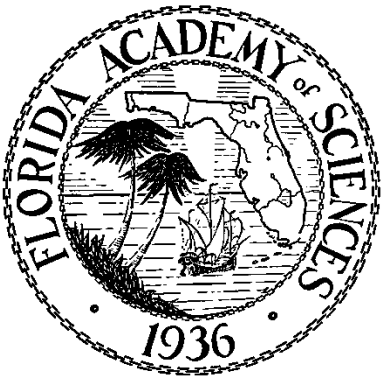
Florida Academy of Sciences



87th ANNUAL MEETING

Southeastern University
Lakeland, Florida

March 8, 2024

FLORIDA ACADEMY OF SCIENCES
2023-2024

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Science Teaching: Dr. Tom Arnold, Lake Erie College of Osteopathic Medicine & Ms. Carmen Carpenter, South University
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 **Through the Looking Glass: Foresights for the United States Health Care System.** Elaine Thompson, Distinguished Professor of Professional Practice, Southeastern University.
Using an "Alice in Wonderland" metaphor, this presentation will take you on a journey through the shortcomings, madness, and obstacles within the US contemporary healthcare delivery system. By encouraging a fresh perspective, one where we view the world "upside down," we aim to inspire a moral commitment that steers towards not just the provision of high-quality and equitable healthcare services, but also the enhancement of health and equity for all people, making it our guiding North Star.

BANQUET ADDRESS

FRIDAY 6:30 p.m.
SESHA SRINIVASAN, FAS PRESIDENT, presiding

7:00 p.m. BQT-01 **Mysid tales from one of Florida's primary undergraduate institutions (PUIs).** W. Wayne Price , Professor Emeritus of Biology, University of Tampa and 2023 Florida Academy of Sciences Medalist

AGR = AGRICULTURAL AND NATURAL RESOURCE SCIENCES

(Meeting with BIO)

FRIDAY 11:45 a.m. - 12:00 p.m.
JULIE BOSWELL, INDIAN RIVER STATE COLLEGE, presiding

11:45 a.m. AGR-01 **Minimum inhibitory concentrations of antimicrobials for potential applications against citrus greening disease.** Samuel Eastmond[(1)] , Naileth Gesto[(1)] , Crissy Massimino[(1)] , Melanie Giachetti[(1)] , Erina Okamoto[(1)] , Jerson Zacarias[(1)] , Nicholas Larson[(2)], Wayne Hunter[(2)] ,Megan Carroll[(1)] and Tom D'Elia[(1)] . [(1)] Indian River State College, Fort Pierce, Florida; [(2)] USDA Agricultural Research Service, Fort Pierce, Florida. Citrus greening dis-

ease, or Huanglongbing (HLB), is caused by the transmission of the gram-negative bacterial pathogen *Candidatus Liberibacter asiaticus* (CLas) by the Asian citrus psyllid, *Diaphorina citri*. This disease impacts the phloem of citrus trees, making them unable to effectively transport nutrients, leading to crop failure and the eventual death of the tree. There is no known cure for HLB, and since CLas is not able to be cultured, the development of antimicrobial therapeutics is challenging. Current treatment options include application of the antibiotic oxytetracycline. This process raises concerns about environmental exposure and development of antibiotic resistance. Silver and zinc-based nanoparticles have also shown promise in treatment of HLB and in facilitating delivery of therapeutic compounds. We screened a panel of antibiotics (oxytetracycline, vancomycin, cefotaxime, and streptomycin) and silver and zinc nanoparticles against culturable CLas analogs *Agrobacterium tumefaciens* and *Sinorhizobium meliloti* to determine the minimum inhibitory concentrations (MIC). Our results confirm that oxytetracycline is most effective, with the lowest MIC for effective growth inhibition (0.156 and 0.313 ppm for *A. tumefaciens* and *S. meliloti*, respectively). Silver and zinc nanoparticles were less effective than the tested antibiotics. Previous work has indicated that oxytetracycline and silver nanoparticles work synergistically, resulting in lower MICs than when tested individually. Evaluation of the combinations of the antibiotics and nanoparticles from our panel, along with phytotoxicity assays, will provide insights to direct future treatments and minimize environmental and resistance risks.

Keywords: Citrus Greening, *Diaphorina citri*, therapeutics, nanoparticles.

Corresponding Author: Naileth Gesto, gestono@mail.irsc.edu

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

AGR-P01 **Annotation of RNA Helicase Genes in *Diaphorina citri*.** Marciela Bucio[(1)] , Brandi Yip[(1)] , Lizbeth Ayala[(1)] , Alan Neiman[(1)] , Crissy Massimino[(1)] , Surya Saha[(2)] , Tom D'Elia[(1)] . [(1)] Biology Department, Indian River State College, 3209 Virginia Ave. Fort Pierce, FL 34981. [(2)] Boyce Thompson Institute, Ithaca, NY 14853. Citrus greening disease, or Huanglongbing (HLB), is caused by the bacterium *Candidatus Liberibacter asiaticus* (CLas). It is vectored by the Asian citrus psyllid (ACP), *Diaphorina citri* Kuwayama. When infected with HLB, the leaves of the infected plants will develop a blotchy mottle appearance. Any fruits present will become small, lopsided, poorly colored, and contain aborted seeds. HLB is reported to be the most devastating citrus disease worldwide. Citrus production in Florida has drastically decreased throughout the years. As of right now, there is no current method to cure plants infected with HLB. This project looks at

the genome of the vector to identify and characterize genes that could help researchers develop strategies to mitigate the spread of citrus greening. Here, we focus on the RNA helicase superfamily 2 (SF2), which are characterized by the presence of the DEAD motif. RNA helicases are highly conserved enzymes that play a role in RNA metabolism by using adenosine triphosphate to bind to RNA structures and ribonucleoprotein complexes. A total of 18 putative helicases were identified in the *D. citri* genome. Phylogenetic analysis was performed to confirm the classification as RNA helicases in the SF2 superfamily. Additional analysis of domains indicated the presence of the characteristic N and C helicase superfamily domains in 15 of the amino acid sequences, aiding the classification of these as dead-box ATP dependent RNA helicases. These characterized RNA helicases may help with the develop therapeutic treatments to help fight citrus greening.

Keywords: citrus greening disease, helicase, genomics, annotation

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AGR-P02 **Annotation of Genes Involved in the Ecdysteroidogenic Pathway in *Diaphorina citri*.** Brandi Yip[(1)] , Marciela Bucio[(1)] , Lizbeth Ayala[(1)] , Alan Neiman[(1)] , Crissy Massimino[(1)] , Surya Saha[(2)] , Tom D'Elia[(1)] . [(1)]Biology Department, Indian River State College, 3209 Virginia Ave. Fort Pierce, FL 34981. [(2)] Boyce Thompson Institute, Ithaca, NY 14853. To combat the threat of citrus greening disease (Huanglongbing or HLB), it is essential to gain a thorough understanding of the Asian citrus psyllid (*Diaphorina citri*), the insect vector. HLB is caused by *Candidatus Liberibacter asiaticus*, which affects the phloem of citrus trees and hampers the efficient transport of nutrients. This ultimately leads to crop failure and the eventual death of the citrus tree. This project aims to identify specific genes that may be involved in the vector's ability to survive and reproduce. Characterization of these genes will provide a foundation of understanding their role in the insect's ability to vector the disease. The Halloween genes are involved in the biosynthesis of ecdysteroids, which play a crucial role in regulating the timing and progression of molting and metamorphosis in insects. The ecdysteroidogenic pathway feeds into the 20-hydroxyecdysone (20E) signaling pathway, which activates nuclear receptors which modulate numerous physiological processes. A total of 7 Halloween genes and 7 nuclear receptors in the 20E signaling cascade were identified in the *D. citri* genome. Comparative analysis of these genes showed predicted gene models to be accurate representations of gene structures. When compared to other hemipterans, the amino acid sequence length and conservation (percent identity and similarity) along with identification of core domains supported the completeness of the gene models. Accurate annotation of the gene models in *D. citri* provides a valuable resource for further functional and comparative genomics studies.

Keywords: citrus greening disease, genomics, ecdysteroids, annotation

Corresponding Author: Brandi Yip, Yipbd@mail.irsc.edu

AGR-P03 **Effect of ultraviolet exposure on antimicrobial properties of silver nanoparticles.** Erina Okamoto, Jerson Zacarias, Samuel Eastmond, Naileth Gesto, Megan Carroll, and Tom D'Elia. Biology Department, Indian River State College, 3209 Virginia Ave. Fort Pierce, FL. The antimicrobial properties silver nanoparticles (AgNPs) have been well documented against a range of bacterial, fungal and viral pathogens. Due to their size and surface area, AgNPs provide a sustained release of silver ions, resulting in efficacy at low concentrations. This precise control over the antimicrobial agent's dosage minimizes environmental impact. Consequently, AgNPs have emerged as an attractive alternative to antibiotics in the treatment of agricultural pathogens. Numerous studies have demonstrated the susceptibility of bacterial plant pathogens to AgNPs, prompting further evaluations for potential field applications. In order to determine the stability of AgNPs in environmental conditions, we evaluated the effect of UV irradiation on the antimicrobial properties of AgNPs against *Sinorhizobium meliloti* and *Agrobacterium tumefaciens*, analogs of the citrus greening pathogen *Candidatus Liberibacter asciaticus*. Previous research has shown that UV irradiation of AgNPs produced hydroxyl radicals which increased the antimicrobial activity of AgNPs when tested against *Escherichia coli*. For our analysis, AgNPs solutions were exposed to UV light from a distance of 5 cm for times of 0, 30, 60 seconds, and 3 and 30 minutes. A significant increase in antimicrobial activity was observed for the 30-minute treatments. *S. meliloti* growth decreased from 1.97 x 106 CFU/ml to 1.87 x 105 CFU/ml, a change of approximated 90%. Exposure to UV light is a major concern for any type of treatment applied in the field, and AgNPs show significant increase in efficacy under UV exposure, further supporting these as good candidates to control agricultural pathogens.

Keywords: silver nanoparticles, citrus greening, antimicrobial

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ANT = ANTHROPOLOGICAL SCIENCES

(Meeting with MED)

FRIDAY 11:15 a.m. - 11:30 a.m.

JUSTIN MAIERS, UNIVERSITY OF SOUTH FLORIDA, presiding

11:00 a.m. ANT-01 **Microscopic analysis of cut mark characteristics on bone from chopping/hacking tools.** 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. Evaluating sharp force trauma (SFT) injuries to bone inflicted by a larger class of chopping/hacking tools (i.e., swords, axes, hatchets, machetes, cleavers) from forensic contexts can be improved with additional experimental SFT research. Previous research utilizing chopping/hacking tools has analyzed multiple microscopic characteristics for the goal of tool differentiation. However, there has yet to be a study that incorporates the majority of these characteristics into one analysis. The purpose of this research was to analyze a large sample of microscopic characteristics derived from the chopping/hacking literature to determine if increased differentiation of tool type could be made based on microscopic characteristics. The skeletal sample for this research was derived from a previous experiment where trauma was inflicted to 20 partially fleshed pig limbs utilizing four chopping/hacking tools (i.e., axe, hatchet, machete, cleaver) as well as a large carving knife for comparison. Cut marks were evaluated for 15 microscopic cut mark characteristics to assess statistical significance. Utilizing a chi-square analysis, nine of the 15 cut mark characteristics demonstrated statistically significant differences in relation to the tool utilized, and Cramer's V correlations indicated moderate to relatively strong effect sizes. This research builds upon previous research by increasing the variation of chopping/hacking tools utilized during experimentation as well as encompassing the majority of microscopic characteristics discussed within the previous chopping/hacking experimental literature. However, further research using an expanded data set of tools is warranted due to the potential for chopping/hacking tool differentiation.
Keywords: forensic anthropology, sharp force trauma, chopping/hacking trauma, cut mark characteristics

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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 **Effects of UVC Dosage on Three Different Marine Coatings and its Efficacy in Representative Environments**. Tenzin Yeshi, Abby Cermak, Madison Kozee, Geoff Swain, Kelli Hunsucker. Center for Corrosion and Biofouling Control, Florida Institute of Technology 150 W. University Blvd. Melbourne, FL 32901. The use of ultraviolet light (UVC) is of interest for biofouling prevention in the marine environment. Previous studies have proven it to be effective in high saline environments, but it is unknown how the dose will need to be adjusted based on geographic location and with the addition of marine coatings. This project compares and analyzes the difference in fouling prevention on three different marine coatings using UVC synergistically at two distinct locations (Merten's Center, Melbourne, and Cape Marina, Port Canaveral, Florida). A sub-objective is to compare a constant versus a pulsed dose of UVC. The Merten's Center test site is located on the Indian River Lagoon where the test coatings were immersed in an estuarine environment, whereas the test coatings at Cape Marina were immersed in a marine environment. The three coatings tested were a copper-based system (BRA 640), a fouling release (Intersleek 1100), and an inert surface control coating (Epoxy). Control coatings were placed at both test locations. The test coatings were exposed, and visual assessments (ASTM D6990-05) were conducted at both sites monthly for three months, from July to October 2023. During the visual assessments, biofouling growth and/or coating damages were collected with photographs of all panels at corresponding assessment times. Differences in exposure and biofouling responses will be discussed based on coating and location.

Keywords: Biofouling, ultraviolet light, UVC,

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08:45 a.m. AOS-02 **The Abundance and Composition of Biofouling Associates in Subtropical Locations.** Annemarie Herfurth, Cierra Braga, Kelli Hunsucker. Ocean Engineering and Marine Sciences, Florida Institute of Technology. Biofouling, the attachment of living organisms to manmade structures, is well-studied and known for its detrimental impacts. However, one of the benefits of biofouling is the formation of a habitat for mobile organisms comprising a range of sizes. The quantification and classification of these fouling associates is not well documented. The purpose of this study was to begin to identify common fouling associates located in a subtropical estuary. Settlement panels immersed at an estuarine location at the Merten’s Center in Melbourne Florida and a high saline location at the Port Marina in Port Canaveral, FL were sampled to collect fouling associates from a range of size classes. Data will be used to compile a list

of common fouling associates and to compare between locations. This will help to reveal important relationships between attached fouling organisms and the associates.

Keywords: Biofouling, fouling associates, subtropical, estuarine

Corresponding Author: Annemarie Herfurth, aherfurth2016@my.fit.edu

09:00 a.m. AOS-03 **Assessing the gut content of *Styela plicata*: a benthic filter feeder in the Indian River Lagoon.** Honor L. Edmands, Robert Weaver, and Kelli Hunsucker. Florida Institute of Technology 150 West University Boulevard Melbourne, FL 32901. The water quality of the Indian River Lagoon has experienced a significant decline in recent years due to harmful algal blooms. The Florida Institute of Technology's Living Docks restoration program has sought to improve water quality by deploying oyster mats on dock pilings throughout the lagoon. As a whole, the communities that settle on oyster mats have improved local water quality on a small scale throughout the lagoon. However, contributions by individual species which make up these mat communities are unknown. This study examines the capabilities of *Styela plicata*, a sea squirt commonly found on the oyster mats, in removing harmful algal bloom species from the lagoon. The purpose of the study was to 1) determine if algal and bacterial composition varies between S. plicata and the surrounding water column and 2) if so, examine spatial and temporal differences in algal and bacterial composition between S. plicata and the surrounding water column. Gut content of S. plicata was quantified in phytoplankton density by species, and presence of bacterial species. Gut data was compared to open water data to examine the possibility of S. plicata having a selective diet. Two locations were each sampled at two timepoints, and data was compared within and between locations to identify spatial and temporal patterns.

Keywords: Indian River Lagoon, harmful algae blooms, phytoplankton, bacteria, gut content

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09:15 a.m. AOS-04 **The decline in syngnathid populations within the Indian River Lagoon.** Shaunace Bowen, Endi Carter, Senait Yusef, and Sarah Krejci. Bethune Cookman University. Wild seahorse and pipefish are important parts of coastal marine ecosystems but are currently faced with multiple anthropogenic pressures such as habitat loss, overharvesting, pollution, and climate change. The Indian River Lagoon has been experiencing repeated algal blooms since 2010 that has resulted in an 85% loss of seagrasses. Since syngnathids have

close associations with submerged aquatic vegetation, it is likely that habitat loss will result in syngnathid loss. This study compared syngnathid populations within the Mosquito Lagoon and Northern Indian River Lagoon between 2014 and 2023. Both locations showed a decline in four species of syngnathids (2 seahorses and 2 pipefish species). Greater numbers of pipefish were found in the N.IRL in both years. Dwarf seahorses were completely absent from samples in 2023 from both locations. The sex ratio was skewed in the N.IRL in 2023 due to the presence of a single female pipefish and the total length of gulf pipefish was 1cm shorter in 2023 compared to 2014, also attributed to a loss of larger females from the population. Syngnathid populations have declined between the two locations during this period of extended disturbance. Additional studies are needed to understand the long-term impacts of syngnathid loss to the Indian River Lagoon.

Keywords: Indian River Lagoon, Mosquito Lagoon, Syngnathidae, seahorses, pipefish

Corresponding Author: Shaunace Bowen, shaunace.z.bowen@students.cookman.edu

09:30 a.m. AOS-05 **Examining the recovery rate of the syngnathids spp. in the Northern IRL.** Lakean McGregor, and Dr. Sarah Krejci. Bethune-Cookman University; Department of Integrated Environmental Science; Daytona Beach, FL. The Indian River Lagoon, located on the eastern coast of Florida, is an extensive estuarine ecosystem characterized by its distinct habitats and biodiversity. Once known as one of the most biodiverse estuaries in North America, the Indian River Lagoon is now a shell of its former self due to the increased anthropogenic factors including coastal development, pollution, and most notably nutrient loading. As a result, the lagoon has been experiencing an alarming decline in seagrass habitats due to increased harmful algal blooms, and SAV loss. Seagrasses play an essential role in maintaining the ecological balance of the lagoon, providing many marine species with suitable habitats. Historically, members of the Syngnathidae family have been closely associated with seagrass habitats, using them for shelter, mating, and foraging for food. However, the degree of reliance on seagrass by members of the Syngnathidae family and the specific environmental parameters that are closely linked to their abundance is not well understood. This study aims to determine how syngnathid species changed over time in the Northern IRL and how these changes can provide insight into the recovery of syngnathid species.

Keywords: Indian River Lagoon, Syngnathidae, Estuarine, Seagrass

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BIO = BIOLOGICAL SCIENCES

FRIDAY 11:00 a.m. – 11:30 a.m.
TOM D'ELIA, INDIAN RIVER STATE COLLEGE AND KYM ROUSE HOLZWART, SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT, presiding

11:00 a.m. BIO-01 **Response of Fish through Ontogeny in MPA and adjacent waters of the IRL.** Jesse R. Blanchard[(1)] , Andrew Pyryt[(2)] , Ralph G. Turingan[(2)] . [(1)] Florida International University, Miami FL; [(2)] Florida Institute of Technology, Melbourne FL. Along with supporting one of the most ecological diverse and economically valuable estuarine fish communities in the world, the Northern Indian River Lagoon also contains a highly enforced functional marine protected area surrounding the Kennedy Space Center. We hypothesized that the protection afforded by this secured area would significantly impact resident fishes, potentially spilling over harvestable adults into recreational areas. Here, we develop spatiotemporal models of density for three key fishes of interest, Spotted Seatrout, Mangrove Snapper, and Pinfish) at three life history stages (larvae, juveniles, and adults), inside and outside of the protected area demonstrating ontogenetically variable impacts of this protected area, and the value of such spaces.

Keywords: Indian River Lagoon, Marine Protected Areas, fish, Kennedy Space Center

Corresponding Author: Andrew Pyryt, apyryt2021@my.fit.edu

11:15 a.m. BIO-02 **Growth Patterns and Response to Freeze of Mangroves in Northwest Florida.** Christopher Miller. Saint Leo University. Mangrove trees are tropical forest species that in recent years are increasingly found in temperate zone salt marshes. The resultant regime shift due to the migration of mangrove trees into an herbaceous system may have profound implications on biomass allocation, biodiversity and food web dynamics along the Gulf Coast of Florida. This research seeks to examine the growth of individual mangrove trees along a latitudinal gradient over several years from temperate North Florida to

sub-tropical Tampa Bay. The response to freezing temperatures is examined more closely and a discussion of the morphological changes in the trees along the latitudinal gradient is presented. Finally, the role micro-climate plays in shaping these morphological characteristics is considered.

Keywords: Mangroves, freeze, Tampa Bay, latitudinal gradient

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

BIO-P01 **The Clash of Subclusters: A Comparative Analysis of E Cluster Phages.** Madison Gunn, Luis Gomez, Timothy Conneally, and Iain Duffy. Dept. of Natural Sciences, Saint Leo University, 33701 County Road 52, St Leo, FL 33574. The SEA-PHAGES program was created by Professor Hatfull at Pittsburgh University, with the aspiration of discovering novel bacteriophage, learning more about their genomes and life cycles, and potentially discovering viruses with prospective use in phage therapy. Saint Leo University joined the program as part of the 11th Cohort in 2018. The program is aimed at freshmen students to introduce them to various microbiology techniques. Students use soil samples to isolate phage against Actinobacteria, mainly *Microbacterium foliorum*. The students name the phage and it, and all the other details, are then presented on a dedicated web page. The bacteriophages are isolated and purified, followed by purification of the phage DNA. Both the phage and their DNA undergo further analysis. Saint Leo has discovered 72 bacteriophages to date, and of that number, 15 have been sequenced and annotated. The phages found by the university are all a part of the E cluster but within that cluster there are 8 EE, 4 EB, 1 EF, and 2 EK1 bacteriophages. By analyzing the phage and their DNA, differences can be ascertained between bacteriophages from different clusters. Within phage from the same cluster, we can see many similarities but, more surprisingly, there are major differences. Here we present work on our currently sequenced and annotated EE subcluster phages and compare that to the other E cluster phages that have been sequenced and annotated previously.

Keywords: bacteriophage, SEA-PHAGES, *Microbacterium foliorum*, DNA analysis, E cluster

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BIO-P02 **More Than Just A Passing Phage: TootsiePop.** Alexa Keeler, Asia Terry, Aliya Fredette-Huffman, Mitchell E. Laforge, Juan Contreras Jimenez, Arianna A. Adams, Audrey Ang, Chloe M. Farr, Domenica Fierro, Daniela L. Guerrero, Gabriella N. Roman, Dr. Iain Duffy. Saint Leo University, University of Pittsburg and HHMI. As the efficacy of antibiotics diminishes rapidly in treating bacterial infections, there is an increasing sense of urgency surrounding the quest for innovative and novel approaches to treat these infections. A potential alternative to antibiotics is the use of bacteriophage. Thus, Prof. Hatfull at Pittsburgh University created the SEA-PHAGES program, with the primary objective of uncovering novel phages and annotating their genomes. More than twenty-five thousand phage have been isolated from Actinobacteria, as part of the SEA-PHAGES program, to date. Just under five thousand phage have been sequenced and annotated. From this, it is believed that we know the function of approximately 30% of those genes. Therefore, the HHMI SEA-GENES program was created with the purpose of conducting various assays to contribute to assigning functions to the remaining 70% of genes. Saint Leo University became part of Cohort III in 2021, and was assigned the TootsiePop phage, with a 93 gene genome. In the first two years, the students of the SEA-GENES program at Saint Leo successfully cloned 80 genes into the pExTra plasmid. A majority of the pExTra clones have been electroporated into *Mycobacterium smegmatis*, and then assessed for their potential cytotoxicity to the *M. smegmatis* bacteria. Those that are determined to be cytotoxic will then be sub-cloned into a plasmid, p2Hα, the next step in determining gene function. Here, we will present our data to date, which builds on the previous years data, and show the cytotoxic genes from phage Tootsiepop.

Keywords: SEA-PHAGES, SEA-GENES, bacteriophage, Tootsiepop

Corresponding Author: Alexa Keeler, alexa.keeler@saintleo.edu

BIO-P03 **Microbial Masterpieces: The Symphony of Science and Creativity.** Mikylla Torralba, Wendy Jiang, Jesus Hernandez, Mintoo Patel. South Florida State College. From color theory to the golden ratio, science is commonly integrated into art and has greatly benefited from technological advances. This project was inspired by the emerging field of Bio Art where biotechnology is used to create artwork that integrates biology, engineering, art, and photography. Initially, art principles were used to create a template for the artwork. Some designs utilized a 3D-printed stamp to help transfer their art onto the agar plate. LB Agar plates were used as our canvas and we used genetically modified *E.coli* strains as paint while integrating cell cultures. Bacterial colonies of different colors were produced from the transformation of *E. coli* with plasmids that contain genes for chromogens such as blue chromogen, pink chromogen, purple

chromogen, and green fluorescent protein. For the bacteria to grow, the agar plate contained Ampicillin to maintain selective pressure and isopropyl β-D-thiogalactopyranoside to induce the expression of the chromogen gene. The plates were then incubated for 72 hours in a 37°C incubator, which led to the growth of bacteria into bacterial colonies which caused the color on the designs to be more visible. Finally, pictures of the bacterial designs were captured applying photography principles and were edited digitally, printed, and mounted for display. This interdisciplinary project served as a learning opportunity that uniquely integrated art, engineering, photography, and molecular and microbiology principles together.

Keywords: Microbiology, integrated art, Bio Art.

Corresponding Author: Mikylla Torralba, mikyjt008@gmail.com

BIO-P04 **The Oral Microbiome and its adverse effects on Obesity and Metabolic rates.** Sammi Rather, Dr. Mintoo Patel. South Florida State College. The dramatic incline of obesity as a life-threatening disease has been of close observance for health professionals worldwide. Aside from its physically alienating and deformative consequences, the internal effects of obesity are adverse and can be fatal. The precedent for many life-threatening diseases like hypertension, type II diabetes, cardiovascular disease, and stroke is set by the scale. With recent developments in metagenomic methods it has become evident that the oral and gut microbiome have transformative and systemic effects on the body. The microbiome itself hosts millions of bacteria including the phyla Firmicutes and Bacteroidetes that have roles of maintaining internal homeostasis. When the bacterial ratio becomes skewed or uneven, the effects may be seen in obesity-related risks, and this has raised great concern. Diet rich in simple sugars and fats and often associated with obesity create an environment conducive to the growth of various harmful bacteria such as *Streptococcus mutans, Porphyromonas gingivalis*, *Prevotella* and *Fusobacterium* leading to dysbiosis and disruption of the natural metabolic cycle. In this project, we characterized microbiome from tongue coating biofilm samples collected from four healthy young individuals using whole genome sequencing and metagenomic analysis. The presence of harmful bacteria may be predictive of dysbiosis, and a healthy diet may be warranted as a preventative measure. Strategies to restore oral microbiome will be pivotal in modulating gut microbiome and reversing obesity. Supported in part by a grant in aid of research from the Florida Endowment for the Sciences of the Florida Academy of Sciences.

Keywords: Microbiome, obesity, biofilm, harmful bacteria

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BIO-P05 **Stability, Structural Insight, and Characterization of Novel Photosensory Transducer Encoded by ALR 3166 in *Anabaena* PCC 7120.** Providence Pangira, Terence Oscar-Okpala, Brandon T. Vernier, and Vishwa D. Trivedi. Bethune-Cookman University, Daytona Beach. Organisms of all life domains use photoreceptor proteins with bound chromophores such as retinal in retinylidene proteins to sense and respond to light. Rhodopsins found in Eukaryotes, Bacteria, and Archaea consist of opsin apoproteins and a covalently linked retinal which is employed to absorb photons for energy conversion or the initiation of intra- or intercellular signaling. *Anabaena* sensory photoreceptor is present under bicistronic operon with another soluble protein in freshwater cyanobacteria, *Anabaena* PCC 7120. Both genes are in a bicistronic operon reflecting the influence of their regulatory function. Though the structural information along with the significance of their interaction in membrane proximity is evident, the detailed signal cascade is obscure. Interestingly, recently we have outlined the phosphorylation ability of transducer protein. Our detailed bioinformatics study has revealed two possible phosphorylation sites on this novel tetrameric transducer in distinct motifs, first one at 53-56 and another at 105-108 region. In this project, we have focused on stability determination, and motif structural insight using NovaFold and NovaFold AI. The folding pattern of the transducer is quite similar to G-beta. Based on predicted models, we observed that a helical carboxyl-terminal segment for the transducer is quite analogous to the only other available structure in the database, TM1070. We used motif analysis to report key similarities between these 2 known structures. The influence of point mutation in 53-56 and/or 105-108 sequences on structural perturbation will be analyzed further. After the initial success of single mutations, we plan to extend double mutant construction.

Keywords: Protein structure, *Anabaena*, phosphorylation, stability, computational

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BIO-P06 **Structural Outlook of Hypothetical Protein TM1070 from *Thermotoga maritima*: comparative analysis with *Anabaena* Sensory Rhodopsin Transducer.** Ashly Dessources, Brandon T. Vernier, and Vishwa D. Trivedi. Bethune-Cookman University 640 Dr Mary McLeod Bethune Blvd, Daytona Beach, Fl, 32114. *Thermotoga maritima* is a hyperthermophilic, anaerobic organism. As a member of the order Thermotogales, *T. maritima* carry a unique

ability as only fermentative bacterium to produce hydrogen as clean energy. We noticed a hypothetical protein TM1070 [Protein Data Bank, PDB 1NC7]. This protein is characterized as a member of DUF, domain of unknown function. Interestingly, this sequence length of 138 amino acids matches to only known structure of cognate transducer in *Anabaena* PCC 7120 [2II7-2II9 etc]. The scaffold of both transducer and TM1070 protein is tetrameric. We analyzed 114 highly conserved sequence two these two proteins. The detailed structural analysis of all three space groups (P4, C2 and P21, 21, 21-large crystal) transducer forms the same tightly packed tetramer with C4 symmetry. In the P4 space group, this tetramer is formed by crystallographic symmetry, while in the other two space groups the tetramer symmetry is non-crystallographic. The same tetramer was observed in the only structural homolog of transducer in the PDB, protein structure of 1NC7. This 114 residue protein possesses significant sequence identity with transducer. In this project we have focused on motif structural insight using PyMol, AxPyMol and NovaFold AI. Interestingly, we found well-coordinated divalent magnesium present in the core of tetrameric assesmbly of 1NC7 with polar pocket [Thr amino acid]. It is likely that magnesium is crucial for phosphoryl transfer, as found in transducer leading to destabilization of tetramer as part of signaling state. Our detailed motif characterization reveal a novel ligand binding to this DUF tetramer.

Keywords: *Thermotoga maritima, Anabaena* PCC 7120, protein

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BIO-P07 **Metabolic analysis and synthesis of quorum sensing signals in *Chlamydomonas reinhardtii*.** Adam J. Bach, Andrew G. Palmer Ph.D. , Alan B. Brown Ph.D. . Florida Institute of Technology. Numerous species of prokaryotes have been found to regulate symbiotic and pathogenic relationships, exhibit phenotypic switching based on cell density, and other chemical processes (i.e., metabolism) using a method known as quorum sensing. In Gram-negative bacteria quorum sensing systems allow bacteria to coordinate in specific behaviors using N-acyl L-homoserine lactones (AHLs) as a signal. AHLs are made up of an L-homoserine head group, and a varying length acyl tail and varying substituents dependent on what species of bacteria is using them to communicate. In this experiment all AHLs will be synthesized, but in their natural environment they can also be used as a nutrient source for the bacteria producing them, as well as other organisms in the surrounding microbiota. One eukaryotic organism shown to use AHLs as a nutrient source is *Chlamydomonas reinhardtii*. Being a model system, *C. reinhardtii* has been shown to secrete quorum sensing regulatory compounds

that may be able to be impacted by AHLs. Due to these factors, it can be hypothesized that *C. reinhardtii* should be able to metabolize and incorporate the AHLs. Using Carbon-13 (13C) nuclear magnetic resonance (NMR), the metabolic activity of *C. reinhardtii* can be traced. By feeding a 13C enriched sample of AHLs to *C.reinhardtii*, it will be clearly seen whether or not the AHLs can be metabolized by *C. reinhardtii* or not due to the presence of the isotope.

Keywords: Quorum sensing, *Chlamydomonas reinhardtii*, N-acyl L-homoserine lactones (AHLs)

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BIO-P08 **Influence of potassium phosphate on *Cosmarium* growth and physiological parameters in Vitro.** Katelyn F. Orta, Corrilynn J. Williams, Joven J. Jose, and Melba D. Horton. Southeastern University, 1000 Longfellow Boulevard, Lakeland, Florida. *Cosmarium* is a unicellular green alga under the group Desmids of the Division Charophyta. It plays an important role in maintaining the aquatic ecosystem and acts as a bioindicator since it is sensitive to changes in environmental factors and even increased amounts of phosphate and nitrate. Studies have shown that algae can store large amounts of potassium phosphate making them to have high storage capacity. This study looked at the possible uptake of potassium phosphate by *Cosmarium* and its effect on growth, cell size, and lipid production after 4 weeks of culture in vitro. The purpose of this study was to: 1) count the number of cells that have grown in both Control and Experiment treatments, 2) measure the average length of cells for both treatments, and 3) compare the amount of lipid produced after 4 weeks by weekly determining the absorbance value at 875 nm using UV-Vis spectroscopy. The growth of the *Cosmarium* cells was monitored using an automated cell counter. Weekly phosphate absorbance was determined using a UV Vis spectrophotometer. Lipid extraction was performed using the Bligh and Dyer method and the *Cosmarium* cells were then vacuum-filtered. The filtrate was placed into a 45°C oil bath to evaporate where lipid percent yield was collected. Results showed that high phosphate levels increase algal growth and length of the cell. A decrease in potassium phosphate after a population bloom suggests possible cell uptake. Lastly, algae with increased levels of potassium phosphate tends to produce higher amounts of lipid than the control treatment.

Keywords: *Cosmarium*, algae, potassium phosphate, lipid, growth

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BIO-P09 **High Phosphate Effect on Bioproducts and Colony Formation of *Scenedesmus*.** Vargas, R. , Jose, J. , Goodrich, H. , & Horton, M. D. . Southeastern University, 1000 Longfellow Blvd., Lakeland, FL 33801. The depletion of fossil fuels and the associated environmental impact has driven extensive research into sustainable energy sources. Algal biofuels, particularly those derived from *Scenedesmus*, present a promising alternative due to their high lipid content and adaptability to diverse environments. This study investigates the impact of phosphate availability on the growth, lipid content, and anti-inflammatory properties of *Scenedesmus*, focusing on optimizing biofuel production and exploring pharmaceutical applications. Phosphate, a crucial macronutrient, plays a vital role in microalgae's growth and metabolic activities, influencing cell division, photosynthesis, and lipid synthesis. The abundance of phosphate in Lakeland, Florida's lakes make it an ideal location for experimentation. *Scenedesmus* was commercially obtained and cultivated in Southeastern University's Biology Laboratory under controlled conditions. The experimental setup included two treatments: a control with standard phosphate concentration and an experimental group with seven times the standard concentration. Results reveal more *Scenedesmus* cells in the experimental treatment during the initial weeks, with varying colony sizes. The control treatment exhibited predominantly smaller colonies, while the experimental treatment showcased a diverse range of colony sizes. Despite phosphate concentration variations, *Scenedesmus* cells produced consistent photosynthetic pigments, including chlorophyll a, b, and carotenoids. This research contributes valuable insights into optimizing cultivation strategies for enhanced lipid yields in biofuel production. Additionally, the study highlights the potential anti-inflammatory properties of *Scenedesmus*, opening avenues for pharmaceutical applications. The findings underscore the importance of phosphate in shaping algal growth, lipid accumulation, and colony morphology, offering practical implications for both biofuel and pharmaceutical industries.

Keywords: *Scenedesmus*, phosphate, biofuel production, anti-inflammatory properties, algal growth, lipid content, cultivation strategies.

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BIO-P10 **Characterization of bioactive extracts from *Scenedesmus* for health applications and biofuel potential.** Joven Jose, Hannah Goodrich, Rocco Vargas, and Melba D. Horton. Southeastern University, 1000 Longfellow Boulevard, Lakeland, FL 33801. Phosphate pollution, which contributes to algal blooms, is a concern for Florida’s waterways. However, microalgae’s ability to grow in eutrophic conditions, such as excess phosphorus, make it a candidate for wastewater processing. Additionally, microalgae are a source of carotenoids, fatty

acids, and lipids which have antimicrobial, antioxidant, and anti-inflammatory effects. The lipids extracted from microalgae can also be processed and used as biodiesel. This study examined the effect of excess phosphate on the quantity and composition of lipids and antioxidant compounds of the nonmotile, colonial microalgae *Scenedesmus*. Commercially obtained *Scenedesmus* cells were grown under controlled conditions; after six weeks, the lipids were extracted with dichloromethane and analyzed with UV-Vis spectrophotoscopy. The algal residue was resuspended into organic solvents for biochemical analysis. A statistically significant higher lipid yield was obtained from the experimental treatment compared to the control treatment, though the higher antioxidative activity observed in the experimental treatment was not statistically significant from the control except for the lipid extracts.

Keywords: Microalgae, antioxidant scavenging, phosphate pollution

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BIO-P11 **Antioxidant properties and biofuel potential of colonial green algae.** Joven C. Jose, and Melba D. Horton. Southeastern University, 1000 Longfellow Blvd, Lakeland FL 33803. Colonial microalgae such as *Pediastrum* and *Scenedesmus* of class Chlorophyceae are photosynthetic non-motile freshwater coenobium which have emerged as a promising feedstock for biofuel production and extraction of antioxidative bioactive compounds that could replace the present synthetic antioxidants due to advantages, such as rapid growth rate and high lipid content. Algal cell growth, lipid accumulation and synthesis of bioactive compounds are susceptible to environmental conditions and this study has inculcated the prevailing ecological condition of high phosphate concentration in Florida lakes given that the state supplies almost 80 percent of the country's phosphate needs. The purpose of the study was to determine the effect of phosphate repletion on lipid production and antioxidant activity by DPPH and hydrogen peroxide radical scavenging biochemical assay on *Pediastrum* and *Scenedesmus* cells after 5 weeks of growth. Results indicated that there is a statistically significant 17% increase in lipid content within colonial green algal cells at high phosphate concentration. All solvent fractions in this study efficiently scavenge free radicals, indicating that DPPH and hydrogen peroxide radical scavenging biochemical compounds with both hydrophilic and hydrophobic properties were dispersed in the aqueous residue and organic fractions of control and experimental treatments. Higher antioxidative compounds were observed at high phosphate concentrations compared to the control, although statistically not significant. This aligns studies that show how high phosphorus concentrations can induce synthesis of biochemical compounds within microalgal cells. This study postulates that under high

phosphate concentration, the mechanism of colonial microalgal production of polar and nonpolar compounds is enhanced as exhibited by the high lipid content and antioxidant production which compels for further investigation.

Keywords: Microalgae, Phosphate, Biofuel, Antioxidant, Florida lakes.

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BIO-P12 **Structural Outlook and Molecular Docking to probe influence of Sensory Receptor's charged cytoplasmic Motif involving Ionic Interaction in *Anabaena* PCC 7120.** Terence Oscar-Okpala, Providence Pangira, Brandon T. Vernier and Vishwa D. Trivedi. Bethune Cookman University. *Anabaena* Sensory Rhodopsin, ASR, a hepta-helical integral membrane photoreceptor with retinaldehyde as its chromophore, is present under dicistronic operon with another soluble protein in *Anabaena* PCC 7120. Besides ASR's transmembrane atomic resolution structure [1XIO], the structure of 35 cytoplasmic residues beyond 226 [227-261 amino acid sequence] is not established. Our predicted model for this motif is to be alpha-helical extension. In this study, we used a systematic approach using motif structural prediction for the cytoplasmic domain [DeepMind's alpha Fold] of receptor and molecular docking [CABS docking, etc] to outline the influence of this region [227-261] in interaction with a cytoplasmic cognate transducer. Interestingly, the oligomeric is vital in the proposed protein-protein cross talk. In contrast to a few known microbial sensory rhodopsins, ASR interacts with the transducer within cytoplasmic regions rather than established transmembrane region interaction towards signaling. It mimics a eukaryotic-like model in the bacterial system. We focused on the presence of a series of positively charged residues [7-Arg (20% of motif sequence)] and 7 polar Ser/Thr] in this cytoplasmic extension of sensory rhodopsin to potentially preferred in interaction with a cognate transducer. Preliminary docking results supported our model with 10 consensus modes of sensory receptor-transducer interaction. We observed the proximity of charged residue using distance in most consensus models. It validates our hypothesis that ionic interactions are crucial in sensory receptor-transducer interaction. We plan to attempt force computations including coulomb interactions expressed with tools like PyTorch.

Keywords: *Anabaena*, protein structure, molecular docking, Intermolecular interactions, rhodopsin

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BIO-P13 **A preliminary characterization of microcystin exposure in estuarine sentinels in the Indian River Lagoon, Florida.** Ami Krasner[(1)] , Wendy Noke Durden[(2)] , Teresa Jablonski[(2)] , Agatha Fabry[(2)] , Megan Stolen[(3)] , Annie Page[(4)] , Wendy Marks[(4)] , and Spencer Fire[(1)] . [(1)] Florida Institute of Technology, 150 W. University Blvd., Melbourne, FL 32901, [(2)] Hubbs-Sea-World Research Institute, 4020 S. Hwy A1A, Melbourne Beach, FL 32951, [(3)] Blue World Research Institute, 728 West Ave., #174, Cocoa, FL 32927, [(4)] Harbor Branch Oceanographic Institute, 5600 US Hwy 1 N., Fort Pierce, FL 34946. The Indian River Lagoon (IRL) is a diverse estuarine ecosystem experiencing declining water quality in conjunction with increasing vulnerability to harmful algal blooms (HABs). Aquatic mammals inhabiting the IRL can serve as sentinels of One Health threats by demonstrating the presence and deleterious effects of HAB toxins. Microcystin (MC), a potent hepatotoxin and tumor-promoter produced by blue-green algae, is an emerging concern in the IRL. Initially introduced to the lagoon by freshwater outflows from Lake Okeechobee, MC persistence is due to eutrophication, toxin sedimentation, and climatic factors. Microcystin has been detected in IRL residents, domestic animals, free-ranging fauna, and water samples. Yet, there is no routine testing for MC exposure, severely limiting our knowledge of toxin occurrence and health consequences. Thus, we are prospectively and retrospectively screening estuarine indicator species, common bottlenose dolphins (*Tursiops truncatus*) and North American river otters (*Lontra canadensis*), for MC exposure and are correlating findings to health markers. (Funding provided by the Indian River Lagoon Council, Contract No. IRL2022-11).

Keywords: Indian River Lagoon, microcystin, liver, estuarine mammal, sentinel

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BIO-P14 **Standardized protocol to determine brevetoxin's electrophysiological properties using whole-cell patch-clamp techniques.** Dayhana Justiniano and Mustafa Mujtaba. Florida Gulf Coast University, 10501 FGCU Blvd. S., Fort Myers, FL 33965. Patch-clamp techniques are used in electrophysiology studies to evaluate the function and behavior of various ion channels, including voltage-gated sodium ion channels (VGSCs). VGSCs are transmembrane proteins important in excitable nerve and muscle cells for their involvement in electrical signaling. In this study, we outline procedural methods using the whole-cell patch-clamp techniques for determining brevetoxin’s (PbTx-2) VGSC modulating properties on murine RAW 264.7 macrophage and rat GH3 pituitary cells. Sodium current recordings using the voltage-clamp mode were conducted on each

cell line using a 35-mm tissue culture disk as the recording chamber. Recording pipettes with a tip resistance of 0.8-2MΩ were fabricated from borosilicate glass capillary tubes using the P-97 micropipette puller. These pipettes were filled with an internal solution, while the external solution filled the recording chamber. Once whole-cell configurations were established, PbTx-2 at various concentrations or media (control) were perfused into the recording chamber and command voltages were controlled by the pCLAMP software. Patch-clamp protocols (in the presence and absence of PbTx-2) included VGSC activation and inactivation kinetics, drug steady-state affinities to VGSCs, concentration–response curves for resting and inactivated VGSCs, development and recovery from the inactivated state of VGSCs, and use-dependency kinetics (when cells are stimulated repetitively). Thus, we outline in this study standardized patch-clamp protocols to determine electrophysiological properties of PbTx-2 on VGSCs using murine macrophages and rat GH3 cells to aid investigators in exploring ion channel behavior.

Keywords: VGSC, brevetoxin-2, whole-cell patch-clamp, RAW 264.7, GH3

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BIO-P15 **Effect of BMAA neurotoxin on zebrafish spinal cord motor neurons.** Emmanuelle Legerme and Sherri Emer. Department of Biological Sciences, Florida Gulf Coast University, 10501 South FGCU Blvd. Fort Myers, Florida 33965. Beta-N-methylamino-L-alanine, or BMAA, produced by cyanobacteria, can be considered neurotoxic at concentrations of 10-30 nm. Increases in cyanobacteria (blue-green algae) blooms often result in elevated BMAA in the environment. While earlier experiments show neurotoxic effects of BMAA on developing fish embryos, there are limited data on the enduring effects in adult fish. FGCU pilot studies of BMAA effects on adult zebrafish suggest negative impacts on brain tissue and swimming behavior. Given the observed effects on locomotion, our goal was to determine possible effects of BMAA on motor neurons located in the spinal cord. In order to test the hypothesis that cell death and degeneration of motor neurons increased as BMAA concentration increased, adult zebrafish were exposed to zero, low, medium, and high concentrations of BMAA, based on local concentrations reported for Sarasota Bay. Dissected spinal cords of exposed fish were used with an immunohistochemical marker for the apoptotic protein caspase and fluorescence microscopy to evaluate cell death and motor neuron density. The quantitative image analysis results presented here will help us further understand the relationship between BMAA and neurodegeneration. Ultimately, studies using zebrafish to model effects of environmental neurotoxins would yield important implications to both wildlife and human health.

Keywords: Sarasota Bay, cyanotoxin, blue-green algae, spinal nerves, locomotion.

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BIO-P16 **BMAA effect on adult zebrafish apoptosis in the brain.** Dani J. Hamilton and Sherri A. Emer. Department of Biological Sciences Florida Gulf Coast University 10501 FGCU Blvd. South, Fort Myers, FL 33965. Beta-N-methylamino-L-alanine, or BMAA, is a neurotoxin produced by cyanobacteria. Elevated environmental BMAA levels that result from blue-green algae blooms may negatively affect the nervous systems of aquatic and terrestrial life, including humans. Here, I used zebrafish as a model to understand cell death within the brain. Specifically, I used immunohistochemistry and fluorescence microscopy to test the hypothesis that apoptosis in the brain increases with increasing exposure concentrations of BMAA. Using local BMAA levels reported for Sarasota Bay, adult fish were exposed for 30 days to low and high concentrations of BMAA and subsequently maintained in untreated water for 15 or 72 days. Then, dissected brains were sectioned, immunolabeled with the apoptosis marker caspase, and imaged. Image analysis suggested that apoptosis was maintained in the brains of the fish even following long term removal from BMAA. Further, labeling was specifically observed in the telencephalon, optic tract, optic tectum, and cerebellum along with other areas functioning in movement, integration, and metabolism. Intensity of labeling was greatest in the forebrain and progressively declined caudally, toward the brain stem. Localization of apoptosis in BMAA-exposed fish can help us understand the relationship between tissue neurotoxicity and its relationship to behavior, the potential for effects in adulthood, and the capacity for recovery, all of which are critical to survival of a diversity of organisms in natural environments.

Keywords: cyanobacteria, brain, cerebellum, optic tract, apoptosis

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BIO-P17 **Observation of zebrafish behavioral changes in response to resveratrol using EthoVision XT.** Ella Brown, Taylor Moorman, Gavriel Burger, and Dr. Lyndsay Rhodes. Florida Gulf Coast University. 10501 FGCU Blvd, Fort Myers, FL 33965. Zebrafish (*Dani rerio*) serve as a well-established model organism for oncology research, as they have physiological and molecular pathways similar to humans. Zebrafish are sensitive to pharmacological treatments and can provide indications of toxic effects of substances through changes in development and behavioral responses. Deviations in movement patterns, velocity, and heartbeats per minute (bpm) can be monitored and tracked to evaluate

drug sensitivities and possible toxicity. This study was designed to test and monitor the effects of possible cancer treatments on zebrafish larvae behavior. Resveratrol, a stilbene compound derived from plants, has gained popularity in cancer research and has shown anti-carcinogenic properties. The aim of this study was to determine the possible toxicity of resveratrol—and some of its analogues—at sub-lethal doses by tracking changes in behavior using EthoVision XT software. Zebrafish larvae were treated at 4-5 hours post fertilization (hpf) with resveratrol and retreated every 24 hours until the end of the experiment. Heartbeats were monitored at 2 days post fertilization (dpf), and live tracking of the larvae was achieved for 5 minutes through EthoVision XT at 6 and 7 dpf. Data collected included distance moved, velocity, and frequency of movement. Results show that there are changes in zebrafish larvae behavior between treatment and control groups. These results suggest that further research must be done to determine appropriate dosage and administration of resveratrol as an anti-cancer treatment.

Keywords: Zebrafish, Drug screening, Behavior, EthoVision XT, Cancer

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BIO-P18 ***Syngnathus louisianae* Distribution and Habitat Associations in the Indian River Lagoon.** Nicholas Davis, Dr. Sarah Krejci. Bethune Cookman-University. *Syngnathus louisianae* (Chain Pipefish) is a species of fish belonging to the Syngnathidae family. *Syngnathus louisianae* can be observed throughout the lagoon, but there is little research that addresses the densities of these fish's distribution in the estuary, and their habitat associations. This study aims to identify the population density of these fish throughout the Indian River Lagoon, and the habitats they associate themselves with. The Florida Fish and Wildlife Commission (FWC), Fisheries Independent Monitoring (FIM) data was used to analyze the presence of *Syngnathus louisianae* in ArcGIS Pro through point density and pair-wise buffer analyses.

Keywords: Chain Pipefish, Indian River Lagoon, ArcGIS, Fisheries Independent Monitoring (FIM)

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BIO-P19 **Using Unmanned Aircraft System (UAS) to Assess Body Condition of Common Bottlenose Dolphins (*Tursiops truncatus truncatus*) in the Indian River Lagoon, Florida.** Jessica Provenzano, Wendy Noke Durden,

Teresa Jablonski, Agatha Fabry, Spencer Fire. Florida Institute of Technology, Hubbs SeaWorld Research Institute. Common bottlenose dolphins (*Tursiops truncatus truncatus*) in the Indian River Lagoon (IRL) have experienced four Unusual Mortality Events (UMEs) with the most recent mortality event being attributed to starvation. The stock is considered immunocompromised and is routinely subjected to persistent anthropogenic stressors such as fishing gear entanglement, vessel strikes, contaminants, and harmful algal blooms. These factors necessitate monitoring nutritional status to evaluate health trends in IRL dolphins. Previous body condition assessments of this stock have involved invasive capture-release examinations or subjective methods using lateral images of the body. To improve precision, we are investigating the use of photogrammetry data collected from noninvasive unmanned aircraft systems (UAS) combined with models developed from capture-release data to estimate morphometric parameters and subsequently determine the body condition of these free-swimming ecosystem sentinels.

Keywords: Bottlenose dolphins, Indian River Lagoon, Unmanned Aircraft System, UAS, body condition assessment

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BIO-P20 **TRPV1 and ferritin in Burmese python retina.** Lucia Felipe, Nicole Bartling, Dr. Sherri A. Emer. Florida Gulf Coast University. From prokaryotes to higher vertebrates, orientation, navigation, and/or homing are important aspects of survival. Organisms in all major taxonomic groups have exhibited behavioral responses to magnetic fields, and study results suggest that even snakes have a map and compass sense involved in navigation and orientation within the local environment demonstrated by their ability to navigate home. While the mechanism for magnetoreception is debated, it may involve abundant intracellular magnetic particles such as iron that are associated with a mechanosensitive membrane receptor capable of converting mechanical signals into electrical signals usable by the nervous system. Our goal was to use local, wild-caught invasive pythons to test the hypothesis that the snake retina contains a mechanosensitive transient receptor potential protein (TRPV1) that potentially colocalizes with the iron storage protein ferritin. Fixed Burmese python eyes were thinly sliced and used with immunohistochemistry and fluorescence microscopy to evaluate TRPV1 and ferritin presence and distribution. In our preliminary assessments, we observed TRPV1 labeling distributed throughout most retinal cell layers. Analysis of ferritin is also discussed, as it is reportedly widely and unevenly distributed throughout the retina, where it functions in DNA repair and maintenance of phototransduction

components. These results can advance knowledge regarding these invasive, apex predators, their spatial orientation abilities, capacity for geographic expansion and opportunities for management, while also enhancing understanding of the potentially primal sensory modality of magnetoreception.

Keywords: snake, navigation, homing, iron, magnetoreception

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BIO-P21 **The laboratory husbandry of southern toads (*Anaxyrus terrestris*) and future applications.** Connor J. McCowan. Florida Gulf Coast University, Department of Biology, 10501 FGCU Blvd, Fort Myers, Florida 33965. The southern toad, *Anaxyrus terrestris*, is one of the most unique and integral Anuran species in Floridian ecosystems. Historically, southern toads have fulfilled the role of a mid-level consumer, acting as a balance weight between their invertebrate prey and top-level consumers. In the past decades, southern toads have come under threat from anthropogenic pollution, habitat destruction and invasives species. To better understand the vulnerability and resilience of southern toads and by proxy other Anurans, it is advantageous to bring these animals into the laboratory. In the lab, we can examine their behaviors and ecology in more detail. To study them most accurately in the lab, we must mimic their natural habitat and unique ecology as closely as possible. We look to do this by creating habitats that will mimic the Floridian landscape. The key aspects that will be recreated in their husbandry are their burrowing nature, diverse diet, photocycles, humidity and temperature requirements, in addition to other key notes of their ecology. By keeping these animals in the laboratory, we intend to study their vulnerability to invasive parasites, primarily from cane toads. We will specifically be examining the invasion dynamics of the nematode parasite *Rhabdias pseudosphaerocephala* that is commonly found in the lung tissue of cane toads. Through this, we will learn if these parasites can spread naturally and how parasitic invasion affects southern toads physiologically. Therefore, by learning more about this incredible animal in the laboratory, we can be better informed about their conservation requirements to best protect the natural chorus of the Floridian night.

Keywords: laboratory husbandry, amphibian husbandry, *Anaxyrus terrestris*, invasive nematode, conservation

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BIO-P22 **Florida Scrub Species Identification Through DNA Barcoding.** Jean Fleurimond, Daniella Grace Jeanjaquet, Wendy Jiang, Irfan Mahadi Sharif. South Florida State College. DNA barcoding is a species identification technique that is useful within biodiversity studies, particularly in today's world, which is characterized by ever-increasing human activity. This technique is accessible to a broad range of individuals, including high school and undergraduate research students. As IB Diploma high school students interested in the biodiversity of our local Lake Wales Ridge ecosystem, we desired to gain hands-on DNA barcoding experience to broaden our molecular biology knowledge. For our investigation, we collected our sample from this ecosystem, which is a biodiversity hotspot. Using morphological characteristics, we identified the sample as a spider egg. However, using only morphology, it was not possible to identify the species that laid the egg. To resolve this issue, we performed DNA barcoding to identify the species of our spider egg. To do so, DNA from the sample was extracted, amplified using COI PCR primers, and sequenced through Sanger sequencing. Using the bioinformatic analysis platform DNA Subway and COI sequences from BLAST searches, we were able to determine that our spider egg most likely belonged to the species *Emblyna roscida*. Specifically, our BLAST searches showed that a COI gene sequence from *Emblyna roscida* had a sequence similarity value of approximately 98.5% with the sequence of our sample. Through this poster, we will discuss our taxonomic results, which showed how our *Emblyna* sequence related to COI sequences from other *Emblyna* species. Additionally, we will also discuss our experiences and perspectives with regard to this investigation.

Keywords: Florida scrub habitat, DNA Barcoding, biodiversity

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BIO-P23 **Use of Annual Growth Rings to Determine Age of White Mangroves (*Laguncularia racemosa*).** Angela Dees, Luanna DePaula, Christopher Miller. Saint Leo University. Mangroves are coastal ecosystems regarded as critical to the storage of blue carbon, belowground biomass associated with estuaries and ocean systems. Determining the age of mangrove trees in coastal ecosystems could further help estimate carbon storage rates and understand mangrove forest dynamics. Currently, the age of individual mangrove trees is unknown, and there are few reliable means of age determination. While the use of annual rings has been widely used in temperate and boreal ecosystems in age determination of individual trees and forest stands, tropical species, including mangroves, are often regarded as not generating annual growth rings in their stems. In this study, we demonstrate that annual rings in white mangrove (*Laguncularia racemosa*) can be used to determine the age of individuals and stands. Cross-sectioned stems

from young (<6 years) fire-killed trees from the Rock Ponds Ecosystem Restoration site, Tampa Bay were used to determine the age of individuals. The age of the trees was corroborated by the use of historical imagery from Google Earth. The study demonstrates that annual growth rings are present in *L.racemosa* and they may be successfully used in determining the age of trees.

Keywords: Mangroves, White Mangroves, *Laguncularia racemosa*, age determination

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CMS = COMPUTER/MATHEMATICAL SCIENCES

FRIDAY 09:00 a.m. – 09:45 a.m.
RICARDO JIMENEZ, BARRY UNIVERSITY, presiding

09:00 a.m. CMS-01 **Continuity of the Roots of Nonmonic Polynomials and its Application to Prove Kharitonov's Theorem**. Jason Elsinger, Aaron Welters, Anthony Stefan. Lewis University; Florida Institute of Technology. The continuity of the roots of a monic polynomial on its coefficients (in C) can be proved using an elementary real analysis approach using essentially just the Bolzano-Weierstrass Theorem. Other approaches require higher-level techniques from either complex analysis or topology, which are not readily accessible to undergraduates. Fortunately, our elementary approach does apply for non-monic polynomials that occurs in many important areas such as in singular perturbation theory, perturbation theory for generalized eigenvalue problems, and, as we will see in this talk, in the stability theory of polynomials. Furthermore, the possibility of a change in the degree of the perturbed polynomial from that of the unperturbed polynomial, requires a special consideration that does not occur for monic polynomials. In particular, we are able to provide a short and simple proof on the continuity of the roots of non-monic polynomials as a function of their coefficients using only elementary results from analysis. Finally, we show how to apply the root continuity to give an elementary proof of an important and well-known theorem in the stability of polynomials, the so-called Kharitonov's Theorem.

Keywords: Kharitonov's Theorem, polynomials,

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09:15 a.m. CMS-02 **End-to-End Security for Relational and NoSQL Database Management Systems.** Denis Ulybyshev. Department of Computer Science, Florida Polytechnic University. 4700 Research Way, Lakeland, FL, 33805. Database security is essential since database management systems are widely used in modern software systems and they may store sensitive data. There are several known methodologies to protect database records at the server side and in transit. However, data protection is also needed after the retrieved database records arrive to a client side. My research project aims to provide protection for database records on the client side for both relational and non-relational database management systems. The approach also supports fine-grained role-based, attribute-based, and content-based access control models for database management systems.
The proposed methodology to secure relational and non-relational databases is successfully applied for monitoring virtual machines hosted in cloud infrastructures and for secure delivery of event notifications and diagnostics information to the cloud and/or virtual machine owner(s). System events and diagnostics messages are often stored on cloud instances in the form of unstructured log files, including JSON files. Cloud owners need to promptly receive notification about the problem, for example, when a database server is down, or X.509 certificate has expired or is about to expire for a web site hosted on the cloud instance. Notifications on certain types of events may represent sensitive information and, thus, are delivered to the owner of a virtual machine and/or a system administrator in a protected form, using various communication channels. The proposed approach allows to protect sensitive event records on the client side.

Keywords: database security; database management systems; cloud monitoring; data privacy; access control

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09:30 a.m. CMS-03 **Transforming math education with ChatGPT: Practical strategies for success.** Monika Kiss, Jacci White, and Katrina Weicht. Saint Leo University Post Office box 6665 St. Leo, Florida 33574. In this session, we'll introduce ChatGPT's capabilities for interactive math lessons, focusing on real-time feedback and personalized tutoring. We'll delve into practical applications such as adaptive learning paths and collaborative environments, emphasizing the role of AI in fostering peer-to-peer knowledge exchange. The presentation will conclude with a discussion on ethical considerations, showcasing successful case studies, and providing educators with actionable strategies for immediate implementation in their math classrooms.

Keywords: Artificial Intelligence, AI, ChatGPT, education

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ENG = ENGINEERING SCIENCES

FRIDAY 08:30 a.m. - 11:30 a.m.
SESHA SRINIVASAN, presiding

08:30 a.m. ENG-01 **Influence of biochar on the removal of Microcystin-LR and Saxitoxin from aqueous solutions.** Cadianne Chambers, and M. Toufiq Reza. Florida Institute of Technology. The present study assessed the effective use of biochar, a pyrogenous organic material derived from plant or animal waste, for the adsorption of two potent HAB toxins namely, Microcystin-LR (MCLR) and Saxitoxin (STX) through a combination of dosage, kinetic, equilibrium, initial pH, and competitive adsorption experiments. Characterized results of biochar displayed promising adsorption potentials in the form of high carbon stability (H/C = 0.02, O/C = 0.11), well-defined pore network (SBET = 261.06 m2/g), decorated surface functionality (oxygen-containing groups 941.33 µmol/g), and positive surface charge. The results suggest excellent adsorption capabilities of biochar for the removal of MCLR and STX, with STX reporting higher adsorption capacities (622.53 – 3507.46 µg/g). STX removal required a minimal dosage of 0.02 g/L, while MCLR removal needed 0.4 g/L for > 90 %. Similarly, a shorter contact time was required for STX removal compared to MCLR for > 90 % of toxin removed from water. Initial pH study revealed that for MCLR acidic conditions favored higher uptake while STX favored basic conditions. Kinetic studies revealed that the Elovich model to be most suitable for both toxins, while STX also showed suitable fittings for Pseudo First and Pseudo Second Order in individual toxin systems. Similarly, for the Elovich model the most suited kinetic model for both toxins in presence of each other. Isotherm studies confirmed the Langmuir-Freundlich model as the best fit for both toxins. These results suggest adsorption mechanisms such as electrostatic attraction, hydrogen bonding, hydrophobic interactions, π-π interactions, dispersive interactions, and pore filling.

Keywords: Harmful Algal Blooms, HABs, Microcystin, Saxitoxin

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08:45 a.m. ENG-02 **Computational screening and experimental validation of hydrophobic deep eutectic solvents for efficient removal of Microcystin-LR from water.** Laura Fronchetti Guidugli, Cadianne Chambers, M. Toufiq Reza. Florida Institute of Technology. Microcystin-LR (MCLR) is a naturally occurring toxin produced by cyanobacteria and is the most toxic substance in its family. These toxins are associated with algal bloom and possess a significant threat to a wide range of organisms, including humans. This study evaluates the use of hydrophobic deep eutectic solvents (HDESs) to extract MCLR from water samples. Hydrophobic deep eutectic solvents (HDESs) are a type of green solvent that consists of a mixture of a hydrogen bond acceptor and hydrogen bond donor, typically a quaternary ammonium salt, resulting in a significant reduction of the melting point of the mixture and an improvement in the solvent properties, such as solubility and extraction efficiency. Conductor-like Screening MOdel for Real Solvents (COSMO-RS) was utilized to screen over five hundred different HDESs by computing the σ-surfaces, σ-profiles, σ-potentials, ln(activity coefficients), and excess enthalpy of adsorption. Extraction experiments were carried out utilizing deep eutectic solvents based vortex-assisted liquid-liquid microextraction (DES-based VALLME) using the nine (9) best performing HDESs. Experimental results reveal that TBAB:acetic acid in a 1:1 ratio achieves 79.85 ± 0.75% removal of MCLR. Subsequently, Virtual models for property Evaluation of chemicals within a Global Architecture (VEGA) analysis was conducted on the most effective HDESs (TBAB:acetic acid, TBAB:arginine, and TBAB:glutamic acid) to assess human and environmental toxicity endpoints, including mutagenicity, carcinogenicity, acute toxicity, and bioconcentration factor (BCF). The results indicate that these HDESs exhibit low toxicity and minimal environmental concerns.

Keywords: Cyanobacteria, Microcystin, Toxicity, Harmful Algal Blooms, HABs

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09:00 a.m. ENG-03 **Hydrothermal Carbonization: An Effective Manure Management Technology.** Bilash Devnath, M. Toufiq Reza. Florida Institute of Technology. The 9.8 billion heads of cattle and poultry raised in the US each year generate up to 1.4 billion tons of manure. Untreated Animal manure from factory farms is produced at a rate about 13 times higher than that of the US population, degrading the environment, emitting offensive scents, and posing health risks to the workers and the surrounding community. Farmers are collecting and storing that manure in retention ponds or composting it and using it as fertilizer. These practices are not good for the environment or not enough for this volume of waste. Meanwhile, hydrothermal carbonization (HTC) is a chemical

technology in which heat is applied to wet biomass feedstocks, and they convert to biochar. This process can be used to process wet manure derived from livestock farming and solve the environmental pollution from livestock farming. Hence, this study aims to apply HTC on different manures at different temperatures and determine the effect of temperature on Solid and liquid product characteristics from HTC. Manure was collected from Poultry, Swine, and Dairy farms. Deionized water was added to Poultry Manure, and Swine manure and Dairy manure were strained to make the solid-to-liquid ratio 1:10. Hydrochar and Process Liquid were derived from Hydrothermal Carbonization on animal manure at 180, 220, and 260 oC to analyze the effect of temperature on solid and liquid product characteristics. Elemental analysis and surface morphology were done on hydrochar through CHNS analysis, Thermogravimetric analysis, FTIR, and SEM EDX. Ion analysis on processed liquid and digested hydrochar was done with ion chromatography. The thermal stability of hydrochar of animal manure was more than that of dried raw manure, and it increased with temperature. The distribution of essential elements with different temperatures was different for each manure. Hydrochar from Poultry and Swine manure produced chemically enriched solid products; for Dairy manure, process liquid was more enriched than hydrochar. pH, DO, and Conductivity measurements of different process liquids supported that distribution. In conclusion, HTC can be used as an effective manure management technology for various manures.

Keywords: Livestock waste, Hydrochar, Manure Management

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09:15 a.m. ENG-04 **Hydrothermal Valorization of Waste Lignin into Solid Fuel.** MM Rahman, M. Toufiq Reza. Florida Institute of Technology. Lignin is the second most abundant and waste organic polymer on Earth and a key component of lignocellulosic biomass. It exists in various types, distinguished by extraction methods and source materials. Each type of lignin exhibits distinct chemical properties and structural characteristics, influencing its suitability for energy applications. In this study, alkaline, dealkaline, organosolv, and lignosulfonate lignin were hydrothermal carbonized (HTC) at 230, 260, and 290°C in a 100 ml Parr reactor. The HTC process utilized a ratio of 1:8 for raw lignin to deionized water, and the resulting solid char was separated from the products. The produced hydrochar was characterized through energy content, ultimate analysis, proximate analysis, thermal stability, and combustion indices. The produced hydrochar has enhanced fuel properties at higher HTC temperature. This comprehensive investigation provides insights into the potential upgrading of lignin to fuel.

Keywords: Hydrothermal carbonization (HTC), lignin, waste to fuel

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09:30 a.m. ENG-05 **Optimized Carbon Capture using Deep Eutectic Solvent to Functionalize Loblolly Pine derived Activated Hydrochar.** Swarna Saha, Sarah Pezzenti, and Toufiq Reza. Florida Institute of Technology. In recent years, CO2 emissions have emerged as a contentious issue due to their association with global warming and various other natural disasters. An economically viable adsorbent for CO2 capture could be produced from loblolly pine (LP), a common remnant of forests, through functionalization with deep eutectic solvent (DES) which is known as a prospective environmentally friendly liquid solvent. The objective of this study is to develop hydrochar from loblolly pine through hydrothermal carbonization at temperatures varying from 200°C to 260°C. Following 1 hour of pyrolysis at 600°C, the hydrochar will be further functionalized with choline chloride-ethylene glycol, choline chloride-urea, and tetra-n-butyl ammonium bromide-urea and compare the effectiveness of CO2 capture with activated hydrochar from LP without post treatment. The activated characters displayed significant surface porosity (118.34-356.78 m2/g) and pore volume (0.074-0.1573 cm3/g). The adsorbent demonstrated improved surface functionalities and an increase in total nitrogen content after functionalization with DES. At 3 bar and 25°C, functionalized activated chars demonstrated improved uptake efficiency with a type IV adsorption isotherm compared to the activated hydrochars with a type I adsorption isotherm. While comparing the CO2 capture capacity, activated hydrochar at 260°C functionalized with tetra-n-butyl ammonium bromide-urea exhibited the highest uptake of 10.247 mmol/g. The enhanced CO2 capture efficiency was a result of the combined influence of increased surface functionalities and porosity, which improved the physical and chemical adsorption mechanisms.

Keywords: Deep Eutectic Solvent, Activated Hydrochar, carbon dioxide adsorption

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09:45 a.m. ENG-06 **Carbon Capture on Chemically Activated Biomass.** Al Ibtida Sultana, Joshua Calhoun, and M. Toufiq Reza. Florida Institute of Technology. In recent years there has been an increase in the demand for environmentally friendly solutions to CO2 capture. Natural residues and eco-friendly solvents have been acknowledged as possible solutions. Loblolly pine (LP) has been favored due to its natural abundance and high porosity. Methods such as chemical activations have been a verified way in which to notably improve the porosity of

LP, but often the chemical agent utilized, for example, potassium hydroxide (KOH), generates hazardous waste. Melamine is an activation agent that offers a greener alternative and with the addition of Deep Eutectic Solvents (DES), this study sought to favorably improve the properties of LP. Choline chloride-urea DES was used to pretreat LP and was then activated via hydrothermal carbonization (HTC). This was done at temperatures of 170, 200, and 230°C. Samples were then chemically activated with either Melamine, KOH, or a combination of the two activation agents. The sample's surface area and porosity were then evaluated via the utilization of nitrogen (N2) adsorption–desorption. To observe the crystallinity and thermographic composition of samples, X-ray powder diffraction, and thermographic analysis were used, respectively. The initial hypothesis indicated that samples super activated with both Melamine and KOH being most beneficial, but it was observed that the results suggested that Melamine was a superior activation agent, with DES pretreated hydrochars being the most beneficial when considering the success of CO2 capture due to the increase of functionality in the ultra-porous material. It was found that samples adsorbed CO2 at values as high as 3.941 mmol/g, at 1 bar.

Keywords: Carbon capture, carbon dioxide, hydrothermal carbonization (HTC), hydrochar

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10:00 a.m. BREAK

10:15 a.m. ENG-07 **Photodegradation of Thermochromic Materials and their Protection via Microencapsulation.** Sushant Nagare[(1)] , Addam Ben Abdallah[(2)] , Brennan Halsey[(2)] , Daniil Ivannikov[(2)] , Elias Stefanakos[(1)] , Sesha Srinivasan[(2)] . [(1)]University of South Florida, [(2)]Florida Polytechnic University. Thermochromic materials have potential use as energy savers in building envelopes, due to the fact that their color chromatic behavior changes with temperature. External stimuli, such as solar radiation, often causes degradation in the physicochemical characteristics that impact their optical performance in real-time outdoor applications. The off-the-shelf polymeric encapsulated thermochromic dyes blended in a sodium silicate binder were prepared as coating materials on glass substrates using a dye-casting process with a film thickness of approximately 300 µm. These films have been systematically exposed to extended simulated sunlight environments at ambient conditions. The optical absorption, and color chromatic characteristics using UV-Vis spectroscopic and C.I.E. calorimetric measurements, were evaluated and compared with those of the pristine samples for photodegradation and related processes. We have also attempted to mi-

croencapsulate these thermochromic dyes and characterized via FTIR, to understand the chemical make-up of the encapsulants for possible degradation mitigation of the dyes, and these results are also presented and discussed in this study.

Keywords: Thermochromic materials, photodegradation, dyes

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10:30 a.m. ENG-08 **Experimental Study of a Composite Phase-Change Material and Aluminum Foam for Heat Dissipation.** Emily Geiger, Ethan Trulson, and Gerardo Carbajal. Florida Polytechnic University 4700 Research Way Lakeland, Florida 33805. The experimental work investigated heat transfer capabilities of composite aluminum foam and phase-change material (PCM) for heat dissipation of a variable heat source. The composite material were aluminum foam blocks impregnated with eicosane (PCM); these combined material properties affected its thermal conductivity. Initial steps studied aluminum foam block's standalone heating properties. The heat source was a solid cylinder with an embedded heater placed in the block. Thermocouples were placed near the surface of the cylinder and throughout the block recording their temperatures over time as the block was heated and then cooled. This process was performed at three heat transfer rates 10W, 25W, and 40W. Each rate was tested at airflow velocities, 2.4 m/s, 1.7 m/s, and 0 m/s, providing different levels of convection heat transfer for the system. Airflow was applied to one face of the block; therefore, tests were conducted on four individual sides due to their non-uniform surface that changed airflow efficiency. Maximum temperatures ranged from 45°C to 140°C under varying conditions. Aluminum foam blocks were then impregnated with eicosane, with an embedded heater and thermocouple. The composite was heated until either the thermocouple reached eicosane's melting temperature, the eicosane fully melted, or temperature did not change significantly over time. Solidification time was recorded after power was cut and cycle repeated two more consecutive times. Tests were conducted at 2W, 4W, 6W, and 8W with aluminum foam blocks with 5 pores per inch (PPI), 10 PPI, 20 PPI, and 40 PPI. Preliminaries showed the composite can stand for longer heating/cooling cycles.

Keywords: Phase-changing material, aluminum foam, heat transfer, thermocouple, convection

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10:45 a.m. ENG-09 **Unveiling the Electrochemical Potentials of Amino Acid-derived Graphene.** Russell C. Smith, Gene Koifman, Pavithra Pathirathna, and M. Toufiq Reza. Florida Institute of Technology. Using alternative energy devices has skyrocketed in the past couple of decades and is only increasing as more research is being put into the alternative energy field. Graphene is one of the most revolutionary materials discovered in the early 21st century and a reason responsible for this boom in alternative energy devices. Unfortunately, a couple of hurdles graphene presents for manufacturers to adopt commercially: high cost and material consistency. Hence, this study is focused on converting a common amino acid, L-glutamic acid, into graphene by a 2-step process in the presence of an Iron (III) Nitrate catalyst to determine the homogeneity and cost efficiency of this method in producing graphene. L-glutamic acid and Iron (III) Nitrate are first mixed in a ratio (5:1) and then carbonized at 200℃ followed by graphitization at 1000℃, 1200℃, and 1400℃ to alter the amorphous carbon structure into a crystalline graphene structure. Excess Iron (III) Nitrate was washed with HCl 0.5M to purify crystallized graphene. The synthesized graphene was characterized by scanning electron microscopy for surface morphology analysis, X-ray diffraction for analyzing the crystal structure, Fourier transform infrared spectroscopy to detect functionality, cyclic voltammetry to evaluate the electrochemical properties, elemental analyzer to measure the elemental composition, and energy-dispersive X-ray spectroscopy to analyze the elemental structure. Furthermore, the synthesized graphene samples were used as electrodes to compare the electron transfer kinetics against commercial graphene electrodes. Data is being collected and analyzed, and preliminary results will be presented.

Keywords: Graphene, amino acids, L-glutamic acid

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11:00 a.m. ENG-10 **A Novel, Ultra-Fast Electrochemical Sensor to Detect Cd2+ via Fast-Scan Cyclic Voltammetry.** Noel Manring, Gene Koifman, Miriam Strini, and Pavithra Pathirathna. Department of Chemistry and Chemical Engineering, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL, 32901. Detecting neurotoxic heavy metals, such as Cd2+, is crucial as the widespread metal contamination poses significant global health concerns. These neurotoxic agents can breach the blood-brain barrier, causing severe and often irreversible damage to the central nervous system and other vital organs. A highly sensitive and rapid detection method for these metals is an essential next step in sensor technology to mitigate these detrimental health effects and start early therapeutics. Conventional techniques for detecting metals have their own limitations, resulting in altering the speciation of metals, a factor that determines

their toxicity. In this study, we fabricate a novel Cd2+ sensor by modifying the surface of carbon fiber microelectrodes by electrodeposition of gold nanoparticles. Our sensor employs fast-scan cyclic voltammetry with a 100 ms temporal resolution, marking it the fastest Cd2+ detection sensor. We established a calibration based on the concentration of Cd2+ in a tris buffer that mimics artificial cerebellum fluid, yielding an impressive limit of detection of 1.32 nM. Selectivity tests and complexation studies with different metal ions and ligands reveal that our sensor can detect free Cd2+ in complex matrices. We also analyzed the solution chemistry of Cd2+ in different matrices using PHREEQC, a commonly used geochemical model, and found our electrochemical data well agreed with PHREEQC findings, thus validating our sensor's response. Additionally, our sensors performed optimally with excellent stability and sensitivity when detecting Cd2+ in artificial urine, showcasing an excellent potential for our sensors to be used for future biological samples and in vivo measurements.

Keywords: Heavy metals, carbon-fiber, cyclic voltammetry, geochemical modeling

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11:15 a.m. ENG-11 **Implementation of static logic gates using GNRFET and CMOS technology.** Sheldon Taylor, and Muhammad Ullah. Florida Polytechnic University, 4700 Research Way, Lakeland, FL 33805. The Si-CMOS based technology has been dominating the digital design for more than 40 years. However, numerous device non-idealities that cause critical reliability issues in Si-CMOS designs are introduced at 32nm technology nodes and beyond. Continued scaling gives rise to short channel effects that diminish the controllability of the gate. Other factors like significantly increased leakage power dissipation, larger process variation and other technological and economical challenges arise with continued Si-CMOS scaling. Therefore, traditional Si-CMOS technology has reached a point where further advancement in terms of speed and size is becoming extremely challenging as devices scale down into the deep submicron region. Graphene Nano Ribbon Field Effect Transistor (GNRFET) is an emerging technology that has received a lot of attention in recent years due to its high carrier mobility for ballistic transport, compatibility with high k dielectrics, high carrier velocity to have abrupt switching, and good thermal conductivity. In this work, various GNRFET-based conventional two-input digital logic gates are implemented. The different gate designs are analyzed in terms of speed of operation, leakage power dissipation, and energy consumption using HSPICE. The results are then compared to the Si-CMOS implementations of these gates at the same future size and nominal voltage. Simulation results demonstrate that

GNRFET could be potential emerging energy efficient electronic device at semiconductor industry for future digital systems design.

Keywords: CMOS technology, digital logic gates, GNRFET technology, HSPICE, Semiconductor Device

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

ENG-P01 **CANCELLED**

ENG-P02 **Modeling Hydrodynamic Coefficients for Simulating Ship Maneuvering and Handling.** Alex R. Milgram, and J. Travis Hunsucker. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. This work aims to develop a methodology for determining the hydrodynamic coefficients for ship maneuvering simulations. Finalized ship models are used to provide ship pilots accurate simulation and training scenarios. Results from the simulations are compared with sea trial data to assess accuracy. The simulations were run in Wärtsilä's Virtual Shipyard (VSY) using a test ship measuring 126 meters in length with a displacement of 4646 tons. The coefficients were fine-tuned based on turning circle, zigzag, and inertia open water sea trials. The tuning process requires modification of the added mass, sway force, damping force, and propeller side force coefficients. Each coefficient influences the forces and moments acting along a vessel, directly impacting the maneuverability. The sensitivity of each coefficient to the overall maneuverability was determined via inspection and iterative simulation runs. This methodology was applied to the test ship to improve its accuracy against real-world data. The final discrepancies between simulated and sea trial results for their respective parameters were between 3.6 and 18.0 meters during the turning circle test. There was less than a 1-degree error for overshoot angles during the zigzag test, and a 6-meter difference in head reach during the inertia open water test.

Keywords: Ship maneuvering; Turning circle test, Zigzag test, Ship simulation, Sea trial

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ENG-P03 **Methodologies for quantifying drag reduction in air lubrication systems.** Jonathan L. Carter, Wyatt Amarosa, and J. Travis Hunsucker. Florida Institute of Technology 150 W University Blvd, Melbourne, FL 32901. A small-scale water tunnel with a floating element (FE) is being designed to accurately determine the reduction in frictional drag for full-scale ships. International Maritime Organization (IMO) guidelines aim to reduce CO2 emissions by 40% across international shipping by 2030. The frictional drag of water along the ship's hull accounts for up to 80%-90% of the total drag on a ship. Reducing the frictional drag will reduce fuel consumption and resulting CO2 emissions. A recently developed strategy to overcome some of this frictional drag is a method called air lubrication systems (ALS). ALS delivers a steady stream of air along the underside of the ship's hull that has been shown to reduce frictional drag. Despite being shown to reduce frictional drag in certain applications, ALS has yet to be optimized for full-scale ships. Additional methods for quantifying the drag reduction of ALS are required to confirm which ALS application strategies result in the largest drag reduction. Flow channel is capable of calculating the frictional drag of the test coupons at friction Reynolds numbers (Re_τ) ranging from 750 up to 2000 with an estimated uncertainty of less than 5%.

Keywords: Drag reduction, air lubrication systems (ALS), frictional drag, floating element, Reynolds number

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ENG-P04 **Optimization of Heat Sink Design Through Analysis of Materials Selection and Cooling System Configuration.** Dustin Fandetti, Corey Kado, Sydney Wickett, Gerardo Carbajal. Florida Polytechnic University, 4700 Research Way Lakeland FL 33805. Heat sinks are metal parts consisting of a fin array often employed in electronic systems to assist in thermal energy dispersal from heat-generating components. The effectiveness of a heat sink in transferring heat from the chip or any heat source is dependent on the thermal conductivity of the metal, while the ability of a heat sink to subsequently disperse this heat to its surroundings is conditional on the total exposed surface area through which heat is transferred. Fins are extended surfaces that increase the heat transfer rate from heat sinks by increasing the total exposed surface area. The cooling rate of a microprocessor chip is enhanced by the inclusion of a fan, making power consumption a crucial consideration in design. The most restrictive factors in heat sink design are cost and size. The present study intends to detail the development of an optimized heat sink of specified dimensions with a particular focus on the impact that metal selection, fin quantity, fan velocity, and, by direct relation, fan power consumption have on a heat sink's performance, quantified by its heat

transfer rate. The analytical solution was done in MATLAB and considered varying tip boundary conditions. The performance of each heat sink configuration was defined relative to its total cost of fabrication to aid in the designation of the most optimal design. Key findings include the significantly negative impact of thermal spreading on heat sink performance, the importance of fan consideration, and the suitability of aluminum for use in heat sinks based on both cost and performance.

Keywords: heat sink, fin, efficiency, thermal spreader, fan power

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ENG-P05 **Engineering 3D Printed Tool For Relieving Body Tension.** Ean Cheng, Mikylla Torralba, Wendy Jiang, Mintoo Patel. South Florida State College. Many people in today's world suffer from uncomfortable tension in their bodies. This widespread issue not only affects daily lives but can also lead to long-term health problems. While there is a wide variety of mass-produced relief tools designed as one-size-fits-all solutions, these tools are fit for only a fraction of the population that comprises individuals with great variation in size. A personalized tension relief device will be a better option to cater to an individual's needs for tension relief. Having a customized device according to a person's body will improve the effectiveness of the device. To solve this problem, we propose to use a 3D printer and a computer-aided design to create a tension-relief prototype for alleviation along the upper to lower back, shoulders, hip flexors, and psoas muscles. We intend to utilize the SOLIDWORKS 3D CAD software to produce an efficient prototype with optimal results for the alleviation of muscles and tissue tension. A personalized design will be created according to an individual's body measurements. Factors such as weight, height, waist size, and body width can all affect the design of the relief tool's size and shape. The personalized product will be capable of soothing discomfort and tension along the upper body and hips. Due to its customization, the MEW-relief-tool will provide superior comfort and stress relief compared to generic, mass-produced products.

Keywords: Body tension, 3D Printing, tension relief device

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ENG-P06 **Flash Flood Detection Using Satellite Data with a Machine Learning Approach.** Kisha Mulenga, Farahnaz Golroo, Hyun Jung Cho, Seenith

Sivasundaram, Juan Calderon. Dept. Computer Science and Engineering, Bethune Cookman University. Flash flooding in Florida poses a serious threat, causing disruptions in daily activities, infrastructure damage, and risks to residents' safety. These sudden, violent events can engulf urban areas within minutes, resulting in property damage and significant mobility challenges, highlighting the state's vulnerability to such extreme weather conditions. The implementation of a flood early warning system would be extremely beneficial for Florida, providing a vital tool to protect communities from potential risks and minimize the devastating impact of extreme weather events. The approach of this project involves the use of multispectral satellite images provided by NASA to analyze water levels in the state of Florida. Our goal is to mitigate flood risks in areas near the Indian River Lagoon, the proposal includes the implementation of advanced Machine Learning and Deep Learning techniques. These methodologies will be applied to develop a predictive model capable of identifying and forecasting potential flood threats in different areas of Florida, thereby offering an early warning system to safeguard vulnerable communities from extreme weather events.

Keywords: Machine learning, Flash flooding, Flood forecasting

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ENG-P07 **Design and Development of a Robotic Platform at Scale for Implementing Artificial Intelligence and Computer Vision Algorithms in Autonomous Vehicles**. Shaquan Tyson, Aldridge Kalenga, Chibundu Awandu, Santosh Lamichhane, Buchizya Mwase, Tianna Brown, Juan Calderon,. Dept. Computer Science and Engineering, Bethune Cookman University. The automotive industry has shifted towards electric vehicles in the past decade. Electric cars are beginning to dominate the market and are expected to become the global standard for mobility. This transition from gasoline vehicles to electric ones has facilitated the approach and development of autonomous driving systems. This project focuses on designing and developing a 10:1 scale electric vehicle platform, integrating multiple sensors and computer systems. The project has three primary objectives: (1) the development of an autonomous vehicle platform, (2) the exploration of artificial intelligence and computer vision algorithms, and (3) providing university instruction in autonomous vehicles (AV). The platform replicates AV features by incorporating electric motors, batteries, and essential sensors for AV, such as RGB cameras, LiDARs, depth perception cameras, and radar. An onboard computing system enables the evaluation of advanced artificial intelligence and computer vision algorithms in a controlled environment. The project involves the development and testing of algorithms for autonomous navigation, sensory data processing, and real-time decision-making. Simultaneously, the project aims to

impact education by creating innovative teaching materials. The scaled platform will serve as an educational resource for undergraduate students interested in autonomous vehicles, artificial intelligence, and computer vision. This interdisciplinary approach aims to prepare the next generation of professionals in the emerging field of autonomous electric vehicles

Keywords: Computer vision, Artificial Intelligence, Autonomous vehicles

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ENG-P08 **Face detection and recognition using Viola-Jones algorithms for autonomous cars.** Buchizya Mwase, Tianna Brown, Shaquan Tyson, Aldridge Kalenga, Chibundu Awandu, Santosh Lamichhane, Juan Calderon. Dept. Computer Science and Engineering, Bethune Cookman University. "With the escalating advancements in autonomous vehicle technology, ensuring robust safety systems has become significantly important. This project aims to augment the safety features of autonomous cars through the utilization of advanced face detection and recognition techniques. By leveraging the Viola-Jones algorithms, recognized for their effectiveness in real-time face detection, the project aims to integrate these algorithms into the autonomous driving systems of vehicles. The primary objective is to enhance the accuracy and speed of face detection and recognition in diverse driving conditions, thereby assisting in crucial functions like driver monitoring. The project involves the development of an integrated system utilizing Viola-Jones algorithms to detect faces within the vehicle. This system is designed to identify the presence of a person in the vehicle and specifically determine the driver's identity. Implementing these algorithms in autonomous cars is expected to significantly contribute to accident prevention and improve security and theft prevention measures. The current phase of the project has successfully implemented the Viola-Jones face detection module, exhibiting promising results across various lighting and environmental conditions. The subsequent stage involves refining the recognition algorithms to accurately distinguish between different individuals, a critical step toward personalized driver settings. The anticipated outcome of this research is a groundbreaking enhancement in autonomous car safety features, setting a new standard in vehicular technology. This research not only advances the field of automotive safety but also underscores the potential of face detection and recognition technologies in practical applications, promising a safer future for road travel"

Keywords: Viola-Jones algorithms, Face recognition, Autonomous vehicles

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ENG-P09 **Interest objects detection for self-driving cars using a Deep learning approach.** Chibundu Awandu, Santosh Lamichhane, Shaquan Tyson, Aldridge Kalenga, Buchizya Mwase, Tianna Brown, Juan Calderon. Dept. Computer Science and Engineering, Bethune Cookman University. In the rapidly evolving realm of autonomous driving technology, ensuring the safety and effectiveness of self-driving cars remains a top concern. As urban areas become increasingly congested, the ability to accurately detect and respond to various objects in complex environments is crucial. However, current detection systems often struggle with precisely identifying objects in diverse and dynamic settings, posing a significant problem for the safe deployment of autonomous vehicles. Addressing this challenge, our project proposes a sophisticated solution utilizing a deep learning approach, specifically leveraging the capabilities of You Only Look Once (YOLO) combined with Python programming. YOLO, renowned for its efficiency and accuracy in real-time object detection, is integrated into a Python-based framework to enhance the detection capabilities of self-driving cars. Our methodology involves training the YOLO algorithm with extensive datasets comprising various urban scenarios, ensuring robust object recognition. The system is fine-tuned to recognize a wide array of objects including pedestrians, other vehicles, traffic signs, and unexpected obstacles. Python, chosen for its versatility and extensive libraries, is used to interface with the YOLO algorithm, facilitating data processing and integration with the car's navigation system. The expected outcome of this project is a significant improvement in the detection accuracy and response time of self-driving cars, leading to safer autonomous navigation in complex urban environments. The implementation of this solution promises to be a substantial step forward in the field of autonomous driving, showcasing the potential of combining advanced deep-learning techniques with practical programming solutions.

Keywords: Object detection, Autonomous vehicles, Deep learning

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ENG-P10 **Driver behavior detection using a Deep Learning approach.** Aldridge Kalenga, Shaquan Tyson, Chibundu Awandu, Santosh Lamichhane, Buchizya Mwase, Tianna Brown, Juan Calderon. Dept. Computer Science and Engineering, Bethune Cookman University. Road traffic accidents are one of the

leading causes of death worldwide. According to the World Health Organization (WHO), nearly 1.4 million people are involved in car accidents worldwide each year, resulting in around 3,700 fatalities in traffic every day, primarily due to driver carelessness or errors in judgment. The purpose of this research is to design a next-generation driver monitoring system for vehicle management that utilizes Machine Learning (ML) and Deep Learning (DL) techniques. The goal is to decrease the accident rate caused by factors such as distractions and microsleep. The system utilizes in-vehicle cameras to analyze visual cues such as the driver's posture, expressions, and eye movements while driving. Convolutional Neural Networks (CNN) are part of the latest advanced models used for real-time prediction. The current stage of the project involves identifying the driver inside the vehicle, analyzing their posture, and determining the positions of specific points of interest, such as hands and face. Future work aims to enhance the detection of high-risk behaviors, such as cell phone use and microsleep, offering potential breakthroughs in road safety. This research not only contributes to automotive safety but also opens avenues for applying ML and DL in practical monitoring systems. The anticipated outcome is a substantial decrease in traffic accidents, thereby improving public safety and well-being.

Keywords: Driver monitoring, Deep learning, Autonomous vehicles

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ENG-P11 **Lane Detection using ANN for self-driving car.** Santosh Lamichhane, Chibundu Awandu, Shaquan Tyson, Aldridge Kalenga, Buchizya Mwase, Tianna Brown, Juan Calderon. Dept. Computer Science and Engineering, Bethune Cookman University. This research delves into the application of Artificial Neural Networks (ANN) for enhancing lane detection in self-driving cars. Our objective involves training the ANN on a diverse dataset that includes various road scenarios and factors such as lighting conditions and road markings, we aim to improve the vehicle's perception system. Rigorous testing would demonstrate the effectiveness of the model in real-world driving conditions, emphasizing its contribution to advancing autonomous driving technology. Unlike traditional pixel-wise segmentation approaches, our method draws inspiration from human perception, treating lane detection as an anchor-driven ordinal classification problem. This approach, utilizing global features and a sparse row-anchor-driven representation, addresses efficiency challenges and localization errors. We expect the method to exhibit high performance in both speed and accuracy, providing a promising solution for robust lane detection in diverse real-world conditions.

Keywords: Artificial Neural Networks (ANN), Autonomous vehicles, Lane detection

Corresponding author: Santosh Lamichhane, santosh.lamichhane@students.cookman.edu

ENG-P12 **Lane detection using artificial vision for autonomous cars.** Tianna Brown, Buchizya Mwase, Shaquan Tyson, Aldridge Kalenga, Chibundu Awandu, Santosh Lamichhane, Juan Calderon. Dept. Computer Science and Engineering, Bethune Cookman University. The automotive sector has shifted significantly toward electric vehicles over the past decade. This move has seen a rise in electric cars dominating the market, poised to become the global standard for transportation. This transition from traditional gasoline-powered vehicles to electric ones has paved the way for advancements in autonomous driving technologies. The future landscape of transportation is anticipated to heavily rely on the progression of autonomous driving systems, aiming to diminish both accidents and environmental pollution. This endeavor involves creating a lane detection algorithm designed to construct a lateral control system for self-driving vehicles. Utilizing a 360-degree artificial vision system equipped with cameras, the algorithm employs classical image processing methods like thresholding, Gaussian and Canny filters, Hough transform, and non-linear regression models. The subsequent phase of this initiative encompasses integrating the mathematical model of the vehicle with the lane detection algorithm, thereby incorporating it into the lateral control system of autonomous cars. Moreover, the project aims to enhance the development of the lateral control system by implementing car detection algorithms utilizing visual data.

Keywords: Artificial vision, Autonomous vehicles, Lane detection

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ENV = ENVIRONMENTAL CHEMISTRY AND CHEMICAL SCIENCES

FRIDAY 10:00 a.m.
JEROME WILLIAMS, ST. LEO UNIVERSITY, presiding

10:00 a.m. ENV-01 **Ultra-fast, Electrochemical Detection of Arsenite Carbon-Fiber Microelectrodes Coupled with Fast-Scan Cyclic Voltammetry**

in Aqueous Solutions. Noel Manring, Miriam Strini, and Pavithra Pathirana. Department of Chemistry and Chemical Engineering and Sciences, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL, 32901. Increased arsenic contamination is a global concern due to the detrimental health hazards associated with arsenic poisoning. Arsenite interferes with cellular respiration, causing cell injury and death; thus, long-term exposure causes cancer, skin lesions, cardiovascular diseases, diabetes, and death. Therefore, developing a selective, robust, cost-effective arsenite sensor is crucial. Traditionally employed methods of arsenite detection require sophisticated equipment, expert personnel, and sample pretreatment, thereby altering metal speciation, a critical factor for determining metal toxicity. In this study, we utilized carbon-fiber microelectrodes (CFMs) coupled with fast-scan cyclic voltammetry (FSCV) for rapid electrochemical detection of arsenite in tris buffer that mimics artificial cerebellum fluid. Because arsenic species' redox chemistry depends on the pH, we conducted an in-depth pH study to explain the sensor of our response under different acidic and basic conditions. We constructed calibration curves in both basic and acidic media to obtain excellent limits of detection and sensitivities. Furthermore, we conducted a selectivity test and found that our optimized parameters for basic and acidic media are specific for arsenite. To our knowledge, this is the fastest electrochemical sensor available to detect arsenite. Our preliminary data showcases the power of our sensor, which will be developed as a future in vivo arsenite sensor.

Keywords: Arsenic contamination, Arsenite, Carbon-Fiber microelectrodes (CFMs)

Corresponding author: Pavithra Pathirathna, ppathirathna@fit.edu

10:15 a.m. ENV-02 **Early studies on the effectiveness of industrial hemp as a phytoremediator of polluted waters.** Liliana Plata, Isabela Potter, and Kate Calvin. South Florida State College, 600 W. College Dr., Avon Park, FL, 33825. Fresh water lakes and waterways in Florida have been declining as the result of nutrient pollution. Large amounts of nitrogen and phosphorus from fertilizer, animal feed, phosphate mine events and human waste have been identified as 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. The goal of this project is to grow plants that will survive when placed in impaired water long enough to pull out some of the excess nutrients. The hypothesis is that the excess nitrogen and phosphorus in the impaired host water will provide the nutrients needed for

the plants' survival. The plant growing strategy used here conditions plants to seek water directly and three generations of plants have demonstrated the ability to survive with their roots submerged in water for over three months. Established EPA methods were used for segmented flow analysis of Total Kjeldahl Nitrogen (TKN), and Total Kjeldahl Phosphorus (TKP) in the water. Preliminary data show that over a period of 36 days and 12 samplings, five plant setups 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. Additional trials are pending, and nitrate/nitrite studies are underway.

Keywords: Industrial hemp, phytoremediation, Cannabis sativa, water quality

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

ENV-P01 **Electrochemical behavior of adrenaline using nanopipet via ion-transfer between two immiscible electrolyte solutions.** Ralph J. Page, Gene Koifman, and Pavithra Pathirathna. Department of Chemistry and Chemical Engineering, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Adrenaline (Adr), or epinephrine, is a principal adrenal hormone that functions as a hormone modulator and excitatory neurotransmitter. Adr is primarily synthesized and secreted in the adrenal medulla as a response to acute stress, mediated by sympathetic nerve fibers, causing increased cardiac output and elevated blood glucose levels. Abnormally and consistently high Adr levels can be indicative of chronic stress, resulting in anxiety, depression, schizophrenia, sleep disorders, hypertension, diabetes, compromised immune system, etc; thus, developing devices for monitoring changes in Adr levels in the human body is crucial. Among various analytical techniques, electrochemical sensors are ideal for detecting biomolecules in real time due to their excellent selectivity and outstanding sensitivity, robustness, portability, low cost, and less intensive sample preparation. In this study, we fabricate a glass-based nanopipet electrode to detect Adr in several matrices using a non-redox-based electrochemical technique known as ion transfer between two immiscible electrolyte solutions. We study the transfer of Adr in the presence of two ionophores, dibenzo-24-crown-8 and dibenzo-18-crown-6, across the water/dichloroethane interface in DI water, KCl, CaCl2, and tris buffer. We also study the effect of pH, ionic strength, and interference ions on the transfer of Adr. Moreover, we perform calibration curves to determine the

analytical parameters such as the limit of detection, linear range, sensitivity, etc. Our preliminary data showcases the strength of glass-based nanopipet electrodes to be developed into an excellent tool for monitoring fluctuations in Adr concentrations in brain dialysates.

Keywords: adrenaline, ITIES, nanopipet, electrochemistry.

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ENV-P02* **Synthesis of a Biogenic Aldehyde, 3,4 Dihydroxyphenyl-acetaldehyde (DOPAL), a Toxic Dopamine Metabolite in vivo: Implications for Parkinson's Disease Pathogenesis.** Joven Jose, Ralph Salvatore, Nadja Bijelic, Savannah Page. Southeastern University, 1000 Longfellow Blvd, Lakeland FL 33803. Parkinson's Disease (PD) is one of the most common neurodegenerative disorders that affects roughly 2% of individuals over the age of 65. Pathologically the disease occurs by the loss of dopaminergic nerve cells located in the substantia nigra. These cells are responsible for the production of dopamine. 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 has been directly linked to neurotoxicity and the PD disease state. In an early, reported synthesis, DOPAL was isolated in four steps, three chromatographic separations, and proceeded with an overall yield of about 4%. One of the routes used in this research project to synthesize DOPAL uses Epinephrine/Adrenaline 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 present research 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 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. Furthermore, we can compare our results to authentic DOPAL.
***Poster displayed with BIO-P11**

Keywords: Parkinson's Disease, Biogenic aldehyde, 3,4 Dihydroxyphenyl-acetaldehyde, Epinephrine, Neurotoxicity

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ENV-P03 **Mild and Efficient Cs_2CO_3-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 and carbonates are ubiquitous compounds that hold a wide array of use as pesticides, serve as novel protecting groups, and possess interesting medicinal applications as peptidomimetics. A novel phosgene free method, environmentally benign synthesis of silyl carbonates and silyl carbamates were developed via a three-component coupling of an amine or alcohol, carbon dioxide and a trialkyl or trialkylsilyl halide. Cesium carbonate not only promoted successful carbonylations of alcohols and carbanations 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 carbonates , Silyl carbamates, synthesis

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ENV-P04 **Phytoremediation of engineered nanoparticles using aquatic plants.** Parisa Ebrahimbabaie. Dep of Integrated Environmental Science, Bethune-Cookman University, 640 Dr. Mary McLeod Bethune Blvd, Daytona Beach, FL 32114. Laboratory and field measurements and mathematical models indicate that engineered nanoparticles (ENPs) escape to the environment during manufacture and use. It is expected that the majority of released ENPs eventually enter freshwater environments. Many aquatic (freshwater) plants are known to tolerate high levels of pollution and may serve as useful indicators of ENP fates. Cattail (*Typha latifolia*) and sedge *(Carex rostrata*) served as test plants. Healthy plants were placed into plastic vessels containing dilute nutrient solution. Plants were exposed to five ENP types (ZnO, TiO_2, $BiVO_4$, Cu_2O, and Ag) (three replications of each) for 15 weeks. At weeks 5, 10, and 15, plant tissues were harvested and processed for recovery of ENPs. Shoot tissue was digested using a microwave system, and samples are currently being analyzed for ENPs via ICP-AES. Selected plant variables such as leaf enzyme activity, chlorophyll production, shoot height, root length, toxicity symptoms and leaf area were determined. Every week pH and EC of the nutrient medium were measured using a pH meter and EC meter, respectively. TEM/SEM was used to visualize ENP particle size and degree of

aggregation, and also the presence of nanoparticles in plant roots and shoots. The findings of this study can provide useful data regarding the ability of common aquatic plants to remediate nanoparticle-contaminated aquatic ecosystems.

Keywords: nanoparticles, aquatic plants, phytoremediation, cattail, sedge

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ENV-P05 **Environmental Impact Assessment of Paint Equipment Washout in Terrestrial and Aquatic Ecosystems.** Elizabeth Eskildsen, Dallas Eskildsen, Dr Ashley Spring. Eastern Florida State College. Paint disposal techniques, including equipment washout, may negatively impact terrestrial and aquatic ecosystems. The hypothesis of this phase of the study posits that the presence of latex paint at increasing concentrations of none (control), low, medium, and high concentrations will result in decreased activity and survival levels among earthworms (*Lumbricus terrestris*) and fiddler crabs (*Uca pugnax*). The research also highlighted the environmental risks associated with titanium dioxide, especially in nanoparticle form, found in paints and primer-sealers. The findings underscored the need for ongoing research into the long-term and chronic impacts of these substances on aquatic environments and organisms.

Keywords: Paint, environmental risks, titanium dioxide

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GEO = GEOSCIENCES

FRIDAY 10:00 a.m. - 10:45 a.m.
AL KARLIN, DEWBERRY AND BRUCE NOCITA, S&ME, INC., presiding

10:00 a.m. GEO-01 **Topobathymetric lidar in the eastern Gulf of Mexico, 2019 – present.** Alvan Karlin, Emily S. Klipp, and Amar Nayegandhi. Dewberry, 1000 N. Ashley Drive, Suite 801, Tampa, FL 33602. Since 2017, Dewberry has been awarded NOAA and/or USGS task-orders to assist in mapping portions

of the Everglades and the Florida Keys, as well as Tampa Bay, the Big Bend region, and the southwestern coast from Egmont Key to Naples using topobathymetric lidar. Of local significance, in 2019 and again in 2020, Dewberry was tasked by NOAA to use the same technology to map the shoreline and nearshore bathymetry of Tampa Bay and then in 2022 to fill-in the central portion of the bay not surveyed in the previous missions. Most recently, Dewberry was tasked by NOAA to map a large nearshore portion of the Big Bend Region of Florida using the latest topobathymetric sensor, the Coastal Zone Mapping and Imaging Lidar (CZMIL) sensor from Teledyne. This past year, as a part of the Florida Department of Environmental Protection/Office of Resilience and Coastal Protection, Florida Seafloor Mapping Initiative (FSMI), Dewberry was tasked to map three of the six regions of Florida: Panhandle, Big Bend, and Southwest Gulf of Florida, in water depths to the 20-meter isobath. To accomplish these mapping tasks, Dewberry has employed not only the CZMIL and other topobathymetric lidar sensors, but also incorporating Satellite-derived Bathymetry (SDB). As the SDB can be produced every three days for the areas of interest along the Gulf of Mexico, the results are used to help predict the water clarity, which is a major contributor to the success of the mapping. This discussion focuses on how the SDB are used to assist in the topobathymetric lidar mapping and some "Lessons Learned" during the process in the eastern Gulf of Mexico.

Keywords: Lidar, Topobathymetric maps, Florida, Gulf of Mexico

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10:15 a.m. GEO-02 **Florida hurricanes and the relationship between rapid intensification and sea surface temperature.** Josephine M. Hoffman. University of Tampa Department of Environmental Studies. As a direct result of anthropogenic processes, an increase in greenhouse gas production, and subsequent building of the ozone prevents heat and energy from the sun from leaving the planet's surface. The heat that typically leaves the surface and escapes out to space is trapped on the surface and increases sea surface temperatures (SST). An increase in SST amplifies the strength of tropical cyclones through rapid intensification (RI), causing unreliable tropical cyclone predictions and danger to communities. Hurricanes Idalia and Ian are perfect examples of RI and had massive impacts on the Gulf Coast of Florida. A GIS map of each storm's track and SST layered together shows the impact of increasing SST. Comparing NASA Jet Propulsion Laboratory's MODIS instrument SST data for the months of September 2022 and August 2023, as well as NOAA's Historic Hurricane Track and the

ArcGIS Living Atlas, the location of where each storm underwent RI is determined. As predicted, areas of SST of about 300K/80 o F/30o C is where the maximum sustained wind speed increased by 35 mph, marking RI. Increases in SST have led to an increase in atmospheric water vapor. The increase in SST and atmospheric water vapor are directly related to increases in severe weather systems. The main environmental parameters that cause RI are SST and an unstable and moist atmosphere. Specifically in the Gulf of Mexico, RI tends to occur more frequently due to the Gulf's warmer waters and moist atmosphere.

Keywords: Florida hurricanes, Rapid intensification, Sea surface temperature, Florida West coast, Geographic Information Systems

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10:30 a.m. GEO-03 **Green and Loggerhead Sea Turtle Strandings on Florida Coasts, 1980-2021.** Jacob Hack. The University of Tampa 400 W. Kennedy Tampa, Florida 33606. Sea turtle strandings occur yearly and are ecologically important. Green (*Chelonia mydas*) and Loggerhead (*Caretta caretta*) sea turtles are endangered keystone species whose activities are critical to marine ecosystems. Green sea turtle populations graze on seagrass beds, recycling nutrients back into the environment while Loggerhead sea turtles recycle nutrients from crustaceans and mollusks. Strandings (dead, injured or ill animals) threaten populations by diminishing reproductive individual numbers. National initiatives to save them include creating marine protected areas (MPA's). This report analyzed 41 years (1980-2021) of Florida Fish and Wildlife sea turtle stranding data to determine: 1) Whether reported strandings occurred less frequently in marine protected areas; 2) Whether there was a difference in rates of strandings between Green and Loggerhead sea turtles during this time; 3) Whether there was a difference between the straight carapace length of stranded turtles between the East and West coasts of Florida. The data revealed: (1) There were almost twice the number of reported strandings outside the marine protected areas (6,150) than inside the areas (3,262); (2) The annual incidence of strandings was consistent for both species of sea turtles until 2009. In the subsequent years, Green sea turtle stranding rates markedly accelerated and continued through 2021 compared with Loggerheads; (3) The straight carapace length of both species who strand on the East Coast of Florida were consistently smaller (mean 26.4 cm Green, 48.1 cm Loggerhead) when compared with the larger stranded turtles (mean 36.7 cm Green, 63.1 cm Loggerhead) on the West coast. Our data indicates a rising rate of Green sea turtle strandings compared with Loggerhead sea turtles, particularly outside

MPA's in Florida, and a large difference in locations where larger and smaller sea turtles strand. Further study is needed to clarify the causes of our findings. (there was no grant funding for this project).

Keywords: Sea turtles, Turtle strandings, Marine Protected Areas

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MED = MEDICAL SCIENCES

FRIDAY 8:30 a.m. - 11:15 a.m.
ERIC GUISBERT, FLORIDA INSTITUTE OF TECHNOLOGY, presiding

08:30 a.m. MED-01 **Preserving the effectiveness of a carmine staining solution for cell nuclei.** Allen A. Smith, and Andrea Delgado. Barry University School of Podiatric Medicine, 11300 NE 2nd Ave., Miami Shores, FL 33161. Carmine, a vivid crimson dye derived from the Mexican cochineal insect, is used to stain cell nuclei, chromosomes, or mucin by varying the mordant used. This study introduces antioxidants to the staining solution for cell nuclei to combat carmine's susceptibility to oxidation by air. Copper carmine is made by dissolving 0.8 g cupric acetate monohydrate and 0.8 g carmine alum lake in 40 ml of water and adding 6 ml 28% ammonium hydroxide. 1 g glutathione and 500 mg vitamin C are added to prevent oxidation. The solution is stirred 15 minutes and filtered through fast filter paper (Whatman #4). This solution keeps its staining efficacy undiminished for 3 weeks. Deparaffinized tissue sections are stained 10 min, differentiated 30 sec in 1% HCl in 70% ethanol, rinsed in water, dehydrated, cleared, and mounted.

Keywords: carmine, nuclear stain, antioxidants

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08:45 a.m. MED-02 **Rare genetic variation in *C. elegans* underlies differences in resistance to the environmental toxicant chlorfenapyr.** Timothy

A. Crombie. Department of Biomedical Engineering and Science, Florida Institute of Technology, Melbourne, FL, USA. Human responses to environmental toxicants vary due to genetic differences among individuals, which makes risk assessment challenging. To overcome this obstacle, knowledge of the specific genetic variants that drive disparities in environmental toxicant responses is required. The nematode *Caenorhabditis elegans* is a useful model for addressing this challenge because it has levels of natural variation that are similar to humans, is easy to screen for toxicant responses, and has the conserved molecular, cellular, and developmental properties of a metazoan. Here we use high-throughput *C. elegans* toxicant response assays and genetic mapping approaches to find genetic variants that influence responses to chlorfenapyr, a widely used commercial insecticide. We found that among a sample of 192 genetically distinct wild nematode strains, most of the variation in chlorfenapyr response was driven by a single, highly resistant strain, ECA36. Most strains exposed to 0.6uM chlorfenapyr develop 50% slower than normal, but the development of ECA36 is unaffected. To map the genetic differences underlying ECA36 chlorfenapyr resistance, we built a panel of 192 recombinant inbred lines (RILs), sequenced their genomes, and measured their chlorfenapyr responses. We then used a linkage mapping approach to correlate genotype with phenotype across more than 10,000 markers. We found that 88% of the variation in chlorfenapyr resistance among the RILs is explained by a 164 kb genomic region on chromosome V. This region contains 49 distinct genes, including 10 cytochrome P450 genes. Future work will use CRISPR-Cas9 genome editing techniques to measure the effect of specific variants within these genes on chlorfenapyr resistance.

Keywords: toxicant, natural variation, risk assessment, genetics

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09:00 a.m. MED-03 **Synaptic and Mitochondrial Defects in a *C. elegans* Tauopathy Model.** Aidan Anderson, Xinxing Ding, Melissa Borgen. Florida Institute of Technology. Tauopathies are a subset of neurodegenerative diseases, including Alzheimer's disease (AD), frontotemporal dementia (FTD), Pick's disease, progressive supranuclear palsy, and corticobasal degeneration. The rise in neurodegenerative disease prevalence has dramatically increased the research effort on this front. Molecular events preceding degeneration are poorly understood. Using a *Caenorhabditis elegans* humanized tauopathy model, we are able to assess subcellular events contributing to tauopathy pathogenesis. Comparative analysis of integrated reporter constructs for synaptic components using confocal im-

aging shows a reduction in synaptic vesicle protein RAB-3 throughout development. These data suggest the disease-associated mutation in Tau induces synaptic defects prior to axon and neuron loss in neurodegeneration. We also show an increase in mitochondrial TOMM-20 fluorescence signal in the tauopathy-model. There are several possible mechanisms underlying this phenotype. We are using combinatorial genetics to elucidate the pathways involved and gain insight into molecular mechanisms contributing to the mitochondrial aberration. Data assessing candidate genes in this context show a strong role for rpm-1, which is genetically inhibited by tau. Additionally, RPM-1 is functioning through negative regulation of DLK-1, which sits atop a kinase cascade that is likely targeting the transcription factor CEBP-1.

Keywords: Tauopathy, neurodegenerative diseases, *Caenorhabditis elegans*

Corresponding author: Aidan Anderson, aidan2022@my.fit.edu

09:15 a.m. MED-04 **The RPM-1 signaling network promotes neurodegeneration in a Tauopathy disease model.** Xinxing Ding, Aidan Anderson, Melissa Borgen. Florida Institute of Technology. Neurodegenerative diseases, such as Alzheimer's Disease and Frontotemporal Dementia, are growing in prevalence as the population ages. Identifying genes and molecules that can be targeted for new treatments and diagnostics relies on better understanding of the cellular and molecular events that happen throughout the disease process. We have used a *C. elegans* model for Frontortemporal dementia to identify a novel role for the RPM-1 signaling pathway in regulating neurodegeneration. RPM-1 is a large, highly conserved ubiquitin ligase that serves as a signaling hub in development of the nervous system. Loss of rpm-1 is protective against degeneration of the worm motor cord in the tauopathy model. This suggests RPM-1 is involved in the neurodegeneration process, acting to promote axon and neuron loss. We assessed known RPM-1 pathway genes for their effects on degeneration of the motor cord. We find that RPM-1 functions upstream of multiple genes that influence degeneration, including both positive and negative regulation targets. Our candidates include regulators of the endosomal/lysosomal pathway, microtubule stability regulators, and kinases that affect several downstream processes. GLO-4, a guanine nucleotide exchange factor (GEF), works downstream of RPM-1 to promote degeneration. Alternately, the Ser/Thr Kinase and known ubiquitination target, DLK-1, plays a neuroprotective role. Loss of DLK-1 exacerbated degeneration in the tauopathy model. Due to the prominent regulation by DLK-1, we have assessed potential downstream kinases to determine the pathway functioning in degeneration, as well as transcription factors that may be the targets for the kinase pathway. These results show 1) a novel role for RPM-1 signaling, 2) identify the

specific kinase cascade involved, and 3) provide insights on potential mechanisms underlying degeneration.

Keywords: Tauopathy, RPM- 1 signaling pathway, neurodegenerative diseases

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09:30 a.m. MED-05 **Regulation of HSF1 by SF3B1.** Michaela Foley, Karen Kim Guisbert, and Eric Guisbert. Florida Institute of Technology 150 West University Blvd Melbourne, FL 32901. High levels of HSF1 are correlated with poor patient outcomes in multiple cancers such as prostate, breast, and melanoma. HSF1 is the master regulator of the cytoprotective heat shock response (HSR), which increases expression of chaperones upon stress. When HSF1 levels and activity are increased, there is a greater capacity for cancer cells to harbor their mutational burden. Inhibition of HSF1 is a potential strategy for anticancer therapeutics. The regulation of HSF1 activity has been heavily studied, but the mechanisms of regulating HSF1 levels have yet to be defined. We have identified a regulator of HSF1, a splicing factor known as SF3B1. In this presentation I will describe a novel approach towards targeting HSF1 levels via this pathway for the development of an anticancer therapeutic.

Keywords: cancer, HSF1, luciferase, cell-based screening

Corresponding Author: Michaela Foley mfoley2017@my.fit.edu

09:45 a.m. BREAK

10:00 a.m. MED-06 **Double-Bore Carbon Fiber Microelectrodes for Simultaneous Detection of Neurotransmitter and Toxic Metal via Ultrafast Scan Cyclic Voltammetry** Noel Manring, Miriam Strini, and Pavithra Pathirathna. Department of Chemistry, Florida Institute of Technology, 150 W. University Blvd, Melbourne, FL 32901. Neurodegenerative diseases (NDD) pose a global health concern despite the numerous therapeutics aimed at slowing their multifactorial progression. Carbon-fiber microelectrodes (CFMs) have provided important electrochemical insights into NDDs, yet their single neurotransmitter analysis limits real-time understanding of interactions. Addressing this, a multi-bore microelectrode with multiple carbon fibers (CF) offers insights into evoked neurotransmitter heterogeneity and interactions at specific locations. However, challenges in engineering such microelectrodes stem from lengthy processing

times and costs. This study presents a double-bore CFM with two sensing components, each bore housing a single CF as a unique electrode for specific analyte detection. Characterizing the sensor with dopamine, serotonin, ascorbic acid, and Cu(II) using fast-scan cyclic voltammetry (FSCV), simultaneous signals were acquired in analyte mixtures. Calibration curves revealed non-interference at nm-wide separation during ultra-fast scan rates. Exciting interactions between ascorbic acid and Cu(II) were observed. Additionally, we successfully performed co-detection of various toxic heavy metal ions, an exciting find for metal detection. This study reports the first use of double-bore CFM for simultaneous detection of two analytes without altering electrochemical parameters at a 100 ms resolution. This highlights its excellent potential for in vivo real-time detection of multiple neurotransmitters and toxic metal ions.

Keywords: Neurodegenerative diseases, Carbon-fiber microelectrodes, CFMs,

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10:15 a.m. MED-07 **Novel 4D Printing Biofabrication Methodology for Magnetically Aligned Collagen Scaffolds**. Nashaita Y. Patrawalla[1], Karly Liebendorfer[1], Vipuil Kishore[1,2]. [1]Department of Biomedical Engineering and Sciences, Florida Institute of Technology; [2]Department of Chemistry and Chemical Engineering, Florida Institute of Technology. Anisotropic orientation of collagen fibers is a promising strategy to generate biomimetic constructs with improved mechanical and topographical properties to control cell function. Biofabrication using 3D printing allows for the generation of application-specific tailor-made collagenous scaffolds with high geometric precision. However, these scaffolds lack collagen anisotropy. In this work, 3D printing was combined with the magnetic alignment approach in an innovative 4D printing scheme to introduce high degree of collagen fiber alignment over a larger-scale custom scaffold by optimizing streptavidin-coated magnetic particle (SMP) concentration and ink composition. Collagen and xanthum gum were combined in varying ratios (Col:XG – 1:1, 4:1, 9:1) to which a photoinitiator and SMP (0, 0.2, 0.4 mg/ml) were added. An extrusion-based printer was used to 4D print constructs in the presence of a magnetic field (0.2 T). The prints were incubated at 37 °C to induce gelation followed by UV crosslinking. Rheological analyses were performed to compare the viscosities of inks. Print fidelity was quantified by measuring the areas of the printed constructs. Qualitative analysis of collagen fiber alignment in 4D printed constructs was performed using polarized light microscopy (PLM) and scanning electron microscopy (SEM). Rheological studies revealed that all ink compositions demonstrated shear thinning properties. Use of higher XG composition yielded inks with higher viscosity, printed constructs with greater fidelity,

but a lower degree of collagen alignment. Increase in SMP concentration to 0.4 mg/ml resulted in a significant decrease ($p < 0.05$) in ink viscosity compared to 0 and 0.2 mg/ml SMP concentrations resulting in lower print fidelity. Degree of collagen fiber alignment assessed using SEM and PLM was higher in constructs made using highest SMP concentration. In conclusion, fine-tuning ink composition and SMP concentration can produce 4D printed scaffolds with high degree of collagen fiber alignment. This study presents an innovative strategy for producing biomimetic scaffolds towards tendon tissue engineering applications.

Keywords: Biofabrication, 4D Printing, Collagen scaffolds

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10:30 a.m. MED-08 **Examining the Interplay between Collagen Alignment and Bioceramic Incorporation on Osteoblast Cell Proliferation, Differentiation and Mineralization.** Nashaita Y. Patrawalla[1], Kathryn Bock[1], Karly Liebendorfer[1], Vipuil Kishore[1,2]. [1]Department of Biomedical Engineering and Sciences, Florida Institute of Technology; [2]Department of Chemistry and Chemical Engineering, Florida Institute of Technology. Biomimetic scaffolds provide essential biophysical and biochemical cues to guide cell behavior. Although the effects of biomaterial-directed cues on cell response have been widely reported, few studies have sought to decouple these effects to better understand the interplay between the different physicochemical factors on tissue-specific cell function. In this study, beta-tricalcium phosphate (β-TCP) was incorporated into electrochemically aligned collagen (ELAC) and random collagen threads, and the individual and interactive effects of biophysical and biochemical cues on osteoblast proliferation, differentiation, and mineralization were investigated. ELAC threads were prepared from collagen solution with β-TCP using isoelectric focusing. Pure ELAC threads were prepared without β-TCP. Random collagen threads with and without β-TCP were prepared by casting neutralized collagen solution into a PLA mold and incubating at 37 ºC for 60 min to induce fibrillogenesis. Confirmation of β-TCP incorporation and validation of collagen fiber alignment was carried out using scanning electron microscopy (SEM) and polarized light microscopy (PLM). Tensile tests were performed to assess the mechanical properties of collagen threads. Saos-2 cells were seeded on threads to assess cell proliferation, differentiation, and mineralization. Results from SEM and PLM confirmed that collagen fiber alignment in ELAC was retained upon β-TCP incorporation. ELAC threads were significantly stronger and stiffer ($p < 0.05$) than random collagen threads. Alkaline phosphatase (ALP) activity was significantly higher ($p < 0.05$) in ELAC threads compared to random threads. In addition, β-TCP incorporation

into ELAC significantly augmented ($p < 0.05$) cell metabolic activity, ALP activity, and cell-mediated calcium deposition. In conclusion, results from this study indicate that topographical cues from aligned collagen significantly enhance osteoblast function which was further augmented by β-TCP incorporation. Overall, β-TCP incorporation into aligned collagen framework can yield biomimetic functional scaffolds for bone regeneration applications.

Keywords: Biomimetic scaffolds, osteoblasts, bone regeneration

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10:45 a.m. MED-09 **Chronic Pain "Hotspots" in a Primary Service Area: Connecting: Population Health to Clinician Experience.** Craig Gillen, Sarah Snell, DNAP, CRNA; Jessica Bogard DNAP, CRNA; Martin Perry DNAP, CRNA; Russ Butler, PhD. AdventHealth University. Chronic pain (CP, pain lasting more than three months) is a biopsychosocial condition that affects approximately 20% of the global population or ~50 million US adults. Certified nurse anesthetists observed clinical CP prevalence indicating local distribution bias. To assess this, a collaboration was formed between these clinicians and population-health researchers specializing in spatio-temporal health analytics. The goal of this study was to conduct a novel CP analysis at clinically relevant spatial scales and through a unique collaboration of clinicians and population health analysts. Most often, CP population studies are conducted at state or national levels. Our methods focus on a more appropriate clinician frame-of-reference, a primary service area (PSA) of a healthcare institution. We created a healthcare facility's 30-minute drive time in which we geo-attached race/ethnicity and socio-economic variables to all 232 census tracts (CT). Then using an established source (Centers for Disease Control) CP calculations per race/ethnicity, economic variables, and age class, we calculated CP prevalence per CT and PSA. We conducted statistical "hotspot" analyses. We found that CP could be affecting 132,000 people in the PSA and that it differentially affects minorities and people of lower incomes. The hotspot results indicated that they accounted for 32% of the population, but ~ 40% of low income and 47% of Black PSA, CP prevalence. The "coldspots," 11% of population accounted for 7% & 5% of PSA low income and Black CP, respectively. These types of collaborations and analyses will better inform clinicians and health professionals as the industry begins to shift away from fee-for-service and to value-based and capitation reimbursement models.

Keywords: Orlando, Chronic Pain, GIS, Healthcare

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11:00 a.m. MED-10 **Metabolism and Mathematics: New Perspectives on Old Brains**. Fapianey Alexandre. University of Florida. Glucose is a sugar molecule metabolized by the body as the main energy source of the brain. Cerebral metabolic rates of glucose decrease with age, resulting in cognitive deficits. Ketone metabolism, however, remains the same across the lifespan, and the brain will break down ketones for energy in the absence of glucose. Inducing ketosis (a non-pathological increase of ketone levels in the bloodstream) helps mitigate the neuronal stress that is associated with normal aging by providing the brain with an alternative energy source to glucose. Since older populations face difficulty maintaining a strict ketogenic diet, our study set out to investigate whether, with an otherwise normal diet, exogenous ketone supplementation would induce ketosis and whether this ketosis would improve performance on age-affected behavioral assessments. Aged rats, a preclinical model extensively used to investigate mechanisms of cognitive decline, experience the same neural impairments associated with age as elderly humans. In a pilot cohort of Fischer-344 brown Norway hybrid rats (young females, young males, aged females, and aged males), statistical comparison showed improvements across all groups receiving the supplement, leading us to speculate that cognitive performance was enhanced by the ketone supplement. Interestingly, one adjustment to one of the behavioral assessments led to ceiling performance across all groups, and eliminated age deficits in a well-known, age-affected behavioral task. This experimental manipulation led the authors to a new question: how can aging be mathematically quantified? The authors went on to consider assessing age-related variances in neural manifold dimensionality, cellular distribution and its adherence to stochastic behaviors, and peri-critical behavior in the brain as potentially more accurate methods of quantification. The authors propose these mathematical methods to shift current perspectives on the aging brain away from the long-held belief that aging brains are automatically slower and less capable than younger brains.

Keywords: Glucose, Ketosis, ketone supplements, cognitive decline, aging

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

MED-P01 **Demonstration of *Staphylococcus aureus* biofilm on histologically prepared samples.** Daniel Packert, Ruwayd Alguhani, Fatimah Almajhad. Barry University. Biofilm formation by pathogenic bacteria including

Staphylococcus aureus is one of the major causes for drug resistant chronic infections. Identification of biofilm products has always had limitations in the histology laboratory. The products stained by traditional staining methods include DNA, proteins, and carbohydrate structures. The most abundant structure in biofilms, produced by the bacterial environment, is the carbohydrate component. Each bacterial strain is capable of producing specific carbohydrates that can be useful for bacterial identification. One method to try to isolate products for visualization on a histological slide is to use lectins. Lectins are protein structures that are capable of covalent binding to carbohydrates in a very precise manner. This lock and key mechanism for attaching of the lectin to a specific carbohydrate is useful in isolating and identifying species specific carbohydrates when the lectin is conjugated with a visualization marker. This study focuses on utilizing lectins to stain the carbohydrate components of *Staphylococcus aureus* biofilm using a full thickness skin model infected with a biofilm forming strain of *Staphylococcus aureus*. Being able to identify the specific products of biofilm via histological staining methods could help in the identification of the specific bacteria present at the infection site. Biofilm forming *Staphylococcus aureus* produces poly-n-acetyl glucosamine, a carbohydrate that binds to a number of different lectins and identifying a lectin that does not cross-react with non-biofilm forming *Staphylococci* or infected tissues in general would allow for diagnosis of *Staphylococcus* in histological tissue samples.

Keywords: biofilm, histology, histochemistry, infections, PNAG, lectin, staining, staphylococcus aureus

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MED-P02 **Kinetics of TNFRSF25 (DR3) after TCR Activation in an in vitro Murine Model.** Caleb Stacey[1], Henry Barreras[1], Dietlinda Wolf[1,2], Gina Adams[1], Robert Levy[1,2,3]. [1]Department of Microbiology and Immunology, University of Miami School of Medicine; [2]Sylvester Comprehensive Cancer Center, University of Miami School of Medicine; [3]Department of Ophthalmology, University of Miami School of Medicine. Tumor necrosis factor receptor superfamily 25 (TNFRSF25), also known as death receptor 3 (DR3), is a cell surface receptor found primarily on lymphocytes. TNFRSF25 is involved in the regulation of apoptosis and lymphocyte homeostasis and has one known ligand, TNF-like 1A (TL1A). We explored the previously unknown kinetics of TNFRSF25 after in vitro T-cell receptor (TCR) stimulation via suspended a-CD3 and a-CD28 of unfractionated B6 Thy1.1 peripheral lymph node (pLN) and spleen (SPL) cells followed by quantitative PCR. pLN results show that unstimulated cells (M = 36.68)

have a higher cycle threshold (Ct), indicating less RNA, that then rapidly increases within the first 6 hours (M = 29.33) then stays stagnant at 18 hours (M = 28.54) and 24 hours (M = 27.53) before decreasing at 48 hours (M = 29.33) and 72 hours (M = 32.93). Spleen results show a later increase where unstimulated cells (M = 36.22) and 6 hours stimulated (M = 37.09) have similar Ct which then begins to increase at 18 hours (M = 33.97) and 24 hours (M = 32.08) then decreases at 48 hours (M = 33.04) and 72 hours (M = 35.95). These results establish groundwork for future research into the kinetics of an in vivo model, different cell subsets, and protein kinetics. Preliminary data of CD4+ (M = 26.77) and CD8+ (M = 28.15) pLN cell subsets indicate CD4+ cells produce more TNFRSF25 during TCR stimulation. A better understanding of TNFRSF25 may aid in developing treatments for immune mediated disorders.

Keywords: TNFRSF25, DR3, TCR, Tregs, Activation

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MED-P03 **Evaluating the Role of the Melatonin in the Mitochondrion-mediated Apoptosis in Thyroid Cancer Cell (MDA-T41).** Jessica Crews, Angela Huang, Daniel Sanches. South Florida State College. Melatonin, a hormone produced by the pineal gland, is typically known for its modulation of several physiological functions, alongside its ability to synchronize the sleep-wake rhythms. In recent years, its interactions with cancerous cells and its role in prevention and treatment have been increasingly studied. It has been demonstrated that melatonin can improve the efficacy of chemotherapy drugs and directly inhibit neoplastic cell action. In addition, while melatonin typically displays anti-apoptotic effects in normal cells, it holds pro-apoptotic effects in cancer cells. However, the mechanisms by which melatonin affects cell death and metabolism remain unclear and seemingly differ from cell to cell. Our work aims to understand better melatonin's role in thyroid cancer cell (MDA-T41) apoptosis. We cultured the MDA-T41 cell line with varying melatonin quantities and measured cell death levels using the Realtime-Glo Annexin V Apoptosis and Necrosis assay. Our results showed that melatonin provided anti-apoptotic effects to MDA-T41 cells when co-treated with staurosporine, an inductor of apoptotic cell death. Both apoptosis and necrosis were reduced by 50% in melatonin-treated cells twenty-four hours after treatment. Our next steps will be to evaluate the role of the mitochondrion pathway by measuring caspase activities and expression and the cells' redox state.

Keywords: Melatonin, thyroid cancer, metabolism, apoptosis

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MED-P04 **E-Cadherin Expression as a Predictor of Epithelial to Mesenchymal Transition in Early Onset Colorectal Cancer.** Anika Bhandare. South Florida State College. Colorectal cancer (CRC) is the third leading cause of cancer-related deaths in both men and women, and it's the second most common cause of cancer deaths when numbers for men and women are combined according to the American Cancer Society. This is concerning because it is also the most treatable cancer if caught in early stages. Recent trend of rise in early onset CRC (EOCRC) adds significantly to this public health challenge as this involves the younger age group that is not yet recommended for the colonoscopy screenings which start at 45 years age, and the disease is often diagnosed at a late stage. The epithelial to mesenchymal transition (EMT) has emerged as a crucial event in cancer progression. This project aims to investigate the role of E-cadherin as a biomarker for EMT in EOCRC. E-cadherin is transmembrane glycoprotein expressed in epithelial cells of the gut lining where tumors arise and functions in maintaining cell-cell adhesion. Loss of E-cadherin is associated with EMT process in CRC. E-cadherin expression in formalin fixed paraffin embedded human EOCRC tissue as well as normal non-cancerous tissue sections was analyzed by immunofluorescence staining. Results showed a marked decline in E-cadherin expression in the EOCRC tissue as compared to the normal tissue suggesting the likelihood of EMT. Identification of EMT in CRC will aid in early detection of metastatic potential of tumor holding promising implications for prognosis and therapeutic interventions. Supported in part by a grant from the Florida Academy of Sciences.

Keywords: Colorectal cancer, epithelial to mesenchymal transition, E-Cadherin, biomarkers

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MED-P05 **Assessing Cytotoxicity of Peptides as Therapeutic Approach toward Breast Cancer.** G. Connelly, and S. Borysov. Dept. of Natural Sciences, Saint Leo University, 33701 State Road 52, Saint Leo, FL 33574-6665. Breast cancer is the most common cancer among women, and the most prevalent cancer overall. Producing novel effective therapies is paramount for reducing

mortality rates and enhancing the quality of life of individuals affected by this disease. Peptides and their derivatives comprise a substantial sector of drug development initiatives. However, reduced peptides solubility significantly impairs their biological availability and prevents their further testing in vivo. Here we report a physicochemical analysis of cytotoxic peptides that inhibit the CMG helicase and are prone for aggregation in vitro. Our previous research identified a short amino acid motif of X-Leu-Met-Leu-X that is responsible for these peptides aggregation. To enhance solubility of our peptides, we generated a panel of their derivatives with Leu-Ala and Leu-Ser substitutions. By utilizing colorimetric cell viability assay we assessed their cytotoxic effect on BT-549 breast cancer cells.

Keywords: Breast cancer, cytotoxic peptides, cancer therapies

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MED-P06 **Characterization of a triple-negative breast cancer spheroid model for drug screening.** Gavriel Burger, and Dr. Lyndsay Rhodes. Florida Gulf Coast University. 10501 FGCU Blvd, Fort Myers, FL 33965. Multicellular tumor spheroids (MTSs) are cells grown in aggregates to form a 3D tumor model. While 2D cell culture—cells grown in a monolayer—is useful for cancer research and drug screening, the response is often variable from what would occur in vivo. 3D cell culture mimics the tumor microenvironment and contains other similarities to in vivo tumors, such as necrotic and hypoxic regions, allowing for a more realistic prediction of treatment response. In this study, the protocol for generating MTSs from multiple triple-negative breast cancer (TNBC) cell lines was developed to use as a drug screening tool for potential treatments. For each cell line, an MTS model was developed and characterized to determine the cell number required to achieve spheroids with a diameter of ~400 microns after 72 hours of growth. All spheroids were generated in low-adhesion cell culture plates. Developed spheroids were then tested in drug screening assays, and results were compared to previous 2D results. Data collection included final spheroid diameter, cell density, and cell viability count to assess the effects of administered treatment. This model will be used in future studies to better understand the impacts of drug treatments in a more translational model.

Keywords: Spheroid, Tumor model, Cancer, Drug screening, 3D Culture

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MED-P07 **Small molecule HSR activation using *Caenorhabditis elegans* neurodegenerative disease models.** Rahul Kulkarni, Alec Himmelstein, Karen Kim Guisbert, and Eric Guisbert. Department of Biomedical Engineering and Sciences, Florida Institute of Technology, Melbourne, FL, United States. Activating the heat shock response (HSR), a cytoprotective cellular pathway, has been suggested as a therapeutic strategy for treating neurodegenerative diseases including Alzheimer's disease. We tested a variety of small molecule HSR activators for their effects on two AD models in *C. elegans*. Our data indicates that one molecule, Pyrrolidine dithiocarbamate (PDTC), ameliorates beta-amyloid toxicity in muscle cells. We also found that PDTC extended the lifespan of wild-type worms. Taken together, these results support the hypothesis that the HSR is beneficial for Alzheimer's disease and suggest that small molecule HSR activators have therapeutic potential.

Keywords: Beta-amyloid, Tau, *C. elegans*, heat shock response, HSF-1.
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MED-P08 **Pre-post study of the effect of pamphlets in creating awareness of age-related eye diseases among patient populations.** Mary McIntosh, and Dr. Nader Moinfar. University of Central Florida College of Medicine 6850 Lake Nona Blvd, Orlando, FL 32827. Despite contributing to a significant portion of global blindness, there is relatively low awareness of general and age-related eye diseases. The aim of this study is to evaluate possible methods of increasing public awareness of these diseases in order to increase the amount of early diagnosis and treatment leading to slowed, or reduced, vision loss. This study specifically evaluates the effect of pamphlets on increasing awareness of common eye diseases and symptoms among a population of patients of varying health literacies. The pamphlet used in this study included basic information about the importance of eye care, as well as symptom and demographic information for five common eye diseases. Study invitation flyers were distributed to various clinics in the Orlando area which included a link to a survey where participants filled out a pre-survey regarding their awareness of eye disease, accessed a digital version of the pamphlet, then completed a post-survey regarding their change in awareness of eye disease. A t-test for matched pairs was run on the pre and post results, demonstrating a statistically significant increase in mean self-assessed participant knowledge after participants viewed the pamphlet. The results of this study can contribute to medical professionals' and public health officials' efforts in understanding the effectiveness of various options for reducing preventable eye diseases in their communities.

Keywords: ophthalmology, medical outreach, patient education, medical pamphlets, public health

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RES = FLORIDA COMMITTEE ON RARE & ENDANGERED PLANTS & ANIMALS

(Meeting with BIO)

FRIDAY 11:30 a.m.
I. JACK STOUT, UNIVERSITY OF CENTRAL FLORIDA, **presiding**

11:30 a.m. RES-01 **GC-MS analysis of compounds present in the endangered plant *Ziziphus celata***. Kim Pham, Jesus Hernandez, and Kate Calvin. South Florida State College, 600 W. College Dr., Avon Park, FL, 33825. *Ziziphus celata* (Florida jujube) is a spiny flowering shrub native to Florida, found only along the Lake Wales Ridge in Highlands and Polk Counties. It is officially listed as "endangered" at federal and state levels and very little is known about it. Efforts continue to characterize compounds in genomic variants of this species in order to make informed decisions regarding habitat restoration. Gas chromatography – mass spectrometry (GC-MS) was used to gather a profile of organic compounds present in *Ziziphus celata* stem and leaf. Samples were prepared by solvent extractions using polar protic, polar aprotic and non-polar organic solvents. GC-MS data acquisition and software library analysis form the basis of the results presented. Literature and database searches supplied information on compound functions. A large number of unique compounds were identified in specific tissues of two genetic variants, including terpenes, phenols, halogenated compounds, benzopyrans, carbohydrates, waxes and fatty acids. Leaf analysis identified 57 unique compounds and 54 compounds in common. Bark analysis identified 52 unique compounds and 24 compounds in common. 37 unique compounds were identified in leaf tissue at different stages of development. These results continue the expansion of this project as the first study undertaken to analyze the chemical compounds present in *Ziziphus celata*.

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

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

RES-P01 **Impact of artificial lighting on the orientation of hatchling of sea turtles in Brevard County beaches**. Shanam C. Patel, Ashely Chelberg, and Mairi Brooks. Stella Maris Environmental Research 155 Duval St. Melbourne Beach, FL 32951. On sea turtle nesting beaches, artificial lighting associated with human development interferes with hatchling orientation from nest to sea. Although hatchling disorientation has been documented for many beaches, data that managers can use in understanding, predicting, and managing the issue are of limited detail. The South Brevard beaches and the Archie Carr National Wildlife Refuge (ACNWR) continue to be developed by humans alongside record numbers of green turtle nests being observed, where many citizens are unaware of the effects of lighting or ordinances. The present study provides insight into lighting effects thwarting hatchlings during the most critical journey from emergence to the sea and the level of artificial light at night on integral sea turtle nesting beaches as well as the potential impact on sea turtle population success of artificial lighting. The study site collects data aligned with historical studies performed by UCF Marine Turtle Research Group with Blair Witherington (FWC/ FWRI) and work performed by Dr. Tomo Hirama (FWC/FWRI). For hatchlings of Leatherback, loggerhead, and green turtles we determined the "light scape" by measuring light intensity at night on nesting beaches helping regulators determine compliance to Brevard County lighting ordinances and decrease dangers to marine turtles.

Keywords: artificial light, sea turtles, sea turtles, hatchling orientation, population, night scape.

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RES-P02 **Preserving Florida's Unique Biodiversity through DNA Barcoding.** Rebecca Kesling, Mintoo Patel. South Florida State College, 600 W. College Dr., Avon Park, FL, 33825. The Florida Ridges, which is part of the North American Coastal Plains, the 36th Global Biodiversity Hotspot, is integral to the state's historical narrative, harboring a unique tapestry of plant life found nowhere else on Earth. Within the Florida scrub, a biodiverse habitat emerges, hosting rare and endemic plants, embodying the intricate history of the region. Urbanization, industrialization, and pollution pose significant threats to these delicate ecosys-

tems. Protecting these endemic plants is crucial, as they serve as vital representations of Florida's history. Moreover, these endemic species may hold valuable elements for medicinal breakthroughs. Prompt identification of species is a key necessity in preservation efforts, however, the current method of identification by morphological analysis is time consuming and requires highly trained taxonomists. This project aims to employ DNA barcoding to identify a specific plant in the Florida ridge area, eliminating the time-consuming traditional taxonomic process. DNA barcoding allows efficient correlation of genetic information with precise species, enabling easier access to plant classification. Unveiling the plant's significance not only contributes to scientific knowledge but also encourages active participation in preserving Florida's invaluable biodiversity. This project underscores the importance of understanding and safeguarding unique plant life, fostering a deeper connection between individuals and their environment.

Keywords: Biodiversity, DNA Barcoding, Florida Ridge

Corresponding author: Rebecca Kesling, rebeccakesling@gmail.com

RES-P03 **Differential expression of metabolites in genetic variants of the endangered plant *Ziziphus celata*.** Esmeralda Morales, and Kate Calvin. South Florida State College, 600 W. College Dr., Avon Park, FL, 33825. *Ziziphus celata* (Florida jujube) is a spiny flowering shrub native to Florida, found only along the Lake Wales Ridge in Highlands and Polk Counties. It is officially listed as “endangered” at federal and state levels and very little is known about it. Efforts continue to characterize compounds in genomic variants of this species in order to make informed decisions regarding habitat restoration. Gas chromatography – mass spectrometry (GC-MS) and ultra-performance liquid chromatography – tandem mass spectrometry (UPLC-MS/MS) with multiple reaction monitoring were used to obtain comparative information on the metabolites detected in two distinct genotypes (labeled 436 and 353) of the plant. These data were analyzed by relative signal, class, subclass, and KEGG pathway. Where possible, this information was connected to specific plant functions. This information will help to shed light on the varied strategies used by *Ziziphus celata* for communication, defense, stress response, growth regulation, and other survival processes.

Keywords: *Ziziphus celata*, mass spectrometry, differential expression, metabolites, KEGG pathway

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SOC = SOCIAL SCIENCES

JENNIFER WORTHAM, UNIVERSITY OF TAMPA, presiding

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

SOC-P01 **The psychometric properties of the left-wing authoritarianism scale.** Antonio Laverghetta, and Greg Connelly. Saint Leo University, 33701 County Road 52, St Leo, FL 33574. The notion of Left-wing Authoritarianism (LWA) as a valid construct has been the subject of debate in political psychology for decades (e.g., Altemeyer, 1996 & Jost et. al., 2003) with many researchers in psychology remaining recalcitrant in its acceptance. Indeed, Altemeyer, whose seminal work measuring Right-wing Authoritarianism (RWA), stated that while RWA is relatively easy to find in convenience samples, LWA is the search for "The Loch Ness Monster" (Altemeyer, 1981;1996), relegating LWA as a myth in the field. However, surveys such as the RWA scale are not well suited to measure LWA, calling into question the validity of these instruments in assessing LWA. Recently, Conway et al. (2016) modified the items on the RWA scale (Altemeyer, 1981) to reflect a more liberal and progressive focus. Conway et al. (2016) reported that the LWA scale significantly positively predicted political liberalism, prejudice, and dogmatism. The goal of the present study is to further elucidate the psychometric properties of the LWA scale. Participants are a convenience sample of college students recruited at Saint Leo University, enrolled in various psychology courses. Participants voluntarily completed an online survey package which includes the LWA scale, a scale of liberal and conservative political ideology, and a concern for political correctness scale. Preliminary findings suggest that LWA scores predict conservative and liberal political ideology scores and concern for political correctness scores. This data has provided further evidence regarding the discriminate and predictive validity of the LWA scale. A factor analysis of the LWA scale is ongoing. Results and discussion will shed light on the psychometric properties of the LWA scale and its usefulness in predicting political behavior.

Keywords: political ideology, authoritarianism, political psychology, psychometrics, factor analysis.

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SOC-P02 **Enhancing Voter Equity Through Vote By Mail.** Mahogony Jules, Kamaiah Nunn, Jamar Lambart, and Monika Previl. Bethune Cookman University, 640 Dr. Mary McLeod Bethune Blvd. Daytona Beach, FL 32114. This research is dedicated to enhancing voter equity in Volusia County by focusing on improving Vote by Mail (VBM) enrollment procedures. The primary objective is to increase voter participation by identifying and addressing barriers to VBM enrollment and reenrollment through a multifaceted approach, including data analysis, community engagement, and educational initiatives. The study delves into historical and socioeconomic factors influencing VBM participation, with a focus on developing targeted outreach programs for underrepresented groups such as minorities, low-income individuals, and those facing logistical challenges. By evaluating existing voter education programs, the research aims to create customized educational materials that resonate with the diverse population of Volusia County. Furthermore, the project underscores the importance of maintaining accurate voter registries and seeks to simplify the reenrollment process. The overarching goal is to promote a more inclusive democracy by ensuring that all eligible residents possess the necessary information and resources to participate in the electoral process. The outcomes and strategies generated from this research are intended to serve as a model for enhancing voter equity and engagement in other regions across the nation facing similar challenges.

Keywords: Vote by mail, enrollment, reenrollment

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SOC-P03 **The Relationship between cultural misorientation and Afrocentricity.** Alyssa-Resha Williams. Bethune-Cookman University. The proposed study will investigate the relationship between cultural misorientation and afrocentricity. There is a significant lack of research between cultural misorientation and afrocentricity. The study proposes two research questions: Does cultural misorientation significantly predict afrocentricity in college students at an HBCU? Do male and female college students at an HBCU have significantly different levels of cultural misorientation? The study will use a quantitative research methodology and correlational research design. The sample will include 100 students at a southeastern HBCU. A correlation and independent samples T-test will be conducted. It is expected that in research question one cultural misorientation will be found to be significantly related to afrocentricity. In research question two the expected findings are that male and female college students will be found to be significantly different in their levels of cultural misorientation.

Keywords: Afrocentricity, cultural misorientation, HBCUs

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SOC-P04 **The Relationship between Phobias and Workplace Anxiety.** Taikya Ducksworth. Bethune-Cookman University. The proposed study will investigate the relationship between phobias and workplace anxiety. There is a significant lack of research between phobias and workplace anxiety. The study proposes two research questions. Do phobias significantly predict workplace anxiety in college students at an HBCU? Do male and female college students at an HBCU have significantly different levels of phobias? The study will use quantitative research methodology and correlational research design. The sample will include 100 students at southeastern HBCU. A correlation and independent samples T-test will be conducted. It is expected that in research one, phobias will be found to be significantly related to workplace anxiety. In research question two, the expected findings are that male and female college students will be found to be significantly different in their levels of phobias.

Keywords: Workplace anxiety, phobias, HBCUs

Corresponding author: Taikya Ducksworth, taikya.j.ducksworth@students.cookman.edu

SOC-P05 **Predicting Suicide Risk Among Police Officers.** Kaitlynn Lee, Jada Brown, and Dr. Daniel L. Hollar. Bethune-Cookman University. In 2020, the former Attorney General of the United States, Bill Barr, reported that in the previous year "more officers died by suicide than in the line of duty". The current study examines the prediction of suicide risk among police officers and explores the role of fitness-for-duty (FFD) data in identifying officers at risk. The hypothesis posits that financial problems, alcohol abuse, and family problems reported in FFD evaluations are predictive of suicide risk, particularly when accounting for an officer's trauma history. Data was collected from 250 FFD evaluations conducted by a third-party agency at a large metropolitan police department in the Midwest. The analysis of the data confirmed the utility of FFD evaluations in predicting suicide risk among police officers, thereby enabling identification and support for officers in need. The study also reveals alcohol abuse and a history of homicidal threat as significant predictors of suicide risk, which adds new

knowledge to existing literature. The findings contribute to a better understanding of mental health issues within the police community and highlight the importance of creating safe spaces for officers to receive adequate mental health care. The investigation concludes with a discussion on the study's findings, limitations, generalizability, and potential solutions for reducing suicide risk among police officers.

Keywords: resilience, trauma, suicide, fitness-for-duty, police officers

Corresponding author: Dr. Daniel Hollar, HollarD@cookman.edu

SOC-P06 **Facial Emotion Recognition Tasks in Autistic Children vs. Neurotypical Children.** Angela Easterling, Dr. Nancy Aaron Jones. Harriet L. Wilkes Honors College of Florida Atlantic University, Florida Atlantic University. This study aims to gain a better understanding of the facial emotion processing abilities of children between the ages of 4 and 8 with ASD in understanding and accurately recognizing different emotions. We examined whether children with ASD had variation in recognizing various emotions: anger, happiness, sadness, fear, disgust, and surprise. Participants were presented with a display of neutral faces morphing into expressions of emotions. In addition, we aimed to measure observed power and (frontal) asymmetry using EEG data in order to understand the neural activity that underlies the socio-emotional aspects of ASD. The goal of this project is to examine if there is a difference in facial emotion recognition in children with ASD versus typically developing (TD) children.

Keywords: Autism, ASD, emotion processing, facial expressions

Corresponding author: Angela Easterling, aeasterling2019@fau.edu

SOC-P07 **The Relationship Between Love and Family Relationships.** Taysia Palmer. Bethune-Cookman University. The proposed study will investigate the relationship between love and family relationships. There is a significant lack of research between love and family relationships. The study proposes two research questions: Does love significantly predict family relationships in college students at an HBCU? Do male and female college students at an HBCU have significantly different levels of love? The study will use a quantitative research

methodology and correlational research design. The sample will include 100 students at a southeastern HBCU. A correlation and independent samples T-test will be conducted. It is expected that in research question one love will be found to be significantly related to family relationships. In research question two the expected findings are that male and female college students will be found to be significantly different in their levels of love.

Keywords: Family relationships, HBCUs

Corresponding author: Taysia Palmer, taysia.j.palmer@students.cookman.edu

SOC-P08 **The Relationship between infidelity and family relations.** Amir Moore. Bethune-Cookman University. The proposed study will investigate the relationship between infidelity and family relations. There is a significant lack of research between infidelity and family relations. The study proposes two research questions: Does infidelity significantly predict family relations in college students at an HBCU? Do male and female college students at an HBCU have significantly different levels of infidelity? The study will use a quantitative research methodology and correlational research design. The sample will include 100 students at a southeastern HBCU. A correlation and independent samples T-test will be conducted. It is expected that in research question one infidelity will be found to be significantly related to family relations. In research question two the expected findings are that male and female college students will be found to be significantly different in their levels of variable infidelity.

Keywords: Family relationships, infidelity, HBCUs

Corresponding author: Amir Moore, amir.m.moore@students.cookman.edu

SOC-P09 **The relationship between sexuality and pornography.** Jasmine Tharrington. Bethune-Cookman University. The proposed study will investigate the relationship between pornography and sexuality. There is a significant lack of research between pornography and sexuality. The study proposes two research questions: Does pornography significantly predict sexuality in college students at an HBCU? DO male and female college students at an HBCU have significantly different levels of pornography? The study will use a quantitative research methodology and correlational research design. The sample will include

100 students at a southeastern HBCU. A correlation and independent samples T-test will be conducted. It is expected that in research question one pornography will be found to be significantly related to sexuality. In research question two the expected findings are that male and female college students will be found to be significantly different in their levels of pornography.

Keywords: Sexuality, pornography, HBCUs, gender differences

Corresponding author: Jasmine Tharrington, jasmine.tharrington@students.cookman.edu

SOC-P10 **The Relationship between Pornography and Marijuana Use.** Tatiyana James, Dr. Mu-tor Flood. Bethune-Cookman University. The proposed study will investigate the relationship between pornography and marijuana. There is a significant lack of research between pornography and marijuana use. The study proposed two research questions. The first one was if pornography significantly predicts marijuana use in college students at an HBCU? The second was if male and female college students at an HBCU have significantly different levels of marijuana usage? The study will use a correlational research methodology. The sample will include 100 students at a southeastern HBCU. A correlation, simple linear regression and independent samples T-test will be conducted. It is expected that in research question one pornography will be found to be significant in predicting marijuana use. In research question two. The expected findings are that male and female college students at an HBCU will have significantly different levels of marijuana use.

Keywords: Pornography, marijuana, HBCUs, gender differences

Corresponding author: Tatiyana James, tatiyana.p.james@students.cookman.edu

SOC-P11 **An Economic Analysis of the Mango Horticulture Industry: Evaluating Factors Influencing Global Agriculture.** Ean Cheng,. South Florida State College. Mango Horticulture serves as a crucial factor in many agricultural economies all around the world. Contributing greatly to development, trade, and farming this industry has been a center of innovation and change. This study will

focus on how the different economic factors play a role in the sustainability and profits of the mango horticulture industry. This literature review aims to synthesize already existing bodies of research on the economic analysis of mango horticulture. Considering factors of production that may influence changes in profitability and sustainability as well as how these factors benefit growth in the specific industry. The review collects data from multiple cases and outlets while also considering geographical locations including Pakistan, Spain, and several other different countries in order to provide a wide perspective of the mango horticulture industry's economic dynamics. With many of the countries having different locations and climates. Considering a global economy and any future progression or regression that may happen in future productions of the listed countries. Examining how individual countries' different characteristics impact not only production but their Agricultural Economic status.

Keywords: Horticulture, mangos, global agriculture

Corresponding author: Ean Cheng, eanche435@gmail.com

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TCH = SCIENCE TEACHING

FRIDAY 11:15 a.m. – 12:00 p.m.
THOMAS ARNOLD, LAKE ERIE COLLEGE OF OSTEOPATHIC MEDICINE, presiding

11:15 a.m. TCH-01 **A qualitative study exploring female college students' perceptions of STEM instruction.** Cheryl L. Berry. Saint Leo University 33701 County Road 52, Saint Leo, Fl 33574. The problem addressed by this research is a lack of understanding of how female college students' perceptions of course climate and instruction affect their representation in STEM courses. A gap in the literature exists related to how female college students may ascribe academic performance and self-efficacy in STEM courses differently depending on faculty gender. The purpose of the research questions in this basic qualitative study was to explore the effect of faculty instructional practices on female STEM students' self-efficacy, academic performance, and perceptions of instruction based on faculty gender. A purposively selected sample (n =18) out of the average yearly enrollment of the total population (N =200) of female first- or second- year

students in STEM major courses was used in this study. Data collection was conducted using a focus group protocol instrument, a structured interview protocol instrument, and a questionnaire. Emergent themes were interpreted from data collected from this study's participants. Findings support active learning inclusive instructional pedagogy as integral to a female STEM student's self-efficacy and academic performance. Self-efficacy and academic performance were revealed as inseparable and directly influencing one another. Findings indicate female STEM students ascribe course instructional experiences impacting academic performance primarily as faculty gender independent; however, female faculty presence affects female student self-efficacy through same-gender role modeling.

Keywords: STEM, self-efficacy, faculty, female student, academic performance

Corresponding author: Cheryl L. Berry, Cheryl.berry@saintleo.edu

11:30 a.m. TCH-02 **Supplemental Instruction and Its Effectiveness as a Cooperative Learning Strategy for General Chemistry.** Jerome K. Williams. Department of Natural Sciences, Saint Leo University. Supplemental Instruction (SI), a recent innovation in cooperative learning at the college level, emphasizes student achievement through active learning in a peer-led workshop setting. SI evaluation data indicates that students in SI programs earn substantially more quality grades (A, B, C) than their counterparts in non-workshop classes. For colleges and universities that have adopted the model, SI appears to be quite successful in helping students of low and moderate ability, and in reducing the traditionally high attrition rates in chemistry courses. This presentation tracks SI student performance in general chemistry in a four-year liberal arts university natural science department and will present evaluation data taken from general chemistry.

Keywords: Supplemental Instruction, General Chemistry, student performance

Corresponding author: Jerome K. Williams, jerome.williams@saintleo.edu

11:45 a.m. TCH-03 **A Paradigm Shift in Learning Methodologies and Associated Students' Outcome In the Freshman Courses**. Emadelden Fouad. Florida Polytechnic University. As educators, we need to prepare our students to take complete responsibility for themselves as they transition from high school to college. It is essential for them to develop a college mindset and become inde-

pendent learners. However, with the pandemic, we have noticed that many freshman students struggle with taking notes, reading the text, and solving multistep problems. To help our students succeed, we have implemented several measures. Firstly, we have reduced the cost of textbooks so that they can be more affordable for students. Secondly, we have made all assignments available on Canvas, which makes it easier for students to access and complete their work. Lastly, we encourage students to attend a four-hour preparation course, which helps them become aware of what is expected of them in college, gives them a better understanding of the course, and enables them to plan accordingly. These measures will help our students transition smoothly into college life and develop into responsible and independent learners.

Keywords: Learning Management System, OpenStax, Independent Learners, Student Learning Outcomes.

Corresponding author: Emadelden Fouad, efouad@floridapoly.edu

TCH Posters - 3:00 p.m.-6:00 p.m. Friday

TCH-P01 . **Post-exam surveys and practice exams impact on an undergraduate Genetics course exam scores.** Madison Stevens, and Yainitza Hernandez-Rodriguez. Biological Sciences Department at Florida Gulf Coast University 10501 FGCU Blvd, Fort Myers, Florida 33965. Students' success at a university, their retention, graduation, and employment are crucial for reaching professional and career goals. Exams are a conventional tool to measure knowledge and understanding of content. However, exams may be challenging and may reduce the likelihood of success despite the instructor's support through study guides and in-class and online review sessions. Post-exam metacognition analysis and practice exams, may improve student perception of their study habits resulting in increased scores. This study assesses students' metacognition of their study habits through post-exam surveys to assess students' improvement on their preparation and exam scores. In addition, interventions include presenting exam "practice questions" prior to "difficult" exams with the goal of assessing if exam averages improve based on completion of the "practice exam." The genetics courses at Florida Gulf Coast University have been classified as 1 of 3 top courses with the highest drop-fail-withdrawal (DFW) rates. This intervention may potentially benefit students in understanding and improving study habits and may provide genetics professors tools to improve exam scores and student metacognition. Analysis

of students' feedback will provide cues to improve genetics course content and pedagogical style, and consequently DFW rates, particularly if other professors incorporate these methods within their own courses. Preliminary results advocate that higher exam averages are the outcome of the intervention that includes exam practice questions and surveys. Excitedly, there seems to be a correlation between higher exam-grades and students' metacognition on their study habits. Our data suggests a direct impact on the improvement of students' study habits.

Keywords: metacognition, study habits practice exams, graded exams, student success

Corresponding author: Madison Stevens, mastevens@fgcu.edu

TCH-P02 **Higher Education Interventions for Preparing Undergraduate Students to Thrive in the Data Economy.** Shawna F. Brooks. Bethune-Cookman University. Data is now recognized as "a factor of production" to produce goods and services. The Coronavirus Disease 2019 (COVID-19) pandemic has accelerated the need for higher education interventions that effectively prepare students for success in the data economy workforce. The Data Economy Workforce is composed of people who collect, store, manage and analyze data as their primary activity, or as a relevant part of their activities. The Transdisciplinary Data Scholars Development Program at Bethune-Cookman University in Florida has designed a collection of curricular, co-curricular and experiential learning interventions with the overall goal of preparing students to thrive in the data economy. During the session, we will share designs of these higher education interventions including metacognition-promoting learning transactions, data economy teacher education, and mentored experiential learning of data investigations. Participants will have opportunities to identify and explore potential areas of collaboration for transforming STEM higher education.

The "Digital Transformation" has accelerated the global higher education and workplace need for requiring information and communication technologies (ICT) to facilitate remote work, remote education, remote learning and other remote activities. The COVID-19 accelerated irreversible digital transformations of employer operations have increased the data economy; defined as the production, distribution and consumption of digital data.

The Data Economy Workforce is composed of people who collect, store, manage and analyze data as their primary activity, or as a relevant part of their activities [1]. Data is now recognized as "a factor of production" [2] to produce goods and services. Despite the growing data economy in 2020, the youth unemployment rate in the United States increased from 8% in January 2020 to 25% in July 2020

[3]. Clearly, there is an urgent need for strategies to best prepare U.S. teenagers and young adults for employment in the data economy.
The COVID-19 pandemic related unemployment and shortage of qualified individuals for jobs in the data economy are pressing societal needs that brings to the forefront the need for fundamental research on how to best prepare students at all levels of education with 21st Century Competencies. National consensus reports have recommended that academic institutions provide and evolve a range of educational pathways to prepare students for an array of data science roles in the workplace [4] and transferable competences [5].
There are connections between the 21st century competence domains (cognitive, intrapersonal and interpersonal) and data acumen (good judgment, use of tools responsibly and effectively) that are needed for eligibility for employment positions as well as success and productivity in the data economy. The challenges associated with the data economy are related to the challenges described for data science. The data challenges are in the dimensions of data flow (i.e., collection, storage, access, and movement), data analytics (i.e., modeling and simulation, statistical analysis, and visual analytics), and data curation (i.e., preservation, publication, security, description, and cleaning) [6].
Our innovation in higher education interventions is to provide learning experiences (interactions with learning environments) that lead to expertise (ability to predict actions) that can be applied in data culture and corporate culture, where culture is a set of shared beliefs, values and expected behaviors.
The Date Economy Frontiers initiative is building on five years of experience with the Transdisciplinary Data Scholars Development Program (TDSDP, https://sites.google.com/a/cookman.edu/tdsdp/). In 2023, we completed our second year of an online 8-week Data Economy Experiential Learning program. Additionally, we have designed the curriculum and associated course schedule for a Data Economy Frontiers undergraduate degree program.

Keywords: Data economy, COVID-19 pandemic, undergraduate education

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Time	*CHNS 117*	*CHNS 119*	*CHNS 121*	*CHNS 122*
8:00	Registration: CNHS Entrance Lobby			
8:15				
8:30		ENG-01	MED-01	AOS-01
8:45		ENG-02	MED-02	AOS-02
9:00	CMS-01	ENG-03	MED-03	AOS-03
9:15	CMS-02	ENG-04	MED-04	AOS-04
9:30	CMS-03	ENG-05	MED-05	AOS-05
9:45	BREAK	ENG-06	MED-06	BREAK
10:00	ENV-01	BREAK	BREAK	GEO-01
10:15	ENV-02	ENG-07	MED-07	GEO-02
10:30	BREAK	ENG-08	MED-08	GEO-03
10:45		ENG-09	MED-09	BREAK
11:00		ENG-10	MED-10	BIO-01
11:15	TCH-01	ENG-11	ANT-01	BIO-02
11:30	TCH-02			RES-01
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13:30	FAS Business Meeting (CHNS 107)			
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14:00	Plenary Speaker (CHNS 107) Dr. Elaine C. Thompson Distinguished Professor of Professional Practice			
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15:15	Poster Session (Welcome Center Lake Bonny Room)			
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18:30	Banquet (Tuscana Ristorante) Dr. Wayne Price 2023 FAS Medalist			
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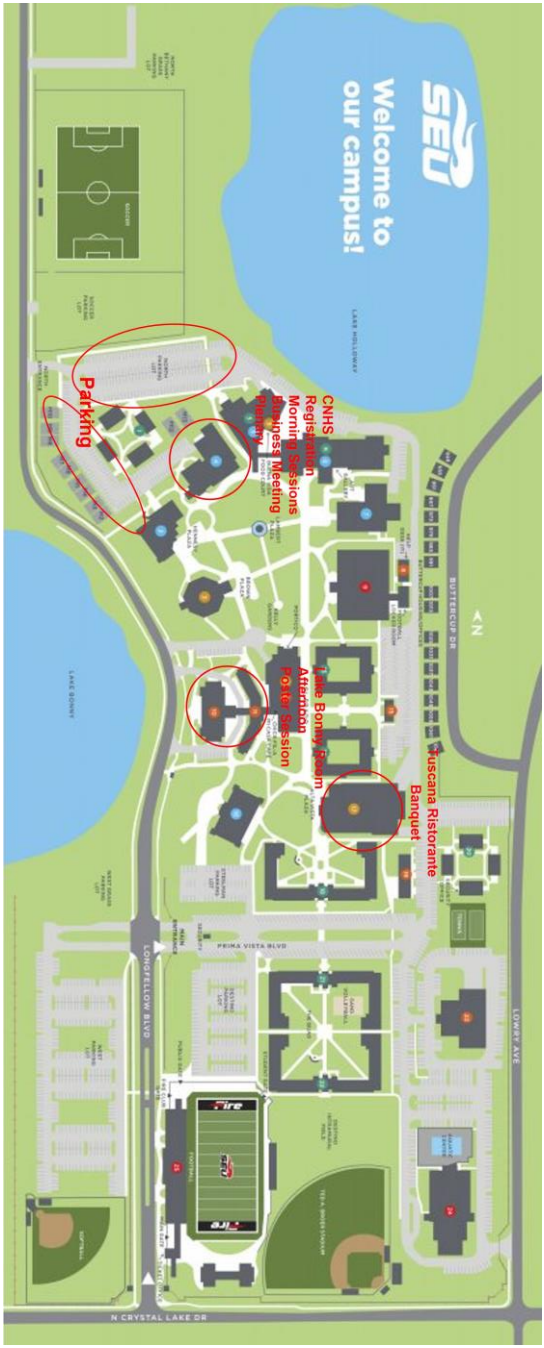
Welcome to our campus!
Parking
CNHS Registration
Morning Sessions
Business Meeting
Lunch
Lake Bonny Room
Afternoon Poster Session
Tuscana Ristorante
Banquet
N CRYSTAL LAKE DR
LONGFELLOW BLVD
PRIMA VISTA BLVD
BUTTERCUP DR
LOMBARDY