatory and inhibitory hippocampal cells (CA1) across sleep states. We monitored sleep-wake states using EEG and EMG. Simultaneously, PKA activity was measured using a fluorescent sensor of PKA and Fluorescence Lifetime Photometry (FLiP). Our current findings indicate synchronous PKA dynamics across diverse brain regions, suggesting that there is some coordinated mechanism of regulation governing the protein's activity with respect to sleep-wake states.

Keywords: sleep, brain, neuroscience

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10:00 a.m. BREAK

10:15 a.m. MED-07 **EEGs in Space: the knowns and the unknowns.** Sara Flick, Careesa Liu, Sujoy Ghosh Hajra. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Electroencephalograms (EEGs) are a way to measure electrical activity in the brain. While the use of EEGs has experienced a resurgence on Earth due to new hardware and technical capabilities, their use in assessing astronaut mental and physiological health have largely been limited to a few demonstrations from many years ago. With the move towards longer duration space flights that travel deeper into space, and the recent advancements in EEG technology, this review aims to consolidate the findings from the previous 10-years in understanding the impacts of space travel on brains and identify opportunities and challenges of utilizing EEG for in-situ cognitive health monitoring. Standard approaches of using keywords for searching scientific databases were utilized. Based on results found in supporting articles, the effects of microgravity on the human brain have been analyzed and can be used to validate the importance of EEGs in regard to spaceflight. The impacts of microgravity have

been identified in wave bands across the brain, including Alpha and Theta bands, which are used to characterize brain relaxation and sleep, respectively, as well as P300, which is a wave that is engaged when completing a task. Various parts of the brain have also been impacted by microgravity and could be a source of higher levels of stress and insomnia amongst astronauts in orbit. By comparing results and understanding the impacts of microgravity on different parts of the human brain, the importance of EEGs in terms of spaceflight can be expanded upon and be used to suggest possible future solutions to many problems faced by astronauts.

Keywords: EEGs, spaceflight, P300, microgravity

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10:30 a.m. MED-08 **Effects of UVA-Riboflavin crosslinking and silk incorporation on mechanics and printability of collagen hydrogels.** Nithyashri Muthu Vijayan, Beste Caner, Rohin Shyam, Arunkumar Palaniappan, Vipuil Kishore. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Collagen type I is a biomaterial of preferred choice due to its biocompatibility and biodegradability. However, low viscosity, weak mechanical properties and rapid degradation of collagen hydrogels are major limitations for 3D printing and tissue engineering applications. The goal of this study is to investigate the effects of silk fibroin incorporation and UVA-riboflavin crosslinking on mechanical properties, stability, and printability of collagen hydrogels. Four different hydrogels were tested: uncrosslinked collagen (UXL-C), UVA-riboflavin/sodium persulfate (SPS) crosslinked collagen (XL-C), and UVA-riboflavin/SPS crosslinked collagen-silk (XL-CS 1:1 and XL-CS 1:2 w/w). Results showed that compressive modulus of UXL-C was the lowest (1.8 ± 0.3 kPa), while XL-C hydrogels showed higher compressive modulus (4.7 ± 2.7 kPa). Upon silk incorporation, the compressive modulus of collagen hydrogels significantly increased (p < 0.05), with XL-CS (1:1) showing a modulus of 9.2 ± 3.4 kPa and XL-CS (1:2) exhibiting the highest modulus of 16.1 ± 8.5 kPa. Degradation results of hydrogels in PBS at 37ºC for 1 week showed that XL-CS hydrogels were significantly more stable (p < 0.05) compared to UXL-C and XL-C hydrogels. Printability was assessed using a gelatinous support bath, and the results revealed that UXL-C was not printable, while XL-C generated inconsistent prints. XL-CS inks yielded prints with high fidelity and shape retention. In conclusion, combining silk incorporation and UVA-riboflavin crosslinking is a promising approach to improve the compressive properties, stability, and printability of collagen hydrogels.

Keywords: Collagen, Silk, Photocrosslinking, Riboflavin, 3D Printing

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10:45 a.m. MED-09 **Understanding the Placental Microbiomes Effects on Pregnancies.** Adrienne U, Perez. South Florida State College 600 W College Dr, Avon Park, FL 33825. The placental microbiome is an important factor in a woman's pregnancy and a major factor in the health of both her and her fetus. Many studies have shown that periodontal disease and pre-existing conditions such as preeclampsia and leaky gut syndrome can affect the outcome of a woman's pregnancy and cause imbalances in her hormones and overall health. Specific bacteria such as Firmicutes, proteobacteria, and lactobacillus have shown significant differences between healthy and nonhealthy pregnant women that have correlated to risky pregnancy. The development of the fetus requires a healthy placenta which can be affected by a multitude of reasons such as stress, socioeconomic status, race, and overall health. This project aimed at analyzing how the microbiome of a placenta affects the health of the baby during and after birth, what disease may be caused by lack of proper nutrients, and how we could potentially screen pregnant women to determine what type of bacteria they may have. We conducted a Pubmed review to select studies for meta-analysis to address these questions. Results are expected to reveal the connection between maternal microbial profile, specific microbial strains, and diseases in the mother and fetus. This analysis will be enlightening to discover treatments, testing, and prevention methods for preterm maternal infections.

Keywords: Microbiome, pregnancy, pre-exsisting conditions

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11:00 a.m. MED-10 **"Redlining:" A Legacy of Chronic Disease Burden.** Diana Ventura, Craig Gillen, Ashley Ferencsik, Christopher Campbell. Dept of Biomedical Sciences & Technology, AdventHealth University, 671 Winyah Dr. Orlando, FL 32903. In the 1930's the Home Owners' Loan Corporation (HOLC) graded over 200 U.S. cities covering over 1000 neighborhoods. The HOLC created four racially biased lending risk categories: from "A" or" "Best" (always White, upper/upper middle class) to "D" or "Hazardous" ("Redlined," always minorities, low income). Tampa, FL was one of the graded cities. Our main question: Do historical inequalities still manifest today in terms of demographics, socio-economics and health outcomes? We used geographic information systems (GIS) as the central technology to integrate publicly available

HOLC digitized locations, socio-economic information and health data. We utilized ArcGIS Pro (Esri, Redlands, CA) to layer these data and conduct geoanalytics. There was a total of 21 HOLC graded areas in Tampa, 4 were "Redlined" and 4 were "Best." Total population (all the following is 2020 data) for Redlined ~46,000; for the "Best" grade, ~8400. The "Redlined" areas averaged 79.5% minority, 15.2% adult diabetes, 37.9% adult obesity and median home value (MHV) of $177,000. By contrast, the "Best" graded areas averaged 22.5% minority, 7.9% adult diabetes, 27.6% adult obesity and MHV of $543,750. Past racially biased economic policies seem to have created environments that still impact people living there today. This suggests that merely ending policies may not be sufficient to addressing the population effects they helped create. We believe that investigating such relationships like HOLC, SDoH's and health metrics is very important for health sciences students to understand, that present population health and wellness can be affected past events to previous generations.

Keywords: Home Owners' Loan Corporation (HOLC), GIS, SDoH, Chronic Disease

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11:15 a.m. MED-11 **Analysis of Socioeconomic Factors of Type II Diabetes Prevalence in Batey Communities within the Dominican Republic.** Niveditha Ssraman, Ying Min Tan, Fadi Gouda, Ian Murray. University of South Florida, 4202 E Fowler Ave, Tampa FL, 33620. Type II diabetes is one of the top ten leading causes of death in the Dominican Republic, especially within Batey communities where residents lack access to healthcare, balanced diets, and a sanitary environment necessary to ensure proper health. It is a result of worn out beta cells from excessive usage, causing them to produce an insufficient amount of insulin. This insulin inefficiency causes the human body to function improperly. Academic research suggests that the prevalence of diagnosed and undiagnosed Type II Diabetes is due to a lack of knowledge about the disease and the culture of a sedentary lifestyle. Through field observations in a variety of clinics, communities, and a health fair, it is recognized that the prevalence of Type II Diabetes extends beyond an issue with education and is a rather complex matter with multiple causations. It was evident that many residents of Batey communities who were diagnosed with diabetes had an extensive knowledge of their disease. Meanwhile, younger individuals who were at risk for developing Type II diabetes appeared to lack interest in diabetes prevention, thus potentially increasing their overall risk of diagnosis. In this work, the aim was to explore additional factors by examining the socio-economic, educational, and systemic barriers that exacerbate the prevalence and impact of Type II Diabetes in Batey communities. This

research advocates for effective interventions and support measures catered to the specific requirements of disadvantaged populations in the Dominican Republic.

Keywords: Type II Diabetes, Bateye, Diagnosis, Economic Barriers, Dominican Republic

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MED Posters – 3:00 p.m.-6:00 p.m. Friday

MED-P01 **Preparing Future Healthcare Students for Success: The Value of Basic Science Education.** Yuri Zagvazdin, Cheryl Purvis, Andrew Monk, Emily Young, Keerthika Ravikumar, AbbyGail Salcido, Aymen Arain, Adalyne Singh, Michelle L. Demory, Ricardo Rodriguez-Millan. Dr. Kiran C Patel College of Allopathic Medicine (NSU MD), Dept. of Medical Education, College of Optometry. Nova Southeastern University, Health Professions Division, 3200 S. University Drive, Fort Lauderdale, Florida 33328. As basic science faculty teaching pre-health majors, we recognize the struggles students face when dealing with challenging topics in anatomy and physiology. However, we often do not assess the importance of these foundational sciences in our students' journey to their career as future healthcare professionals. To address this, we will survey our current graduate students taking Physiology, Histology and Neuroanatomy courses in order to identify additional supplemental resources based on their needs and interests. This will allow us to implement changes in our courses and possibly curriculum to optimize student learning and better prepare them for their future careers.

Keywords: Basic sciences, physiology, histology, Neuroanatomy, pre-health majors

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MED-P02 **Using Clinical Imaging to Strengthen Students Understanding of the Arterial Circle of Willis.** Andrew Monk, Liliya Ryshchak, Emily Young, Keerthika Ravikumar, AbbyGail Salcido, Yuri Zagvazdin, Cheryl Purvis. Dr. Kiran C Patel College of Allopathic Medicine (NSU MD), Dept. of Medical Education, College of Optometry. Nova Southeastern University, Health Professions Division, 3200 S. University Drive, Fort Lauderdale, Florida 33328. Pre-

health students routinely take Anatomy classes which incorporate challenging neuroanatomy concepts. This material can be difficult to master but is relevant to practicing healthcare professionals. To engage students and prepare them for future clinical practice, we have developed an interactive diagram of the arterial Circle of Willis which they can label to visualize the healthy vasculature. They then can correlate this understanding with radiographic images showing anatomical variations known to be associated with clinical visual abnormalities. Our approach is designed to help pre-health majors integrate class material regarding brain vasculature with clinical cases.

Keywords: anatomy, neuroanatomy, brain vasculature, radiographic imaging

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MED-P03 **Statistical analysis and application of reconstructed SPECT medical data.** I. MacDonald[(1)] , C. Hinton[(1)] , J. Sheldon[(1)] , C. Collins[(1)] , S. Boddepalli[(1)] , R. Coni[(2)] , W. P. Segars[(3)] , and D. Mitra[(1)] . [(1)]Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901, [(2)]Burrell College of Osteopathic Medicine, 3011 S. Babcock St, Melbourne, FL 32901, [(3)]Duke University School of Medicine, 40 Duke Medicine Circle, Durham, NC 27710. Single-Photon Emission Computed Tomography (SPECT) imaging is a type of tomographic medical imaging that captures the distribution of radioactive tracer in the human body. Typical medical applications will look at the differences in stress and rest states to identify perfusion-affecting heart conditions. However, no one has ever studied the statistical patterns of tracer distributions in different types of tissues. In this work we have analyzed the amount of tracer in different tissues of the heart and in the liver from reconstructed images across patients. We then compared these values among images taken under similar experimental conditions, grouping those images by disease status and stress/rest condition. This allowed us to identify patterns in the results and fit the tracer distributions to statistical functions. These functions show that the differences in tracer concentration across the given conditions partially matches expectations based on the experimental conditions and established medical facts but reveals some interesting unknown patterns as well. Finally, we used these statistical functions to fill in an extended cardiac-torso numerical phantom (XCAT) with realistic values corresponding to tracer distribution via monte carlo simulation. We call these phantoms, augmented with the tracer distributions, XCAT+.

Keywords: SPECT, XCAT, Cardiac Imaging, Nuclear Imaging

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MED-P04 **Evaluating the effect of bacteriophage and antibiotic combinations on bacterial growth.** Angela Paternoster, Cheyenne Dunaway. Indian River State College, 3209 Virginia Ave, Fort Pierce, FL 34981. Bacteriophages are known for their ability to effectively lyse bacteria and prevent further bacterial growth. The concerning rise of antibiotic resistance has sparked an increased interest in alternative therapies. Phage therapy uses bacteriophages to treat bacterial infections. Concerns exist with phage therapy related to effectiveness and the development of resistance. Many studies have evaluated the use of combinations of phage and antibiotics to address these concerns. In this experiment we evaluated the percent growth reduction of *Microbacterium foliorum* when treated with combinations of Microbacterium phage ShyRosie and vancomycin or streptomycin at different concentrations. The antibiotics differ in their modes of action, with vancomycin disrupting cell wall synthesis and streptomycin inhibiting protein synthesis, and these stresses may directly compound cytotoxic effects of phage infection. Phage lysates with concentrations of 107 to 103 PFU/ml and antibiotics at concentrations of 0.01%, 0.001% and 0.0001% were tested individually and in combinations using a 96 well plate to measure optical density of *M. foliorum* over 24 hours. Combinations of phage and an antibiotic were identified that resulted in an increased percent growth reduction compared to either treatment alone. The results provide support that the addition of bacteriophage with an antibiotic may strengthen their effects, reduce the amount of antibiotics required, and decrease risks of antibiotic resistance.

Keywords: Phage, antibiotics, microbiology

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MED-P05 **Osteoma Cutis: A Rare Case of a Nonhealing Wound.** Megan Yeung B.S., M.B.S.[1] , Cassandra Saint-Louis B.S., M.B.S.[(1)] , Oshin Thomas B.S.[(1)] , Tasmia Unnoor B.S.[(1)] , Cherison Cuffy, DPM[(2)]. [(1)]Second-Year Students, Barry University School of Podiatric Medicine; [(2)]Assistant Professor & Clinical Faculty, Barry University Foot & Ankle Institute. Osteoma cutis (OC) is a rare benign condition characterized by the formation of bone within the skin or subcutaneous tissue. This report details the case of an 81-year-old female who presented with a chronic lower leg ulcer. A biopsy confirmed the diagnosis of OC. The ulcer was complicated by venous insufficiency and prior trauma, and histopathological analysis revealed soft tissue necrosis, suppurative inflammation, and lamellar

bone formation. Imaging studies confirmed soft tissue calcification, which guided the surgical debridement and antimicrobial treatments. Over a follow-up period of four months, the patient's condition improved significantly due to a comprehensive treatment plan that included surgical excision, doxycycline, gentamicin, compression therapy, and advanced wound dressings. Despite some persistent calcifications and sensory deficits, the multidisciplinary approach resulted in successful wound closure without further complications. This case highlights the importance of tailored treatment strategies and emphasizes the value of collaborative care in managing complex wounds associated with rare conditions like osteoma cutis.

Keywords: Osteoma cutis, complex wounds.

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MED-P06 **Chronic treatment with Curcumin modulates the HSP70 ratio and prevents vascular hypercontractility during diabetes.** Anna Grimm, Brooke Biby, Swasti Rastogi. Department of Biomedical Engineering and Sciences, Florida Institute of Technology, Melbourne, FL, 32901. Type 1 diabetes (T1D) is strongly associated with vascular damage. Curcumin, an active ingredient from turmeric rhizomes, has pharmacological properties, such as anti-inflammatory and antioxidant. Heat Shock Protein 70 (HSP70) is a chaperone that coexists in the bloodstream (eHSP70) and intracellular (iHSP70) and is critical for proper vascular function. Curcumin modulates HSP70 in many cell types, but it is unknown whether curcumin modulates HSP70 in the vasculature, minimizing vascular dysfunction in the aorta of T1D rats. We hypothesize that treatment with curcumin modulates the levels of HSP70 by altering the iHSP70/eHSP70 ratio and preventing vascular hypercontractility in the aorta of T1D rats. Methods: Male Sprague Dawley rats (8 weeks) were injected with a single dose of Streptozotocin (STZ, 65 mg/kg i.p.) to induce T1D. Then, animals were treated with curcumin (300mg/kg/day, orally) for 28 days in a controlled environment. Blood glucose and weight were monitored. Systemic and tissue (aorta) HSP70 was determined using Western blotting to assess the ratio eHSP70/iHSP70. Vascular responses to alpha-adrenergic stimulation with Phenylephrine (PE) were assessed in aortic rings by performing a concentration-response curve to PE (10-5 to 10-9M) and a single dose to PE (10-5M, 15 minutes) to evaluate the components of the biphasic contraction curve. Our results showed that: 1) eHSP70/iHSP70 ratio in STZ+Curcumin was reduced compared to STZ; 2) STZ+Curcumin showed decreased vascular contraction compared to STZ group; 3) treatment with curcumin attenuates both phasic and tonic phases of the contraction curve. In conclusion,

our data suggested that treatment with curcumin prevents aortic vascular hypercontractility and affects the HSP70 ratio towards a less inflammatory profile.

Keywords: Diabetes, HSP70, curcumin, hypercontractility, aorta

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MED-P07 **HSP70 rescues vascular function in the aorta of Type 2 diabetic (T2D) mice.** Valentina Ochoa Mendoza, Amanda A de Oliveira, Bailey Astor, Kenia Nunes. Department of Biomedical Engineering and Sciences, Florida Institute of Technology, Melbourne, FL, 32901. Diabetes is a chronic condition associated with cardiovascular disease. Hyperglycemia, a hallmark of diabetes, correlates with the severity of vascular damage and elevated circulating Heat Shock Protein 70 (HSP70), a multifaceted family of proteins. While studies on HSP70 in chronic diseases have primarily focused on its chaperone functions, recent findings emphasize its role in muscle biology. Its deletion impairs cardiac and skeletal muscle function, and pharmacological blockade of HSP70 in smooth muscle reduces contractile force under physiological conditions. However, the role of HSP70 in the vasculature of T2D, a condition characterized by increased vascular contractility leading to dysfunction, remains unclear. We hypothesized that blockade of HSP70 in the aorta of T2D mice, would restore vascular function. Methods: Isolated aortic rings from 16-week-old male diabetic (db/db) and nondiabetic (db/+) mice were used. Blood glucose and abdominal circumference were monitored biweekly. Vessels were mounted in a wire myograph to assess vasoconstriction in response to phenylephrine (PE) with or without HSP70 inhibitor VER155008 (10 □mol/L). Concentration-response curve (CRC) to PE (1 nmol/l to 100 □mol/L) and single-dose stimulation with PE (10 □mol/L, 15 minutes), which generates a biphasic contraction curve, were performed. The fast component of the biphasic curve reveals intracellular Ca+2 efflux, while the slow reflects extracellular Ca+2 influx. Our CRC results showed augmented vasoconstriction in the aorta of db/db mice compared to db/+ controls. VER155008 reversed hypercontractility in the db/db group to the db/+ level. While VER155008 attenuated both components of the biphasic curve, enhanced contraction in db/db mice was observed only in the slow phase. In conclusion, the blockade of HSP70 improves the overall vascular function in T2D by preventing enhanced contractility in the aorta.

Keywords: Hyperglycemia, vascular dysfunction, HSP70

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MED-P08 **Sustained contraction in the aorta of female Spontaneously Hypertensive Rats is age-independent.** Swasti Rastogi and Conner Weaver. Department of Biomedical Engineering and Sciences, Florida Institute of Technology, Melbourne, FL, 32901. Background: Hypertension is associated with vascular dysfunction characterized by abnormal calcium (Ca^{2+}) handling, which plays a crucial role in smooth muscle contraction. Cytosolic Ca^{2+} levels regulate vascular tone, making Ca^{2+} homeostasis essential for vascular function. Upon Phenylephrine (PE) induced stimulation, a selective α_1-adrenergic agonist, vascular contraction generates a biphasic response: a fast, initial phasic phase due to Ca^{2+} efflux from sarcoplasmic reticulum followed by a slow, prolonged tonic phase driven by Ca^{2+} influx from voltage-dependent and independent channels. The Spontaneously Hypertensive Rat (SHR) is a well-known hypertensive model for studying vascular dysfunction. While sex-related differences in vascular contractility are well-studied in males, the mechanisms underlying vascular dysfunction in females remain poorly understood. Here, we investigate whether Ca^{2+} mishandling is present in the phasic and tonic contraction phases in the aorta of female hypertensive rats and if this effect is age-related. Methods: Aortic rings (2 mm) were harvested from female Wistar and SHR (16 and 32-week-old) rats and mounted in a wire myograph to assess vessel contractility ex vivo. Rings were placed in Krebs solution with a preload tension of 30mN. A single dose of PE (10^{-5} mol/L) was applied, and the force development was recorded over 600 seconds to evaluate the phasic (fast) and tonic (slow) components of contraction. Results: 1) The aorta from hypertensive female rats exhibited higher force development than normotensive rats at 16 and 32 weeks. 2) Phasic and tonic phases remain unchanged between the ages of 16 to 32 weeks in the hypertensive groups. Conclusion: The data suggests that females maintain sustained contraction, showing early-onset vascular dysfunction without age-related progression. This could be due to hormonal protection before menopause.

Keywords: Hypertension, vascular dysfunction, female, age

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MED-P09 **Microtubule Instability Drives Developmental Defects in Tauopathy Model.** Joseph Mazzaro. Florida Institute of Technology, 150 West

University Blvd, Melbourne, FL 32901. Though aggregation of Tau into neurofibrillary tangles has been a focus of neurodegeneration research, the functional effects of tau mutations on microtubule stability and disease progression remains unclear. The effects of tau mutations on microtubule stability as they relate to defects earlier in life and in development are also understudied. Previous work suggests that loss of mec-17 destabilizes axonal microtubules in the mechanosensory neurons, resulting in phenotypic defects. In this study, we show that a *C. elegans* tauopathy model produces similar phenotypes in the ALM as the previous mec-17 study, predominantly the ectopic posterior branch. The tauopathy model expresses human tau with the FTD causing V337M allele. Though this allele is known to cause protein aggregation, we believe a major molecular mechanism at play is microtubule destabilization. We use colchicine to pharmacologically destabilize microtubules and taxol to stabilize them. Our results suggest that there are high and low ranges for microtubule stability that affect ALM development.

Keywords: *C. elegans* , tauopathy, neurodegeneration, neurodevelopment

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MED-P10 **Neurodevelopmental defects in a tauopathy model are affected by the microtubule stabilizer PTRN-1.** Katrina Diel. Florida Institute of Technology, 150 West University Blvd, Melbourne, FL 32901. Alzheimer's Disease and other Dementias are thought to arise from aggregation of proteins, particularly Tau. Additionally, Tau aggregation into neurofibrillary tangles also results in the loss of Tau's native function: stabilizing microtubules. Microtubule stability is critical for axon maintenance and function. As protein aggregation has been the major research area, there has been considerably less focus on the cellular and molecular impacts of modulating microtubule stability in neurodegenerative disease models. Here, we use a "humanized" *C. elegans* tauopathy model for Frontotemporal Dementia. We aim to uncover the genetic and molecular underpinnings of degenerative phenotypes, using the mechanosensory neurons to look for both developmental and degenerative effects. In this project, we focus on the relationship between tauopathy and the microtubule-binding protein, PTRN-1/CAMSAP, which functions in axon termination and synapse formation. In this study, we will 1) identify the role of PTRN-1 in degeneration and 2) assess the effects of modulating microtubule stability on tau-related degeneration.

Keywords: neurodegeneration, axons, microtubules, *C. elegans*, tauopathy

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MED-P11 **The Mitochondrion-mediated Apoptosis in Thyroid Cancer Cell (MDA-T41): The Role of the Melatonin.** Ksenia Greene, Colten Denby, Alissa Manley. South Florida State College, 600 West College Drive, Avon Park, FL, 33825. Melatonin, a hormone secreted by the pineal gland, is most well-known for its function in controlling a variety of physiological processes, including sleep-wake cycles' coordination. In recent years, studies have increasingly concentrated on its actions with cancer cells and its role in preventing and treating cancer. There is evidence suggesting that melatonin potentiates chemotherapy drugs and, in addition, inhibits neoplastic cells' activity directly. In addition, even though melatonin tends to have anti-apoptotic activity in healthy cells, it possesses pro-apoptotic activity in specific types of cancerous cells. Nevertheless, its specific mechanism in controlling cell death and metabolical processes is not yet understood and seems to differ between types of cells. In our study, our intention is to understand in detail melatonin's role in modulating apoptosis in thyroid carcinoma cells (MDA-T41) and its involved pathways and processes. We grew out the MDA-T41 cell line and measured cell death with and without melatonin in Realtime-Glo Annexin V Apoptosis and Necrosis under experimental conditions with and without melatonin. In our observations, melatonin showed anti-apoptotic activity in MDA-T41 cells when added with staurosporine, an inducer of apoptotic cell death. After treatment, both apoptosis and necrosis reduced 50% in cells with melatonin following a duration of twenty-four hours. In our future studies, our intention will be to explore whether mitochondrial activity is important in such a regulating mechanism through measurement of caspase activity, mitochondrial membrane potential, and expression of Bcl-2 family proteins.

Keywords: Melatonin, Thyroid Cancer, Apoptosis, Mitochondria

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MED-P12 **Synthesis of Peptidomimetic Scaffold: Combating BCL-2 Cancer Complexes.** Luke Assaad, Joven Jose, Ashley Graham, Weston Logue, Ralph Salvatore PhD*. Southeastern University, University of South Florida 1000 Longfellow Blvd, Lakeland, FL 33801. Cancer is consistently one of the leading contenders in cause of death worldwide, prompting a need for further research into novel cancer treatments. One common factor in the growth of different cancer lines is the ability of cells to evade the natural apoptotic (programmed cell death) pathway, and the Bcl-2 family of oncoproteins plays a central role in this process. Bcl-2 proteins are known to inhibit apoptosis, and overexpression of Bcl-2 has been proven to contribute significantly to tumor formation. With this in

mind, we aim to synthesize a variety of peptidomimetics (a synthetic molecule that mimics the structure of a natural protein) to inhibit Bcl-2 oncoproteins. A known inhibitor of this interaction is the Bak protein, which plays a central role in modulating the promotion of cell-induced death. A potential peptidomimetic structural analog could work to induce the activation of the Bak-Bcl-2 complex through electrostatic interactions while evading degradation by hydrolysis and proteases which the natural Bak protein is susceptible to. These novel artificial biomolecules may serve as potential therapeutics in clinical chemotherapy, and with the ability of peptidomimetics to evade natural degradation, it is expected that the molecule will have increased oral availability in cancer treatments. Recently we have disclosed efficient protocols leading to the synthesis of carbamate, carbazate, dithiocarbazate, polyamine, and phosphonic peptidomimetics. This study is now being extended to the synthesis of other de novo analogs. More recently we have taken an interest in the synthesis of a dithiocarbamate backbone. The proposed dithiocarbamate backbone is expected to mimic the natural Bak protein. After successful synthesis, the dithiocarbamate peptidomimetic is subject to biological assays with the known Bcl-2 inhibiting drug Venetoclax (ABT199), shown to have a 60% progression reduction rate in studied leukemia cases.

Keywords: Cancer, peptidomimetic, oncoprotein, apoptosis, backbone

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MED-P13 **The Effect of Repetitive Blast Exposure on *C. elegans* Associative Learning.** Briannamarie Wallace, Pia Scarpino, Timothy Crombie. Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901. Mild traumatic brain injury (mTBI) is a form of brain trauma that develops from sudden external forces leading to significant cognitive impairments and disruptions within neuronal communication. mTBI can result in cognitive, emotional, and physical symptoms such as memory lapses, attention deficits, and longer-term neurodegenerative risks. *Caenorhabditis elegans*, a small transparent free-living nematode, is a useful model for investigating the neural and molecular bases of mTBI onset and progression. With a simple neural system, well-characterized behaviors, and a wealth of genetic tools, *C. elegans* can be used to study the genes involved in mTBI associated changes in learning, memory, behavior, and neurodegeneration. Here, we used a custom-built impactor device to deliver repetitive sub-lethal blast exposures to *C. elegans* populations. We then measured the effect of blast exposure on survival and associative learning. We found that repetitive blast exposures of 70 psi did not have a significant effect on survival or associative learning capability. Future work will determine whether stronger blast exposures can modulate learning. By determining a threshold for blast-induced cognitive

impairments in *C. elegans*, subsequent research can be done to elucidate the molecular mechanism underlying the progression of mTBI. Ultimately, this work can add to our understanding of mTBI by detailing the progression of cognitive defects in an extremely tractable animal model.

Keywords: mild traumatic brain injury, *C. elegans*, learning, neurodegeneration

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MED-P14 **Natural genetic variation on Chromosome V confers resistance to the widely-used insecticide Chlorfenapyr in *C. elegans*.** Rohan Gandhi Surapaneni, Michaela Foley, Timothy A. Crombie. Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901. Exposure to environmental toxicants poses significant harm to humans. However, assessing the risk for diverse human populations is challenging because genetic differences among individuals can cause disparities in toxicant susceptibilities. A recent study found that genetic variation among *C. elegans* strains can influence their susceptibility to the widely-used insecticide chlorfenapyr. Specifically, the strain ECA36 was found to be resistant to chlorfenapyr relative to other genetically diverse strains. To identify regions of the genome harboring the genetic variants responsible for resistance, 120 recombinant inbred lines (RILs) were created by crossing the resistant strain ECA36 with a susceptible strain, CB4856. Linkage mapping was then performed by sequencing the RIL genomes, assessing their chlorfenapyr responses, and identifying genetic markers strongly correlating genotypes with phenotype. Linkage mapping revealed that a 164 kb wide region centered at 3.9 MB of chromosome V explained 88% of the variation in chlorfenapyr resistance among the RILs. To validate whether this region is capable of conferring resistance to chlorfenapyr, two independent nearly isogenic lines (NILs) were made. These lines have the resistant ECA36 genotype across the identified genomic interval, and the sensitive CB4856 genotype throughout the rest of the genome. By measuring the susceptibility of the NILs relative to the parental strains, we found that the NIL chlorfenapyr resistance was more similar to the resistant strain ECA36 than the susceptible strain CB4856. These findings validate that natural variation in the chromosome V region confers resistance to chlorfenapyr. Future studies will dissect the particular variants and genes within the region that modulate susceptibility.

Keywords: Chlorfenapyr, *C. elegans*, Quantitative Genetics, Toxicant Response, Natural Variation

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MED-P15 **Oral Microbiome Dysbiosis as a Mechanistic and Socio-Cultural Driver of Metabolic Dysfunction.** Sammi Rather. South Florida State College, 600 West College Drive, Avon Park, FL, 33825. The oral microbiome plays a crucial role in systemic health, with emerging evidence linking oral microbial dysbiosis to metabolic dysfunction, particularly obesity. Dysbiosis in the oral microbiome may contribute to insulin resistance, chronic inflammation, and disruptions in adipogenesis and appetite regulation. Using whole genome sequencing and metagenomic analysis, we characterized the microbiome from tongue coating biofilm samples collected from four healthy young individuals. Additionally, a meta-analysis was also performed following literature review. We investigated how diet, particularly high in sugars and fats, fosters the growth of harmful bacteria such as *Streptococcus mutans*, *Porphyromonas gingivalis*, *Prevotella*, and *Fusobacterium*, leading to oral dysbiosis and metabolic imbalance. Additionally, we examined the role of sociocultural determinants, including access to healthcare and nutrition, in exacerbating microbial imbalances. Preliminary results suggest that harmful bacteria may predict dysbiosis, and that a healthy diet can help mitigate these effects. Socioeconomic factors were found to disproportionately affect vulnerable populations, increasing the risk of obesity. Our study underscores the potential of the oral microbiome as a therapeutic target for obesity prevention and highlights the need for improved dietary habits and healthcare access, in nutritiously misguided communities like the United States.

Keywords: Oral Microbiome, Microbiota

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MED-P16 **Various Synthetic Pathways Towards Efavirenz: The Replacement of the Side Chain.** Kaya Brooks, Rocco Vargas, Elizabeth Sanchez Bautista, Roxana Varela, Zully A. Beck, Jessica Echevarria, Brandon Montes, Michael Siekman, Emma Hobby, Emily Hutchinson, and Ralph N. Salvatore, Ph.D. Southeastern University and University of South Florida. Acquired immunodeficiency syndrome (AIDS) is a disease caused by the human immunodeficiency virus (HIV) which affects individuals on all continents. Effective therapy for the treatment of HIV-1 infection and AIDS requires a combination of antiviral drugs. Currently, the standard of care for HIV-1 patients is Efavirenz (EFV), a

nonnucleoside reverse transcriptase inhibitor (NNRTI), or a protease inhibitor and two nucleoside reverse transcriptase inhibitors. EFV directly blocks the action of reverse transcriptase and results in the inhibition of DNA replication. Although EFV has provided excellent results in reducing viral load, cases of resistance associated with adverse effects have led to the search to find new analogs of this drug. Cyclopropyl acetylene (CA) is a key intermediate in the synthesis for EFV. CA is an illusive and expensive raw material, vital in the preparation of the medication. Researchers have demonstrated that the yield of CA could be enhanced by the utilization of milder chlorinating reagents, PCl5 and Ph3PCl2. This, however, has proposed new obstacles in the form of ring openings. An alternative synthetic pathway of CA utilizes the base BuLi. However, this reagent is rarely employed due to its toxicity and flammability. Bases KOtBu, LDA, and CsOH present themselves as hopeful alternatives to BuLi and show promise in synthesizing larger, more stable hydrocarbon rings for the EFV drug. Therefore, it is hypothesized that KOtBu, LDA, and CsOH can be used to synthesis CA. Furthermore, this procedure can be used to form larger hydrocarbon rings, such as cyclobutyl acetylene, with less ring strain and fewer ring openings while still inhibiting HIV RT.

Keywords: HIV/AIDS treatment, Efavirenz (EFV), Non-nucleoside reverse transcriptase inhibitor (NNRTI), Cyclopropyl acetylene (CA)

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MED-P17 CANCELLED [See MED-08]

MED-P18 **Brazil Nut Effect on Protein Amyloid Hydrogel Formation.**
Connor Orth, Aubrey Wheeler, Rachael Crews. Florida Institute of Technology, 150 W University Blvd, Melbourne, FL 32901. Bundles of amyloid fibers dominate the morphology of advanced amyloid plaques/neurofibrillary tangles in Alzheimer's Disease (AD) brains. Understanding how the bundles are formed, their role in neuronal loss, as well as the prevention of their formation is of enormous value both in elucidating the disease pathogenesis and in developing preventive strategies. The continuous self-assembly of proteins to form amyloid fibers results in the gelation of the reaction suspension, leading us to believe that plaques/tangles in AD brains are hydrogels. Protein hydrogels synthesized in the laboratory contain various structural features, including soluble protein monomers, oligomers (colloids), amyloid fibers, fiber bundles, and fractals. When the amyloid fiber hydrogels are produced under vigorous agitation, two distinctive layers are

revealed – an opaque top layer and a transparent bottom layer. This contrasts with the homogenous transparent gels synthesized without shaking. Quantitative analysis suggests that the two hydrogel layers vary in their distribution of aggregates of different sizes. An increasing concentration of protein monomers and a decreasing concentration of amyloid fibers were observed from the top to the bottom of the hydrogel. The opaque appearance within the top layer is likely a result of increased light scattering by the large aggregates, fiber bundles, and fractals. The enrichment of large particles in the top layer can be attributed to the Brazil Nut Effect – agitation at high speed leads to large particles rising to the top and smaller ones settling to the bottom. Without large aggregates, the bottom layer scatters less light and remains largely transparent. Subsequent work will introduce a new method to analyze the concentration of fiber bundles, a dominant structural feature of AD plaques/tangles, produced in each hydrogel layer. Methods established here benefit AD research and other diseases where amyloid fiber deposition is an early event.

Keywords: Alzheimer's, Hydrogel, Amyloid, Protein, Brain

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MED-P19 **Strokes, creativity and artistry of Winston Churchill.** Kayla Rubalsky[(1)] , Daniel Kong[(1)] and Yuri Zagvazdin[(2)] . [(1)] Dr. K.C. Patel College of Osteopathic Medicine and [(2)] Dr. K.C. Patel College of Allopathic Medicine, Nova Southeastern University, 3300 South University Drive, Fort Lauderdale, Florida 33328. Stroke is frequently a devastating event for a patient caused by interruption of the cerebral circulation either because of occlusion or rupture of brain vessel(s). Stroke induced brain damage is typically detrimental to professional skills and creativity. However, there are reported cases where victims were able to recover from stroke and not only continued to excel in their profession but sometimes exhibited peculiar changes in their creative works. For example, some painters or composers showed a significant change in their style (Annoni et al., 2005, Zagvazdin, 2015). In this study, we are seeking to explore the effect of strokes on artistic creativity of Winston Churchill (1874-1965), British Prime Minister (1940-1945 and 1951-1955) who is known for his long dedication to palette and canvas. Churchill admitted that “Painting came to my rescue in a most trying time” (Churchill, 1948) when he was forced to resign as First Lord of Admiralty after the devastating debacle at Gallipoli in 1915-1916. His total count of paintings exceeds 500 and the last painting was completed in 1962. Churchill’s medical history is well described in the literature and includes several strokes that occurred in August of 1949, June 1953, June 1955, October 1956, April and November

1959, and November 1960. Professor Charles Rob, a vascular surgeon, who assessed Churchill in 1959, found him "in good health and mentally still exceptional" (Scadding and Vale, 2019). We are working on finding ways for comparative analysis of Churchill's pictures and evaluation of visible changes or lack of those in Churchill's art works before and after his strokes.

Keywords: Churchill, Stroke, Painting, Creativity

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MED-P20 **Enhanced Community Health Monitoring: Lipid Profiling in Monthly Health Fairs.** Dominique F. DuBose, PhD, ATC, LAT, and Keliy Haynes. Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. Cardiovascular disease is a leading cause of mortality worldwide, with dyslipidemia being a major modifiable risk factor. Many individuals, particularly in underserved communities, lack access to regular lipid screenings, increasing their risk for adverse cardiovascular events. This study evaluated the impact of integrating free lipid profile testing into monthly community health fairs. These fairs provided screenings for body composition, blood pressure, blood glucose, vision, and oxygen saturation, along with health education and counseling. The addition of lipid testing enabled early detection of abnormal cholesterol levels, prompting participants to seek medical follow-up and adopt healthier behaviors. A three-month study assessed whether lipid testing improved participants' awareness of cardiovascular risk factors and led to positive behavioral changes. Participants (n=XX) completed a baseline survey on cholesterol knowledge, heart disease risk factors, and current health behaviors. They then underwent lipid testing using the CardiochekPlus Analyzer, which measured total cholesterol, LDL, HDL, and triglycerides. Health professionals provided individualized counseling based on results. One-month post-screening surveys evaluated changes in diet and exercise. Quantitative analysis measured shifts in awareness and behavior. Qualitative feedback assessed education and counseling effectiveness. Preliminary results indicated many participants were unaware of their cholesterol levels before screening. Most expressed intent to improve their diet and increase physical activity. Follow-up data suggested those with abnormal lipid readings were more likely to seek medical advice and make lifestyle changes. Findings underscored the value of community-based interventions in improving cardiovascular health and emphasized the importance of accessible preventive screenings in at-risk populations. (Funding provided by the BCU Rise Program).

Keywords: Cardiovascular health, lipid profiling, community health fairs

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PSS = PHYSICS AND SPACE SCIENCES

(Meeting with TCH)

FRIDAY 10:30 a.m. - 11:30 a.m.
GEUORGUI BOUROV, EMBRY-RIDDLE AERONAUTICAL UNIVERSITY AND EMADELDEN FOUAD, FLORIDA POLYTECHNIC UNIVERSITY, **presiding**

10:30 a.m. PSS-01 **Validating stellar rotation periods of TESS targets using gyrochronology constraints.** Mariel Lares Martiz[(1)] , Terry Oswalt[(1)] , Derek Buzasi[(2)] , Luca Guida[(1)] , Kylie Boyer[(1)] . [(1)]Embry-Riddle Aeronautical University, Daytona Beach, FL, [(2)]University of Chicago, Chicago, IL . Gyrochronology is the empirical relationship between stellar rotation period and age. We are using this paradigm in an unusual way: to validate rotation periods detected in TESS light curves. The very large pixels in TESS images result in light curves contaminated by stars other than the intended target. In widely separated binaries, both stars in a pair should exhibit rotation signatures consistent with a common age. We hypothesize that if the components of a pair exhibit multiple periods, those in best agreement with a common gyro age are likely correct. We examined a sample of 1,585 WB pairs observed by TESS, identifying correlations between their rotation periods and contamination ratios of the components. Our study defines a flux contamination ratio threshold beyond which Gyrochronology or rotation period determinations are unreliable.

Keywords: Gyrochronology, TESS light curves, stellar rotation

Corresponding author: Mariel Lares Martiz, laresm@erau.edu

10:45 a.m. PSS-02 **An integrative approach to studying Exoplanetary environments by performing parameter exploration for evaluating impact of volcanism on Earth-like exoplanets**. Rahi Kashikar[(1)] , Manasvi Lingam[(1,2,3)] . [(1)] Department of Aerospace, Physics, and Space Sciences, Florida Institute of

Technology; [2] Department of Mathematics and Systems Engineering Florida Institute of Technology; [3] Chemistry and Chemical Engineering Florida Institute of Technology, Melbourne, FL. Biogeochemistry of our planet has been studied quite thoroughly, and several models have been constructed that reflect our understanding of internal processes. While we expect similar geochemistry on exoplanets due to limiting physical and chemical constraints, so far data from exoplanetary atmospheres has only been processed to build climate models aiming to decode different exoplanetary atmospheres. Through this study, we aim to put forth a cohesive and integrated approach to studying exoplanet environments. We approach this goal by considering volcanism as a key influencing factor. Several studies have identified the contribution of volcanic outputs to elemental cycles on our planet. Volcanic emissions directly impact measurable entities such as oxygen and carbon dioxide levels and contribute to sulfur and phosphorus cycles via quiescent and eruptive degassing. Here, we examine the role of volcanic influences on biogeochemistry seeking to implement a continuous and time-integrated biogeochemical model to earth like exoplanets. To overcome the compromise between loss of spatial representation and excessive computing costs over longer runs, SCION, a biogeochemical model that combines the GEOCLIM and COPSE approaches has been employed. Parameter exploration was conducted on three parameters that were identified to be primarily impacted by volcanic outputs. Selected parameters were sequentially modified to reflect changes in oxygen and carbon dioxide levels and nitrogen and phosphorus nutrient fluxes. The phanerozoic plots obtained from SCION predict observations for Earth-like exoplanets with different measurable volcanic levels. Results can be used to infer the planet's biogeochemistry and evolutionary stage and highlight any competing processes or potential gaps in knowledge. Inferring biogeochemistry of a planet can greatly aid in the search for habitable worlds.

Keywords: Exoplanets, volcanism

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11:00 a.m. PSS-03 **Ecology-Based Life Support Systems in Space: Use of cyanobacteria *Anabaena cylindrica* to condition extraterrestrial regolith.** Haley Murphy. Florida Institute of Technology, 150 W University Blvd, Melbourne, Fl 32901. Off-world settlements are a blossoming topic as NASA plans to launch crewed missions into deep-space, with plans to reach the Moon by 2027 and Mars soon to follow. Resources will be limited by cargo space and the time required for resupply ships to arrive. However, long-term missions to deep-space will require reliable plans to preserve astronaut wellbeing in the case of failed

resupply missions. Taking an ecological approach to life support will improve crew independence, mission security, and reduce costs. These systems recycle materials as well as leverage on-site resources, increasing the resources available to astronauts. Microbes like cyanobacteria are integral to the cycling of nutrients like carbon, oxygen, and nitrogen on Earth, giving them the potential to contribute to food production, regolith processing into soil, biomining, waste recycling, water filtration, and oxygen production in space. Cyanobacteria display prolific growth in bioreactors, require little maintenance in growth phases, and have survived exposure to the harsh environment of space. Implementing these organisms for nutrient cycling and ISRU in a space settlement will improve the lifetime of the settlement, astronaut security, and mission success. In this study, cyanobacteria *Anabaena cylindrica* is evaluated for biomining and biofertilizing capacity when grown in the presence of lunar regolith simulant (LHS-2) in a bioreactor. Findings will indicate whether this organism is a viable, sustainable choice to improve regolith-based agriculture.

Keywords: space biology, cyanobacteria, biofertilize, bioregenerative life support system, lunar regolith

Corresponding author: Haley Murphy, hkmurphy11@gmail.com

11:15 a.m. PSS-04 **Characterizing carnivorous plants for lunar regolith conditioning.** Emily Soucy [1,3] and Andrew Palmer [1,2] . Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. [1] Departments of Biomedical Engineering and Sciences, [2] Ocean Engineering and Marine Sciences, [3]Aerospace, Physics and Space Sciences. Further space exploration into the solar system to the Moon and Mars will require more accessible and reliable food resource acquisition. In Situ Resource Utilization (ISRU) and Bioregenerative Life Support Systems (BLSS) present a potential solution to this by establishing regolith-based agriculture as a means to ensure food security. However, metals present in Martian and lunar regolith can accumulate in crops and prove toxic to the plants themselves as well as astronauts. As a result, these regoliths will require treatment prior to their use as an agricultural substrate. Phytoremediation presents a method through which potential toxins can be eliminated from the regolith as biological material is supplemented into it, helping convert the regolith into soil. I propose carnivorous plants, such as *Utricularia gibba*, offer a partial remedy. Not only is *U. gibba* well equipped for growing in oligotrophic environments, it is also capable of accumulating several heavy metals, including Cr(VI) and Mn(II), which are found in both lunar and Martian regoliths in hazardous

amounts to plant and human health. We hypothesize that several *Utricularia* species and their associated microbiomes will be able to successfully capture heavy metals from lunar and Martian regolith and provide 'remediating' services to condition the regolith into a more soil-like substrate. In the present study, we are characterizing the microbiome and heavy metal tolerance *of U. subulata,* a terrestrial species, in order to understand how regolith stress impacts it.

Keywords: carnivorous plants, metagenomics, space agriculture

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PSS Posters – 3:00 p.m.-6:00 p.m. Friday

PSS-P01 **Tracing the Stellar Rotation – Age Relation Using Wide Binary Stars.** Aldir Moreira, Dr. Terry Oswalt, Dr. Mariel Lares. Embry-Riddle Aeronautical University. Gyrochronology, the observed correlation between a star's period of rotation and its age, is a dating method based primarily on known stellar cluster data. This project seeks to quantitatively test the viability of wide stellar binary pairs as an alternative to ages derived from evolutionary models. The specific method used, "daisy-chaining", assumes similar components in pairs have the same age and therefore, the same rotation rate which are then used to trace lines of constant age across the rotation period vs. color index relation. Additionally, this project seeks to eliminate the difficulty in separating stars in the 0.6-1.0 Gyr zone by using the age dependency of stellar kinematical properties. Preliminary results suggest that these wide binaries track bands of constant age, known as "gyrochrones", nearly as well as do stars in clusters. Support from NSF grants AST-1910396, AST-2108975 and NASA grants 80NSSC22K0622, 80NSSC21K0245, and NNX16AB76G is gratefully acknowledged.

Keywords: Gyrochronology, stellar rotation

Corresponding author: Aldir Moreira, moreira1@my.erau.edu

PSS-P02 **Flare Activity and Rotation Rates Among TESS Main Sequence Wide-Binaries.** Cassandra McGinley, Terry Oswalt, Mariel Lares-Martiz. Embry-Riddle Aeronautical University. We present a study of activity among lower main sequence stars using TESS (Transiting Exoplanet Survey Satellite) observations from which the rotation periods have been determined. This study uses a Python-based program called AltaiPony (Ilin et al., 2021; Davenport et al., 2016) to detect flaring activity among 3912 wide, non-interacting binaries. We examined the correlation between stellar activity and stellar parameters such as rotation rate, luminosity, and mass. The well-known relation between stellar rotation and age, known as gyrochronology, implies that as a star ages, its rotation period increases. We found that flare activity and intensity decrease as stellar rotation periods increase, supporting the notion that flare activity diminishes with age. Support from NSF grants AST-1910396, AST-2108975 and NASA grants 80NSSC22K0622, 80NSSC21K0245, and NNX16AB76G is gratefully acknowledged.

Keywords: stellar rotation, TESS, gyrochronology

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PSS-P03 **Automated Pipeline for TESS Data Processing: A Systematic Approach to Light Curve Extraction & Detrending.** Krystian Confeiteiro, Callum Hyder, Dr. Derek Buzasi, Dr. Terry Oswalt. Embry-Riddle Aeronautical University, Florida Gulf Coast University. We present a comprehensive pipeline for processing TESS (Transiting Exoplanet Survey Satellite) data, implementing a systematic and object-oriented approach to light curve extraction and analysis. The pipeline encompasses critical steps, including automated data acquisition, target identification, background level establishment, mask construction and application, data extraction, and detrending procedures using principal component analysis (PCA). This work aims to streamline the processing of TESS observational data while maintaining data integrity and scientific accuracy. Support from NSF grants AST-1910396, AST-2108975 and NASA grants 80NSSC22K0622, 80NSSC21K0245, and NNX16AB76G is gratefully acknowledged.

Keywords: data analysis pipeline, TESS, light curves

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PSS-P04 **Evolution of Complex Variability in Soft-to-Hard X-ray Emissions From AGN.** Aaron Mizrahi, Eric Perlman, Evan Smith. Florida Institute of Technology, 150 W University Blvd, Melbourne, Fl 32901. Active Galactic Nuclei (AGN) are supermassive black holes (SMBH) that are accreting material from the surrounding area and disrupted stellar material. According to models, the accreting material forms a rotating disc that falls into the SMBH. The X-rays observed are theorized to originate from within the disc and higher-latitude corona. In our observations from the Rossi X-ray Timing Explorer (RXTE) database, we observed complex variability in the X-ray band from three AGN, Centaurus A, NGC 4151, and NGC 5548. We compared the variations in hard and soft X-ray bands of 10-18 keV and 2-10 keV respectively to help identify processes that may result in the variations observed. The comparative analysis revealed a correlation between flux variability and clear changes in the X-ray spectral shape. We inspected the evolution of variability through plots of the combined flux vs. flux ratio of soft-to-hard X-ray bands and found clockwise and counterclockwise emission. These results enable us to discuss the evolution of particle acceleration and cooling timescales within the disk, as well as the large-scale obscuration of X-ray emissions.

Keywords: AGN, Black Hole, Astrophysics, Galaxy, X-rays

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PSS-P05 **Galaxy Quest: Determining the Propulsion Methods Necessary for Extragalactic Travel.** Colin Harrison, Kate Helminiak, Bryce Johnson. Florida Institute of Technology, 150 W University Blvd, Melbourne, Fl 32901. The escape velocity from the Milky Way depends strongly upon the corresponding gravitational potential. In this work we explore the scenario of a putative extraterrestrial intelligence sending a probe into extragalactic space (i.e. escaping the Milky Way galaxy). Along expected lines, we determine that the escape velocity increases towards the galactic core. In the most optimal configuration in which the galactic rotation will provide a velocity boost, the extragalactic probe will require an escape velocity on order 300 kps from a position equivalent to the suns distance from the galactic core. In the least optimal case (near the galactic core opposing the direction of galactic rotation) the escape velocity increases to over 1000 kps. Although these speeds are significant compared to current capabilities, they are achievable by established designs for future propulsion methods (e.g., laser sails, nuclear fusion, or nuclear pulse propulsion) without relying on speculative physics.

Keywords: Extragalactic, Propulsion, Orbital Mechanics

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PSS-P06 **A Space Odyssey: Examining the Propulsion Methods Required to Escape the Habitable Zones of Different Star Classes.** Kayla Taylor, Isabela Batista, Bradley Cheney. Florida Institute of Technology, 150 W University Blvd, Melbourne, Fl 32901. It is well known that habitable zones of different stars span a wide range of radii. The escape velocity from the habitable zone of such systems is also dependent upon the mass of the star. In this work, we explore which propulsion systems enable putative extraterrestrial intelligences to exit their habitable zones and escape their planetary systems. We determine that the escape velocity, and therefore the propulsion system, is dependent on the spectral type. Putative intelligences which develop in the habitable zone of main sequence F stars would be able to use chemical propulsion without gravity assists. On the other hand, putative intelligences which develop in the habitable zone of white dwarf stars would require a propulsion system with an exhaust velocity on order 40 kps. This could be accomplished by VASIMR or ion propulsion. Our work could thus inform the search for technosignatures produced by extraterrestrial intelligences in nearby planetary systems.

Keywords: Propulsion, Technosignatures, Orbital Mechanics

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PSS-P07 **Metal extraction of regolith by phytomining.** D. Cheek, A.G. Palmer. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Departments of Aerospace, Physics and Space Sciences, Ocean Engineering and Marine Sciences, Biomedical and Chemical Engineering and Sciences. Heavy metals accumulate in soil by way of natural processes and human activities. While some metals are beneficial to life in the soil others can be a great detriment to those organisms. Even beneficial metals may be harmful to plant growth at elevated concentrations. Common naturally occurring heavy metals in soil include but are not limited to chromium (Cr), aluminum(Al), barium (Ba), cobalt (Co), manganese (Mn), selenium (Se), zinc (Zn), mercury (Hg), Cadmium (Cd), lead (Pb), copper (Cu), Nickel (Ni), and Arsenic (As). Lead, Aluminum, mercury, copper, arsenic, and copper are toxic to plant growth. When present, these metals

interfere with essential metabolic processes of plants. Some plants are able to hyperaccumulate and sequester heavy metals in their roots and shoots. Phytomining is the process by which hyperaccumulating plants are used to extract these heavy metals from soil. Phytomining can be utilized as a method for remediation of polluted or degraded soil or even as a more environmentally friendly approach to acquiring important metals. Furthermore, phytomining could be utilized in the bioremediation of Martian and lunar regolith to sustain plant growth systems. In this experiment the growth and accumulation of heavy metals in Helianthus annuus as well as the efficiency of hyperaccumulator plants as a means of phytoremediation of Martian and lunar regolith were evaluated.

Keywords: phytoremediation, Heavy Metals, Biochemistry, Astrobiology

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PSS-P08 **PEANUTS: Promoting Extraterrestrial Agriculture through Novel Utilization Techniques for Sustainability.**

Trenton Causey[(1)] and Andrew Palmer[(2,3)] . [(1)]Departments of Aerospace, Physics and Space Sciences, [(2)]Biomedical Engineering and Sciences, and [(3)]Ocean Engineering and Marine Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. As humanity advances toward sustained extraterrestrial exploration and habitation, bioregenerative life support systems (BLiSS) must be optimized for long-term efficacy. These astronauts will require sustainable food security to mitigate risks from transportation delays and cargo limitations. To achieve this, BLiSS must integrate *in situ* resource utilization (ISRU) strategies to maximize space crop production via the use of materials such as regolith and recycled waste. Here, the heavily lignocellulosic biomass generated by *Arachis hypogaea* (peanut), is utilized as a recyclable and reusable amendment strategy, thus acting as a spacer to the densely compactable nature of dusty materials such as extraterrestrial regolith. First peanuts will be grown in a regolith simulant to determine the feasibility of peanut production, nodulation, and quantitative growth metrics like root and stem lengths. Shells will then be ground to less than 5 mm to increase surface area, sterilizing to minimize bacterial interference, and redistributing into Lunar Highland Simulant-1 at pre-determined ratios. *Lactuca sativa* will be grown in these substrates to assess the general impacts on plant growth as quantified via image analysis and other metrics, including total biomass and root and shoot length.

Keywords: *Arachis hypogaea,* Regolith, bioregenerative life support systems (BLiSS).

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PSS-P09 **Design of a life support system for use with aquatic animal models and simulated microgravity.** Nathan South, Miguel Zyniewicz, and Sherri A. Emer. Department of Biological Sciences, Florida Gulf Coast University, 10501 FGCU Boulevard South, Fort Myers, Florida 33965. Microgravity simulation is a cost-effective way to gather preliminary data and justify the conduct of experiments on spaceflight missions. Although previous studies have identified a variety of physiological changes in vertebrate models maintained aboard the International Space Station (ISS), the ability to accurately replicate these effects using Earth-based simulated microgravity is debated. Given the widespread use of zebrafish models in research, the development of a prototype for their use with microgravity simulation devices can serve as a precedent for more advanced and scalable designs to encompass a larger focus. Here, we developed an aquatic life support system for use with a random position machine (RPM) to begin to test the hypothesis that simulated microgravity accurately predicts true microgravity effects on vertebrate physiology. Through Blender modeling, iterative stress testing, and animal metabolic evaluation, we produced a vessel capable of containing adult zebrafish on a RPM for hours to days. Further, and given that zebrafish maintained on the Chinese Tiangong space station have exhibited spatial disorientation, we also present here locomotion effects in fish maintained in our system, on the the RPM. Importantly, our prototype can help establish credibility of low-budget Earth-based simulated microgravity- and spaceflight-capable designs and provide a foundation for future studies of physiological systems and drug effectiveness under simulated microgravity conditions.

Keywords: RPM, zebrafish, Blender, spaceflight

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PSS-P10 **Effect of microgravity on mechanosensitive TRP protein distribution in the periodontal ligament**. Nicole Bartling, Sage Cohen and Sherri A. Emer. Florida Gulf Coast University, 10501 FGCU Boulevard Fort Myers, Florida 33965. It is well established that exposure to microgravity impacts bone homeostasis, leading to bone density loss in astronauts and vertebrate animal models. While much research has explored these homeostatic processes in long bones such as the limbs, less is known about the spaceflight and microgravity

effects on jaw bone and its surrounding structures, such as the periodontal ligament (PDL). The PDL plays a crucial role in anchoring teeth, managing the mechanical forces of chewing, and it contains mechanosensitive transient receptor potential (TRP) proteins that can function in jaw remodeling in response to differential forces. For example, Earth-based studies suggest that TRPV4 regulates remodeling through PDL interactions. That said, this study examines how mechanosensitive TRP proteins in the PDL respond to the unique conditions of space. Mandible specimens from young and old mice that were maintained aboard the International Space Station (ISS) and in Earth-based control conditions were analyzed using immunohistochemistry and confocal microscopy to test the hypothesis that TRP protein distribution in the PDL is altered in microgravity. We observed differential labeling of TRPV4 and TRPV1 in young, old, spaceflight, and ground control specimens and noticeable morphological differences in the PDL. These findings suggest that the reduced mechanical forces experienced in microgravity induce adaptations in the PDL, potentially affecting force transmission and jawbone remodeling. By highlighting the mechanosensory role of TRP proteins in the PDL, this research provides critical insights into the physiological challenges of long-term space exploration. Understanding these adaptations is essential for developing strategies to maintain astronauts' oral and skeletal health during extended missions. Additionally, these findings have broader implications, offering valuable perspectives on bone health and dysfunctions experienced on Earth.

Keywords: bone, TRPV, spaceflight, mechanosensation, immunohistochemistry

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RES = FLORIDA COMMITTEE ON RARE & ENDANGERED PLANTS & ANIMALS

FRIDAY 09:00 a.m. – 10:15 a.m.
I. JACK STOUT, UNIVERSITY OF CENTRAL FLORIDA, **presiding**

09:00 a.m. RES-01 **GC-MS Analysis of the Metabolites from Two Genotypes of the Endangered Plant *Ziziphus celata*.** Kate Calvin, Josselyn Cardenas, Kayleigh Cooper. South Florida State College, 600 West College Drive, Avon Park, FL 33825. *Psuedoziziphus celata*, or Florida Ziziphus, was once thought to be extinct. It was named in 1984 from a 36-year-old dried plant discovered in an herbarium drawer ("celata" means "hidden.") After a search, no

living examples were found. However, in 1987, six populations were found in a 35-mile stretch of Lake Wales Ridge. The plant is listed as endangered at the federal and state levels. It has limited geography, a small population, lack of genetic diversity and little to no cross reproduction in the wild. In order to produce viable seeds, different genotypes must cross. Despite its flowers containing both ovary and stamen, Florida Ziziphus cannot self-cross. Some populations are clonal genets, where all individual plants grew from a single ancestor and all are connected underground. Very little is known about the plant's survival strategies and we are working with Bok Tower Gardens gain more information. This project characterizes the metabolites in bark from two different genotypes in the wild and in conservation beds at Bok Tower Gardens. Using gas chromatography mass spectrometry (GC-MS) data, comparisons were made between the metabolic profiles to determine whether the conservation bed plants of one genotype can potentially complement survival responses of wild plants having the other genotype. This process could inform the process of selecting optimal cross reproduction pairs and our results are presented here.

Keywords: *Ziziphus celata*, endangered plant, GC-MS, Lake Wales Ridge, habitat restoration

Corresponding author: Kate Calvin, kate.calvin@southflorida.edu

09:15 a.m. RES-02 **Differential Expression of Vitamins and Analysis of Bark Metabolites in Two Genotypes of Endangered *Ziziphus celata.*** Kate Calvin, Camden Lawrence, Michael Thompson II. South Florida State College, 600 West College Drive, Avon Park, FL 33825. Florida's geological history includes being both above and below the ocean. Over millions of years of changing sea levels, a ridge of narrow sand dunes formed that is now called the Lake Wales Ridge. The Ridge spans ~100 miles from north to south, with most of it being in Polk and Highlands Counties. The Ridge is home to the ancient Florida Scrub habitat and has one of the highest concentrations of endangered species in the US. *Pseudoziziphus celata*, or Florida Ziziphus, is one of these endangered species, designated so at federal and state levels. It was believed extinct but was rediscovered in 1987. Since then, much remains unknown regarding how the plant survives. It was determined that Florida Ziziphus is an obligate out-crosser and it is rare for wild plants to produce viable seeds. Some populations are clonal and not actually individual plants. In collaboration with Bok Tower Gardens (Lake Wales, FL) and MetwareBio (Woburn, MA) we are characterizing the metabolites found in two different genotypes of the plant, which are both located in native areas and conservation beds at Bok Tower Gardens. We compared the metabolic profiles

from conservation bed plants of one genotype to wild plants having the other genotype to help inform the habitat restoration process. Specifically, we analyzed differential vitamin expression from liquid chromatography-mass spectrometry (LC-MS) data and have begun acquiring data on volatile organic compounds in bark using gas chromatography-mass spectrometry (GC-MS). Our current results are presented here.

Keywords: *Ziziphus celata*, endangered plant, differential expression, GC-MS, Lake Wales Ridge, habitat restoration

Corresponding author: Kate Calvin, kate.calvin@southflorida.edu

09:30 a.m. RES-03 **Differential Expression of Lipids and Saccharides and Analysis of Bark Metabolites in Two Genotypes of Endangered Plant.**
Kate Calvin, Jenale Alfonso, Dalton Hammon, Maxine O'Neal. South Florida State College, 600 West College Drive, Avon Park, FL 33825. *Pseudoziziphus celata* (Florida Ziziphus) is a shrub native to the Lake Wales Ridge in Highlands and Polk Counties. The Ridge is a series of ancient sand dunes that host some of the most endangered species in Florida. Florida Ziziphus is one of these, being listed as endangered at both state and federal levels. It is bushy with small waxy leaves and thin, very thorny branches. Leaves drop in winter and the plant flowers prolifically in early Spring. Flowers are very small, yellow and fragrant. They bloom all over the branches, including the thorns. Flowers contain male and female reproductive structures, yet cannot self-cross. This is a reproductive barrier because several populations are clonal genets and not mixed genotypes. Florida Ziziphus is an obligate out-crosser, seeds are rarely seen in wild populations and little is known about how the plant survives. To provide information for habitat restoration processes, we have been collaborating with Bok Tower Gardens (Lake Wales, FL) and Metware Bio (Woburn, MA). We are comparing the metabolic profiles of two plant genotypes located in conservation bed plants and native using gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS). We analyzed the differential expression of lipids and saccharides between conservation bed plants of one genotype to wild plants having the other genotype and vice versa. We also have acquired data on volatile solvent extracts of bark from the same genotypes in the conservation beds. Our results are presented here.

Keywords: *Ziziphus celata*, endangered plant, differential expression, GC-MS, Lake Wales Ridge, habitat restoration

Corresponding author: Kate Calvin, kate.calvin@southflorida.edu

09:45 a.m. RES-04 **Differential Expression of Lignins and Coumarins and Analysis of Bark Metabolites in Two Genotypes of Endangered Plant.** Kate Calvin, Jacobi Dawkins Benedict, Austin Ulm. South Florida State College, 600 West College Drive, Avon Park, FL 33825. The Lake Wales Ridge is the highest natural elevation in Florida. It is the remnant of ancient sand dunes that were once the only part of the state above the ocean surface. The habitat within The Ridge is called Florida Scrub and it is dry, hot and renewed by fire. This pyrogenic habitat gave rise to several now endangered species found nowhere else in the world. One of these species is *Pseudoziziphus celata*, or Florida Ziziphus, a thorny shrub that contributes to fire by adapting sections of itself to die back while other parts remain alive. Very little is known about how this and other survival mechanisms occur in the plant. We are partnered with Bok Tower Gardens (Lake Wales, FL) and Metware Bio (Woburn, MA) to characterize the metabolic profile of Florida Ziziphus with the goal of acquiring information that will help to maintain the species in wild populations. We have begun compiling the metabolic profiles of two plant genotypes located in Bok Tower conservation beds and native sites using gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS). We compared the differential expression of lignins and coumarins between conservation bed plants of one genotype to wild plants having the other genotype and vice versa. We also have acquired data on volatile solvent extracts of bark from these genotypes in the conservation beds. Our results are presented here.

Keywords: *Ziziphus celata*, endangered plant, differential expression, GC-MS, Lake Wales Ridge, habitat restoration

Corresponding author: Kate Calvin, kate.calvin@southflorida.edu

10:00 a.m. RES-05 **Reproductive Season and Fecundity Reassessment of Gopher Tortoises (*Gopherus polyphemus*) in Southeastern Florida.** Riley J. Waters. Florida Atlantic University, 777 Glades Rd., Boca Raton, FL 33431. Gopher tortoises are known to have a breeding season that takes place throughout spring and early summer, beginning in April and lasting until July. However, recent research shows that the gopher tortoises of southeastern Florida have been found to mate throughout the fall and winter months as well. This suggests an

extended, and possibly year-round, reproductive season for the individuals of southeastern Florida. This may be due to the extreme climate conditions of South Florida. This project will evaluate to what extent gopher tortoises have an extended reproductive season in southeastern Florida and analyze the fecundity of females. The study was conducted at two locations in south Florida, one in Jupiter, FL known as the Abacoa Greenway and another in Boca Raton, FL on the FAU campus. Field ultrasound equipment and radiographs were used to find gravid females in the fall and winter months. In the first year of data collection, there were eggs seen on the ultrasound as early as February 5, 2022, and in the most recent year of this study, four tortoises were confirmed to gravid through radiograph on March 20, 2024. These preliminary results provide evidence for a much earlier start to egg development and nesting. The radiographs also show evidence of a larger clutch size than the typical population of *G. polyphemus* (the mean clutch size of this data being 9.6 eggs). All this data acts as evidence towards an extended reproductive season of the *Gopherus polyphemus* populations of this part of their range and their use of this as a survival strategy in the warmer climate of southeastern Florida.

Keywords: Gopher tortoise, *Gopherus polyphemus*, reproduction, fecundity

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RES Posters – 3:00 p.m.-6:00 p.m. Friday

RES-P01 **Differential Expression of Flavonoids and Analysis of Bark Metabolites in Two Genotypes of Endangered *Ziziphus celata*.** Kate Calvin, Isabel Aguilar, Katelyn Edwards. South Florida State College, 600 West College Drive, Avon Park, FL 33825. The Lake Wales Ridge in Polk and Highlands County is home to many endangered species that are found nowhere else in the world. The scrub and sandhill habitats that make up The Ridge are over a million years old, going back to a time when it was connected to the southwestern US by a land bridge. The gopher tortoise and scrub jay are well-known residents of The Ridge. A not-so-well known resident is a thorny shrub called *Ziziphus celata*, or Florida Ziziphus. This plant and the gopher tortoise have a mutualistic relationship in which the tortoise eats the fruit from the plant and the processing of the seed through the tortoise's gut helps the seed germinate. While this is interesting, little is known about other survival strategies of the plant. We are partnered with

Bok Tower Gardens (Lake Wales, FL) and Metware Bio (Woburn, MA) to characterize the metabolic profile of Florida Ziziphus with the goal of acquiring information that will help to maintain the species in wild populations. We have begun compiling the metabolic profiles of two plant genotypes located in Bok Tower conservation beds and native sites using gas chromatography-mass spectrometry (GC-MS) and liquid chromatography-mass spectrometry (LC-MS). We compared the differential expression of flavonoids between conservation bed plants of one genotype to wild plants having the other genotype and vice versa. We also have acquired data on volatile solvent extracts of bark from these genotypes in the conservation beds. Our results are presented here.

Keywords: *Ziziphus celata*, endangered plant, differential expression, GC-MS, Lake Wales Ridge, habitat restoration

Corresponding author: Kate Calvin, kate.calvin@southflorida.edu

RES-P02 **Cause and Regionalization of Sublethal Injuries to Juvenile Giant Manta Rays off the Southeastern Florida Coast.** Bria Kuntz, Jon Moore, Jessica Pate. Florida Atlantic University - Wilkes Honors College, 5353 Parkside Dr, Jupiter, FL 33458. The Giant Manta Ray (*Mobula birostris*) was recently uplisted from Vulnerable to Endangered by the International Union for Conservation of Nature (IUCN), due to global population declines that are driven by anthropogenic factors. Surveys of a juvenile population of *M. birostris* off the southeastern coast of Florida show a large proportion of individuals with injuries. Over the eight-year study period (2016-2024), 92 individual mantas were observed with injuries, some individuals having up to 12 injuries over the study period. Analysis of GoPro footage revealed a total of 212 recorded injuries with the majority being anthropogenic. Injuries were classified into categories: propeller scars (15%), skegs (10%), fishing line (23%), lures/hooks (23%), predatory bites (9%), or unknown (20%), showing the significance human impacts have on this endangered species. This study also analyzed the body regionalization of injuries, dividing the manta anatomy into four distinct sections: head, body, pectoral fins, and tail. This analysis calculated how different injury types occurred more or less frequently compared to the proportional area of each region. Most injuries (57%) occurred on the pectoral fins, which make up 52% of the manta's total area. In contrast, the head comprises only 7% of the manta's total area but showed a significantly higher proportion (20%) of the total surveyed injuries. These findings support the need of strong conservation efforts for manta rays as they face anthropogenic threats to the regions critical for their survival. It is important that effective strategies are implemented to prevent injuries from vessel strikes and fishing gear entanglement in the manta ray's coastal nursery habitat.

Keywords: Giant Manta Ray, southeastern Florida coast, anthropogenic injuries, body regionalization, nursery habitat

Corresponding author: Bria Kuntz, bkuntz2021@fau.edu

RES-P03 **Survey and analysis of gopher tortoise demographics in range X of the Abacoa Greenway.** Rachel Allison. Florida Atlantic University - Wilkes Honors College, 5353 Parkside Dr, Jupiter, FL 33458. Protecting the gopher tortoise (*Gopherus polyphemus*) remains of critical importance given their threatened status and their role as a keystone ecosystem-engineering species. Their burrows provide refuge for many other organisms, including native, endemic, and endangered species. This survey was conducted to obtain demographics on a population in range X of the Abacoa Greenway in Jupiter, FL to better understand the viability of the total population of tortoises in the greenway habitat and compare range X to range VIa. In previous research on range VIa of the greenway, gopher tortoises were found to exhibit faster growth rates and younger ages of sexual maturity than more northern gopher tortoise populations. The results of this survey coincided with that research, showing that gopher tortoises in range X followed the same aging trends. Further analysis showed greater similarity of range X tortoises to range VIa tortoises than range X tortoises to northern populations.

Keywords: Abacoa Greenway, gopher tortoises, demographics, maturity, growth rate

Corresponding author: Rachel Allison, rallison2022@fau.edu

RES-P04 **Microplastic presence at surface and depth on high-density and low-density sea turtle nesting beaches in Volusia County.** Shaunace Bowen, Trinity Resnover, Widline Souverain. Bethune Cookman University, 640 Dr. Mary McLeod Bethune Blvd. Daytona Beach 32214. Microplastics are prolific in marine environments worldwide and present concerns for marine species, including increased disease, exposure to endocrine-disrupting chemicals, and plastic particle ingestion. The presence of microplastics in sea turtle nesting habitats within Florida is not understood. For sea turtles, microplastics could increase nest temperature, which could impact sex determination in incubating eggs, and microplastics may be pulled from the sand's surface down to the depth of incubat-

ing eggs while females are digging. In order to determine the presence of microplastics at different depths and beaches, two high-density sea turtle nesting beaches (Ormond Beach, Ormond-by-the-Sea) and two low-density nesting beaches (Daytona Beach, Wilbur-by-the-Sea) were sampled outside of nesting season to eliminate risk to sea turtle nests. At each beach, five quadrats were sampled at the dune's edge, with sand samples collected at the surface (first 5cm) and at 70 centimeters (approximate sea turtle nest depth). Sand samples were transported back to the lab and dried, and microplastics will be extracted with a supersaturated saline solution. The extraction solution will be vacuum filtered on a 47 μm filter paper, and collected microplastics will be quantified, measured, and classified by color using a stereomicroscope and statistically compared. The results of this study will fill a knowledge gap on potential sea turtle nest exposure to microplastics at depth and among nesting beaches in Volusia County, Florida. Identifying beaches and depths with high microplastic concentrations will support further studies on direct microplastic impacts on sea turtle nests.

Keywords: Sea Turtles, Nesting beaches, Microplastics

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RES-P05 **Evaluating Conservation Strategies for the Perdido Key Beach Mouse.** Providence Pangira, Alyssa Rice. Bethune Cookman University, 640 Dr. Mary McLeod Bethune Blvd. Daytona Beach 32214. Habitat loss and degradation are significant threats to species worldwide, leading to many being listed as endangered or threatened. The Perdido Key Beach Mouse (*Peromyscus polionotus trissyllepsis*) is one such species requiring intensive recovery efforts by different conservation groups, including reintroduction programs following habitat destruction caused by hurricanes. This study evaluates the life spans and causes of death of Perdido Key Beach Mice in zoo populations from 2002 to 2023 to assess the impact of conservation strategies. Statistical tests were done on seven zoos, and they revealed no significant differences in life spans between male and female mice. However, average life spans varied across locations and periods, but the trends were identical, with founder introductions between 2003 and 2015 correlating to a limited genetic pool, suggesting a high likelihood of inbreeding. Major causes of death included kidney, cardiovascular, and cancer-related diseases, indicating potential dietary or environmental factors affecting health outcomes. Conservation efforts for zoo populations need continuous monitoring and evaluation to mitigate risks associated with limited genetic diversity and environmental factors. Future recommendations include refining dietary protocols and expanding genetic variability through strategic population management. More rigorous

genetic tests also need to be done to introduce a wider genetic pool in the safe populations in zoos. This work establishes the importance of data-driven approaches to improving recovery outcomes for endangered species like the Perdido Key Beach Mouse.

Keywords: Habitat Loss, Habitat Degradation, Perdido Key Beach Mouse, Conservation groups, Inbreeding, Conservation strategy

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RES-P06 **Assessment of Endangered Key Deer (*Odocoileus virginianus clavium*) Population on Cudjoe Key, Florida Keys.** Madelyn Brooker, Jon Moore, Katy Hosokawa. Florida Atlantic University - Wilkes Honors College, 5353 Parkside Dr, Jupiter, FL 33458. Key deer (*Odocoileus virginianus clavium*) are an endangered sub-species of white-tailed deer, endemic to the lower Florida Keys, including Cudjoe Key (5mi^2). Four Keys west from the main herd located on Big Pine Key, the Cudjoe Key population, by 2000, had become isolated and restricted, ultimately declining to less than 6 individuals. Recovery efforts from 2003-2005 included translocating 15 Key deer from Big Pine and No Name Key to Cudjoe Key (6 male, 9 female) to boost the population. Survey efforts in 2023 identified 15 males on Cudjoe, indicating a positively growing population trend on the island since the translocations. This current study was conducted in partnership with the USFWS at National Key Deer Refuge, using motion-detecting infrared trail cameras at 10 sites located in western, central, and eastern Cudjoe Key, taking place from September to December 2024. Observing, identifying, and cataloging individual male deer based off of antler configuration, 33 males were identified and verified over the course of the study, estimating a total population of 55 Key deer (based off the Lincoln-Petersen model and estimated Key deer sex ratios) ± 11 individuals. This confidence interval does not account for uncertainties such as fawns identified, pregnant does, or other inaccuracies. These findings, along with other information collected, such as Key deer range and movement throughout Cudjoe, foraging behavior, male sparring, mating attempts, maternal care, interactions between deer, and observations of other native species like birds and small mammals, are insightful to the ecology of the island which the Key deer inhabit. This study is therefore vital to conservation efforts of the endangered Key deer.

Keywords: Key deer, Florida Keys, trail cameras, island ecology, conservation efforts

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SOC = SOCIAL SCIENCES

FRIDAY 11:00 a.m. – 11:45 a.m.

JENNIFER WORTHAM, UNIVERSITY OF TAMPA, presiding

11:00 a.m. SOC-01 **AI4Science and the Discovery/Justification Context Distinction.** Moti Mizrahi. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. "AI4Science" refers to the use of Artificial Intelligence (AI) in scientific research. As AI systems become more widely used in science, we need clear guidelines for when such uses are acceptable and when they are unacceptable. For instance, the 2024 Nobel Prize in Chemistry was shared by David Baker, Demis Hassabis, and John Jumper. While Baker is a biochemist, Hassabis and Jumper are not. They are affiliated with Google DeepMind, where they worked on AlphaFold , which is an AI system for predicting the 3D structure of proteins. AlphaFold's success notwithstanding, it presents a challenge for philosophers of science and technology because it operates as a black box, i.e., it generates predictions of protein structure without revealing the underlying mechanism or the principles it uses to arrive at those predictions. In other words, AlphaFold's predictions of protein structure are not interpretable to human scientists. This opacity raises questions about the production of scientific knowledge in the age of AI, i.e., about AI4Science. Can we use AlphaFold to generate new scientific knowledge when its processes are inaccessible to human understanding? Should we? In this paper, I propose that the distinction between the context of discovery and the context of justification, which comes from the philosophy of science, could provide a clear and useful guideline for acceptable uses of AI in science. Given that AI systems used in scientific research are black-box models, for the most part, we should use such systems in the context of discovery but not in the context of justification. The former refers to processes of idea generation, which may be unproblematically opaque whether they occur in human brains or neural networks, whereas the latter refers to methods by which scientific ideas are justified, which should be transparent.

Keywords: AI4Science, AlphaFold, Artificial Intelligence, Discovery, Justification, Philosophy of Science

Corresponding author: Moti Mizrahi, mmizrahi@fit.edu

11:15 a.m. SOC-02 **Addressing Adverse Childhood Experiences (ACEs) in African American Students at HBCUs.** Adrian Rolle, DNP, MSN, APRN, FNP-C; Genesis Brown; Kandace Dopson; Taliyah Jackson. Bethune Cookman University, 640 Dr. Mary McLeod Bethune Blvd. Daytona Beach 32214. Childhood experiences, whether positive or negative, profoundly influence adult lives. Positive experiences, such as nurturing relationships, positive reinforcement, and safe opportunities for play and exploration, foster well-rounded development and improved mental and physical health. Conversely, Adverse Childhood Experiences (ACEs)—introduced in the mid-1990s by the CDC and Kaiser Permanente—encompass traumatic events during youth, including abuse, household dysfunction, and neglect, which can have lasting effects on well-being. Research demonstrates a strong correlation between the number of ACEs and increased risks of mental illness, chronic disease, behavioral challenges, and other adversities in adulthood. This study explores the prevalence and impact of ACEs among 124 students at Bethune-Cookman University, a private Christian HBCU. Participants represented three majors: Nursing, Health and Exercise Science, and Psychology. Despite extensive research on ACEs, few studies focus specifically on African-American students at HBCUs, presenting a critical opportunity to understand how adverse childhood experiences uniquely affect this population. By addressing this gap, the research aims to advance efforts to mitigate chronic health disparities in African-American communities through targeted education and evidence-based interventions.

Keywords: HBCU's, Adverse Childhood Experiences (ACEs)

Corresponding author: Dr. Adrian Rolle, rollea@cookman.edu

11:30 a.m. SOC-03 **The Evolution of Evil: An Overview of Serial Killers' Classification, Motivations, and Hope for Recovery.** Emmanuelle M. Legerme, Dr. Terence G. Leary, and Dr. Senthil B. Girimurugan. Florida Gulf Coast University, 10501 FGCU Blvd, Fort Myers, FL 33965. The Evolution of Evil: An Overview of Serial Killers' Classification, Motivations, and Hope for Recovery. Emmanuelle M. Legerme, Dr. Terence G. Leary, and Dr. Senthil B. Girimurugan. Florida Gulf Coast University 10501 Fgcu Blvd S Fort Myers, Florida 33965. The Federal Bureau of Investigation characterizes "serial killers" as offenders who have murdered two or more victims in separate events, with some

cooling off time in between, accompanied by a specific intent to terrorize, intimidate, or injure. Dr. Burgess's pioneering collaboration with the FBI in the 1970's revealed a systematic approach to serial killing in which criminal profiles include offenders' childhood experiences, their similar and atypical patterns of behaviors, and their dysfunctional longing for connection. While Dr. Burgess's work revealed two primary types of serial killers (organized and disorganized), the transformation of offenders' modus operandi in recent years exposed a combined set of maladaptive characteristics, requiring law enforcement to consider how technological advancements can serve to manipulate and capture victims. This comprehensive review of the progression of serial killing throughout the years aims to clarify the subtleties of criminal behavior, provide an explanation for the potential circumstances leading to serial killing, increase awareness about the methods of predation, and highlight the corrective power of community to rehabilitate troubled adolescents with maladaptive behaviors.

Keywords: Federal Bureau of Investigation, Serial Killer, Pioneering, Progression, Maladaptive Behaviors

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SOC Posters – 3:00 p.m.-6:00 p.m. Friday

SOC-P01 **The Benefits of Bioethics in the Pre-Medical Curriculum: Molding Compassionate Future Healthcare Professionals.** Adalyne Singh, Emily Young, Keerthika Ravikumar, AbbyGail Salcido, Cheryl Purvis. Dr. Kiran C Patel College of Allopathic Medicine (NSU MD), Dept. of Medical Education, College of Optometry. Nova Southeastern University, Health Professions Division, 3200 S. University Drive, Fort Lauderdale, Florida 33328. The need for ethical competencies in our pre-health majors has never been more critical. The intersection of ethical thinking and real-world dilemmas are often disconnected. By creating an understanding of theoretical and practical ethical awareness, future healthcare professionals, researchers, policymakers, and global citizens will be empowered to navigate ethical challenges with integrity and emotional intelligence. As we prepare students, integrating bioethics into our educational curriculum, we foster ethical reflection, empathy and compassion. Through educating and surveying students, we aim to enhance patient-centered care, communication and equipping them with tools to navigate ethical dilemmas in clinical practices and interprofessional teams.

Keywords: Bioethics, Pre-health majors, medical education, emotional intelligence

Corresponding author: Cheryl Purvis, cpurvis@nova.edu

SOC-P02 **Identifying Key Characteristics in Aspiring Healthcare Professionals: A Strengths and Preference Profile Analysis on Emotional Intelligence.** Keerthika Ravikumar, AbbyGail Salcido, Adalyne Singh, Emily Young, Andrew Monk, Camille Arca, Yuri Zagvazdin, Cheryl Purvis. Dr. Kiran C Patel College of Allopathic Medicine (NSU MD), Dept. of Medical Education. Nova Southeastern College of Optometry. Nova Southeastern University, Health Professions Division, 3200 S. University Drive, Fort Lauderdale, Florida 33328. As educators for future clinicians, it is imperative we are able to analyze personality traits in pre-health majors. To direct students toward an appropriate career path for them, we must be able to understand attributes of successful healthcare providers. In our study, we focus on identifying characteristics in students who have potential to become astute Optometrists. Optometry is a profession focused on patient care, attention to detail, and creative intuition. In this project, Optometry students (N=125) took a strengths inventory and positive psychology-based personal preference profile test. We found that a significant percentage of Optometry students identified as Emotional Helpers.

Keywords: Optometry, Positive Psychology, Personality Traits, Pre-Health Majors, Empathy

Corresponding author: Keerthika Ravikumar, kr2027@mynsu.nova.edu

SOC-P03 **Measuring emotional distress and empathy towards humans and animals.** Emmanuelle M. Legerme and Dr. Nathan Pipitone. Florida Gulf Coast University, 10501 FGCU Blvd, Fort Myers, FL 33965. Empathy refers to the ability to vicariously experience a person's feelings, emotions, and thoughts, by solely relying on the empathizer's imaginative adoption of the target's emotional state. Empathy does not necessarily motivate helpful action, but often elicits personal distress, which may result in action. Previous studies have supported the idea that empathy and emotional distress derive from components of neurobiology, phylogeny, and vulnerability, but how humans respond to emo-

tionally distressful situations based on previous harassment experiences and empathy levels has yet to be explored fully. Here, we investigate people's responses to an emotionally distressful situation by manipulating the targeted individual in an assault scenario; namely, different types of animals and people based on genetic relatedness (phylogeny, inclusive fitness). We will assess how participants' previous harassment experience, levels of empathy, and gender impact levels of distress, among several other variables. Participants read assault scenarios based on different targets and provided past experiences in dealing with visual, physical, or verbal harassment and rated their empathy levels using the Toronto Empathy Scale. Results showed that emotional distress to assault scenarios does change depending on who the victim is and was specifically related to genetic relatedness and the sex of the rater. Those who reported previous harassment experiences also scored higher in levels of empathy. Other results will tell us how empathy and emotional distress vary for individuals demonstrating unpleasant behaviors or adopting different methods of drug ingestion.

Keywords: Empathy, Emotional distress, Phylogeny, Neurobiology

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TCH = SCIENCE TEACHING

(Meeting with PSS)

FRIDAY 11:30 a.m. – 12:00 p.m.
THOMAS ARNOLD, LAKE ERIE COLLEGE OF OSTEOPATHIC MEDICINE, presiding

11:30 a.m. TCH-01 **Astronauts' Cognitive Maps: Leveraging the HTH Model to Illuminate Success in STEM Education and Career Paths.** Jiangduo (Ginger) Chen. Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. The convergence of recent global crises has exacerbated educational disparities, yet humanity's pursuit of space exploration remains a universal constant. While previous studies examine astronauts' training and missions in space, a systematic analysis of their shared perspectives on pivotal moments and environments shaping their STEM success and career paths is lacking. This internal pilot study explores how astronauts perceive and leverage pivotal moments, formative environments, and self-identity to overcome challenges with a whole-

life review approach. The significance of the study is integrating IPA and grounded theory, promoting social equity, and mitigating age-related memory deterioration, including the onset of Alzheimer's disease. Building on the concept of broad cognitive maps fostering rationality, peace, and motivation, this study introduces the Heavenly Hour, Terrain Triumph, and Human Harmony (HTH) model, integrating ancient Chinese philosophy on timing, environment, and human harmony. Employing interpretative phenomenological analysis (IPA) and grounded theory, the research seeks universal essence and philosophical patterns within astronauts' lived experiences to extend their cognitive maps and inspire future generations. The findings are groundbreaking for two reasons. First, they establish three sub-frameworks within the HTH model. Second, they enrich IPA methodology by coining Journey-Memory-Tethering Phenomenology, a collaborative recall method revealing relationship depth through shared life reflections between spouses. The emerging findings presented as prototypes – preliminary thematic summaries and conceptual frameworks – will serve as a foundation for further exploration and validation in the main study.

Keywords: Heavenly Hour, Terrain Triumph, and Human Harmony (HTH) model, interpretative phenomenological analysis (IPA), Journey-Memory-Tethering Phenomenology.

Corresponding author: Jiangduo (Ginger) Chen, chenj2021@my.fit.edu

11:45 a.m. TCH-02 **Enhancing Retention and Success: Coordinating Freshman STEM Courses for Integrated Learning.** Emadelden Fouad, Department of Physics, Florida Polytechnic University, Lakeland, FL 33805. This study aims to enhance the students' retention and their success rate in Freshman Physics courses at Florida Polytechnic University. As a Leader and Course Coordinator of multiple sections of these courses, it was a very rewarding experience to gauge the performance metrics of students within the multiple sections of the course taught by many faculty and their varying style of instructions. We have implemented successfully a "unified approach" by standardizing materials delivery, "common" examination practices, to track students' progress, early alert mechanism, department-wide remedial measures. The best practices based on the above pedagogical strategies enable and lead our efforts to demonstrate improvement in students' enrolling in Freshman Physics courses and their continuous retention after overwhelming course level performance for the past several semesters and/or years. Another unique and innovative approach of "shared Learning Management System (SLMS)" among multiple faculties with a lead course coordinator thus ensured consistency in building common resources, transferring common knowledge repository, and unparalleled course content for both instructors and

students. Affordable and accessible learning materials are yet another positive approach to this learning pedagogy, to support students throughout the course and beyond. Therefore, the above-mentioned successful teaching and learning strategies with unique course design and delivery resulted in more cohesive hands-on best practices among the collaborating faculties, and significantly improved the overall students' retention and passing graduation rate. The course level optimization discuss in this study, remarkably makes our department, our institution, Florida Polytechnic University has been recognized as the No. 1 public college in the Southeast for the fourth consecutive year in the U.S. News & World Report 2024-2025 rankings.

Keywords: Retention, Success rate, Unified approach, Learning Management System (SLMS), Graduation rate

Corresponding author: Emadelden Fouad, efouad@floridapoly.edu

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Time	*Skurla 102*	*Skurla 103*	*Skurla 106*	*Skurla 116*	*Skurla 202*	*Skurla 206*	*Skurla 219*
8:00	Registration: Skurla Hall Lobby						
8:15							
8:30	MED-01	GEO-01	ENG-14	ENG-01		AOS-01	
8:45	MED-02	GEO-02	ENG-15	ENG-02		AOS-02	
9:00	MED-03	AGR-01	ENG-16	ENG-03	BIO-01	AOS-03	RES-01
9:15	MED-04	BREAK	ENG-17	ENG-04	BIO-02	AOS-04	RES-02
9:30	MED-05	ENV-01	ENG-18	ENG-05	BIO-03	AOS-05	RES-03
9:45	MED-06	ENV-02	ENG-19	ENG-06	BIO-04	AOS-06	RES-04
10:00	BREAK	ENV-03	BREAK	BREAK	BREAK	BREAK	RES-05
10:15	MED-07	ENV-04	ENG-20	ENG-07	BIO-05		BREAK
10:30	MED-08	BREAK	ENG-21	ENG-08	BIO-06		PSS-01
10:45	MED-09	ENV-05	ENG-22	ENG-09	BIO-07		PSS-02
11:00	MED-10	ENV-06	ENG-23	ENG-10	BIO-08	SOC-01	PSS-03
11:15	MED-11	ENV-07	ENG-24	ENG-11	BIO-09	SOC-02	PSS-04
11:30		ENV-08		ENG-12	ANT-01	SOC-03	TCH-01
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12:00	Lunch						
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13:30	FAS Business Meeting						
13:45	Gordon Nelson Health Sciences Building Room 141						
14:00	2024 FAS Medalist Address						
14:15	Dr. Randy Avent						
14:30	Founding President of Florida Polytechnic University						
14:45	Gordon Nelson Health Sciences Building Room 141						
15:00	Poster Session						
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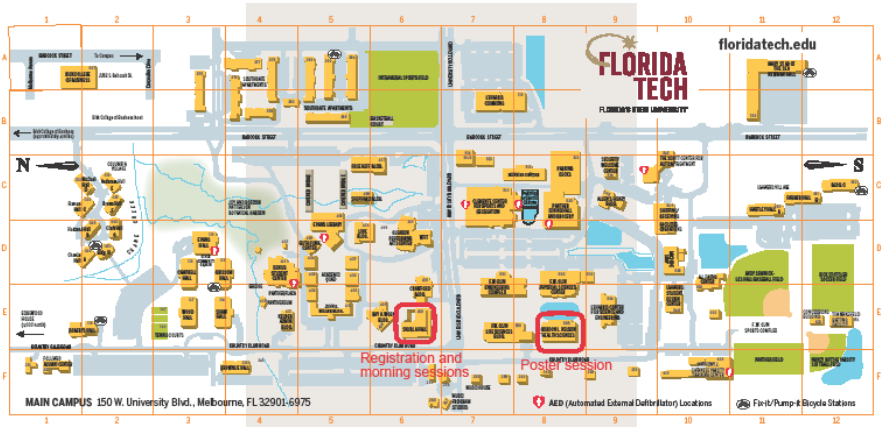
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