1) Internship Title: Seagrass Monitoring through Estero Bay

Student Author(s)
Mya Mandell, Marine Science (B.S.)

Faculty Mentor(s)
James Douglass, Marine & Earth Science

Abstract: I worked over the previous semester alongside James Douglass and other students in the Benthic Marine Lab. We collected samples of different enviornmental seagrasses and studied what we found inside of them to get a better look. Seagrass can be used as a tell all detector for anything strange going on within the water column. This is important to us in SWFL with our reoccuring blooms of red tides and common water issues.

2) Research Title: Chemicals of Emerging Concern (CECs): Monitoring dangerous chemicals in our waterways and modeling their environmental fate

Student Author(s)
David Montoya, Biotechnology (B.S.)
Angela Scine, Biology (B.S.)

Faculty Mentor(s)
Daniel Paull, Chemistry & Physics
Nora Demers, Biological Sciences

Grant Support
SAGE Mini-Grant Program

Abstract: Water quality in Florida is a concerning subject that cannot be overlooked. As agriculture continues to grow, the use of fertilizers, pesticides, and herbicides that are in the landscape has shown to have effects on our biosphere. Homeowners are to blame as well, often neglecting proper use and disposal of industrial chemicals, medications and personal care products which make their way into the environment. Chemicals about which little is known that nonetheless seep into our waterways are now classified as chemicals of emerging concern (CECs). These chemicals have demonstrated and immediate problems, perhaps especially in Southwest Florida, including harmful algal blooms and the strangling of the Everglades. These CECs are by definition unregulated and nearly unmonitored, and we are focusing our efforts on bringing to light the environmental fate of CECs that are known to, or are likely to, affect the endocrine system in animals, causing behavioral and developmental abnormalities. Florida is a leader in reuse water, and these endocrine-disrupting chemicals (EDC) have been linked with cancer, birth defects in children, kidney damage, etc. The objective of our research program is to set up a monitoring program with a modeling component to better track the sources and fate of CECs in the waters of Southwest Florida.

3) Research Title: Air Samples of FGCU's Buildings for Fungal Activity

Student Author(s)
Alex Timmons, Biology (B.A.)

Faculty Mentor(s)
Clifford Renk, Biological Sciences

Abstract: Air quality indoors is one of the most important environmental factors that impact health. Americans on average spend between 80 to 90% of their time indoors (EPA 1997). Exposure to microorganisms in the air can cause serious health issues such as allergies or diseases. Everyday people breathe in thousands of fungal spores usually without any negative effects on their health. However about 10% of Americans have allergies to certain types of mold (Portnoy & Jara). Fungi reproduce using spores, which are microscopic structures (3-40 microns) that can be spread through currents of air. Air sampling can be used to estimate the amount of spores in the air. If there are more spores outdoors than indoors, then the spores are likely being carried inside through open doors or windows. If there are more spores indoors than outdoors then there is likely mold growing inside the building. Air samples were taken in eight different buildings at FGCU to measure the amount of fungal activity in the air. The air samples taken from older buildings did not grow more fungal colonies then the samples from newer buildings. The buildings with the most foot traffic also had the most colonies.

4) Research Title: Endocrine Disrupting Chemicals in Southwest Florida Waters: A Quantitative Investigation of Corruption Sources

Student Author(s)
Angela Scine, Biology (B.S.)
David Montoya, Biotechnology (B.S.)

Faculty Mentor(s)
Daniel Paull, Chemistry & Physics
Nora Demers, Biological Sciences

Grant Support
Student Associates for a Greener Environment (SAGE)

Abstract: Endocrine disrupting chemicals (EDCs) show signs of having the potential to effect male and female reproduction, metabolism, obesity, and different types of cancers. The identification and quantification of EDC's in our local waterways will help identify areas of elevated concern and determine the environmental fate of these problematic compounds, ultimately providing much needed information for improvement of regulations of water quality toward sustainable practices and potential rehabilitation of the environment. In order to detect and quantify the compounds of interest, we will be developing methods for extracting them from environmental water samples and measuring them using liquid chromatography-mass spectrometry (LCMS). LCMS separates the chemical components of the water samples using liquid chromatography and the individual components are read by mass spectrometry. This instrument allows very specific compound identification, ultra-low detection limits, and precise quantification. Examples of the EDCs that we will be analyzing include DEET, atrazine, bisphenols, phthalates, and triclosan. These chemicals can find their way into our local water by many routes, including by passing unchanged through wastewater treatment plants. We hope that when the source, environmental presence, and fate of these EDCs is known, effective preventative measures can be taken, so we aim to measure and define these unknowns.

5) Research Title: Spatial Patterns of Organic Matter Stocks and Sources in Mobile Bay

Student Author(s)
Lauren Alvaro, Marine Science (B.S.)

Faculty Mentor(s)
John Lehrter, Department of Marine Sciences at the University of South Alabama and Dauphin Island Sea Lab

Grant Support
NSF REU grant

Abstract: Terrestrial and phytoplankton-derived organic matter are the base of the food web in highly productive, river-dominated estuaries and drive biogeochemical processes that control carbon, oxygen, and nutrient dynamics. We investigated the controls on the spatial patterns of organic matter quantity and quality in the water-column and sediments of Mobile Bay, Alabama. We hypothesized that spatial patterns were mainly driven by river discharge to the estuary. We measured organic matter quantity and quality, as determined by concentrations, carbon to nitrogen ratios, and stable isotopic (13C and 15N) composition of organic matter in water and sediments. Suspended sediments were collected during June 2019 from 7 rivers that discharge to the bay. Surface and bottom water and sediments were collected from 15 sites within Mobile Bay and 4 offshore sites. Heavy rainfall and runoff during spring 2019 resulted in elevated inputs of organic matter from the rivers to the bay. The near-linear decrease in POC δ13C in the surface and bottom layers versus salinity suggests that salinity is a primary determinant of the POC organic matter type. The sediment surface organic matter was > 50% freshwater origin at sites with S <10. Future work will investigate these spatial patterns during the dry season.

6) Research Title: Did red tide have lasting effects on invertebrate life in a Pine Island Sound seagrass bed?

Student Author(s)
Lauren Alvaro, Marine Science (B.S.)
Rachel O'Brien, Marine Science (B.S.)

Faculty Mentor(s)
James Douglass, Marine & Earth Science

Abstract: Red tide is a type of harmful algal bloom (HAB) that has of late been wreaking havoc on Florida's coastal ecosystems and organisms. Caused by a type of dinoflagellate (single-celled algae) called Karenia brevis, red tide occurs when nutrient runoff from fertilizers and other anthropogenic sources reach the ocean where they cause rapid algal growth. K. brevis produces a neurotoxin that when present in high concentrations can kill marine organisms. To examine the impacts of red tide on the invertebrate life in seagrass ecosystems of Pine Island Sound, epifaunal samples collected during summer 2018 before a red tide event and during summer 2019 after the event were compared. The abundance and diversity of invertebrate fauna before and after red tide were analyzed by processing samples through sieves to separate organisms by size class. This allowed us to use allometric equations to convert counts of organisms, which are classified to the lowest taxonomic level possible, into biomass data. Species richness, biodiversity indices, and biomass data for 2018 and 2019 samples were then compared to determine the lasting effects of red tide in this system.

7) Research Title: Controlling Macroporous Scaffold Architecture via Gas-Foaming and Salt-Leaching

Student Author(s)
Karina McLaughlin, Bioengineering (B.S.)

Faculty Mentor(s)
Jiehong Liao, Bioengineering

Abstract: Scaffolds are an essential component in the tissue engineering paradigm to guide the regeneration of tissues lost to disease or trauma. Cells seeded into three-dimensional scaffolds eventually grow and flourish inside of a living organism as the scaffold degrades and is replaced by newly formed tissue. Scaffold engineering is an active area of research that seeks to develop ideal scaffolds for various tissues using fabrication methods that can be efficiently scaled up and translated to clinical application. Although there are many established methods for generating scaffolds, resulting formats are not always adequate to perform on their own. For macroporous scaffolds, there is a tradeoff between tailoring pore size and maintaining mechanical stability with sufficient interconnectivity for cell and tissue infiltration. When scaffold fabrication techniques are combined, advantageous features from each method are now feasible together. This research investigates the combination of gas-foaming and salt-leaching to create macroporous scaffolds for bone tissue engineering. The objective is to test reagent concentrations and ratios to achieve optimal pore sizes (100-135 m) with sufficient interconnectivity as assessed via scanning electron microscopy (SEM). As a platform to deliver cells and therapeutic agents, a hydrogel dip coating will be applied by investigating solutions of different viscosities.

8) Research Title: How Does Stance Affect the Force of Different Punches?

Student Author(s)
Viktoriya Yakonska, Bioengineering (B.S.)
Anthony Gomez, Bioengineering (B.S.)
Thelma Sanchez, Bioengineering (B.S.)
Cassie Payne, Bioengineering (B.S.)
Karina McLaughlin, Bioengineering (B.S.)

Faculty Mentor(s)
Derek Lura, Bioengineering

Abstract: This study aims to investigate the effects that a fighting stance can have on different punches' force. Inexperienced and experienced boxers will be studied and compared based on their biomechanical parameters before and during the exertion of the jab and cross punch. A marker-based motion-capture system (Qualisys) will be utilized to analyze motions of the participant and the punching target to obtain the force of the punch. Ground reaction forces will be measured to determine the impulse force of the ground and compare it to how much of the impulse force is transferred to the force of the punch. Angles of the knee will be measured to represent the type of stance the person is exhibiting before the punch, and an analysis will be made to evaluate if knee angles affect the efficacy of the punch based on stance. Hip and shoulder velocity will be measured during the exertion of the punch to also evaluate the influence of these biomechanical parameters on the force of the punch. In conclusion, all these measurements will inform investigators of a relationship between the stance of an

individual and types of punches being performed when evaluating the data of experienced boxers versus inexperienced participants.

9) Research Title: Controlling the regioselectivity of silyl ketene polymerization via computational prediction

Student Author(s)
Ian Baxter, Biochemistry (B.S.)

Faculty Mentor(s)
Daniel Lambrecht, Chemistry & Physics

Abstract: Silyl ketenes, R3SiC=C=O, can polymerize using both the C=C and the C=O functionality providing access to a range of products. This versatility could provide access to desirable targets such as conjugated or potentially degrable polymers. To synthesize a specific desirable target polymer, one needs to control the regioselectivity of the chain propagation. This work investigates how the reaction can be steered toward propagation via the oxygen functionality to yield products such as potentially degradable esters. Specifically, computational studies were performed to predict the reaction pathways of silyl ketenes with nucleophiles to initiate the chain propagation. Depending on the nature of the nucleophile, the silyl ketene either deprotonates - leading to here undesired propagation via the carbon functionality - or undergoes nucleophilic addition - leading to here desired propagation via the oxygen functionality. The relative preference for nucleophilic addition versus deprotonation is investigated for molecules representative of a wide range of nucleophilicity. Trends between preference for the nucleophilic addition pathway and simple molecular descriptors are investigated. Several nucleophiles are identified that facilitate the desired propagation via the oxygen functionality.

10) Research Title: In vivo Antibacterial Assessment of Silver Nanoparticles in Zebrafish Embryos at Sublethal Concentrations

Student Author(s)
James Alday, Biology (B.S.)
Matt Miller, Biology (B.S.)
Coursean Thomas, Biology (B.S.)
Asma Saheed, Biology (B.S.)

Faculty Mentor(s)
Kerry Lee, Biological Sciences

Abstract: Silver nanoparticles (Ag NP's) are found in many applications as an antibacterial agent, including medical equipment coating, hygiene products, and household cleaning agents. However, excess usage of Ag NP's produces toxic effects in biological systems. Zebrafish (Danio rerio) is a model organism in which NP properties are effectively studied; while Ag NP research has shown both biocompatibility and toxicity in zebrafish embryos, its efficacy as an antibacterial agent in vivo had yet to be explored. In this study, synthesized Ag NP's were used as antibacterial treatment for zebrafish embryos infected with the pathogen Aeromonas hydrophila. These infected embryos were subjected, via environmental uptake, to Ag NP treatments of different concentrations up to the sublethal threshold. The effects were observed and recorded up to 120 hours post fertilization (hpf). The results revealed that Ag NP's at the tested sublethal concentrations were ineffective as an antibacterial agent in

developing zebrafish embryos. In conclusion, this study would provide additional insight into understanding both the potential risks and benefits developing organisms and aquatic systems would face by the use of Ag NP's as an antibacterial water treatment.

11) Research Title: Enabling structure identification for polyglutamine peptides causing neurodegenerative diseases - the case of neutral molecules

Student Author(s)
Melissa Chen, Biology (B.S.)
Cassandra Blanco, Clinical Laboratory Science (B.S.)

Faculty Mentor(s)
Daniel Lambrecht, Chemistry & Physics

Abstract: Polyglutamine peptides have a higher propensity than other proteins to aggregate and impede normal functioning within a cell, leading to the occurrence of a multitude of deleterious neurodegenerative diseases, such as Huntington's disease and muscular atrophy. The goal of this project is to enable structure determination of neutral polyglutamine peptides. This was achieved by computing the impact of peptide conformation on the vibrational spectra of the molecule. Specifically, the chi-1 angles (composed of the angle created by the amine nitrogen, alpha, beta, and gamma carbons of the molecule) and the vibrational frequencies were determined. This was accomplished with the use of scientific software such as Avogadro (for visualizing vibrations and altering the chi-1 angles) and Q-Chem (for computing the frequencies at a given chi-1 angle). Angles ranging from -180° to 180° were investigated. The frequencies focused on were 850 to 1700 1/cm, as they displayed greater sensitivity to changes in the chi-1 angles. Four promising vibrations were identified with shifts in the vibrational frequencies of approximately 100 1/cm between the biologically relevant angles of -180° and 60°. These results enable one to easily identify the conformation of polyglutamine peptides using vibrational spectroscopy and thereby contribute to the molecular understanding of the pathogenesis of these debilitating diseases.

12) Research Title: Searching for Evidence of Endocrine-Disrupting Compounds in Gambusia holbrooki

Student Author(s)
Brooke Hollan, Biology (B.S.)

Faculty Mentor(s)
Nora Demers, Biological Sciences

Grant Support
Student Association for a Greener Environment (SAGE)

Abstract: In order to aid in furthering the knowledge of how Gambusia holbrooki, or mosquitofish, are being affected by chemicals that infiltrate their habitats, fish were caught from two sites, permitting that they found their way into the breder trap. Upon capture, the anal rays of the fish were measured and examined, and the ratio of anal ray 4 length to anal ray 6 length were calculated for each fish. This ratio can be used to determine if masculinization took place within the female specimens, indicating the presence of endocrine-disrupting chemicals in the water. These chemicals can affect the endocrine system, which is vital in reproduction, growth, and metabolism. It was found that some females from

both collection sites experienced masculinization. Additionally, these measurements were taken twice by two different personnel that could later be used to test the reproducibility of the data. It was shown that the data, on average, was reproduced about 90% of the time. The effects experienced by these fish could possibly be applied to humans as Gambusia are a good model organism, and therefore, testing done on this species can possibly be important to society.

13) Research Title: Design and application of green, solid-supported palladium catalysts for synthesis of important chemical targets in water

Student Author(s)
Jennii Burrell, Biochemistry (B.S.)
Aaron Cagle, Biology (B.S.)

Faculty Mentor(s)
Daniel Paull, Chemistry & Physics

Grant Support
Departmental funds
Whitaker Center Mini-Grant- Travel

Abstract: Carbon - carbon coupling reactions are a fundamental tool in organic synthesis, used in the creation of many important compounds. Traditionally, homogeneous transition metal catalysts are used for these reactions, leaving traces of metal in the final product and creating hazardous metal wastes. In pursuit of a heterogeneous catalyst to implement in aqueous coupling reactions, the unique reactivity of functionalized N-heterocyclic carbene rings (NHC) serves as the base for our solid-phase palladium catalysts. Synthesis and use of these catalysts offer several benefits when it comes to C - C coupling reactions. The palladium - NHC catalyst is water stable and easily recoverable post-reaction, reducing organic waste and allowing for full recyclability. As we implement these catalysts in Sonogashira reactions for the synthesis of resveratrol analogues in TNBC research, we will analyze how different structural traits of the catalyst affect catalytic efficiency and recyclability. Structural differences we will be exploring include variations on the carbon chain length, counter ion used, functionalization of the NHC starting material and alternate materials for the solid support feature, such as resins. Aside from the applications within our lab, the functionality of this catalyst provides an exciting prospect for future utilization in many coupling reactions requiring a heterogeneous catalyst.

14) Research Title: Design and Synthesis of Solid-Supported Palladium Catalysts Using N-Heterocyclic Carbenes for Greener Coupling Reactions

Student Author(s)
Aaron Cagle, Biology (B.S.)
Jennii Burrell, Biochemistry (B.S.)

Faculty Mentor(s)
Daniel Paull, Chemistry & Physics

Grant Support
Sheffield/Blair/Brodie Summer Research Scholarship
Whitaker Center Mini-Grant- Travel

Abstract: Electron rich N-Heterocyclic Carbenes (NHCs) are well known for their stability and as transition-metal ligands. Their role in the catalysis of carbon-carbon coupling has been demonstrated in several popular synthesis routes including Suzuki-Miyaura, Heck, and Sonogashira reactions. This research aims to reduce chemical waste by strategically designing and synthesizing recyclable solid-supported palladium catalysts using NHCs as building blocks.
Not only are the catalysts green in the sense that they are recyclable, but they may also allow the use of water as a solvent in lieu of solvents that aren't environmentally friendly. Our synthesis route for the catalysts begins with an SN2 reaction, which forms an ionic liquid (IL). The IL is then "clicked" to form a thioether before either coordinating to palladium or being covalently bound to silica. The order of the last two steps is now being explored as binding to silica before coordination may yield better results. After thorough cleaning and characterization through proton NMR, each catalyst will be tested for efficiency using a Sonogashira coupling reaction to synthesize resveratrol analogues. The goal of this research is to enable greener coupling reactions with broader scopes, while maximizing catalytic efficiency and reducing environmental impact.

15) Research Title: Lifeline Interdependency: A Case Study of Infrastructure Lifeline Interdependencies under the Impact of Hurricanes

Student Author(s)
Alexis Slobodzian, Environmental Engineering (B.S.Env.E.)

Faculty Mentor(s)
Long Nguyen, Environmental and Civil Engineering
Claude Villiers, Environmental and Civil Engineering

Grant Support
WiStem/VentureFund

Abstract: Independent infrastructure lifelines including energy, water transportation, and communications are interconnected at a local level. Normally, these lifelines must interact in order to be functional and reliable. Extreme events, such as hurricanes, disconnect these interactions and prolong the recovery period of the infrastructures. These interactions must be studied to determine their extent. Southwest Florida's infrastructure lifelines were damaged by Hurricane Irma in 2017. This study investigated the direct impacts of Hurricane Irma on the recovery of two counties transportation infrastructure and other physical, cyber, geographical, and logical dependency lifelines. Primary and secondary data were collected from both county departments of transportation. Group interviews with engineers and managers, employed by the departments, assessed the extent that transportation infrastructure depended on energy, water, and communication infrastructure during recovery. Hurricane Irma caused power failure to 100 percent of intersections within each department for at least a short period of time, therefore electric power was found to be a dominant lifeline in the recovery process. This study's conclusions contribute to improving the resilience of transportation infrastructure in managing future hurricane events.

16) Research Title: Determination of the Promoter Region for the CCE1 Cauliflower Gene

Student Author(s)
Carolina Cora, Biotechnology (B.S.)

Brandon Sanchez, Biology (B.S.)

Faculty Mentor(s)
Marilyn Cruz-Alvarez, Biological Sciences

Grant Support
Departmental funds

Abstract: Brassica oleracea includes vegetables such as broccoli and cauliflower. This range in diversity portraits the ability of one species to display different physical appearances. Farmers have difficulty harvesting the edible portions of specific varieties, as environmental factors can affect gene expression and development. To investigate this heterogeneity, genes expressed in only one variety can be identified. One copy of a transposable element, named CCE1 (CAULIFLOWER CURD EXPRESSION1), has identical sequences among varieties but appears to be expressed preferentially in cauliflower. Transposable elements can be silenced through methylation, modifying chromatin structure and altering gene expression, which leads to developmental differences amongst varieties. Differences in DNA methylation have been found in the CCE1 gene. DNA constructs containing 5' flanking CCE1 sequences fused to the β-glucuronidase (GUS) gene were introduced into broccoli protoplasts. No GUS expression was detected, implying that the promoter is not located in these CCE1 sequences. To examine if the promoter is located within the CCE1 coding region, the complete gene was introduced into broccoli protoplasts and Arabidopsis thaliana plants. CCE1 mRNA is detected in transformed broccoli protoplasts, showing that the promoter is contained within the coding region. Analysis of RNA samples from transgenic Arabidopsis plants is still being conducted.

17) Research Title: Research and Development of Real World Case Studies for General, Organic, and Biological Chemistry

Student Author(s)
Jamison Seaney, Biology (B.S.)

Faculty Mentor(s)
Sari Paikoff, Chemistry & Physics

Abstract: A combined general, organic, and biological chemistry class is an ideal way for Nursing majors to learn the most essential aspects of chemistry in a concise, yet comprehensive course. The fundamentals of chemistry are used constantly by nurses when determining factors like dosing, administering drugs to patients, and interpreting lab values.
Research was done to find real world examples that were then analyzed and formatted into case studies to fit best within a nursing program discipline. Three well known drugs were used as the main focus of the study to enhance the potential for understanding, comprehension, and overall student success. The following case studies were designed with the goal that they would give students an in-depth and applicable base for their future careers.

18) Research Title: Geothermobarometry of granitic migmatite leucosomes from the Sotomó-Chaiquenes High Grade Metamorphic Complex, Chile

Student Author(s)
Molly Norris, Environmental Studies (B.A.)

Faculty Mentor(s)
James H. MacDonald, Marine & Earth Science

Grant Support
USSSA (Undergraduate Student Scholarship Support Award) Mini Grant
Whitaker Center Mini-Grant- Travel

Abstract: The Sotomó-Chaiquenes High Grade Metamorphic Complex (SChMC) resides south of Calbuco Volcano, Chile, located within the Alerce Andino National Park. The SChMC is a section of basement rock that consists of gneisses and schists with migmatites. The complex is undated with only a few papers published on it and no estimations made for the temperature and pressure for the formation of the granitic migmatite leucosomes. Our goal was to identify if the granites formed from partially melted continental crust or from other events like volcanic activity. Plagioclase, muscovite, and biotite from three migmatite leucosomes, two two-mica granites and one garnet muscovite granite, were analyzed using the electron probe micro-analyzer (EPMA) from the Florida Center for Analytical Electron Microscopy, FIU. Thermometers and barometers were used from other scientific papers. Data were found to be primary with characteristics indicative of crustal formation like garnets. The peraluminous compositions and calculated temperatures and pressures suggest that the SChMC migmatites leucosomes are S-type granites formed from partial melting of continental crust at depth. This can aid in the understanding in how basement rocks and complexes impact a highly volcanic area like Chile. Felsic rocks such as SChMC can cause a volcano to be more explosive.

19) Research Title: Activity of resveratrol analogues against triple-negative breast cancer (TNBC) cells and LCMS monitoring of molecular isomerization

Student Author(s)
Hind Benmerabet, Clinical Laboratory Science (B.S.)

Faculty Mentor(s)
Daniel Paull, Chemistry & Physics
Lyndsay Rhodes, Biological Sciences

Grant Support
Honors Program

Abstract: Resveratrol is a plant-derived stilbene found mainly in the skin of red grapes, peanuts, and berries. It is a strong antioxidant agent that has been associated with treatments against diabetes, obesity, cardiovascular diseases; moreover, it has been proven to be effective against certain types of cancer. However, its low solubility and bioavailability has posed great problems for researchers seeking to use it as a treatment method. In an effort to discover a more effective alternative, our research group has synthesized and tested resveratrol analogues against multiple breast cancer cell lines. Recent studies have demonstrated the efficacy of resveratrol analogues against estrogen positive (ER+) breast cancer cells and have associated this effect to the structural similarity of these molecules to estrogen, assuming the analogues would act as antagonists to estrogen signaling. Surprisingly, though, some of our analogues have shown high activity against ER+ cell lines, but also against triple-negative breast cancer (TNBC) cell lines despite the lack of the ER-a on the surface of these cells. Our compounds inhibit cell growth, induce apoptosis, and even cause morphological changes that indicate a possible reversal of

epithelial-mesenchymal transition and thus a potential inhibition and reversal of metastasis. Recently, we have been focusing our efforts toward the expansion of our analogue inventory in an attempt to fit in the missing pieces of the puzzle and delineate a possible structure-to-effect relationship. The integrity of our compounds in the culture media was monitored by means of the LCMS (Liquid-Chromatography Mass-Spectrometry).

20) Internship Title: Internship at the FGCU Archives, Special Collections, & Digital Initiatives

Student Author(s)
Molly Norris, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies
Melissa Minds VandeBurgt, Archives, Special Collections, & Digital Initiatives

Abstract: The Florida Gulf Coast University Archives, Special Collections, & Digital Initiatives preserves original primary source materials and provides access to both the university and the public. This is accomplished through gallery visits, exhibits, and digital collections. As an intern I helped organize and catalog the donation from Kevin Erwin Consulting Ecologist, Inc. The collection included the material for the building of FGCU.

21) Research Title: Water Quality Assessment of Lake Tupkee at the Naples Botanical Garden

Student Author(s)
Samuel Perez, Environmental Studies (B.A.)

Faculty Mentor(s)
Brian Bovard, Ecology & Environmental Studies

Grant Support
Departmental funds

Abstract: The Naples Botanical Gardens contains 100 acres of natural areas where animals are protected, including a few lakes within that area. During the summer of 2019, the Garden estimated species richness using several different methods once a week for ten weeks and found the lakes contain mostly invasive species such as Mayan Cichlids. Given the Gardens are concerned with preserving the natural areas, the lakes within the natural areas should be a concern. The lakes should contain native species of fish such as largemouth bass and bluegill. In this study we assessed the water quality of Lake Tupkee at the Garden. To ensure the water quality of the lake is sufficient for the health of the native species water samples were taken and tested for Nitrogen, pH, salinity, Phosphate during mid to late summer 2019. Phosphate concentrations were the only parameter that were significantly high in this study (0.09 ppm). These values may be due to the proximity of the lake to fertilized areas of the garden. The data from this study indicates Lake Tupkee is relatively healthy for native fish species if they were to be restocked.

22) Research Title: Stress Cytokines; Influence of IL-1β, IL-6 and IL-8 on the Development of Neurological Disorders Autism & Alzheimer's

Student Author(s)
Rance Musco, Biology (B.S.)

Faculty Mentor(s)
Clifford Renk, Biological Sciences

Abstract: The purpose of this study is to determine if pro-inflammatory cytokines IL-1β, IL-6, and IL-8 through oxidative stressors and microglia factors are protagonists to the development of neurological disorders, Alzheimer's Disease and Autism Spectrum Disorder. This review contains two parts, first developing the systematic review of articles, collecting data and utilizing these results to specify on where future investigations should be directed. A focus on pathophysiological mechanisms shared among these neurological disorders utilizing animal studies and correlating it with human research will be emphasized. Is affected brain regions systematized by oxidative stress, mitochondrial dysfunction and immune cytokine dysregulation identified in neurological disorders hypothesize the research review?

23) Research Title: Stocking Lake Tupkee

Student Author(s)
Samuel Perez, Environmental Studies (B.A.)

Faculty Mentor(s)
Biran Bovard, Ecology & Environmental Studies

Grant Support
Departmental funds

Abstract: The Naples Botanical Gardens is more than just a than just a repository for striking plant specimens from around the world. It contains 100 acers of natural areas where animals are protected, including a few lakes within that area. After taking species richness tests via several different methods once a week for 10 weeks of the lakes the results of this showed that the lakes contain mostly invasive species such as Mayan Cichlids. Seeing as how the Gardens are concerned with preserving the natural areas, the lakes within the natural areas should also be a concern. The lakes content should contain native species of fish such as Largemouth Bass, Blue gill. When stocking the lake "Expect a range of 500 to 1,500 comestibles per acre. You'll need 10 bluegills for every bass." (Scroppo)." According to a GIS program the lake of interest (lake Tupkee) has an area of approximately 7 acres. This means that the cost of properly stocking the pond could be around 4,000 per acre so the total cost of stocking the lake will be around $28,000 (JonesFish). This is considering that many other species are taken also introduced into the lake. For just bluegill and Large Mouth bass the price would be around $8,000. To ensure the water quality of the lake is sufficient for the health of the native species water samples were taken and tested for Nitrogen, pH, salinity, Phosphate. Everything was good except for the high phosphate concentration in the water, perhaps because of the close proximity of the lake to the garden where fertilizer is used. Data is still being collected to fully confirm if the lake is habitable for those native species however, it seems to be a healthy lake.

24) Research Title: Virtual Reality Approach to Learning Data Structures and Algorithms

Student Author(s)

Flornaldine Pierre, Software Engineering (B.S.)

Faculty Mentor(s)
Fan Zhao, Information Systems & Operations Management
Anna Koufakou, Software Engineering

Grant Support
WiSER Eagles work study

Abstract: Virtual reality environments have become very popular and have been used for various applications besides entertainment, for example science, medicine, or education. This work studies the use of immersive virtual reality environments towards learning advanced Computer Science topics. Specifically, the objective of this study is to explore the use of immersive learning environments to aid students as they learn topics in data structures and algorithms, and hopefully improve their comprehension of these topics. For the study, students engage in a virtual reality game whose purpose is to teach algorithms, such as the Quicksort algorithm, in an immersive and visual approach. The virtual reality game is designed and developed from scratch using the Unity platform. We plan to involve students in the Software Engineering program, for example on designing certain aspects of the algorithm that students may struggle with the most. Ultimately, the use of an interactive and immersive environment should stimulate the students' interest and help students learn more than they would with traditional teaching methods.

25) Research Title: Analysis of The Function of Melaleuca quinquenervia CAULIFLOWER-like and LEAFY-like Flowering Genes.

Student Author(s)
Gabriel Taggart, Biology (B.S.)
Shawn Brunelle, Biology (B.A.)
Rodrigo Tomas, Biotechnology (B.S.)

Faculty Mentor(s)
Marylin Cruz-Alvarez, Biological Sciences

Grant Support
Departmental funds
Scholarship-Research Venture Capital Fund

Abstract: Melaleuca quinquenervia is an invasive tree species in Southwest Florida known for flowering frequently during the wet season. To better understand this flowering, research is being conducted on two Melaleuca genes with homology to flowering genes in other species, CAULIFLOWER (CAL) and LEAFY (LFY). RNAs from Melaleuca flowers and stamens were reverse transcribed and amplified through Polymerase Chain Reaction (PCR) using primers specific for CAL and LFY, respectively, to obtain complete coding regions. Amplified fragments were inserted into plasmid pCR2.1-TOPO. E. coli cells were transformed with these plasmids. Ampicillin resistance and blue-white screening were used to select transformed colonies with desired inserts. Selected colonies were grown and plasmid DNAs prepared from the colonies were sequenced. Sequences from the inserts were compared to the genomic sequences of the genes to ensure there were no mutations. After identifying clones with the correct coding sequences, these sequences will be placed between 5' and 3' regulatory regions so they

can be expressed in plant cells. Once these expression cassettes are made they will be transferred into Agrobacterium tumefaciens. These bacteria will be used to transform cal and lfy mutants of Arabidopsis thaliana to analyze if expression of Melaleuca genes rescues the Arabidopsis mutations.

26) Research Title: The Effects of Green Chemistry Gold Nanoparticles on the Development and Mortality of Zebrafish (Danio rerio) Embryos

Student Author(s)
Natalie Harvey, Other (specify below)
Johan Elrubaie, Chemistry (B.A.)

Faculty Mentor(s)
Ju Chou, Chemistry & Physics

Grant Support
Sheffield/Blair/Brodie Summer Research Scholarship

Abstract: The study of zebrafish embryo development and mortality while placed in incubation with gold nanoparticle solution gives great insight as to if green chemistry synthesized nanoparticles will be acceptable for use in the future on humans as a medication transport for cancer fighting drugs. These trials tested the effects of approximately 2nm through 10nm gold nanoparticles. The nanoparticle solutions created are all natural as they are made from fruit extract from bananas, kiwis, apples, and peaches. Over the course of a 5-day growth period of zebrafish embryos into fully formed fish, the embryos are monitored to determine if the effects of nanoparticles within their system result in harm to the embryo development. Our results indicated that the 2nm gold nanoparticles resulted in a lower mortality rate than that of the trials using 8nm gold nanoparticles. Those wells that house the highest concentration of nanoparticle solution resulted in a high percentage embryonic death by day 5. Overall, these trials proved to be successful in determining which size nanoparticles would be best for a medical application and which concentrations allowed into the biological system are tolerable before they become deadly.

27) Research Title: Using Methods in Biotechnology to Investigate the Unique Flowering Behavior of Southwest Florida's invasive Melaleuca quinquennia

Student Author(s)
Shawn Brunelle, Biology (B.A.)
Rodrigo Tomas, Biotechnology (B.S.)

Faculty Mentor(s)
Marilyn Cruz-Alvarez, Biological Sciences

Grant Support
Whitaker Center Mini-Grant- Research
FGCU Scholarship-Research Venture Capital Fund

Abstract: Melaleuca quinquenervia is an invasive tree in Southwest Florida. One of the most important factors in Melaleuca's dominance is its unique flowering. Southwest Florida Melaleuca trees can flower up to 5 times a year, and within a year after germination - a trait that is nonexistent in the native

Melaleuca of Australia. Although there has been research done on ways to combat the spread of Melaleuca, there lacks research on why it exhibits this flowering behavior only in Southwest Florida. The objective of this research is to utilize methods in biotechnology to investigate this behavior by analyzing how different environmental conditions affect the regulation of Melaleuca's floral development genes. Understanding this behavior could be useful in accelerating the flowering of agricultural tree species with long juvenile phases, such as citrus trees. The project presented here highlights an experiment designed to investigate the regulation of expression of the Melaleuca CAULIFLOWER (MqCAL) gene. This gene encodes a protein homologous to the floral transcription factor CAULIFLOWER (CAL) in Arabidopsis thaliana. Agrobacterium tumefaciens-mediated gene transfer is being used to develop transgenic Arabidopsis lines with the β-glucuronidase (GUS) reporter gene downstream of a 1.7-kb 5' region of MqCAL containing putative regulatory sequences.

28) Research Title: Characterization of The Floral Meristem Identity gene LEAFY in Melaleuca quinquenervia

Student Author(s)
Rodrigo Tomas, Biotechnology (B.S.)

Faculty Mentor(s)
Marilyn Cruz-Akvarez, Biological Sciences

Grant Support
Whitaker Center Mini-Grant- Research
Scholarship-Research Venture Capital Fund.

Abstract: The study of flowering is an area of interest to agriculture due to the role in fruit formation and to satisfy an increasing demand for food. Melaleuca quinquenervia is a species that has early and frequent flowering capabilities and understanding this may have important applications. The floral meristem identity gene LEAFY (LFY) is essential for flowering in many plants and the goal of this research is to clone and characterize the LFY homolog in M. quinquenervia (MqLFY). A Melaleuca genomic library was screened by Polymerase Chain Reaction (PCR) amplification of the fosmid DNA in bacterial colonies using primers complementary to conserved sequences of LFY genes from other species. A colony (67C10) containing these LFY sequences was identified and compared with a LFY homolog from Eucalyptus globulus. The clone contains a 9 base long 5' and 3' flanking sequences and the complete coding sequences, includes 3 exons, 2 introns. A construct with the promoter region of MqLFY was made to transform Arabidopsis thaliana. The amino acid sequence encoded by MqLFY shows 94.4% homology to the Eucalyptus globulus LFY protein. Analysis of gene expression by reverse transcriptase-PCR has shown MqLFY expression in several floral organs but not in floral buds or leaves.

29) Research Title: Utilizing CRISPR to Induce Duchenne Muscular Dystrophy (DMD) in the C2C12 Mouse Myoblast Cell Line

Student Author(s)
Nicholas Metro, Bioengineering (B.S.)

Faculty Mentor(s)
Jiehong Liao, Bioengineering

Abstract: Duchenne's Muscular Dystrophy (DMD) is a genetic disorder caused by many different alterations to the DNA sequence of the protein dystrophin. The most common single exon deletion that causes DMD occurs at exon 50. The mutation leads to the production of a nonfunctional dystrophin that fails to bind the cytoskeleton of the muscle cell to its cell membrane, which causes muscle to degrade over time. Further developments with clustered regularly interspaced short palindromic repeat (CRISPR) systems have provided a means for correcting genetic disorders. Utilizing CRISPR, a further deletion of exon 51 will allow for a partially functional dystrophin protein to be transcribed. This research will look into inducing DMD in the C2C12 mouse myoblast cell line by creating a frameshift mutation at exon 50. To confirm that the deletion has been successful, western blotting accompanied by immunofluorescence will be used to analyze molecular weight and dystrophin protein production. These assays will allow for the detection of dystrophin before and after deletions of exon 50 and 51 are conducted. Once exon deletion is complete, and mutated/non-mutated cell cultures are stable, further analysis of muscle cell function and population recovery will be tested under dynamic culture conditions simulating physical therapy.

30) Internship Title: Internship with the Florida Department of Health - Lee County's Epidemiology team

Student Author(s)
Sofia Sciancalepore, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: I worked with the Florida Department of Health - Lee County's Epidemiology team. The purpose of this team is to track and monitor cases of reportable illnesses contracted by residents of Lee County. Throughout my internship, the state of Florida had been experiencing a major outbreak of Hepatitis A. I was able to assist with this by evaluating human exposure through field interviews using and by participating in a staff meeting where we discussed current cases and options for best practices. I also took care of other tasks when staff was busy with outbreak investigation. During that time, I completed data entry and analysis related to animal bite cases, requested laboratory PCR and serology test results for patients who potentially had the Zika virus, and created monthly newsletters on current issues for local physicians. This internship gave me the opportunity to apply theoretical knowledge, acquired in my courses, in a professional setting. My work with the department taught me how environmental health plays a big role in maintaining public health and vice versa. I plan on pursuing my passion for this work by studying the correlation between the state of the environment and human health in graduate school.

31) Research Title: The Effects of Glass Substrates on Determining The Stiffness of Hydrogels

Student Author(s)
Nicholas Metro, Bioengineering (B.S.)
Jacob Grate, Bioengineering (B.S.)

Faculty Mentor(s)
Christopher Geiger, Bioengineering

Grant Support

Sheffield/Blair/Brodie Summer Research Scholarship

Abstract: Polyacrylamide gels have long been used in experiments as substrates for cell colonies to provide a more accurate mechanical environment compared to glass or tissue culture plastic. Using hydrogels as a substrate, researchers can develop mechanical environments that are much less stiff than glass or plastic and can help develop a better understanding of cellular characteristics such as morphology, structure, motility and adhesion. Additionally, as these gels are clear, they can be used for microscopy applications. Unfortunately, as these gels are significantly softer than glass or plastic, if they are mounted on these traditional substrates, the stiffness of the glass or plastic can influence the mechanical environment felt by the cells. The goal of this research was to identify the minimum allowable hydrogel thickness before a glass substrate affects the gel's apparent macroscopic shear moduli.

32) Research Title: Will Cypress Trees on the FGCU Campus Produce False Growth Rings for the Current Growing Season?

Student Author(s)
Sofia Sciancalepore, Environmental Studies (B.A.)

Faculty Mentor(s)
Brenda Thomas, University Colloquium
Brian Bovard, Ecology & Environmental Studies

Abstract: Taxodium distichum, or bald cypress, is a tree commonly found in wetland habitats throughout Southwest Florida. Bald cypress trees often produce false growth rings, making them difficult to use in dendrochronological research. These rings are considered "false" because they do not indicate annual growth patterns for the that tree. Although the development of false rings is common among this tree species, the reason for their onset is still unknown. For this project, micro-cores were collected monthly from five bald cypress trees on the FGCU campus. The samples were collected using a Haglöf increment hammer before being brought back to the laboratory where they were mounted, dried, and sanded for analysis. Micro-cores were examined for indications of false ring development as well as to identify differences in growth on the north and south side of same tree. Results are expected to indicate that increased rainfall in a given month will lead to the presence of inconsistent growth, and potentially false rings, on both sides of a sampled cypress tree. Understanding what causes these rings to occur would help researchers understand the growth patterns of this species, potentially leading to their use in dendrochronological research in Southwest Florida swamps.

33) Internship Title: Behind the Scenes: FGCU "Wings of Hope" Program

Student Author(s)
William Greene, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies
Ricky Pires, FGCU "Wings of Hope" Director

Abstract: The FGCU "Wings of Hope" Program is an environmental education program that educates 450 FGCU students plus 5,000 Lee and Collier county 4th and 5th grade students each year on the

importance of the endangered Florida panther, black bear and coexisting with wildlife. Since its inception in 2000 by director and FGCU Alumna "Mrs. Ricky" Pires, the program has grown to reach over 30 elementary schools and has touched the lives of thousands. But this program requires a tremendous amount of planning, organizing, and behind the scenes work in order for the program to run smoothly. Most of this work occurs during the summer semesters when there is no public school in session. This internship dives into this very crucial part of this once in a lifetime program.

34) Internship Title: Internship at Peace River Wildlife Center

Student Author(s)
Timothy Weaver, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: At the Peace River Wildlife Center, I completed my environmental studies internship, and gained plenty of experience while volunteering there. The wildlife center is dedicated to helping animals regain their health, receiving dozens of injured animals each week from citizens who bring the animals to the center. While working at the wildlife center, I fed all types of animals including baby birds, and walked the gopher tortoises in the grass outside the center. I also assisted in giving medicine to many animals that were injured. I gained experience in taking care of a wide variety of animals, and the proper steps that should be taken if I see a wild animal that is injured. I plan to use this experience that I have gained in my future career, and also plan to continue to volunteer at the wildlife center when I am able to.

35) Research Title: Text Mining of Public Comments on Power Restoration in Florida after Hurricane Irma

Student Author(s)
Nathalie Crespo, Software Engineering (B.S.)

Faculty Mentor(s)
Anna Koufakou, Software Engineering
Long Nguyen, Environmental and Civil Engineering

Grant Support
Scholarship-Research Venture Capital Fund, FGCU

Abstract: Hurricane Irma was devastating to Florida, including the physical damage in the Lee County area that was estimated to be about $742 million. These damages led to severe power outages all over Florida with varying times of restoration. The electric power companies and the state and local governments tried to resolve the outages in a timely manner. Many local residents turned to online forums to provide feedback related to the power restoration efforts. The purpose of this research was (i) to collect comments posted on the Florida Public Service Commission (FPSC) platform from Floridians regarding the power restoration efforts after Hurricane Irma, and (ii) to identify the themes and trends of these public comments. A total of 746 comments were collected and manually labeled into three categories. The first category of comments focused on power restoration time and communications with electric companies. The second category focused on switching to solar power or some other renewable

energy sources. The last category was used to group together miscellaneous comments. We are currently studying the application of clustering and classification algorithms to analyze the comments, utilizing Data
Mining and Natural Language Processing (NLP) techniques.

36) Research Title: Application of Brevetoxin in Coastal-Marine Sediments as a Proxy for Historic Reconstruction of Red Tide Events in Southwest Florida

Student Author(s)
James Javaruski, Marine Science (B.S.)

Faculty Mentor(s)
Puspa Adhikari, Marine & Earth Science
Joanne Muller, Marine & Earth Science

Grant Support
FGCU Capital Venture Fund 2019

Abstract: Florida red tide is a natural phenomenon caused by dinoflagellate (Karenia) blooms. However, recently red tides appear to have become more frequent, intense and longer-lasting, leading to questions on potential roles of recent land development and changing water quality in bloom dynamics. Unfortunately, historic information on red tides is not available, and unbiased scientific data doesn't exist before approximately 50 years ago. Although the scientific record is short, it is possible to assess historic frequency of red tides by looking at chemical biomarkers (e.g., brevetoxin itself) in seafloor-sediments. This study quantifies brevetoxin in dated coastal-sediment cores to reconstruct historical red tide events, determine links between frequency of red tides and urbanization in Southwest Florida, and investigate whether historic blooms are related to other environmental factors. A total of 5 cores were first dated using a 210Pb-based approach, and subsamples were then solvent extracted and analyzed utilizing a GC/MS/MS for the four main analogs of brevetoxin; PbTx-1, PbTx-2, PbTx-3, and PbTx-C.A. The concentrations of toxins in the sediment cores ranged between .15 to 6.89 ng/g of wet sediments. The down-core variability of brevetoxin characterizes the past red tides events which is very important for tracking historical blooms utilizing the sedimentary record.

37) Research Title: Using Zebrafish to Evaluate Embryonic Cardiovascular Defects Due to Exposure to Non-steroidal Anti-Inflammatory Drugs (NSAIDs) During Reproductive Stages

Student Author(s)
Coralie Antoine, Biology (B.S.)
Elianis Rill, Biology (B.S.)

Faculty Mentor(s)
Sherri Emer, Biological Sciences

Grant Support
Whitaker Center Mini-Grant- Research

Abstract: Headaches, toothaches, cramps, sprains, arthritis symptoms, and other daily discomforts are commonly relieved with painkillers classified as non-steroidal anti-inflammatory drugs (NSAIDs). NSAIDs

are used by over 30 million Americans each day. The ultimate purpose of these drugs is to reduce pain, stiffness, swelling, and fever. NSAIDs reduce inflammation by slowing down the formation of prostaglandins, which regulate inflammation through vasodilation and vasoconstriction. This mechanism is accomplished by inhibiting the enzyme cyclooxygenase (COX), which produces prostaglandins. Scientists recently determined that COX inhibitor (e.g., NSAID) use is related to cardiovascular diseases. Additionally, NSAID use by pregnant women is associated with adverse embryo-fetal and neonatal effects and an increased risk of congenital defects. To test the hypothesis that NSAIDs are related to cardiovascular development complications, we evaluated cardiac development in zebrafish (Danio rerio) larvae following embryonic exposure to low and high NSAID concentrations. We measured embryonic heart rate and distance between heart sinus venosus and bulbous arteriosus structures, which provided an index of heart chamber development. Zebrafish are widely used as research models because they are 70% genomically similar to humans. This work provides important information on the linkage between embryonic development and cardiovascular complications related to NSAID exposure.

38) Research Title: A longitudinal survey to assess the impact of GEMS on Middle School Girls' Future Careers Choices and Aspirations in STEM Fields

Student Author(s)
Coralie Antoine, Biology (B.S.)

Faculty Mentor(s)
Yainitza Hernandez-Rodriguez, Biological Sciences
Laura Frost, Chemistry & Physics

Abstract: Girls in Engineering, Math, and Science (GEMS) is an outreach program with a mission to encourage young girls to follow careers in the Science, Technology, Engineering and Mathematics (STEM). GEMS is an ongoing outreach program initiated in 2007 and delivered through the Whitaker Center for STEM Education at FGCU since 2014.The GEMS program provides support for girls with an interest in STEM during their middle school years. Engaging in STEM helps students enhance their problem-solving skills and science educational background. This research is to conduct a longitudinal study of the impact of GEMS on participants attending GEMS between 2014-2017.The survey correlates the interest and impact in a STEM career to the number of GEMS events attended by a middle school student. The survey concluded that a vast amount of GEMS girls believed the GEMS program influenced them in their STEM based path. With a 6% survey response rate, we were able to utilize this data to see how the attendance of the girls correlated to the number of GEMS events participated. The feedback provided allowed GEMS coordinators to see whether they have been successful in maintaining a girl's interest in STEM as they progress through high school and into college.

39) Research Title: Assessing the effectiveness of three methods to keep wild hogs out of citrus groves in south Florida

Student Author(s)
Travis Jones, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: The invasive wild hog has been plaguing the U.S. for decades and are near impossible to

stop, they eat most everything and are very powerful and intelligent animals. Electric fencing, trapping, and hunting are the three methods that will be tested in this proposal. Wild hogs damage crops and the land food is grown on which has a significant impact on the billion-dollar agricultural industry. Determining the most effective method would benefit the agricultural economy by slowing down the wild hogs from getting into the farms. The study could then be used to reduce negative effects on farmlands all over by comparing the results and using the best system to keep the wild hogs out.

40) Research Title: Comparison of Nutrient Concentrations in the Caloosahatchee River Estuary at Selected Sites

Student Author(s)
Ian Lisle, Environmental Studies (B.A.)

Faculty Mentor(s)
James Douglass, Marine & Earth Science

Abstract: The Caloosahatchee River, located in the Fort Myers/Cape Coral region of southwest Florida, has been experiencing increased algal blooms over recent years. Although the main cause of this increase in the algal blooms has not yet to be identified, many believe it is due to human based nutrient inputs into the Caloosahatchee River. If this trend persists it could become harmful to not only the environmental health of the area, but the economic health as well. For this research the nutrient data (PO4-P, NOx, TN) was downloaded from five collection sites that were located strategically within the Caloosahatchee River. The data was then analyzed using Microsoft Excel and SPSS statistical software to see if there was a significant increase in nutrient levels near wastewater sites, compared to nutrient levels not near wastewater sites during the wet and dry seasons. The results showed that the concentration of nitrogen cultures was greater at the sites located away from the wastewater sites compared to the sites near them during the wet and dry seasons. The phosphorous levels were found to be greater near the wastewater sites compared to the sites located away from the wastewater sites.

41) Internship Title: Never Say Goodbye' FGCU Wings of Hope: Panther Posse Internship

Student Author(s)
Kylie Henslick, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies
Ricky Pires, FGCU Wings of Hope

Abstract: There are approximately 150 Florida Panthers left in the world. The FGCU Wings of Hope: Panther Posse program educates elementary students about Florida's wildlife, both native and exotic, and provides the students with means to make a positive change.

42) Research Title: Seasonal environmental effects on habitat preferences of small mammal communities at Florida Gulf Coast University

Student Author(s)

Kylie Henslick, Environmental Studies (B.A.)

Faculty Mentor(s)
Matthew Metcalf, Biological Sciences

Abstract: Small mammals serve important ecological roles such as consumers of plants and microfauna, major food sources for predator species, and they facilitate the dispersal of seeds and diseases. We captured small mammals at six sample sites on the Florida Gulf Coast University campus in Fort Myers, Florida. Sample sites include two cypress domes, two wet prairies, and two pine flatwoods. We evaluated the effects of temperature, humidity, and rain events by sample site to determine the responses of small mammal populations to environmental changes. Over the course of this study (January 2019 to present), four species of small mammals (Sigmodon hispidus, Oryzomys palustris, Peromyscus gossypinus, Peromyscus maniculatus) were observed. By better understanding the health of our local indicator species, we can better maintain and manage our natural and urban areas. Results formulated from the data collected may have logistical impacts on campus development and surrounding communities in the future. Further implications of this data may affect research on local predator species of concern such as birds of prey and snake species.

43) Research Title: Effects of Climate Change in Southern Florida: Differential Changes in Rainfall Totals from 1915-2015

Student Author(s)
Emily Marcus, Environmental Studies (B.A.)

Faculty Mentor(s)
Donald Duke, Ecology & Environmental Studies

Abstract: Changes in rainfall patterns are an observable effect of the combination of many variables including climate change and urban development. The objective of this research was to determine whether changing climate is associated with differential changes in annual rainfall in Florida, in particular differences by proximity to the coast. The researcher used data from 16 sites grouped into 3 regions, each region including coastal and inland sites. The data spanned 100 years, from 1915-2015. The results of this research indicate that changes in rainfall have occurred. Wet season rainfall totals at coastal sites appear to have increased within the last 10 years, with 4 out of 7 coastal sites totaling greater than the 1970-1990 average. Dry season rainfall for coastal and inland sites has decreased, with 9 out of 11 sites having totals lower than the 1970-1990 average. Variation in rainfall between inland and coastal sites could be a result of warming ocean temperature, which would have a greater impact on locations closer to the coast. The conclusion of this research is that precipitation has changed differentially based on spatial location since 1915, which has the potential to be early evidence of the impacts of climate change in Florida.

44) Internship Title: Africa Internship at ZooTampa at Lowry Park

Student Author(s)
Emily Marcus, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: ZooTampa, formerly Lowry Park Zoo, is a zoo accredited by the Association of Zoos and Aquariums. Their mission is to create experiences that connect people with wildlife and the natural world while rescuing, rehabilitating, and caring for endangered and threatened species. As an intern in the Africa department, I was able to help provide daily care for many animals including elephants, rhinos, giraffes, and zebras. My primary responsibilities included assisting the keepers in cleaning all animal habitats and holdings, providing daily enrichment activities for every species, organizing food supplies and preparing diets, and observing training sessions. I was able to benefit the zoo by helping the team with daily tasks, which allowed them to have more time available to spend doing training sessions and preparing enrichment for the animals. I also had the opportunity to educate the public about the conservation mission of the zoo by presenting Keeper Talks to the guests.

45) Internship Title: Environmental Education at Zoo Miami

Student Author(s)
Samantha Headley, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: Zoo Miami, which is currently the largest zoo in Florida, was founded in 1948 and currently sits on 750 acres of land; 324 acres of which are developed for visitation. The Zoo is host to numerous events throughout the year, one being Zoo Camp. As an intern I was able to learn what it takes to develop various aspects of the camp. This included budgeting, drawing membership, adjusting work schedules for counselors, meal purchases, developing lessons plans, handling biofacts, setting up classrooms, assisting in outreach events, and creating craft activities for the campers. This internship allowed me to develop the new skills, work on the ones I already had, network with prospective employers, and make friends that I am extremely grateful to have gotten the chance to work with.

46) Research Title: The Contribution of the Estero River to the Eutrophication of Estero Bay

Student Author(s)
Samantha Headley, Environmental Studies (B.A.)

Faculty Mentor(s)
Mary Abercrombie, Marine & Earth Science
Aaron Nunes-Zaller, Integrated Studies

Abstract: Within recent years Southwest Florida has experienced numerous occurrences of harmful algal blooms due to eutrophication of the water; which is when an abundance of nutrients are found within the water, the most common being phosphorus and nitrogen. These nutrients are introduced into the system through agricultural, industrial, and domestic runoff of chemicals like lawn fertilizers, pesticide, herbicides, and even detergents. The Estero River sits as an access point in which these nutrients can be introduced, eventually emptying into the Estero Bay. The goal of this research is to analyze the concentrations of phosphorus, nitrogen, chlorophyll in vivo, chlorophyll acid, and the concentration of dissolved organic matter of Estero River and if it correlates to the concentrations in Estero Bay. Currently there is not statistically significant evidence to state the Estero River concentrations correlate with the Estero Bay concentrations. However, this does open the discussion for further analysis.

47) Research Title: Detection of Drugs from Latent Fingerprints on Different Substrates Found at Crime Scenes

Student Author(s)
Makenzie Freeman, Other (specify below)
Courtney Rush,

Faculty Mentor(s)
Sulekha Coticone, Chemistry & Physics

Abstract: Drugs of abuse taken by an individual are usually detected by measurement of the active substance in urine, blood, hair or saliva. Recently, it has been shown that drug metabolites can be detected in the sweat deposited in a latent fingerprint using antibody-nanoparticle conjugates. The present study was conducted in collaboration with the Sarasota County Sheriff's office drug detection division to determine whether fingerprint powder could affect the chemical integrity and detection of a drug present at a crime scene. Three different drugs were placed in three different brands of plastic bags. The bags were dusted for fingerprints on the outside and inside using fingerprint powder. Samples of the drug were subsequently taken out of each bag, and analyzed using Thin Layer Chromatography (TLC) to detect if there was a difference in the Rf values. Based on the Rf values no statistically significant difference was observed for all the trials. Additional experiments using NMR and IR will be conducted to determine any interference between the powder and the drug spectra. Further experiments are also being performed to determine the concentration of protein present in fingerprints obtained from different substrates. These studies will further help in the development of new methods to simultaneously detect latent fingerprints and drugs of abuse at crime scenes.

48) Research Title: ATP Luminometer Test for Evaluating Levels of Contamination on Contact Surfaces

Student Author(s)
Johana Cruz, Biology (B.S.)

Faculty Mentor(s)
Clifford Renk, Biological Sciences

Abstract: The formation of Adenosine Triphosphate (ATP) results from the chemical reaction between ADP, phosphate and input of free energy as shown by the equation [ADP + Pi + Energy = ATP]
Various metabolic processes such as Glycolysis, Krebs Cycle and the Electron Transport Chain make up cellular respiration in various organisms as a source to obtain ATP. ATP is the key link between energy-producing and energy-demanding processes in all living things. The amount of ATP can be used when evaluating cleaning practices in operating businesses like restaurants, hospitals, and universities. ATP levels in microorganisms can be measured and serve as a vital indicator on the contamination of contact surfaces. ATP Hygiene Monitoring System, specifically EnSURE, was used to quantify levels of ATP from two locations: Whitaker hall bathroom and vending machine. Over the course of thirteen weeks, ultrasnap swabs were used to collect surface samples and placed in the Hygiene System chamber-this allowed contact with the liquid reagent in order to test for ATP production. The microsnap method was also utilized to determine if the contamination was bacterial in nature. ATP is measured in relative light units (RLU) and levels of ATP production are proportional to the amount of light emitted from the device upon exposure to the swab sample. The greater amount of ATP produced, the higher the RLU thus the

greater amount of cellular load present on the surface. Overall, the results indicate contamination in both the bathroom and vending machine, however, the presence of ATP producing bacteria in the bathroom sink was higher. The contamination was determined to be naturally occurring meaning most of the ATP came from microorganism normally shed from the skin.

49) Internship Title: South Village Garden: Bringing Organic, Local Food to FGCU Dining

Student Author(s)
Ray Baldwin, Environmental Studies (B.A.)

Faculty Mentor(s)
Kathleen Crawford, FGCU Environmental Health and Safety
Carol Kennedy, Environmental Health & Safety

Abstract: Beginning in the Summer of 2019, I began my internship at the South Village Garden with my mentor, Carol Kennedy. Carol and I worked as a team to maintain the raised beds while providing the South Village Diner with fresh herbs and teaching visitors about the garden. As an intern, large part of my job was to sow seeds, water, and document actions, observations, and environmental data. This internship allowed me to gain hours on hands-on experience outdoors with people who have an environmental background, as well as those without, like chefs and new students.

50) Research Title: Examination of the Effectiveness of Burial Method of Propagation on American Beautyberry

Student Author(s)
Ray Baldwin, Environmental Studies (B.A.)

Faculty Mentor(s)
Anna Goebel, Biological Sciences

Abstract: A previously untested propagation technique was explored for use in propagating the American Beautyberry via cuttings, in order to improve the rate of cutting survival among woody-stemmed plants. One hundred and six cuttings were collected from 14 wild population American Beautyberry plants, from three different Florida locations: Charlotte Harbor Environmental Center, the FGCU Buckingham Campus, and the Tallahassee Museum. Cuttings varied by section and were divided into tip, middle, and base. The cuttings were planted and examined every week for 12 weeks for growing data. The data indicated that there was a steady 35.85% success rate at the 12th week.

51) Research Title: Efforts Toward the Total Synthesis of Pentenomycin

Student Author(s)
Jacob Foster, Biology (B.S.)
Daniel Quiroz, Biochemistry (B.S.)

Faculty Mentor(s)
Greg Boyce, Chemistry & Physics

Grant Support

Sheffield/Blair/Brodie Summer Research Scholarship

Abstract: Pentenomycin is a natural product that has exhibited activity against both gram-positive and gram-negative bacteria. A reported synthesis has successfully formed the racemic form of this molecule in 33% yield. Our efforts to find a more efficient route to this antibiotic is described. Our synthetic strategy begins with 2-cyclopentenone and utilizes a Morita-Baylis-Hillman and oxidation to stereoselectively form an advanced precursor of pentenomycin. Two steps remain under investigation to finish the cyclopentitol natural product.

52) Internship Title: Intern at FGCU Library Archives and Special Collections

Student Author(s)
Jonathan Farquhar, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies
Abigail Winslow, FGCU Library Archives and Special Collections
Abstract: Over the summer I interned for the FGCU Library Archives and Special Collections. I was responsible for analyzing, organizing, and preserving materials that were donated by Kevin Erwin including files, charts, data, maps, etc. Erwin is an ecologist whose work includes ecosystem restoration and community development. Much of his work was located in South Florida and his company helped with the development of FGCU.

53) Research Title: Fish Food: Are invertebrates in tape grass beds as diverse and productive as those in seagrass beds?

Student Author(s)
Kelly Chase, Marine Science (B.S.)
Hafez Ahmad, Marine Science (B.S.)

Faculty Mentor(s)
James Douglass, Marine & Earth Science

Abstract: Epifaunal invertebrates are vital components of submerged aquatic vegetation (SAV) ecosystems, serving not only to control and suppress epiphytic algae growth, but also as an important food source for higher trophic level species. Furthermore, invertebrate communities are susceptible to both "top-down" and "bottom-up" control, thus, assessing epifaunal invertebrate communities is essential in developing a deeper understanding of biological factors contributing to the condition and maintenance of SAV ecosystems. The Caloosahatchee River estuary (CRE) harbors six genera of SAV, with their distributions reflecting their physiological requirements. Vallisneria americana (tape grass) a freshwater SAV dominates in the upper, fresher regions of the CRE, while Thalassia testudinum (turtle grass), a marine therefore true seagrass species, is frequent throughout the lower CRE and surrounding estuarine systems. Epifaunal communities have been extensively studied in seagrass habitats, however, little is known about communities occurring in low-salinity V. americana habitats. Here we assess epifaunal invertebrate communities occurring in both V. americana and T. testudinum beds, to determine differences in diversity and productivity between respective invertebrate communities in hopes of being able to ultimately conclude weather or not diversity and or productivity varies between tape grass and seagrass beds.

54) Research Title: Spatio-Temporal Variability of SST and Primary Productivity in the Bay of Bengal

Student Author(s)
Hafez Ahmad, Marine Science (B.S.)

Faculty Mentor(s)
Felix Jose, Marine & Earth Science

Abstract: Large scale quantitative assessment of chlorophyll (Chl-a) concentration and its variability is the primary key to understand Ocean productivity and it's seasonality. This research is focused on the spatial and temporal variability of Chl-a concentration and sea surface temperature (SST) in the Bay of Bengal during two monsoon seasons (southwest and northeast), using data from 4 satellite missions, viz., MODIS/Aqua, MODIS Terra, VIIRS and JPSS1. Level-2 Chl-a and SST data from these satellites during January 2014 to October 2019 were extracted from NASA ocean color web portal (https://oceancolor.gsfc.nasa.gov/) and were filtered, mapped and daily composites were generated using Batch operations implemented in WimSoft. Using the daily composites, 5-day, 15-day and monthly composite imageries of Chl-a and SST were generated for 6 years. As it is well known, River influx from Ganges-Brahmaputra and Meghana Rivers contribute most of the nutrient input to the northern Bay of Bengal. Additionally, seasonally reversing monson wind pattern promotes coastal upwelling and mixing. Cyclones that are originated and intensified within the Bay of Bengal also play a significant role in the circulation and mixing prcoesses in the study area. To compare the productivity between the coastal zones and the open Bay of Bengal, the study area has been divided into 5 non-overlapping zones. Most productive zones are predominantly within the continental shelf and heavily influenced by river inputs. For April- August, monthly Chl-a data were mostly spotty, as the region was dominated with convective cloud formation during southwest monsoon. While zones off the coast of India and Myanmar showed a combination of coastal and open water influence, mid-Bay of Bengal zone exhibits relatively warmer SST and lowest Chl-a concentration. Monthly and Inter-annual variability in Chl-a and SST for these 5 zones will be presented in the poster. From the 6-year data analysis, it has been observed that highest productive zone oscillates between western and eastern Head bay, where most of the river input is discharged. Also, the productivity is highest not during the spring peak river discharge season; rather after the setting of northeast monsoon. Martin and Shaji (2015) also observed similar seasonal pattern for the primary productivity in the Bay of Bengal.

55) Research Title: Development of cyanophage isolation techniques to combat local blue-green algae blooms

Student Author(s)
Kelsey White, Biology (B.S.)

Faculty Mentor(s)
Scott Michael, Biological Sciences

Grant Support
Seidler Scholarly Collaborative Fellowship

Abstract: Microcystis aeruginosa is a species of cyanobacteria and the most problematic blue-green algae affecting Southwest Florida. M. aeruginosa blooms produce microcystin, a toxin that at low doses

induces acute coughing, sore throat, chest pain, and asthma-like symptoms. Cyanophage are viruses that specifically infect cyanobacteria. In humans and other organisms, phage therapy is a promising therapeutic method that utilizes phage to treat bacterial infections and has recently been gaining more interest from the scientific community. We hypothesized that phage therapy utilizing cyanophages would be a novel and effective method to combat cyanobacterial growth. Multiple methods of phage isolation utilizing enriched local water samples collected by the Department of Environmental Protection were tested and developed. Specifically, spot platting methods have been a particular focus. In addition, a local strain of M. aeruginosa is in the process of being grown as a pure local strain. The protocols developed with this research and the first pure local strain of M. aeruginosa are to be used to continue the development of this novel research.

56) Research Title: Progressive Growth Of Myoblast In A Guided Channel On A Hydrogel Of Various Densities

Student Author(s)
Brandon Roche, Bioengineering (B.S.)

Faculty Mentor(s)
Jiehong Liao, Bioengineering

Abstract: Tissue repair studies have shown that cellular growth slows along fibrous scar tissue, partly due to the density of the fibrin replacing the extracellular matrix during the repair process. This study is to determine the growth rates of C2C12 (mice myoblast) along a guided channel on hydrogel structures of various density. The different densities will determine an optimal growth rate in a linear direction down the channel. Characterizing the optimal growth rate will provide a better understanding of the dynamics of the myoblast growth in damaged tissue. This will provide future studies with the foundation to utilize this determined optimal growth rate in aiding post-trauma repair time. Minimizing trauma repair time allows for patients to have shortened rehabilitation time and improve quality of life.

57) Research Title: Imaging of Ag Nanoparticle Optical Probe Penetration in Breast Cancer Tumor Spheres

Student Author(s)
Rodrigo Yanes, Biology (B.S.)
Logan Stone,

Faculty Mentor(s)
Kerry Lee, Biological Sciences

Abstract: Imaging of Ag Nanoparticle Optical Probe Penetration in Breast Cancer Tumor Spheres
Rodrigo Yanes, Logan Stone, Gilbert Lanoue, Sydney Nowak, Lyndsay Rhodes, and Kerry J. Lee
Department of Biological Sciences, Florida Gulf Coast University, Fort Myers, FL 33965
In the search for effective cancer therapies, the behavior of Ag nanoparticles (Ag NP's) in tumor cells have been analyzed for their potential cytotoxic and therapeutic effects, however the introduction of Ag NP's in tumor-spheres of triple negative breast cancer (TNBC) and estrogen positive cells (MCF-7) has yet to be examined. The utilization of breast cancer cell lines as models for tumors maintains its relevance in that they provide an unlimited source of homogenous self-replicating material, free of contaminating stromal cells, and often easily cultured in standard media. Specifically, TNBC's cell lines are not

susceptible to hormone-targeted therapies due to their lack of hormone receptors, hence their treatment is limited. TNBC tumors also express resistance to cytotoxic compounds due to the presence of ABC transporters, transmembrane proteins that contribute to the failures of chemotherapy as they efflux chemotherapeutic agents which consequently leads to reduced intracellular drug levels and drug insensitivity. Additionally, these cell lines exhibit abnormal morphologies in response to the dose-dependent effects that Ag NP's can induce. To examine the cytotoxic effects of purified Ag NP's on these cell lines in relation to resulting structural differences of tumors, samples of assay were imaged under confocal optical microscopy. These structural abnormalities may provide an explanation for the varying penetration capabilities of Ag NP's in different cell lines. In this experiment, we manufactured Ag NP's which characteristically displayed stability in cancer cell media, and introduced them into living tumor-spheres of both cell lines and monitored their behavior in real-time using dark field optical microscopy (DFOM).

58) Research Title: The Impact of Permeability on Storm Water Retention Ponds in Lee County

Student Author(s)
Tyler Panariello, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Grant Support
Communities in transition internal funding through the office of undergraduate research

Abstract: The present study explores how a variety of factors influence storm water retention ponds. Each sample that was collected contained a specific area which was determined by the age of the pond. The goal was to see if the older ponds had a higher permeability rating than the younger ponds which meaning that in certain areas run off was a higher risk in certain ponds. Time was a crucial factor in both the experiment and in the nature of time for the experiment. If the samples were not tested within the first couple of days, then the samples would be considered contaminated. Sampling then would have to be redone in the field which then would cause for more crucial lab time. Samples included the sediment from four parts of each pond which consisted of two deep sediment samples and two shallow sediment samples. In the end we had a lot of different data which was a little inconclusive to determine without more sampling and more scientific research.

59) Research Title: Medical Cannabis in Florida: Patient demographics and reported perceptions of physician guidance.

Student Author(s)
Hailey Kalamaras, Biology (B.S.)
Laura Longa, Biology (B.A.)

Faculty Mentor(s)
Martha Rosenthal, Biological Sciences

Abstract: Our research seeks to understand the habits and practices of medical marijuana users in the state of Florida in order to inform the development of patient and physician education programs. Our team created and disseminated a survey to medical marijuana patients across Florida. The patients'

responses were compiled into easy to digest tables, and various statistical analyses were conducted. There was no significant difference in physician guidance for route of administration, dosage, and strain based on gender. However, there was a significant difference in physician guidance level given to whites and non-whites , in that non-white patients were more likely to report receiving adequate guidance. Our sample was compared to Florida's 2010 census data and it was discovered that our subject pool race demographic varied significantly with Florida's actual population and that our study had significantly more females than males represented. Additionally, patients in the survey reported reduction and/or cessation of prescription and over-the-counter drugs due to the use of medical marijuana.

60) Internship Title: Storm Water Management in Collier County

Student Author(s)
Tyler Panariello, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: During my internship, I have studied the way our storm water ponds are managed and maintained . We have people from the county come and inspect the storm water levels. Along with creating graphs of the data, we also keep a lot of records from SWPPP. This allows us to meet certain water standards and make sure there is not too much construction run off into the storm water ponds. Throughout my time with Toll Brothers, I have learned how to make construction sites more manageable for SWPPP workers in collier county. Last of all, I was able to make a lot of connections during my internship which lead to networking with a lot of different people. My mentor was able to show me how to run proper procedures when dealing with storm water which gave me very valuable knowledge for the future.

61) Research Title: Viral Defense in Gordonia terrae conferred by the Production of Viral Prophage.

Student Author(s)
Bradley Krzysiak, Biology (B.S.)

Faculty Mentor(s)
Sharon Isern, Biological Sciences
Scott Michael, Biological Sciences

Abstract: The threat of complete antibiotic resistance is an issue that has weighed heavily on the thoughts of researchers and medical professionals alike. Bacteriophage therapy has been identified as a strong candidate for use alongside antibiotics. Previous research has highlighted the ability of temperate phage to impart their hosts with increased resistance to viral infection. In this research, the potential ability of Gordonia terrae prophages to resist phage infection will be investigated. Two cultures of different prophage species were produced and plated in the presence of different phage species to determine the resulting change in overall infection. Prophage cultures were created using lysogenic phages Mollymur and Datboi, these cultures were generated by spot plating lysate and picking the 'cloudy' centers of plaques. Plaque picks were streaked to isolation twice and subsequently grown in liquid medium. Infectivity testing involved full plate titers of each prophage and wild G. terrae, each was plated with phage (Mollymur, Datboi, and Lollipop) and phage buffer as a negative control. Observations showed Lollipop normally infected all cultures, Datboi showed significantly reduced infection on

Mollymur prophage, and Mollymur was unable to infect any prophage cultures. The results obtained through this investigation highlight possible variability in lysogen-mediated viral resistance.

62) Research Title: Hydrology of Southwest Florida Wet Detention Ponds: Can Stormwater Detention Ponds on the FGCU Campus Reduce Runoff and Mitigate Flooding in the Estero River Watershed?

Student Author(s)
Abigail Krueger, Environmental Studies (B.A.)

Faculty Mentor(s)
Don Duke, Ecology & Environmental Studies

Grant Support
Seidler Scholarly Collaborative Fellowship

Abstract: Florida communities would benefit if their stormwater wet detention ponds, installed under State requirements for water quality purposes, were also useful for flood mitigation. This research studied 12 ponds on the FGCU campus for 12 months beginning September 2018 and quantified their response to precipitation events, as a means to investigate whether the ponds detain sufficient runoff to reduce peak flow from extreme events. Results document very different responses between wet-weather conditions, featuring steady precipitation on a near daily basis and surficial water table essentially as high as the pond surface; and dry-weather conditions, when soils are unsaturated and pond level is much lower at the beginning of a given precipitation event. Also, the 12 studied ponds demonstrate different responses - those very near one another (<100 meters) tend to respond as a group, but groups that are as little as 500 meters apart have different elevation changes per unit precipitation, and different degrees of variation among storm events. During dry conditions, the unit rise for three groups of campus ponds has a median between 2.5 and 5.7, with a relatively low variation in "Main Campus" and "Welcome Center" ponds, but much higher variation in "SoVi" ponds. During wet season, regression analyses show that only longer-term precipitation (modeled here as 21-day aggregate rainfall) is significant in predicting change in pond level, with no statistically significant influence from short-term (3-day aggregate) or medium-term (9-day aggregate) rainfall. Results suggest the ponds can accommodate a relatively large amount of precipitation during dry periods, so they are useful to detain peak flow during an isolated storm event, even a large one. However, during wet season there is almost no relationship between pond elevation and short-term precipitation, suggesting very little capacity to detain peak flows or reduce flooding during those conditions, which are crucial flooding conditions in south Florida. Ponds are probably not useful to mitigate flooding at those times.

63) Research Title: In Vivo Study of Effects of MgO Nanoparticles on Swimming Behaviors in Zebrafish (Danio rerio) Larvae

Student Author(s)
Kylie Kellermeier, Biology (B.S.)
Heather McCord, Biology (B.S.)
Sashia Fraley, Biology (B.S.)
Kristin Deichman, Biology (B.S.)
Beatriz Jose Gonzalez, Biology (B.S.)

Faculty Mentor(s)

Kerry Lee, Biological Sciences

Abstract: Magnesium oxide (MgO) nanoparticles are a metallic compound that is currently being used in nano-cryosurgical tumor treatment and have the potential to be used for more applications in cancer research. However, toxicological assessments on behavior have not yet been established. Utilizing zebrafish (Danio rerio) as our whole organism model system, this study will evaluate MgO 2 nanoparticle neurobehavioral effects on their early developmental stages. The data collected was evaluated and interpreted for swimming speed, aversion behavior, and thigmostasis in order to determine whether or not MgO nanoparticles can be further applied to medical research on cancer cells or if toxicity arises at the behavioral level.

64) Internship Title: Internship at Earth Tech Environmental LLC

Student Author(s)
Abigail Krueger, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Grant Support

Abstract: Earth Tech is an environmental firm that focuses on ecosystem restoration and environmental compliance both on land and water. They specialize in exotic eradication and native plant installation for private, commercial and municipal clients. My main role here was as the nursery assistant. They grow many of the plants used in their restoration projects. By growing the plants, themselves they are able to sell the plants directly to the clients instead of buying them from another nursery and then selling them to the client. It is critical to care for and maintain the nursery because the plants are a product to be sold. I have learned a lot about nursery maintenance, specific plant needs, mitigation policies, and I have become much more familiar with the scientific names of common flora native to Florida. It is important to be familiar with many aspects of the environment to be able to assess an ecological system and this internship has given me a solid foundation with the local plants.

65) Research Title: Isolation, Purification, and Genomic Identification of Cyanobacterial Species from Lake Okeechobee and its Waterways

Student Author(s)
Elizabeth Schroeder, Environmental Studies (B.A.)

Faculty Mentor(s)
Hidetoshi Urakawa, Marine & Earth Science

Grant Support
NSF and Army Corps of Engineers

Abstract: Cyanobacteria, or blue-green algae, are an essential part of aquatic ecosystems worldwide, but an overgrowth of these microorganisms can affect water quality and cause concern for human health due to their potential for toxicity. There is a lack of genomic study and characterization of cyanobacteria, especially from Lake Okeechobee, due in part to the difficult nature of isolation and purification of

unialgal cultures from the environment. In efforts to improve cyanobacterial research progress in Southwest Florida, isolation processes were used to culture representative cyanobacterial species from Lake Okeechobee and its waterways in order to examine their genomic and ecological features. Microfiltration followed by antimicrobial treatment was found to be a promising method for establishing axenic cultures of cyanobacteria. Sequencing of the 23S rRNA gene was determined over 14 cyanobacterial isolates which were then matched to genome sequences available in the NCBI GenBank. Environmental data for these cultures were studied, including chlorophyll-a, nitrates, ammonia, and phosphorus, to identify a range of conditions from which species were found. These cyanobacterial isolates will also be used in a whole-genome sequencing to determine their capability to produce toxins and fix dinitrogen.

66) Research Title: Development of Peptides Having Interferon and Antiviral Properties

Student Author(s)
Wislet Joseph, Biology (B.S.)

Faculty Mentor(s)
Mustafa Mujtaba, Biological Sciences

Grant Support
Seidler Scholarly Collaborative Fellowship

Abstract: Viral disease can be very devastating and could lead to mortality if it is not properly treated. Today, there is a limited option for preventing and curing viral infections. The human body produces cytokines called interferons that are involved in alerting the cellular immune system to viral infection of host cells; however, these interferons are not induced by some viral infection. In addition, some interferons can have toxic side effects when given a high dose as therapeutic. The goal of this research was to design peptides that are not toxic to cells but can induce antiviral activity in them similar to interferons. We designed fifteen peptides based on interferon sequence and their receptors binding sites. Their activity on cell proliferation, toxicity, and antiviral inducing activity against vesicular stomatitis virus (VSV) challenge was measured using L-929 cells. The WST-1 cells proliferation kit, as well as crystal violet staining protocols, were used to measure proliferative and antiviral activity. Results show that peptides were not toxic to L929 cells. Furthermore, unlike interferons, the peptides did not show antiproliferative activity. In addition, none of the peptides tested conferred any significant antiviral activity on L929 cells when peptides were preincubated with the cells for 24 hours before VSV challenge as compared to control media treated groups challenged with VSV only ($p > 0.05$). Although this study was conducted on mouse L929 cells, we will look at the antiviral and antiproliferative activity of these peptides on human cell lines in future studies as well as determine if the peptides can directly neutralize the virus. Thus, this study increases our knowledge of developing antivirals for therapeutic use.

67) Internship Title: Aquatic Microbial Ecology Lab Internship

Student Author(s)
Elizabeth Schroeder, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Hidetoshi Urakawa, FGCU

Grant Support
NSF and Army Corps of Engineers

Abstract: From March through August 2019, I interned with Dr. Hidetoshi Urakawa, a professor in the Department of Marine and Ecological Sciences at the Water School at FGCU. I worked at his Aquatic Microbial Ecology lab in Seidler Hall, which is currently focused on studying water quality and associated algal blooms in Southwest Florida. Throughout the internship, I helped with regular laboratory and research operations, including water quality monitoring, nutrient analysis, field research, and microorganism cultivation. I also had the opportunity to assist the Army Corps of Engineers and the U.S. Geological Survey in their study of harmful algal blooms at the Franklin Lock and Dam on the Caloosahatchee River. By working with Dr. Urakawa, I gained knowledge of maintaining a research lab, the microbial ecology of Southwest Florida, and what types of studies are useful in aquatic ecological research. In the future, I would like to use the knowledge and skills I have gained for a career in environmental research with a focus on water quality. I will continue to volunteer my time with community organizations to assist in studying the unique aquatic ecosystems of Southwest Florida.

68) Research Title: Viability of Breast Cancer Cells After Treatment of Resveratrol Analogues

Student Author(s)
Andrea Buchholz, Biology (B.S.)
Jessica Pevida, Biology (B.S.)

Faculty Mentor(s)
Lyndsay Rhodes, Biological Sciences

Abstract: One of the ways in which breast cancer is classified is through the presence of hormone receptors. Estrogen-receptor positive (ER+) breast cancer expresses estrogen-receptor alpha (ER-α) and typically respond to estrogen by proliferating. ER+ breast cancers account for approximately 70% of all diagnosed cases, and the vast majority of these cases are hormone-dependent, meaning they require estrogen to survive and proliferate. Due to the heterogeneous nature of breast cancer, acquired resistance of ER+ breast cancers to current treatments, and the undesirable side effects of chemotherapy and radiation, finding targeted therapies for breast cancer is of great importance. Over the years, the use of phytochemicals such as phytoestrogens have surfaced as possible therapeutic agents in the treatment of cancer. Resveratrol, a naturally occurring stilbene-based phytoestrogen, has been shown to have antioxidant and anticancer properties with minimal negative effects on normal cells. Previous research from our lab investigated the effects of several resveratrol analogues on ER+ breast cancer cell viability with promising results for several compounds. The purpose of the current study was to expand that research to a new series of resveratrol analogues on ER+ breast cancer cell lines. Additionally, we have also explored why some stilbenes performed better than others using our previous results, literary research, and molecular modeling. By identifying similarities between the best performing structures, more effective stilbenes can be synthesized for future study. We hope this research will lead to development of better targeted treatment options for patients.

69) Research Title: Enabling structure determination in polyglutamine peptides linked to neurodegenerative diseases - model studies on zwitterionic glutamine

Student Author(s)
Ieda Andrade, Biology (B.S.)
Loygdna Laurissaint, Biology (B.S.)

Faculty Mentor(s)
Daniel Lambrecht, Chemistry & Physics

Abstract: Polyglutamine (polyQ) peptides have been linked to a range of neurodegenerative diseases. A central characteristic is that the polyglutamine sequence leads to protein misfolding as well as aggregation into fibrils and that the polyQ sequence length is linked to the severity of the particular neurodegenerative diseases. However, the molecular pathway is not yet understood by which the free proteins aggregate into fibrils. This work aims to enable structure determination for glutamine from its vibrational spectra. Specifically, this work uses computational approaches to determine the relation between glutamine conformation and its molecular vibrations. In this way, a measured infrared or Raman vibrational spectrum can be mapped onto glutamine conformations to reveal the structure and dynamics of fibril formation. This project investigated a glutamine zwitterion - water cluster as a model system. The Avogadro program was used to generate and visualize molecular structures and the Q-Chem program package was used to simulate infrared and Raman spectra. Thirteen molecular vibrations were found to be sensitive to the conformation of the glutamine molecule, as described by the "chi1" dihedral angle. These findings allow one to extract the chi1 angle from vibrational spectra in order to shed more light onto the molecular process of polyQ-related fibril formation.

70) Research Title: Genetic Preference in Male Drosophila Flies

Student Author(s)
Loygdna Laurissaint, Biology (B.S.)

Faculty Mentor(s)
Dean Croshaw, Biological Sciences

Abstract: There has been a variety of research suggesting that many animals attempt to maximize genetic diversity in their offspring. Female fruit flies, for example, may mate with male fruit flies of a similar or differing genotype for a specific trait to which their offspring may be better adapted to their specific environment. The propagation of this particular trait may increase genetic diversity and overall offspring fitness. We hypothesized that a wild type male fruit fly (Drosophila melanogaster) would display more courtship behaviors toward a female of differing genotype, such as apterous or white eye, than one of his own genotype. Single male fruit flies were paired individually with single females of these three genotypes. After a 30-minute acclimation period, each fruit fly cross was watched for 15 minutes. Any courtship behaviors, such as courtship song, chasing, mounting, and licking, displayed in each pairing was recorded. There was no significant difference in courtship behaviors between wild-type males mated to female fruit flies of differing or similar genotypes, thus proving our hypothesis incorrect. The results may have displayed no difference due to the female counterparts of male fruit flies being the choosy species in reproductive mating.

71) Internship Title: GIS Internship with Rookery Bay Reserve

Student Author(s)
Forrest Wallace, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: I spent my internship working with the GIS specialist, Jill Schmid, at Rookery Bay National Estuarine Research Reserve. Located in Collier County, the reserve provides education and learning opportunities for the community as well as conducting research on the surrounding area. My main job as a GIS intern was to work with Jill on surveying the Gopher Tortoise burrows on Shell Island Road that are required every five years for Florida Fish and Wildlife. During the surveys I was responsible for collecting GPS coordinates, and burrow data which were then used to create a visual map of the locations of the burrows. Additionally, I was lucky enough to participate in many secondary projects that expanded my knowledge and skills in the field. Some of these projected included installing Surface Elevation Tables and participating in sea turtle nest surveys. This internship provided the opportunity to learn and improve technical skills related to my chosen field as well as provided me an opportunity to work with some excellent professionals in the field.

72) Research Title: An analysis of home range and movement patterns of the Eastern Diamondback Rattlesnake (Crotalus adamenteus) in Southwest Florida.

Student Author(s)
Forrest Wallace, Environmental Studies (B.A.)

Faculty Mentor(s)
Matthew Metcalf, Biological Sciences
John Herman, Biological Sciences

Abstract: The Eastern Diamondback Rattlesnake (Crotalus adamanteus) is a large venomous snake endemic to the southeastern coastal plain of the United States. This species has experienced population declines for several decades primarily attributed to habitat loss and degradation caused by human pressure. Despite these declines and the ecological importance of the species, C. adamanteus has yet to accrue federal or state protective status, with the exception of North Carolina. In order to implement effective management strategies, we must better understand the spatial limits and dispersal patterns of this species throughout its entire range. The present research addresses these knowledge gaps by utilizing radio telemetry and geospatial modeling to determine home range sizes, landscape usage, and habitat preferences for C. adamanteus in its southernmost range.

73) Research Title: Cell Towers in Graphs

Student Author(s)
Tom Shlomi, Mathematics (B.S.)

Faculty Mentor(s)
Erik Insko, Mathematics
Katie Johnson, Mathematics

Grant Support
FGCU Scholars Grant

Abstract: A well-studied problem in graph theory is graph domination, or the guard problem. If each guard can protect the vertex it is placed at and all adjacent vertices, what is the minimum number of guards needed to guard the graphs? In the past decade, study has begun in (t,r) broadcast domination. In the 21st century, working cell signal is needed in the graph. Each broadcasting vertex provides (t-d) signal to each vertex a distance d away, and r signal is needed for the cell signal to work. Again, we are trying to minimize the number of broadcasts needed. I explore this problem on infinite grids of arbitrary dimension.

74) Research Title: Graphene Solar-Photon Sail: using a figure of merit of a solar sail membrane for interstellar space exploration

Student Author(s)
Morgan Barkhurst

Faculty Mentor(s)
Derek Buzasi, Chemistry & Physics
Abstract: Graphene is a one-atom-thick monolayer hexagonal lattice of carbon atoms with a theoretical thickness of 0.345 nanometers and unique tensile strength capabilities. This study aims to determine how monolayer graphene can be utilized with an aluminumized polyimide film to improve the merit of a solar-photon sail membrane. Monolayer graphene sheets were transferred to polyimide samples and tested for reflectivity and emissivity. The reflectivity was enhanced by graphene and compensated for losses in reflectivity caused by the transfer process. The emissivity data are variable and inconsistent, making it inconclusive, therefore the polyimide's known emissivity was used. The graphene samples had a significantly higher interstellar cruise velocity than the other groups at some of their high sail velocities, even using graphene's lowest possible velocity. Graphene's velocity is likely between 6,300 and 19,000 m/s, greater than velocities of the samples without graphene, supporting the conclusion graphene improves solar-photon sail membranes. Graphene's ultimate tensile strength is 1,000 times the strength of the polyimide. Tensile strength should be considered in the figure of merit in future research. This study aims to pioneer the application of graphene for interstellar space exploration and spark future discoveries, discussions, and inventions involving this unique and promising material.

75) Research Title: Examination of Struvite Precipitation as a Sustainable Alternative Treatment Method for Nitrogen Removal/Recovery from Portable Toilet Waste

Student Author(s)
Monica Castro, Environmental Engineering (B.S.Env.E.)
Kimberly Sutter, Environmental Engineering (B.S.Env.E.)

Faculty Mentor(s)
Jong-Yeop Kim, Environmental and Civil Engineering

Grant Support
Honors Program
Sheffield/Blair/Brodie Summer Research Scholarship

Abstract: Struvite precipitation (SP) has demonstrated to be a successful sustainable pretreatment process, capable of producing a slow-release fertilizer. Focusing on NH4-N and PO4-P recovery, this study discusses the influence of pH, chemical molar ratios, and order of chemical addition on SP on

portable toilet waste (PTW). A maximum NH4-N removal efficiency of 97% was achieved at pH 9.5 when pH was adjusted after chemical addition, while a maximum NH4-N removal efficiency of 97% was achieved at pH 11 when pH was adjusted prior to chemical addition. This suggests that adjusting pH after chemical addition results in optimized NH4-N removal in PTW, as less pH adjustment is required to achieve a high removal efficiency. Increasing the ratio of supplementary magnesium resulted in a drastic decrease of PO4-P concentration within the PTW, while maintaining high TP removal efficiencies between 25-77%. High removal of TSS and COD was also observed. TSS decreased drastically with pH increase at a chemical molar ratio of 1:1.2:1.2 and decreased up to 82% at a chemical molar ratio of 1:2.4:1.2. A maximum COD removal of 50% was achieved at a 1.2:2.4:1.2 chemical molar ratio.

76) Research Title: The Influences of Sunlight On Berry Production for Callicarpa Americana (American Beautyberry)

Student Author(s)
Ashley Brown, Biology (B.S.)
Shana Perry, Biology (B.S.)

Faculty Mentor(s)
Clifford Renk, Biological Sciences

Grant Support
Whitaker Center Mini-Grant- Research

Abstract: In this project we explored the conditions for what would allow wild, Callicarpa americana, commonly known as Beautyberry to thrive. Twenty plants were observed over a 6 month period (January-June) at the Florida Gulf Coast University Buckingham Complex located in Fort Myers, FL. Each plant was observed for flowering, leaves, and berries. The 20 plants were divided into three categories: full sun, partial sun, and canopied. The plants were considered thriving if they produced an abundant amount of berries during this period. We hypothesized that the plants that were canopied would produce the most berries because they were not being dried out by the hot Florida sun. Our hypothesis was considered correct in that the bushes that were canopied produced on average a thousand more berries than those that were in direct sunlight all day.

77) Research Title: Optimal Transformation of the Green Florescence Protein Plasmid into Escherichia coli

Student Author(s)
Ivan Jimenez, Biology (B.S.)
Larenz Dixon, Biology (B.S.)

Faculty Mentor(s)
Mustafa Mujtaba, Biological Sciences

Abstract: Various mechanisms of horizontal gene transfer, such as transformation, transduction, and conjugation, are employed by scientists to produce recombinant organisms with beneficial traits that could be exploited by the scientists in various medical, pharmaceutical, agricultural and environmental fields. Furthermore, these methods, especially calcium chloride (CaCl2) heat-shock DNA transformation protocols, are common laboratory experiments in the Microbiology, Molecular Biology, Genetics, and

Cell Biology classes at both the undergraduate and graduate levels. In this study we deduce optimal conditions for the heat-shock transformation of the green florescence protein (GFP) DNA plasmid into Escherichia coli. An analysis of the age of competent Escherichia coli, heat shock time, heat shock temperature, and transforming solution type was made and transformation efficiencies measured. Results showed that Escherichia coli cultures stored at 4 degrees Celsius for more than 96 hours have no or reduced transformation of GFP. The optimal temperature of heat-shock was 40 degrees Celsius, although transformation did occur at room temperature and below. What was surprising to us was that transformation of GFP also occurred without any heat-shock. In addition, unlike the traditional 50 second heat-shock time at 42 degrees Celsius, transformation of GFP DNA plasmid also occurred up to 20 minutes, however, the optimal heat-shock time was at 2 minutes. Testing various transforming solutions ($CaCl_2$, $BaCl_2$, $MgCl_2$, NaCl, $MgSO_4$, KCl, and H_2O), only the use of $CaCl_2$ and $BaCl_2$ solutions showed transformation ability. Thus, from the above results, effective transformation of DNA plasmid into Escherichia coli occurs optimally with the use of fresh overnight Escherichia coli cultures, a heat shock time of 2 minutes at 40 degrees Celsius, and using either $CaCl_2$ or $BaCl_2$ as the transforming solution. The insight gained from this study increases our understanding of optimal and effective methods to transform plasmids into bacterial cells in molecular biology protocols.

78) Internship Title: Internship at the Estero Bay Aquatic Preserve

Student Author(s)
William Mullen, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: Starting in May of 2019 until mid-August, I worked with the Estero Bay Aquatic Preserve (EBAP) an office within the Department of Environmental Protection's Resilience and Coastal Protection division. The EBAP was the first aquatic preserve started in 1966 and works on projects aimed at managing submerged aquatic lands, wildlife, and habitats within the Estero Bay. Throughout my internship I got the opportunity to assist with every project the office participates in. This includes rookery monitoring, sea grass monitoring, oyster monitoring, tributary monitoring, water quality of the bay, educational wading trips for the public, data entry, and research for the office as well. By working with EBAP I was able to gain experience with fieldwork as well as a realization that it does come with office work as well giving me skills such as how to collect water samples, using a YSI and analyzing sea grass health using a quadrat abundance and shoot count method. In the future I would like to be able to apply these skills in sustainable land management as well as conservation and restoration efforts in combination with predicting and adapting with a changing climate.

79) Research Title: Cracking the theobromine dimer through co-crystal formation with salicylic acid derivative

Student Author(s)
Alexandria Kerr, Biochemistry (B.S.)

Faculty Mentor(s)
Gregory McManus, Chemistry & Physics

Grant Support

Student Government
Whitaker Center Mini-Grant- Travel

Abstract: Multi-component crystals, such as co-crystals, are utilized throughout the Pharmaceutical industry in an effort to develop drug formulations with enhanced solubility and bioavailability. Improving our understanding of how molecules hydrogen bond in the solid-state is crucial towards enhancing our ability to design drugs and control the physicochemical properties of active pharmaceutical ingredients. Constructing co-crystals from theobromine, through non-covalent interactions was attempted using salicylic acid derivatives. Given its tendency to dimerize, theobromine's structure prevents salicylic acid from breaking the 2-point hydrogen interaction between imide groups on adjacent theobromine molecules in the solid state. Instead, the carboxylic acid moieties from salicylic acid molecules hydrogen bond to the aromatic nitrogen of theobromine outside of the dimer forming a 2+2 co-crystal. However, it was reported that 5-chlorosalicylic acid breaks the theobromine dimer and forms a 2:1 co-crystal. This project involved studying a series of salicylic acid derivatives and determining which ones could form co-crystals with theobromine, and subsequently which derivatives would involve breaking the theobromine dimer. Our efforts to synthesize and identify co-crystals using mechanochemistry, powder X-ray diffraction, and single crystal X-ray diffraction are described herein.

80) Research Title: Improvement of ethanol fermentation by Saccharomyces cerevisiae yeast through evolutionary engineering and mutagenesis

Student Author(s)
Alice Trescott, Biology (B.S.)
Samuel Persichilli, Biology (B.S.)

Faculty Mentor(s)
Mustafa Mujtaba, Biological Sciences

Abstract: The use of Saccharomyces cerevisiae yeast and other organisms for production of fermentation products is a multibillion dollar industry. However, Saccharomyces cerevisiae fermentation performance for production of fermented beverages and bioethanol is decreased by the accumulation of ethanol (above 15%) in the medium. Furthermore, fluctuations in pH, temperature, water activity and substrate osmolarity also effects the yeast's viability and thus ethanol production. In this study, we used directed evolution (or evolutionary engineering) environmental stresses and mutagenic conditions (ultraviolet light exposure, alkaline an acidic pH medium, and high sugar osmolarity) on Saccharomyces cerevisiae yeast to determine if yeast could evolve that could produce higher concentrations of ethanol. Saccharomyces cerevisiae was grown for 48 hours in a Sabouraud medium exposed to various dosing conditions (pH, alcohol, dextrose levels). Other Sabouraud agar plates inoculated with the yeast were exposed to short UV wavelength (254nm) for various times. Yeast cells surviving the most extreme conditions (determined to be pH 5.0, pH 9.0, 12.5% alcohol, 30% dextrose, and 1 minute UV exposure) were then used to ferment a stock dextrose solution at 37 degrees Celsius. The specific gravities and alcohol by volume (ABV) of each treatment was determined over time using a hydrometer. Results show that all yeast treatment groups fermented the dextrose within three weeks to produce alcohol concentrations between 8.0% to 9.2%. Although in our directed evolutionary and UV mutagenesis treatments, the 12.5% alcohol and 30% dextrose treated yeast produced the highest alcohol levels (9.19%), these methods did not produce yeast cells that were statistically better at ethanol production as compared to controls yeast cells. There were no statistically significant difference

between the treatments and the control relating to final ABV production and specific gravities. The information in this study could be used to further our understanding of yeast fermentation modulation conditions and ethanol production.

81) Internship Title: Education Camp Internship at The Naples Zoo

Student Author(s)
Alexandra Lake, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: At the Naples Zoo, I was an education camp intern. I planned, coordinated and executed camp activities. I educated children from 5-12 years old on different important conservation topics and facts about animals. During this internship I obtained many different skills. I was able to sharpen my interpretation skills, practiced my public speaking and learned how to manage big groups of people.

82) Internship Title: A Synthesis of Sugar to View Cell Membrane of Bacteria

Student Author(s)
Gili Lokiec, Chemistry (B.A.)

Faculty Mentor(s)
Sulekha Coticone, Chemistry & Physics

Abstract: As an intern at Tel Aviv University in the summer of 2019, I worked with Dr. Micha Fridman on understanding the mechanism of antibiotic resistance. It is a well-known fact that gram-negative bacteria have become more and more resistant to antibiotics. This is due to lipopolysaccharides that decrease the mobility of the outer membrane (OM), making the passage of antibiotics into the bacteria impossible. In the inner leaflet of the OM, phospholipids are present. When these lipids are misplaced into the outer leaflet, it increases the mobility of the OM and the passage into the bacteria is possible. The reason as to how and when the placement of the phospholipids in the outer leaflets occurs is unknown. Therefore, understanding how the cell membrane looks can help form a basis for research in antibiotic resistance. A sugar, resembling 8-KDO, was synthesized to feed to gram-negative bacteria, E. Coli, to determine how the cell membrane of bacteria looks using metabolic labeling. Preliminary data using a nine-step process resulted in a sugar (189.10g/mol) with a yield of 507.9mg. This sugar was further characterized using column chromatography and Thin Layer Chromatography (TLC).

83) Internship Title: Water Sciences Field/Lab Intern

Student Author(s)
John Tracey, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: During my internship with Orange County Government I worked in the county's Environmental Protection Division as a Water Sciences Lab and Field Intern. Much of my work consisted of going out

with a field team to collect water samples from various lakes, rivers, culverts, and more so we could analyze the sample to see if the site was meting regulatory standards. While we measured more standard parameters such as pH, nitrogen, and phosphorus, we also tested more harmful parameters such as E. Coli and metals. The information we collected is used by the county when forming action plans when, for example, E. Coli levels are too high. The data collected is publicly available and used on Orange County's Water Dashboard to give a visual representation of some of the data collected for each water body. Aside from learning technical skills in the field and in a lab setting I also learned a lot about communication, teamwork, effective planning, and problem solving in a professional environment relevant to my field of study.

84) Research Title: Plant essential oil Cinnamomum cassia inhibits the growth of the human pathogen Aspergillus fumigatus

Student Author(s)
Naysha Vega-Almodóvar, Biology (B.S.)
Bryan Álvarez, Biology (B.S.)

Faculty Mentor(s)
Yainitza Hernández-Rodríguez, Biological Sciences

Grant Support
Departmental funds

Abstract: Aspergillosis is caused by the filamentous fungus Aspergillus fumigatus and is considered one of the leading opportunistic fungal diseases amongst cancer patients, organ transplant recipients and people living with chronic pulmonary disease. Fungal infections represent a serious threat to these immunocompromised individuals. It is reported that an average of 600,000 deaths occur every year due to aspergillosis. This is further exacerbated due to an increase in azole resistance amongst some clinical isolates of A. fumigatus. This situation has become problematic as physicians are quickly being left with little to no ways of treating these infections. This research focuses on the ability of the plant essential oil Cinnamomum cassia to inhibit the growth of A. fumigatus. To assess the response of the fungus under the oil treatment, we compared the inhibitory effects during germination and after colony establishment. We further assessed the differences in oil efficacy at 30°C (room temperature) and 37°C (body temperature). This comparison allows us to model and distinguish the effectiveness of the oil against the fungus in a patient that is already presenting signs of infection versus a patient that might be at risk. Here we show that Cinnamomum cassia has an inhibitory effect against A. fumigatus and might be a safer and more natural alternative treatment for immunocompromised patients compared to current therapies.

85) Research Title: Placement of solar panels to provide enough electricity for an average house in Florida

Student Author(s)
Viktoriya Bardenova, Mathematics (B.S.)

Faculty Mentor(s)
Erik Insko, Mathematics
Katie Johnson, Mathematics

Grant Support
Undergraduate Research from FGCU Scholars, Venture Capital Funds

Abstract: In this project, we apply efficient broadcast domination to search for the most cost-efficient way to deliver solar electricity to a city in Florida through photovoltaic cells and batteries installed on a square grid. Until now, electricity is produced in huge plants due to logistics involving delivery of coal, oil, natural gas, nuclear waste, etc. Since those problems do not exist with the delivery of solar energy in Florida, the project looks into creating grids that can supply 100 percent solar electricity. Then it compares costs to provide electricity to 100 houses and determine which one is the most efficient at the moment and since batteries and photovoltaic cells get cheaper each year at what point another grid configuration might be a better solution.

86) Research Title: Testing species boundaries in Stillingia (Euphorbiaceae) of the North American Coastal Plain, with a focus on south Florida

Student Author(s)
Allison Boza, Biotechnology (B.S.)
James D'Amico, Biology (B.S.)
Alex Amador, Biology (B.S.)
Norman Jabopuin, Biotechnology (B.S.)
Matthew Erb, Biology (B.S.)

Faculty Mentor(s)
Jay Horn, Biological Sciences

Grant Support
Seidler Scholarly Collaborative Fellowship

Abstract: To conserve biodiversity, an understanding of species concepts is crucial, given that species are the "currency" of biodiversity. Herein we investigate the species boundaries of the NACP (North American Coastal Plain) members of genus Stillingia (Euphorbiaceae). Stillingia is an ideal group for evolutionary analysis due to long-standing taxonomic discrepancies based on highly variable morphological features and ecological niches. To assess patterns of phylogenetic diversity in NACP Stillingia, we used sequences of the molecular markers ITS and ETS (nuclear genome) and trnH-psbA (chloroplast genome) from 48 samples collected across Florida that encompass the structural and ecological variability in this lineage. Preliminary phylogenetic analyses of our aligned matrix, using both maximum likelihood and Bayesian methods, resolved two clades corresponding to previous concepts of Stillingia sylvatica and S. aquatica. However, within the S. aquatica lineage, two sublineages are resolved. Populations from south Florida with red-pigmented inflorescences that grow in hyperseasonal, marl-based depression ponds are sister to a sublineage containing populations distributed elsewhere in Florida that have yellow-pigmented inflorescences. Our phylogenetic results lay the framework for formulating more detailed hypotheses that relate to speciation, character evolution, and biogeographic history of the NACP Stillingia lineage, all of which can enhance conservation awareness.

87) Research Title: Bioprospecting for Actinomycetes that produce bioactive compounds in the soils of SW Florida

Student Author(s)
Christian Millot, Biotechnology (B.S.)

Faculty Mentor(s)
Jan DeJarnette, Biological Sciences

Grant Support
Departmental funds

Abstract: Members of the order Actinomycetales have been characterized as soil dwelling gram-positive bacteria that possess high-G+C DNA and engage in extremely differentiated life cycles. While the Actinomycetales is comprised of more than 80 genera it is the Streptomyces, and Micromonospora that are most famous for their prolific production of natural antibiotics and the historic impact that their bioactive secondary metabolites have had on human and animal health. However, the rise in antibiotic resistance in-addition to the decline in discoveries of new antimicrobial compounds has led to a resurgence of bioprospecting in those environments for which microbial diversity is poorly understood, or re-prospecting in soils and using improved recovery techniques and recipes for growth. Here we describe the isolation of secondary metabolite producing actinobacteria from soils and sediments in SW Florida. The use of modified Kirby Bauer techniques for active compound screening, supernate collection and testing on problematic microorganisms, and phylogenetic analysis of 16s rRNA for species identification.

88) Research Title: Analyzing Gait Kinematic Differences Between Male and Female Participants

Student Author(s)
Kiana Fredericks, Bioengineering (B.S.)
Alexandria Sergo, Bioengineering (B.S.)
Felipe Avila Mejia, Bioengineering (B.S.)
Jaxira Treminio, Bioengineering (B.S.)

Faculty Mentor(s)
Derek Lura, Bioengineering

Abstract: The purpose of this project is to study the kinematics of the body and the difference in multiple variables between males and females. An even number of males and females were recruited for this study. Reflective markers were placed bilaterally onto the participant's greater trochanter, lateral knee, lateral ankle, second metatarsal, heels and the shoulders. Each participant walked a distance of twenty feet, three times, in a motion analysis lab. The data recorded was processed and analyzed to calculate the angle of flexion of the hip of each participant. Once all the variables were recorded, they will be processed using Qualisys and MATLAB analytical tools, to find the distinctions between the data collected for females and males.

89) Research Title: Investigating the Effect of Bioactive Sutures on Cell Migration and Proliferation

Student Author(s)
Rachel Cepeda, Bioengineering (B.S.)

Faculty Mentor(s)

Jiehong Liao, Bioengineering

Abstract: Absorbable sutures are commonly used to hold wounds close as tissues heal over time. Standard sutures, such as braided vicryl sutures made of polyglactin, can maintain tensile strength over 2-3 weeks and is completely absorbed via hydrolysis. To accelerate the wound healing process, this study aims to impart bioactivity to synthetic sutures by incorporating embedded cells and cytokines. It is hypothesized that the cells and cytokines loaded into the sutures will induce the migration of surrounding fibroblasts to the wound site and stimulate their proliferation and production of extracellular matrix. Fibroblasts will be selectively seeded at the periphery of well plates and vicryl sutures will be anchored at the center of the plates using a thin layer of agarose hydrogel. Migration of fibroblasts toward the suture will be monitored over time via light microscopy, and samples will be taken for cell counts to quantify proliferation. Experimental groups in this initial study include sutures loaded with various density of cells, blank sutures without cells, and blank wells without suture as a control for baseline cell migration and proliferation. After establishing an optimal cell seeding density, the combined effect of loading sutures with both cells and cytokines will be investigated.

90) Research Title: An Evaluation of Predator Impacts on Loggerhead Sea Turtle (Carretta carretta) Nests Along Developed or Natural Beaches in Collier County, Florida

Student Author(s)
Joelle Vernon, Biology (B.S.)

Faculty Mentor(s)
Nora Demers, Biological Sciences
Charles Gunnels, Biological Sciences

Abstract: Loggerhead sea turtles (Carretta carretta) are one of the most common sea turtle species found in southwest Florida. However, their numbers have been in a general decline due to loss of habitat and vulnerability to predators. We interpreted whether Loggerhead sea turtle nests in Collier County, Florida would be depredated more often on beaches with native land in contrast to urbanized beaches with human residences. The specific beaches that were used in the research were Delnor Wiggins State Park, Park Shore, and Vanderbilt beach. We investigated the different forms of depredation provided by the Collier County Parks. This information was analyzed for the depredation types and amounts for each beach. The data revealed that the null hypothesis of natural beaches having more predation than urbanized beaches was incorrect. This may be due to predators being drawn in by direct and indirect feeding by humans. These results reflect the large impact that humans have on their surrounding environment despite conservation efforts and the importance of preserving natural beaches where wildlife may remain undisturbed.

91) Research Title: Developing Sustainable Techniques for the Production of Shea Butter in West African Villages

Student Author(s)
Michaela Clarke, Forensic Studies (B.S.)
Christian Fabrizio, Other (specify below)

Faculty Mentor(s)
Sari Paikoff, Chemistry & Physics

Rachel Campbell, Chemistry & Physics
Joy Sun, Chemistry & Physics

Grant Support
Siedler Globalization Fund

Abstract: Shea butter is a solid mixture of oils and fats that is extracted from the Vitellaria paradoxa tree also known as Shea Tree. The Shea Tree predominantly grows in sub Saharan Africa covering 20 countries (Manikuu, 2017). The purpose of this research was to enhance current methods of Shea butter production in African villages to increase efficiency, sustainability, and profitability. In this initial stage of the process, traditional methods of preparation were replicated and a baseline product was created. The traditional methods of making Shea butter are; the collection of the Shea fruit, de-pulping, removing the shell from the nut, sorting the nuts by isolating the healthy nuts from the discolored and moldy nuts, the healthy nuts are then boiled, sun-dried, roasted, and extracted. The laboratory process simulated the traditional process using dried Shea nuts from Africa. In order to remove the effects of water quality on the product, deionized water was used for the laboratory baseline and control preparation. In total over 20 grams of Shea butter was prepared. The impact of discolored nuts was also assessed by extracting a sample from these nuts. The sample from discolored nuts yielded no product likely do the apparent reduced fat content. The next steps of this research is to; identify a more efficient extraction process, quality control studies to assure replicable quality, understand the role of water contamination on Shea butter production as well as signatures of authenticity and assessment of the medicinal fractions.

92) Research Title: Sustainable and Cost-Effective Food Using Raised Bed Agriculture: Effects of Municipal Compost on Raphanus sativus Plant Growth

Student Author(s)
Adam Tardif, Environmental Studies (B.A.)

Faculty Mentor(s)
Edwin Everham, Ecology & Environmental Studies

Abstract: This experiment is directed towards contributing to the research of sustainable food production practices using municipal compost in an effort to make raised bed gardening and other sustainable farming methods simpler and easier for anybody to pursue regardless of their level of knowledge or understanding. The experiment was conducted between October and December of 2019 to test the hypothesis that the ratio of 2:2 compost to topsoil will generate the greatest yield of radishes. This was compared to the control group of only topsoil (0:4) and the other test groups with ratios of 1:3 and 3:1 compost to topsoil. In order to develop results for research, data was collected after 1 week, 2 weeks, and 3 weeks of growth. Data was also collected after the radishes are harvested anywhere between 21-40 days. Non-mineral rich sandy soil was used as the topsoil in order to prevent skewed results from adding extra nutrients via mineral-rich soil. Test groups with ratios 1:3 and 2:2 were anticipated to show greater growth and a greater overall yield than the 3:1 and control group, giving a better estimate of the best soil-to-compost ratio for growing vegetables in raised garden beds. As the world becomes more unstable and food production becomes increasingly more difficult, it is important to consider moving towards seed to table methods and other more sustainable ways of growing food. By using municipal compost from wastewater treatment facilities as a resource to amend soil, energy can be put back into the system and organic matter can be recycled that would otherwise be wasted.

93) Research Title: Isolating Phage in the Blue-green Algae Host, Microcystis aeruginosa

Student Author(s)
Alicia Belony, Biology (B.S.)

Faculty Mentor(s)
Sharon Isern, Biological Sciences

Grant Support
Seidler Scholarly Collaborative Fellowship

Abstract: In Southwest Florida, blue-green algae blooms caused by cyanobacteria are a common occurrence during the warmer months of the year. Our research focused on isolating naturally occurring viruses (bacteriophage or phage) in the cyanobacteria, Microcystis aeruginosa, that could be used to control the blooms. In land and water ecological systems, bacteria populations are controlled by phage. The phage can either kill or live inside them. Water samples collected by the Department of Environmental Protection were screened for phage in liquid cultures of M. aeruginosa. The samples were tested using direct enrichments and using filtered samples. Direct enrichments select for specific phage and allow for any possible phage to replicate within the host. Filtration is done to restrict bacterial contaminants. We also tested different methods of growing the host to optimize culture conditions for both growth and scale-up to facilitate screening. We also tested different freezing protocols to optimize conditions for long-term storage of the host.

94) Research Title: What you see is what you get: microgravity effects on cells of the retina

Student Author(s)
Carl Corgelas, Biology (B.S.)
Razvan Onica, Biology (B.S.)

Faculty Mentor(s)
Sherri Emer, Biological Sciences

Grant Support
Florida Space Grant to Faculty Mentor

Abstract: During space exploration, astronauts struggle with many physiological challenges such as cardiovascular and musculoskeletal problems. However, it has become increasingly apparent that astronauts experience changes within the visual system upon their return to Earth. Astronauts have reported light flashes, blurred vision, and partial blindness during and following return from microgravity. In order to test the hypothesis that microgravity affects cells in the retina, for example, photoreceptive rods and cones, bipolar, horizontal, amacrine, and retinal ganglion cells, we used histology and immunohistochemistry to compare the retinas of Earth-based ground control mice to those of mice maintained in microgravity aboard the International Space Station (ISS). Because of the similarities in their genetic, biological, and behavioral characteristics, mice are an adequate species for modeling human physiological conditions and changes. This research enhances the relationships between NASA and FGCU while also providing important insight into common visual dysfunctions experienced on Earth. Further, as space exploration gains precedence, it is important to understand the

effects on human physiology that ultimately determine the ability of the human body to adapt to environments beyond Earth.

95) Research Title: Dark matter simulation

Student Author(s)
Noah Boyar,

Faculty Mentor(s)
Jeff Hutchinson, Chemistry & Physics

Abstract: The search for dark matter is a hot topic amongst physicists from a broad range of concentrations. Of the three major methods are direct detection (observing particles interacting with dark matter through recoil effects) and indirect detection (observing products of dark matter decays coming from space to earth). An attractive third option is producing and detecting dark matter in a large-scale particle collider such as the LHC (Large Hadron Collider). Dark matter can theoretically be generated from the collision of two proton beams and therefore observed. However before searches begin, it is important to know the correct conditions under which dark matter would be produced in a collider beam according to our physical theories. Since large-scale particle colliders cost enormous amounts of financial investment, simulations are crucial towards developing our understanding of dark matter in colliders. In our research, we are investigating the effects of different variables in the dark matter model and how these variables change the dark matter signal.

96) Research Title: Carryover Muscle Contraction from Stimulated to Resting Biceps Brachii Muscles

Student Author(s)
Rachel Tompkins, Biology (B.S.)

Faculty Mentor(s)
Sherri Emer, Biological Sciences

Grant Support
Whitaker Center Mini-Grant- Research

Abstract: Exercise is important to overall energy metabolism that supports body health. It is also essential for individuals experiencing muscle weakness and muscle-wasting conditions such as persons with diabetes, multiple sclerosis, and those rehabilitating from stroke. Recent data suggest that exercise increases beneficial gene expression in both exercised muscle tissue and the contralateral corresponding resting muscle tissue. Using electromyography (EMG) to record activity from exercising and resting biceps brachii muscles, I tested the hypothesis that carryover contraction occurs in the resting muscle. Because isotonic eccentric exercise allows the muscle to exert more force without using as much effort, I also evaluated if exercise type (isotonic eccentric, isotonic concentric, and isometric) affected contraction in the resting muscle. The muscle activity recorded in this project adds to studies of gene activity. Understanding carryover contraction is important in determining exercises that are efficient and produce effective results in individuals regaining strength following muscle weakness.

97) Research Title: MRSA is what it eats: the impact of oligotrophy on HA and CA methicillin-resistant Staphylococcus aureus.

Student Author(s)
Alejandro Noy, Biology (B.S.)
Shane Stoeber, Biotechnology (B.S.)

Faculty Mentor(s)
Jan DeJarnette, Biological Sciences

Grant Support
Departmental funds

Abstract: Environmental conditions that de-optimize bacterial growth are the rule rather than the exception, and one of the major selective pressures that impact microbial growth is nutrient availability. To meet this challenge bacteria have evolved a number of different survival strategies; both short term and long term. In addition, the strategies used in response to nutrient availability are not only operating out in the environment, but also within the human environment where the microbiome, and pathogens compete for nutrients with each other, and their hosts.
For this study we used hospital acquired (HA) and community acquired (CA) MRSA to look at the impact of a long term nutrient poor oligotrophic lifestyle on phenotype, and on two genetic markers. We anticipated a decrease in virulence marker activity under prolonged oligotrophic conditions, but the results of the study suggest the opposite where poor nutrient oligotrophic conditions may actually enhance MRSA fitness versus a nutrient rich eutrophic lifestyle. This may explain why circulating HA strains have been eclipsed by more prolific and quickly evolving CA strains of MRSA, which have a greater probability of experiencing de-optimized conditions between hosts.

98) Research Title: Building a Community of Learners around our Watershed: "Educators and Learners Experiences" in a Collaboratively-led Field Trip

Student Author(s)
Taylor LaPeters, Environmental Studies (B.A.)

Faculty Mentor(s)
Heather Skaza Acosta, Ecology & Environmental Studies

Abstract: The Conservancy of Southwest Florida works collaboratively with the Collier County School District to provide a half-day field trip for third grade students focusing on water quality and species diversity. Participating teachers are offered a training program to help lead the field trip at the beginning of the semester. Also, pre- and post-field trip activities are provided to support teaching and learning in the classroom. This study intends to survey teacher's perceptions of the field trip and their participation in it, and examine student performance on an assessment, after field trip participation. The student's comprehension of the information presented on the field trip should be a direct in correlation with the teacher's understanding of the material and engagement in the field trip. We will provide a post field trip assessment to the students in person and provide an online survey to teachers following their field trip. These data will be analyzed to understand the relationship that might exist between teacher experience and student's learning gains. The results of the correlation analysis will be used to revise teacher training, teacher expectations on site, and the field trip itself to best support students.

99) Research Title: Construction, Optimization, and Cost-Benefit Analysis of Floating Aquatic Treatment Wetlands for Phytoremediation Pre-Treatment of Municipal Landfill Leachate Employing Saline-Tolerant Plants

Student Author(s)
Austin Wise, Environmental Engineering (B.S.Env.E.)

Faculty Mentor(s)
Ashley Thomson, Environmental and Civil Engineering

Grant Support
Honors Program
Hinkley Center for Solid and Hazardous Waste Management

Abstract: Leachate treatment is a cost-intensive process for municipal landfills because it carries high concentrations of ammonia, metals, and other dissolved solids which can disrupt the function of wastewater treatment plants (WWTPs). To compensate for potential disruption, WWTPs require payment based on the volume and concentration of compounds in leachate. Some of the substances are: chemical oxygen demand, ammonium, phosphate, nitrate, and nitrite.
Dr. Ashley Danley-Thomson's lab at the U.A. Whitaker College of Engineering at Florida Gulf Coast University tested the ability of saline-tolerant plant species to survive in leachate. After a few species were identified to survive in leachate, those species were suspended in dilutions of 25%, 50%, 75%, and 100% concentrations of leachate to test their ability to treat it. Different floating wetland designs were also tested to determine the most efficient design for reduction of chemical oxygen demand, ammonium, phosphate, nitrate, and nitrite in the leachate.
Once trials were conducted to examine the efficiency of different plants and designs to treat leachate, a cost-benefit analysis was done to determine the extent to which floating wetlands could be used to minimize costs for municipal landfills. The analysis determined different plant species which were more efficient at removing different compounds.

100) Research Title: Karenia brevis and aquatic birds: Analyzing the impact of an antitoxin on feeding behavior of red tide exposed birds

Student Author(s)
Harrison Johnson, Environmental Studies (B.A.)

Faculty Mentor(s)
Brian Bovard, Ecology & Environmental Studies
Kara Lefevre, Ecology & Environmental Studies

Abstract: The purpose of this experiment is to determine if two bird species, the Brown Pelican (Pelecanus occidentalis) and the Double-Crested Cormorant (Phalacrocorax auratus) exposed to red tide (Karenia brevis) have improved feeding behaviors after receiving an antitoxin. This study was completed by the Seaside Seabird Sanctuary in Indian Shores, FL. By controlling the diets of the birds, the amount fed divided by the amount eaten can be expressed as a percentage of food consumed. Following this, the differences in feeding behaviors between individuals exposed to red tide before and 3 days after antitoxin treatment. After analysis, it was shown there was little variation in rate of consumption between birds treated with an antitoxin, and those that were just given fluids and no antitoxin. Although

there was a slight increase in the mean (% food consumed) in both groups from Day 1 until Day 3, this difference was not statistically significant. A follow-up study should consider prophylactically treating the birds before red tide blooms to see if impacts on feeding behavior is ameliorated. This study provides information that will help develop new treatment solutions to red tide exposure of birds.

101) Research Title: The effect of bacterial contamination of sterile and non-sterile soils on the germination of tomatoes and available soil nutrients

Student Author(s)
Kayla Howard, Biology (B.S.)

Faculty Mentor(s)
Mustafa Mujtaba, Biological Sciences

Abstract: Contamination of agricultural farmlands by various microbes and pests can cause devastating effects on crops, resulting in billions of dollars in lost production. Microbes can be both beneficial and harmful to plants depending on their symbiotic relationship. In this study, the effects of various Gram positive and Gram negative bacteria, either alone or in combination, on the germination of tomato seeds, soil nitrate, potassium, phosphorus, and pH levels were observed using sterile and non-sterile soils. Tomato seeds were seeded in either organic non-sterile potting soil or sterile soil that was sterilized using an autoclave. Seeded soils were then contaminated with 100mL of freshly grown overnight bacterial cultures using sterile water as the vehicle of transfer. Bacterial cultures included Pseudomonas aeruginosa, Escherichia coli, and Bacillus megaterium. The bacteria was administered as either solitarily or in a combination of two or all of the different bacteria. Sterile water was used as the control as well. Seed germination was measure after 4, 6, and 12 days. Levels of nitrate, potassium, and phosphorus was measured after 12 days using the Rapitest Soil Test Kit. Results showed that germination of tomato seeds were the highest in the sterile soils contaminated with Pseudomonas aeruginosa (3/4), Escherichia coli (3/4), Bacillus megaterium (3/4), and Bacillus megaterium/Escherichia coli combination group (3/4). Of all of the group in the non-sterile soil, only Pseudomonas aeruginosa contaminated non-sterile soil had the greatest amount of seed germination (3/4). Furthermore, when all three microbes were used together to contaminate the soil, there were no germination of tomato seeds in the sterile soil and only 1 out 4 germinated in the non-sterile soil. The average pH for both types of soil, sterile and non-sterile, did not change significantly. The pH was maintained around 6.67. Levels of nitrate was depleted in all of the sterilized soil groups after two weeks of bacterial contamination, except for the control group, whereas nitrate levels of the non-sterile soil were general adequate or deficient. Levels of potassium and phosphorus did not significantly differ between the sterile and non-sterilized groups. Thus, the results from this study enhances our understanding of tomato seed germination and nutrient levels after contamination of soils with various bacteria.

102) Research Title: Using Novel Osteoblast Differentiation Marker EB1 to Improve In Vitro Osteoblast Models

Student Author(s)
Sydney Edwards, Bioengineering (B.S.)

Faculty Mentor(s)
Jiehong Liao, Bioengineering

Abstract: Currently, there is a growing need to improve cell models for in vitro research. Cell models inform studies examining pharmacokinetics, the biocompatibility of materials, and the identification of novel therapies (Czekanska, Stoddart, Richards, & Hayes, 2012). There is therefore a need to continuously improve these models to better simulate the in vivo bone environment for research applications. The focus of this research is to use end-binding protein 1 (EB1), a osteoblast differentiation marker associated with microtubule plus-end binding, to gauge osteoblast differentiation over time. Current markers typically used in osteoblast research, such as alkaline phosphatase (ALP), osteocalcin and osteopontin, and calcium, peak at different times during differentiation and can only be examined for a set number of days. ALP, for example, peaks between days 5-14 and then starts to decline (Burmingham et al. 2012). In contrast, EB1 has been shown to increase steadily over time (Pustylnik et al. 2013). Western blotting will be performed to examine EB1 levels over time in MC3T3-E1 mouse preosteoblast cell line induced with ascorbic acid for osteogenesis. This work will establish methods for future research examining both chemical and mechanical induction of osteogenesis, which can be used to improve in vitro research models.

103) Research Title: Vertebrate Paleontology in the Bighorn Basin of Montana

Student Author(s)
Alexis Stansfield, Biology (B.S.)

Faculty Mentor(s)
Clifford Renk, Biological Sciences

Grant Support
Honors Program

Abstract: Since the late 1800s, the Bighorn Basin has been a premier region for fossil excavation in North America. The Bighorn Basin Paleontological Institute (BBPI) is a nonprofit that focuses on earth science education, and research in this region. BBPI performs field projects and educational outreach opportunities focused primarily on Mesozoic organisms. The Morrison Formation is a Jurassic sediment layer that is thoroughly studied in Wyoming, but comparatively little is known about its Montana section. At the very northern reach of the Basin, BBPI began studying the Morrison. Since 2017, BBPI has excavated hundreds of specimens, which are housed at the Cincinnati Museum of Natural History and the Drexel Academy of Natural Sciences. This Summer, I joined BBPI for two weeks of their excavation season. While participating in their field paleontology course, I worked closely with paleontologists Jason Schein, Jason Poole, and Dr. Rick Schmidt. Their mentorship helped me navigate my field experience and learn about the region's geology and specimen diversity. I worked on three excavation sites over the course of the two weeks, continuing ongoing work that BBPI is doing in the region. BBPI focuses heavily on making research and education one cohesive mission.

104) Research Title: Identification of Genes Involved in Drought Tolerance of Ball Moss (Tillandsia recurvata)

Student Author(s)
Arianna Smith, Biotechnology (B.S.)
Tara Axelrod, Biology (B.S.)
Jaimie Kittle, Biology (B.S.)

Faculty Mentor(s)
Takashi Ueda, Biological Sciences

Grant Support
USSSA (Undergraduate Student Scholarship Support Award) Mini Grant
Whitaker Center Mini-Grant- Research
Research Venture Capital Fund

Abstract: Stress caused by drought diminishes the productivity of plants more than any other environmental factor. Tillandsia recurvata, commonly known as ball moss, is an intriguing model plant to study as it is indigenous to South Florida and is often found in areas of low water availability. Peroxiredoxins (Prxs) are a family of antioxidants that function in relieving oxidative stress in both plants and animals. It is known that in South African desert plant species Xerophyta viscosa 1-Cys Prx functions to alleviate oxidative stress under drought conditions. A partial sequence of the homolog of this gene was identified in ball moss, and this research aims to clone the complete gene in order to evaluate its importance in preventing desiccation. Currently, a combination of inverse PCR and construction of ball moss genomic library are being attempted to retrieve the full gene sequence. Completion of this research has the potential to enhance drought tolerance by inserting the gene into agriculturally important crops through genetic engineering.

105) Internship Title: Pillar for Conservation Education

Student Author(s)
Corey Elliott, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: I served my internship at Pompey's Pillar National Monument as an AmeriCorps member. The core values of the AmeriCorps is to serve the community and to provide aid wherever necessary. During my internship, I was stationed at Pompey's Pillar National Monument as a park ranger and it is there where I developed insight and crucial skills on my daily duties as a conservation intern. I served for over 450 hours performing hands-on tasks that primarily focused on educating the public about the land's natural history, conservation, and the environment. I was assigned to lead school groups and tour groups as an interpreter at an approximate 500 visitors each week. I was also expected to maintain the grounds in a presentable fashion. I received training in CPR, First-Aid, AED, UTV operations, and an assortment of maintenance equipment. These daily activities made me into an excellent public speaker and educator, and it gave me the confidence to continue my work diligently. Overall, this internship program allowed me to pursue my passion for conservation and education.

106) Research Title: Isolation of the Eyes Absent (Eya) Homolog in Melaleuca quinquenervia

Student Author(s)
Addi Vaz, Biology (B.S.)
Mitchell Hellmann, Biotechnology (B.S.)
Daniel Berenzy, Biotechnology (B.S.)
Nicholas Barkley, Biotechnology (B.S.)

Asbaa Khan, Biotechnology (B.S.)

Faculty Mentor(s)
Takashi Ueda, Biological Sciences

Grant Support
Research Venture Capital Fund

Abstract: Eyes Absent (Eya) is an evolutionary highly conserved gene that plays a critical role in the development of several organs in animals. The gene's conserved domains have been found in both animals and plants, but very little is known about its function in plants. The overall goal of this research is to isolate Eya homolog in plants and determine their functions in plant development. Using a set of degenerate primers, we have amplified and cloned a 1.6 Kb genomic DNA fragment corresponding to Eya homolog in Melaleuca quinquenervia. We are currently screening the genomic library of Melaleuca to obtain a complete Eya homolog sequence.

107) Research Title: Curare in the Body

Student Author(s)
Patricia Nunez, Biology (B.A.)

Faculty Mentor(s)
Sherri Emer, Biological Sciences

Grant Support
USSSA (Undergraduate Student Scholarship Support Award) Mini Grant
FGCUScholars

Abstract:
Temporary muscle paralysis with botulinum toxin is a popular procedure used in medical and cosmetic applications to relieve pain and reduce the appearance of facial aging. The toxin disrupts the nervous system by preventing communication between neurons and muscle through inhibition of the neurotransmitter, acetylcholine. Acetylcholine inhibition blocks signals to skeletal muscle that normally stimulate muscle contraction, resulting in paralysis. Given that paralysis is widely and regularly used in people, it is important to understand the long-term effects of repeated procedures. Recent studies suggest that receiving repeated botulinum toxin (i.e., Botox) treatments in submandibular muscles is related to diminished jawline stability and problems within the mouth. In this study, I used the acetylcholine inhibitor curare, which is similar to botulinum toxin, and bone tissue histology to the test the hypothesis that inhibition affects the distribution of bone remodeling cells in zebrafish. Zebrafish contain major cellular constituents of mammalian bone and have a high degree of homology for genes facilitating mammalian bone homeostasis. This study can provide important information regarding repeated muscle paralysis treatments and their effects on bone maintenance.

108) Research Title: The Impact of Hurricane Irma on Nesting Habits of Wading Birds of Southwest Florida at Naples Zoo in Naples, Florida

Student Author(s)
Tess Catalan, Environmental Studies (B.A.)

Faculty Mentor(s)
Kara Lefevre, Ecology & Environmental Studies

Abstract: Hurricane Irma devastated the habitats of many native species of Florida, including local wading bird populations. With the reconstruction of various exhibits within the facility, there was concern surrounding how the exhibits were being restored, and if the decisions being made would allow for optimal nesting conditions and restore the symbiotic relationship between the wading birds and American alligators. Surrounding the alligator bay exhibit at Naples Zoo, surveys were conducted along eight transects to observe nesting habits. The frequency of wading bird nests was observed and recorded along each transect. Data collection sheets from individual observational sessions from 2014 to 2019 were studied and each transect was analyzed to find the maximum number of nests per species on that transect. This was done for all transects to determine the total number of nests throughout the exhibit during this nesting season. This enabled comparison of individual species frequencies as well as overall population to other nesting seasons with special interest paid to the season following hurricane Irma. This shows that even with hurricane Irma heavily impacting the habitat in the fall of 2017, the wading bird species endemic to Naples, Florida are resilient and recovered to a population close to that of the 2016 nesting season, restoring the natural symbiosis with American alligators and allowing both groups to thrive. After hurricane Irma, Naples Zoo reconstructed the Alligator Bay exhibit with plants that had a high vegetation density in the landscape. This is very important for the security of the birds and allowed them to return to that site to nest in the spring of 2018.

109) Research Title: A Comparison of Different EMG Electrodes

Student Author(s)
Emelly Rodriguez, Bioengineering (B.S.)

Faculty Mentor(s)
Derek Lura, Bioengineering

Grant Support
USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: Introduction: Electromyography (EMG) prostheses have become common in rehabilitation studies. With the use of myoelectric signals from residual limb, EMG prostheses can reflect natural movement with intent from the user. For partial hand deficiency, there are few prosthetic options. Body-powered 3D printed devices are low-cost, however, there is very minimal functionality [1]. A low-cost EMG driven prosthesis for partial hand deficiency can achieve connection between low-cost and high functionality. The objective for this study is to evaluate different EMG systems and the difference in sensitivity for individual finger contraction.
Materials and Methods: This study was done using three separate EMG systems: The BioRadio (Great Lakes NeuroTechnology, Cleveland, OH), LabScribe (iWorx Dover, NH), and Qualisys (Göteborg, Sweden). The Qualisys system uses non-disposable titanium electrodes while the other systems used MVAP-II hydro gel 1" x1" cloth electrodes. All electrode placements are on the anterior forearm, on the flexor digitorum superficial approximately three inches below the elbow with a 1.2-inch separation between the positive lead and negative lead of electrodes. Five participants used for this study presented with no history or present signs of upper limb deficiency or dysfunction. The control force for this study is a Prohand's Via finger exerciser light tension model that requires 4 pounds of force for full contraction.

For each session under different systems the participant waited 20 seconds before contracting the 2nd phalange (index) and held that contraction for 10 seconds before resting for 10 seconds. This sequential pattern of contraction is uniform across the study. Each set of EMG data was extracted at 2 kHz and exported to Excel. Each finger contraction along with the initial resting period was then separated by section before being imported to MATLAB. Using MATLAB, the root mean square (RMS) was calculated for each 10-second window contraction for each individual finger. Then, a ratio between initial rest and each finger contraction was calculated. The average across the participants for each finger contraction to rest ratio was then taken.
Results and Discussion: During the processing of data through the individual systems, it was apparent that the 3rd finger (ring) had the highest activation. The BioRadio system had the most apparent change in signal when the participants contracted the 3rd finger. However, the Qualisys system had the highest sensitivity when contracting each finger separately. When analyzing the data, participant 1 had signals that were not similar to the other participants. Thus, there are high standard deviation values.
Conclusions: When considering sensitivity for an EMG driven prosthetic device, the Qualisys is likely to produce strong signals. However, the BioRadio has strong specificity and can be used for EMG driven prosthetics that have control of individual fingers. The location of the electrodes also indicates a strong signal for the 3rd finger or the ring finger. For future consideration into larger projects, data that is inconsistent, such as those from participant 1, should be avoided when making final conclusions.
References: [1] Murali, Barathwaj, et al. Advances in Mechanical Engineering, Apr. 2019, vol. 11, pp. 1-16.

110) Research Title: Ecological Community Survey of Diptera Insects on the FGCU Campus

Student Author(s)
Jesse DeBella, Biology (B.S.)

Faculty Mentor(s)
Joyce Fassbender, Biological Sciences

Grant Support
USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: FGCU prides itself on being environmentally conscious, but it is important that this is reflected through scientific means. Insects are the most diverse group of organisms on the planet and they are crucial to determining the status of an ecosystem. From serving as prey to countless other animals to being the main agents in pollination, insects are the structural support for any ecosystem. Hymenoptera (bees, wasp, and ants) and Lepidoptera (butterflies/moths) are often thought of as the only insect orders that are useful to ecosystems and are displayed as the main pollinators on media. One overlooked order that is regularly held in contempt is Diptera (flies). 71 out of the 150 families from this order are key pollinators as well, including the pests of the family Culicidae (mosquitoes) (Ssymank et. al.). To shed light on the importance of Diptera I performed a community survey on Diptera at FGCU over the course of the Fall 2019 semester.
Using a Malaise trap, the specimens were collected over a 4-week period in August, on the FGCU Campus. The capture head of the trap was filled with ethyl alcohol to euthanize and preserve collected specimens. Specimens were collected, and the ethyl alcohol replaced, every week for the duration of the experiment. Diptera specimens were then separated from the rest of the insects and organized into suborders: Nematocera, Orthorrhapha, and Cyclorrhapha. From there, each suborder was further organized into superfamilies. Due to time constraints, classification was limited to superfamily, apart

from some distinctly identifiable families. I further sorted them into morphospecies for analytical purposes. A total of 1000 individuals were collected. Data shows 42.6% of the flies are from the suborder Nematocera, but Cyclorrhapha has the most diversity in families. In Cylorrhapha, the superfamily Ephydroidea consisted of 35.8% of this clade. In Orthorrhapha, 98.8% of the specimens were members of the family Dolichopodidae (long-legged flies), except for two individuals from Tabanidae (horse/deer flies). In Nematocera, I used Gnats and Midges as a morphotype classification, and this group was most abundant at 60.7% with 260 individuals.
Reference:
Ssymank, A., Keanrs, B. & C., Clara, C.: "Flies- pollinators on two wings".
http://diptera.myspecies.info/diptera/content/flies-%E2%80%93pollinators-two-wings

111) Internship Title: Calusa Nature Center Camp Counselor

Student Author(s)
Connor Mannion, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: This summer, I was a camp counselor for Calusa Nature Center. My responsibilities involved ensuring the campers' safety throughout all of our activities, educating them on all of our weekly topics in some way, ranging from local ecosystems, animal biology, space, outdoors survival, etc. By utilizing my knowledge learned from the classroom, as well as outside of it, I was able to carry out lesson plans for the campers and get them thinking about various aspects of nature. Another important skill I brought to my internship was teaching on the fly. When it came to the various encounters at Calusa Nature Center, whether intentional or unintentional, I was able to use the information I knew about the animal or plant to give a quick description or facts about it, which was a delight to the campers as well as my boss for adding to the day camp experience. By doing this, I helped Calusa Nature Center promote its mission statement of educating the local population, particularly the younger portion, on our native ecosystems in Florida and their importance.

112) Research Title: Macroporous Scaffolds and Light Therapy for Osteogenic Differentiation of Human Adipose Stem Cells

Student Author(s)
Nicole Doles, Bioengineering (B.S.)

Faculty Mentor(s)
Jiehong Liao, Bioengineering

Grant Support
USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: Synthetic polymer scaffolds are used to culture cells in an in vitro microenvironment more closely resembling the extracellular matrix in tissues of the human body, as opposed to the typical two-dimensional monolayer culture surface of a petri dish. Within an appropriate three-dimensional culture environment, in vitro studies regarding cell function and behavior are more representative of physiological processes. The gas-foaming method for fabrication of macroporous scaffolds is widely used

in bone tissue engineering and regeneration applications due to the high yield of differentiated osteoblasts compared to other structures. Scaffolds generated with this gas-foaming process have an interconnected pore structure that mimics the natural porosity of bone. The purpose of this project is to establish a repeatable process that increases the yield of usable scaffolds by refining previous methodology through process improvement and specially designed tools. The resulting scaffolds will be assessed for their overall morphology and pore size distribution via scanning electron microscopy (SEM), and gravimetric analysis will be used to determine percent porosity. To investigate the effect of scaffold architecture in combination with low-level light therapy on osteogenic differentiation and mineralization for bone regeneration applications, cells will be seeded on macroporous scaffolds and cultured with or without osteogenic supplementation.

113) Research Title: Gopher Tortoise Habitat Loss and Relocations Over a 10-Year Span.

Student Author(s)
Alexandria Nieve, Biology (B.S.)

Faculty Mentor(s)
Nora Demers, Biological Sciences
Senthil Balaji Girimurugan, Mathematics

Abstract: Gopher tortoises' habitats are ideal locations for developers in Florida. Conservation efforts were put into place in 2009 to save remaining numbers of gopher tortoises. There has been research on the successfulness of these relocations but seldom research on how much habitat loss and gopher tortoise relocations have occurred since the conservation plan was enacted. We examined the FWC gopher tortoise permit database set from April 2009 to March 2019 to examine the locations, numbers and temporal pattern of both relocations and habitat loss. Coastal regions had more relocations and habitat loss than inland areas. Central Florida had the most amount of loss and relocations. We compared our findings to Auffenberg and Franz estimations in 1973 of gopher tortoise population and habitat. Mass increase in human population, has caused a rapid increase of development in various regions of Florida and gopher tortoise habitat seems to be the optimal spot. As conservation efforts have been more enforced and monitored, the amount of development that has pushed these tortoises out of their homes has only increased, and not only are the gopher tortoises at stake, but Florida's unique habitat is also at risk of being demolished by continuing human population growth.

114) Research Title: Developing a greener, higher-yield alternative to the Fischer method for the esterification of salicylic acid

Student Author(s)
Kelly Walker, Biology (B.S.)

Faculty Mentor(s)
Daniel Paull, Chemistry & Physics

Abstract: The Fischer esterification is an organic reaction in which a strong acid catalyzes the conversion of a carboxylic acid and an alcohol into an ester. Because this method is usually relatively quick and simple to perform, it is regularly used by students in organic chemistry laboratory courses. However, when the substrate is salicylic acid, desirable for the teaching lab experiment because the product of reaction with methanol is methyl salicylate (the main component of "wintergreen"), the reaction has a

very low yield and requires the use of sulfuric acid, which is extremely corrosive and hazardous to humans and therefore not ideal for relatively inexperienced students to handle. The goal of this project is to develop a method of esterifying salicylic acid that produces a high yield in a short time using greener, less harmful reagents that are safe and easy for students to use. Our results thus far will be presented in further detail.

115) Internship Title: Molecular Ecology Laboratory Intern

Student Author(s)
Elizabeth Dahedl, Environmental Studies (B.A.)

Faculty Mentor(s)
Hidetoshi Urakawa, Marine & Earth Science

Abstract: During my internship I worked in Dr. Urakawa's laboratory on water quality issues related to harmful algae blooms in Lake Okeechobee, the Caloosahatchee River, and other impacted waterways in SWFL. Most of my work has been focused on isolating cyanobacteria and algae cultures from water samples taken in these bodies of water to be used for gene sequencing. I've also had the chance to take part in doing some fieldwork with USGS, collecting and analyzing water samples from a mesocosm experiment at Franklin Lock and Dam. I have also been trained for cell counting and have been apart of a project looking at water samples taken from the Imperial River. Through my internship I have gained extensive laboratory skills and knowledge, especially with regards to water quality analysis in the lab, which will be useful for my future career. I have learned so much about these microorganisms, and the benefits and harm they can bring to an ecosystem, as well as our anthropogenic role in causing bloom related issues. I have learned how to run my own experiments, do scientific research, and collect data, all of which will be useful in future graduate studies.

116) Research Title: Identification of Africanized Aphis mellifera in Southwest Florida through wing morphometrics

Student Author(s)
Demetrius Madonia, Environmental Studies (B.A.)

Faculty Mentor(s)
Serge Thomas, Ecology & Environmental Studies

Abstract: This project seeks to identify and classify the samples of feral Aphis mellifera colonies collected in Southwest Florida, and the percent of which are Africanized. The colonies were collected by Keith Councell, a local bee keeper preforming swarm controls. Some of the collected workers were suspended in alcohol and given over to be tested. Africanized honey bees are a cross between the European honey bee (Aphis millifera) with invasive East African honey bee (A. m. scutellata).These bees are responsible for more stings as swarming more, making them less desirable for honey production. The method being used is known as wing morphometrics, which uses wing measurments to determin the species. Since Africanized workers have shorter wings on average, this is a reliable method for identification. This has been used to identify Africanized colonies through most of the range these bees have spread as it more cost effective than DNA testing. Identifying the percentage of feral colonies that have become Africanized is an important first step in mapping the subraces of Aphis mellifera in Southwest Florida.

117) Research Title: Health Effects of Student Welfare Stigma at Florida Gulf Coast University

Student Author(s)
Emma Hoelscher, Anthropology (B.A.)
Linda Mazanet, Anthropology (B.A.)

Faculty Mentor(s)
Max Stein, Social Sciences

Abstract: Food and housing insecurity among students in higher education are national health crises that impact academic performance, social dynamics, and overall well-being. Yet despite a demonstrable need for financial assistance among US undergraduates, existing research suggests the number of students who seek out available resources is a fraction of those eligible to apply. This study seeks to understand how cultural knowledge and social stigma surrounding welfare use influence undergraduates' encounters with multiple insecurities and identify how such factors shape student well-being. Specifically, we examine individual and group knowledge about available assistance and measure stigma associated with its use to determine their impact on mental wellness. This student-led, mixed-methods and interdisciplinary study is being conducted among credit-earning undergraduates at Florida Gulf Coast University using a combination of surveys, open-ended interviews, focus groups, online questionnaires, and ethnographic methods. Data will be analyzed in IBM SPSS to identify health threats associated with the stigma of student welfare use at FGCU and determine how social, cultural, and economic elements further shape individual risk factors. We hypothesize a positive statistical correlation between individual measurements of student welfare stigma and psychological distress. Research aims to broaden understanding of student financial assistance and usage at FGCU.

118) Research Title: Assessing Carbon Sequestration Potential and Economic Value of Forested Landscapes at Florida Gulf Coast University

Student Author(s)
Kiah St.Onge-Yergi, Environmental Studies (B.A.)

Faculty Mentor(s)
Brian Bovard, Ecology & Environmental Studies

Abstract: As Earth's climate changes and natural resources are depleted, it is imperative to sustainably manage natural resources and protect the ecosystem services they provide. Placing an economic value on ecosystem services is one mechanism to leverage their conservation. Carbon credits offer a way to place a monetary value on the atmospheric carbon stored by forested areas. This study assesses the economic potential of natural areas on FGCU's property based on the annual carbon storage potential of five different ecosystems. Ecosystems included were cypress swamps, pine flatwoods, freshwater marshes, hardwood hammocks, and sloughs. Aerial coverage of each habitat type on the FGCU campus was measured using handheld GPS units and GIS. Carbon storage rates for each habitat type were based on literature values. Storage capacity of each ecosystem was computed as: tC ha-1 yr-1 * ha habitat = tC yr -1. Economic values of carbon were attained using the California Market and European Market values from 2017 to 2019. Values were averaged to determine a low of $11 per tCO_2 and a high of $17 per tCO_2 and applied to each community. Based on our data the cypress swamp habitat was found most valuable at $17,653 to $11,509 per year.

119) Internship Title: Wild Animal Ambassador Internship at the Cango Wildlife Ranch

Student Author(s)
Sara Combs, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: This summer, I traveled internationally to Oudtshoorn, South Africa, to complete my internship at the Cango Wildlife Ranch. The Cango Wildlife Ranch is a World Association of Zoos and Aquariums (WAZA) accredited zoological facility that is dedicated to the conservation and preservation of over ninety species of animals. The Ranch specializes in the breeding of cheetahs, with hopes of releasing these animals back into the wild through their non-profit organization, the Cheetah Preservation Foundation. During my internship, I assisted zookeepers by creating enrichment, informally educating guests, preparing daily diets, recording animal responses and behaviors, disinfecting enclosures, and assisting in formal clicker and target training, all benefiting the Ranch and the animals in their care. As an intern, I was able to help spread the conservation mission of the Cango Wildlife Ranch and WAZA as a whole, through my daily tasks and responsibilities. My internship also allowed me to develop useful skills for any future career in the zoological industry, such as working positively in a team setting, utilizing professional animal care practices, and establishing active listening techniques.

120) Research Title: Linkage Between High-Fat Diet, Obesity and the Loss of Taste Receptors in Cockroaches

Student Author(s)
Racquel Fournet, Biology (B.A.)

Faculty Mentor(s)
Sherri Emer, Biological Sciences

Grant Support
Whitaker Center Mini-Grant- Research

Abstract: Obesity is one of the major contributing factors to the decline in human health. An organism's sense of taste, one of the five senses, is a very important in detecting flavors in food and other substances at the beginning of the eating process. Understanding the link between taste and obesity could have a significant impact in reducing morbidity and mortality caused by obesity. Scientists have recently discovered that obesity is linked with the disappearance of taste receptors. In order to test the hypothesis that taste reception declines with obesity, I used electrophysiology to measure electrical signals from taste areas in cockroaches fed normal and high fat diets. The study explored how taste reception can be used to study effects of high-fat diets in an invertebrate model, which is affordable, readily available, and is less regulated compared to mammalian models. It also provided information on how high-fat diets can diminish taste reception that can lead to over-eating and lower fat diets can reduce over-eating and obesity, thereby leading to a healthier population.
Understanding the link between obesity and the loss of taste receptors could have a significant impact in reducing morbidity and mortality caused by obesity. Obesity is one of the major contributing factors to the decline in human health. An organism's sense of taste, one of the five senses, is a very important sense due to its role in detecting flavors in food and other substances. This detection is performed by

taste buds that contain between 50-150 taste receptor cells. Scientists have discovered that obesity is linked with the disappearance of taste receptors. My experiment tested this theory on cockroaches. The two treatment groups each consisted of six cockroaches, with one group placed on a regular diet (control group) and the other group placed on a high-fat diet. Would cockroaches on a high-fat diet develop diminished taste bud receptors compared to the other group? My hypothesis is the cockroaches on a high-fat diet will display a weak electrical signal, signifying a reduced number of receptor cells. Electrophysiology was used on the legs since the receptors are located there, and signals will run three times and will be recorded for sixteen weeks. This experiment will continue for sixteen weeks with the same six cockroaches. The first possible result supports my hypothesis where the taste receptor responses in the high-fat diet cockroach group are less than the responses in the regular diet (control) cockroach group. The second possible result reveals that both treatment groups have the same taste receptor frequency. This could be a factor of not feeding the high-fat cockroaches enough food in the sixteen weeks to display a change. Another factor could be taste receptors are not affected by diet change, and obesity in cockroaches is not linked to loss of taste receptors. The implication is that high-fat diets do diminish taste bud receptors, which leads to over-eating. If scientists could find a way to stimulate taste bud receptors back to normal levels, this could reduce over-eating and obesity, thereby leading to a healthier population.

121) Internship Title: Internship at Lee County Mosquito Control

Student Author(s)
Gabriel Wilson, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies

Abstract: Over the summer of 2018, I was accepted as an intern at Lee County Mosquito Control. As a intern, I was paired up with a new worker every week, and assigned a permanent mentor named Kara Hall. They had interns experience the same day to day living as a casual worker there like preparing/flying in helicopters in order to reach swamps, collecting water samples, laboratory and field work, spraying different communities around Ft. Myers, and making computer generated maps.

122) Research Title: Investigating spaceflight effects on dental structures in microgravity

Student Author(s)
Christian Foster, Biology (B.A.)

Faculty Mentor(s)
Sheri Emer, Biological Sciences

Abstract: Astronauts spend extended periods of time in the microgravity environment of space, therefore it is important to know and understand the effects of space exploration on human physiology. In microgravity, the body does not experience the resistance or load associated with gravity on Earth. Research on musculoskeletal effects of microgravity that has focused on large structures, specifically the long bones of the limbs, suggests bone density loss. However, it is important to include studies of smaller skeletal components, such as dental structures that are critical to mouth pain and temperature detection, jaw movements, and overall oral health. In order to test the hypothesis that microgravity affects dental structures, I am examining the tooth histology, specifically pulp cavity, dentin, and enamel

morphology, of mice maintained on Earth and on the International Space Station. This study provides a foundation to understanding the effects of microgravity on dental health, of which we have little understanding. It also provides valuable information that may be used to develop criteria, care, and treatment astronauts may need before, during, and following space travel.

123) Research Title: Employing a BINOL based ligand for the design of chiral Metal-Organic Frameworks

Student Author(s)
Isabella Riha, Biochemistry (B.S.)

Faculty Mentor(s)
Gregory McManus, Chemistry & Physics

Grant Support
Sheffield/Blair/Brodie Summer Research Scholarship

Abstract: Metal-Organic Frameworks (MOFs) are three-dimensional porous structures consisting of metal ions linked together through coordinating organic ligands. MOFs have various applications within gas separation and storage, chiral separations, and drug delivery. In this work, a chiral dicarboxylic acid ligand (CL1) was synthesized using (□)-1,1'-binaphtalene-2,2'-diol (BINOL) as the starting material. Given the axial chirality from the BINOL group in CL1 it has the potential be used to generate chiral MOFs. Porous chiral MOFs have significant potential for applications in chiral separations. The structure of the organic ligand was identified by FT-IR, 1H NMR, and 13C NMR. We have explored the coordination chemistry of this ligand using solvothermal reactions with copper(II) and zinc(II) metal salts. Our efforts to characterize the crystallized metal-organic products using single crystal X-ray diffraction, powder X-ray diffraction, gas sorption analysis, and thermogravimetric analysis are described herein.

124) Research Title: An Analysis of Seed Characteristics in the Palm Pseudophoenix sargentii

Student Author(s)
Daniel Martinez, Biology (B.S.)

Faculty Mentor(s)
Randall Cross, Biological Sciences

Abstract: Pseudophoenix sargentii, known commonly as the Sargent palm or Florida cherry palm, is a palm tree native to the Caribbean, Mexico, and Southern Florida. Relevant to this study is its unique trait of having multiple seeds in a single fruiting body (singles, doubles, triples). The purpose of this study is to analyze the seed characteristics in this species and hypothesize as to their purpose.
Seeds were gathered from a group of 4 Sargent palms on the FGCU campus, either picked from the tree or collected after falling. The experiment was divided into two segments: seed germination/vigor analysis and seed type analysis. Measurements of the seeds diameters and weights were taken, with one set of seeds being set aside for planting for germination/vigor analysis and the other for seed type analysis.
Germination/Vigor analysis was unable to be performed due to difficulty in growing the palm. As for seed type analysis, some patterns were observed. The average distribution frequencies of singles, doubles and triples varied, with singles being most frequent and triples being least. The average sizes

and weights of the seeds were also found to differ between types, with singles having the largest average size/weight and triples having the smallest.

125) Research Title: Antibacterial Activity of Various Southwest Florida Weeds

Student Author(s)
Gabriela Gomez, Biology (B.S.)

Faculty Mentor(s)
Mustafa Mujtaba, Biological Sciences

Abstract: Resistance to the common clinical antibiotic by various pathogenic bacteria have become a major world-wide problem, and the need for newer and safer antibiotics is growing. Plants can be found in diverse environments and have been used in the treatment and creation of new medicines, including antibiotics. Weeds are plants that are usually of disturbance to individuals, such as farmers and gardeners, due to their prolific growth, even under stressful environmental and soil conditions. In this study, we looked into the antibacterial potential of five different common weeds (climbing hempvine, matchweed, dollarweed, black nightshade, and Asiatic hawksweed) found in Southwest Florida on both Gram positive (Staphylococcus aureus) and Gram negative (Escherichia coli) bacteria. The antibiotic, ampicillin, was used as a control. Weeds were homogenized in a saline buffer and the supernatants, after centrifugation, were analyzed via a Kirby-Baeur agar diffusion assay as well as a growth inhibition assay in a liquid culture for antibiotic activity. Results showed that none of the weeds had any antibacterial activity on the Gram negative bacterium, Escherichia coli. Furthermore, only one weed, matchweed (Lippia nodiflora) had antibacterial activity on the Gram positive bacterium, Staphylococcus aureus. The growth of Staphylococcus aureus was inhibited by matchweed with 1.2 mm inhibition zone as determined by the Kirby-Baeur assay. Culturing the bacterium with matchweed in the growth inhibition assay showed inhibitory effects of matchweed at a dilution of 1/243 and lower on Staphylococcus aureus, which was statistically significant ($p = 0.015$). Thus, of the five common weeds found here in Southwest Florida, only Lippia nodiflora showed any significant antibacterial activity towards the Gram positive bacterium, Staphylococcus aureus. The information gained from this study could be used to develop newer antibiotics for treatment of pathogenic bacteria.

126) Research Title: Morphological Changes in Gambusia holbrooki (and other Poeciliidae) due to Exposure to Androgenic Endocrine-Disrupting Compounds: Data Collection

Student Author(s)
Cierra Canty, Biology (B.S.)

Faculty Mentor(s)
Nora Demers, Biological Sciences

Grant Support
SAGE Grant

Abstract: Chemicals including medications, personal care products (PCPs) pesticides and plasticizers can disrupt the endocrine system. Physiological and morphological changes in mosquitofish Gambusia upon exposure to endocrine-disrupting chemicals can be easily detected since their anal fins are sexually dimorphic. Male anal fins are specialized to deliver sperm to the live-bearing female mosquitofish. We

hypothesized that there may be evidence of endocrine disruption in fish collected from surface water in San Carlos Park, Fl because that community relies primarily on septic tanks, and residents have lawns that may be using pesticides. According to the literature, the ratio of the 4th to 6th anal fin rays in females is 1:1. The 4:6 anal fin ratios of females fish was actually found to have an average of 1.3 with all 13 sites being greater than 1.2. The females we examined are being masculinized, which is an indication of an androgenic endocrine disruptor being present. This is of great importance as Gambusia are a model for live-bearing organisms therefore is able to be generalized to a greater population, one that could potentially include humans.

127) Research Title: Inducing Cellular Cytotoxicity using Long and Short Wavelength Ultraviolet Radiation in Fibroblast and Pituitary Cell Lines

Student Author(s)
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Kelby Violette, Biology (B.S.)

Faculty Mentor(s)
Mustafa Mujtaba, Biological Sciences

Grant Support
Departmental funds

Abstract: Analysis of the effects of UV light can aid in the understanding of the mechanisms by which cell lines differ in their ability to withstand unfavorable environmental conditions. Mouse fibroblast L929 and pituitary GH3 cells were exposed to short (254 nm) and long (365 nm) UV wavelengths for various time intervals. Cellular toxicity was then assessed using a toxicity assay, WST-1, 24 hours after UV exposure. Short wavelength was found to be more toxic to cells. Within 4 minutes, 31% of L-cells and 47% of GH3 cells were viable, respectively, with short UV radiation exposure ($p<0.05$ for both cell types). GH3 cells were more prone to apoptosis than the L929 cells in the short wavelength experiment. With respect to long wavelength UV exposure, no statistically significant difference was seen until 45 minutes with L929 cells (71% cell viability, $p < 0.05$). At 45 minutes post long wavelength UV exposure, GH3 cells viability was 80%, which was not statistically different than the control group ($p=0.21$). Further research on this topic may be able to provide more substantial evidence to justify or denounce utilization of short or long wavelength UV radiation as a form of medical treatment.

128) Research Title: The Effects of Fatigue on Squat Mechanics

Student Author(s)
Matthew Medovich, Bioengineering (B.S.)

Faculty Mentor(s)
Derek Lura, Bioengineering

Abstract: Squatting is a staple exercise in a majority of strength and conditioning and rehabilitation programs [1]. The growth of CrossFit has highly popularized barbell activities like squatting [2]. Although a relatively safe exercise when performed with proper form, injuries can happen when doing squats [3], [4]. One reason this occurs is because form tends to change when in a state of fatigue [3]. A general definition for fatigue is a decrease in power output [3]. There is a clear need to better understand how

fatigue affects squat mechanics in the upper and lower body. In this study, participants performed a set of barbell back squats done at 15% of their bodyweight for as many reps as possible. Their squats were recorded using an 8-camera motion capture system on dual AMTI force plates. The collected data was processed in MATLAB. Fresh and fatigued knee extension power were compared to determine if a decrease occurred due to fatigue [3]. Knee extension power was also compared with hip extension power to understand if the movement profile changed during the set. Finally, knee extension power was compared to the back flexion angle to determine if they were dependent events.
References: [1] G. Strutzenberger et al, "Joint loading at different variations of squats," Dept. of Sport and Science (KIT). [2] S. Henderson. "CrossFit's explosive affiliate growth by the numbers." Available: https://morningchalkup.com/2018/10/23/crossfits-explosive-affilaite-growth-by-the-numbers/, Oct. 23, 2018. [3] J. D. Stone et al, "Joint-level analyses of the back squat with and without intraset rest," Int. J. Sports Physiol. Perform., vol. 14, (5), pp. 583-589, 2019. DOI: 10.1123/ijspp.2018-0662. [4] J. Kim et al, "Kinematic analysis of front squat in response to loads," Dept. of Movement Arts, Bridgewater State University.

129) Research Title: Water-Energy-Food (WEF) Nexus

Student Author(s)
Amy He, Environmental Engineering (B.S.Env.E.)
Alisha Perez, Civil Engineering (B.S.C.E.)
Maximilian Honigfort, Civil Engineering (B.S.C.E.)
Kaylei Kambak, Environmental Engineering (B.S.Env.E.)

Faculty Mentor(s)
Seneshaw Tsegaye, Environmental and Civil Engineering
Tanya Kunberger, Environmental and Civil Engineering

Abstract: This project aims to provide a life cycle analysis of a closed-loop system that offers a way to dispose of organic wastes and retrieve water for irrigation, nutrients to grow plants and methane gas that can be used for energy generation. This system is driven by microbial processes, and through its optimization, it provides both a sustainable and economical method of waste disposal. The system has three main components, biodigester, water filtration, and plant growth. The biodigester is fed by liquid, solid and food waste. These wastes will provide the microbes a source of food and energy to produce biogas. These biogases are storage and collected in the biogas storage tank. The biogas is analysis to see the relationship between the amount of waste with the amount of biogas production. The liquid waste is filtered through a slow sand filtration to filter out any undesirable particles. A water quality test is being done to test for the TN, TP, TSS, pH, and temperature. The recycled water is used for the hydroponic system to provide nutrients to the plants. The data for the chlorophyll will be collected and compare with the control and the plant from the hydroponic system. Solar panels will be installed to provide electricity for the pumps and the food grinder. The energy that is provided and used from the solar panel will be collected to be discussed in the LCA.

130) Research Title: Comparing the Intestinal Parasite Loads of Gopherus polyphemus from Eight Sites in Southwest Florida

Student Author(s)
Paula Quezada, Biology (B.S.)

Faculty Mentor(s)
Nora Demers, Biological Sciences

Grant Support
Undergraduate Scholarly Award from FGCUScholars

Abstract: Gopherus polyphemus is a threatened tortoise species found throughout Florida, serving as a keystone species. Their habitat has decreased due to intense urban development and it is possible that this may have a negative impact on the health of tortoise populations. The intestinal parasite load of gopher tortoises from eight different collection sites in Southwest Florida was analyzed to determine whether there was any significant difference between sites. These sites included coastal scrub, pinewood scrub, flatwood scrub, and turf habitats. Scat was collected from these sites from May 2018 to May 2019. Samples from captive populations were also collected. Fecal flotations were performed on collected samples. Oxyurid, strongylid, and ascarid eggs were identified and counted in 406 scat samples from 237 unique tortoises. Findings suggest that there is not a significant difference in parasite loads from different sites. Endoparasites are prevalent across individuals and not associated with obvious physical health problems.

131) Internship Title: Program Presenter

Student Author(s)
Hannah Turbiville, Environmental Studies (B.A.)

Faculty Mentor(s)
Molly Nation, Ecology & Environmental Studies
Ricky Pires, Wings of Hope program

Abstract: During the fall 2019 semester, I completed my internship as Program Presenter at the Wings of Hope program. Wings of Hope is an award-winning environmental education program that aims to educate local 4th and 5th graders on the importance of the Florida panther and Florida black bear. During my internship, my main responsibilities included: training student volunteers, presenting program information to classroom visitors, leading bus tours, transporting lunches, and maintaining the classroom. Working with the Wings of Hope program allowed me to gain experience as an environmental educator and gave me the opportunity to learn what it takes to run an environmental education program. Moving forward, I know that the knowledge and experiences I gained while interning will help me in my future environmental ventures.

132) Research Title: Effect of Human Development on the Herpetofauna Community in the Peruvian Amazon Basin

Student Author(s)
Alexander Marsh, Biology (B.S.)

Faculty Mentor(s)
Billy Gunnels, Biological Sciences
Matthew Metcalf, Biological Sciences

Grant Support
Honors Program
John Herman Biodiversity Endowed Scholarship

Abstract: Vertebrate biomass has declined by 60% since 1970, with some areas, such as South America, experiencing even more dramatic declines (~89%). Determining responses of different species to human development is crucial as humans continue to expand into natural areas. Herpetofauna communities are important indicators as they are abundant (~50% of all terrestrial vertebrate species), fill many niches, and are biologically and ecologically diverse. The Peruvian Amazon is one of the most biologically rich, but poorly studied environments. As a result, it is unclear how human development patterns affect wildlife. This was the first study of herpetofauna in the lowland Peruvian rainforest surrounding Iquitos, Loreto. We recorded herpetofauna through three different habitat types (primary and secondary forests and agricultural pastures). Species numbers and diversity were similar between forest types. However, fewer animals were found in the agricultural pastures. Herpetofauna communities in the Peruvian Amazon appear to show some resilience when human development impacts are minimal and restoration efforts are proactive. However, resilience is lost when impacts are severe and sustained. As Amazonia continues to develop, understanding these changes on localized wildlife is vital to conserving one of the most biodiverse and ecologically important areas.

133) Research Title: A Herpetological Survey of Railhead Scrub Preserve in Collier County, Florida

Student Author(s)
Janet Shore, Biology (B.S.)

Faculty Mentor(s)
Phillip Allman, Biological Sciences

Abstract: The scrub habitat found at Railhead Scrub Preserve is among some of the last of this type remaining in Southwest Florida. Florida has many unique reptiles and amphibians that are found only in scrub habitats (i.e. Sceloporus woodi). The goals of this study were to investigate the presence of Sceloporus woodi and other specialized reptiles and amphibians of the scrub. We used a variety of field methods to survey the herpetofaunal community at Railhead Scrub Preserve: artificial cover boards, PVC pipes, game cameras, and visual surveys. Seven cover board arrays were randomly placed in the scrub habitat. Thirteen PVC pipe arrays were also placed around an ephemeral wetland, with each PVC pipe array containing a 2, 1.5, 1.25, 1.0, and 0.75-inch pipe that is 5 feet tall, as well as, one 0.5-inch pipe that is 2 feet tall. All pipes and cover boards were visually checked once per week for 7 months. We documented 4 species of snakes, 6 species of frogs, 3 species of turtles, and 3 species of lizards. All species of tree frogs preferred larger diameter pipes over smaller pipes: Osteopilus septentrionalis preferred 1.5 inch pipes (p-value of 1.4107E-14), Hyla femoralis preferred 1.5 inch and 2 inch pipes (p-value of 5.2295E-19), and Hyla squirella preferred 2 inch pipes (p-value of 0.01085455). This information on pipe diameter preference, among the three frog species studied, was not what we initially hypothesized, but could be useful for future herpetofauna studies using PVC pipes to observe tree frogs. The absence of Sceloporus woodi indicates the species may be extirpated from Southwest Florida. The low number of reptiles may indicate an edge effect since the preserve is surrounded by commercial development and a golf course.

134) Research Title: Masculinization and Gonadopodium Elongation in Female Gambusia of Southwest Florida

Student Author(s)
Gabriella Herrejon, Biology (B.S.)

Faculty Mentor(s)
Nora Demers, Biological Sciences

Abstract: Endocrine disrupting compounds (EDC) are chemicals that alter hormone levels in all organisms. Human waste, medications, plastcizers and pesticides contain EDC. Their presence in aquatic ecosystems could be detrimental to the wildlife residing there. The male mosquitofish (Gambusia) anal fin ray #6 is elongated to allow for sperm delivery. Prior research has shown modifications to the gonadopodium linked to presence of EDCs in water. We looked for the evidence of EDCs in surface waters in 16 different locations including within the drainage ditches of a community using septic tanks, and isolated lakes receiving reuse wastewater in golf courses. The anal fins of each fish were measured and 4:6 anal fin ratio was calculated. The majority of female Gambusia were above the reference cited ratio of 1.01 at all of the sites. The majority of the male Gambusia were also above reference 4:6 ratio of 2.27. A physical observation of the extremely elongated anal fins in females were seen in three locations. Further analyses of the water quality in each of these locations could prove the presence of EDCs and a correlation between the increased 4:6 ratios of the gonopodiums.

135) Research Title: Influence of Dissolved Humic Substances (DHS) on Karenia brevis Cell Concentrations, In Situ Brevetoxin Concentrations and Brevetoxin Aerosolization

Student Author(s)
Mark Leone, Biology (B.S.)

Faculty Mentor(s)
Michael Parsons, Marine & Earth Science

Abstract: Karenia brevis, the dinoflagellate responsible for Florida red tides, produces a suite of potent neurotoxins called brevetoxins (PbTxs) which cause massive fish kills, marine mammal and seabird mortalities. Brevetoxins can aerosolize and be carried ashore by winds, causing eye irritation and respiratory symptoms. Dissolved humic substances (DHS), a form of dissolved organic carbon that dominates estuaries during periods of heavy rainfall and runoff, have been shown to break down brevetoxins. This study examined the impact of two DHS variants, commercially-sourced DHS (leonardite), and natural DHS (Peace River), on K. brevis cell density, in situ brevetoxins, and brevetoxin aerosolization. A 48-hour benchtop K. brevis mitigation trial exposed cultures to 0, 5, and 30 mg L-1 DHS, and aerosolization was simulated with an aerosol generator for 30-minutes at t=48 hr. Commercial DHS significantly ($p<0.05$) inhibited K. brevis survival, with up to 39% mortality, but had no significant impact on in situ brevetoxin concentration or composition. The addition of DHS, however, significantly ($p<0.05$) reduced brevetoxin aerosolization: Peace River DHS additions of 30 mg L-1 were 80% effective at preventing brevetoxin concentrations in aerosols. These data demonstrate that natural DHS are a potentially effective treatment for reducing brevetoxin aerosol during coastal K. brevis blooms.

136) Research Title: Metric and non-metric ancestry evaluation analysis of the craniofacial region in Greek-Cypriots: a pilot study.

Student Author(s)

Madyson Stephenson, Forensic Studies (B.S.)

Faculty Mentor(s)
Xenia Kyriakou, Justice Studies

Abstract: Ancestry is a topic less studied in Europe and Mediterranean region. Little effort has been made to define the morphological parameters of the different populations that constitute the continent. The underlying hypothesis that we are all European-White in Europe has played a major role in ancestry being less commonly researched. However, open borders and immigrant influx from war-afflicted countries have increased the need for ancestry standards to be developed as Europe and the Mediterranean are nowadays characterized by mixed communities.
This research will impact the forensic science community by offering a new composite method in ancestry evaluation which serves as a population-based standard for human identification for Greek-Cypriots. Our research utilizes a combination of metric and non-metric observations to skeletally define the craniofacial region of Greek-Cypriots. This study evaluates the relationship between different facial skeleton bones and bordering landmarks. The study offers a unique insight of how different methods can work together to the development of a single ancestry evaluation approach for a newly studied population. The genetic makeup of Greek-Cypriots resembles that of its neighbors, the results of this study, with little or no modification, could be applicable in establishing positive ID for unidentified remains retrieved in those areas.

137) Research Title: Meaning in Life and Future Time Perspective in Undergraduates

Student Author(s)
Taylor Burress, Psychology (B.A.)
Aaron Abboud, Psychology (B.A.)
Joanna Baerson, Psychology (B.A.)
Morgan Hass, Psychology (B.A.)

Faculty Mentor(s)
Kelly Schuller, Psychology

Abstract: Time Perspective Theory (Zimberdo & Boyd, 1999) states an understanding of past, present, and future time influences attitudes and behaviors across our lifetime. The current study examined the relationship of meaning of life and projected years until death in undergraduate students. The sample consisted of 200 undergraduate college students, at a state university in Florida. Participants' age range averaged from 18-39 years old, (M=20.16, SD: 2.60), 75.6% were females and 61% were Caucasian. Participants were presented with the 10-item Meaning in Life Questionnaire (MLQ) and a measure of future time perspective as part of a larger study. Future Time Perspective (FTP) was assessed by self-reported projected age of death (i.e., "At what age do you think you will die?") An FTP score was calculated by subtracting current age from projected age of death. FTP ranged from 5-102 years (M=62.36, SD: 14.56). An ANOVA showed that students, $F(1, 196)=13.96$, $p < .01$, with higher meaning in life scores (M = 66.12, SD = 12.43) had higher FTP scores (M = 58.59, SD = 12.42). Individuals who have meaning in their lives feel as though they will live longer.

138) Research Title: Tracked Powered Wheel Chair Base With Variable Width: Design & Development

Student Author(s)

Cesar Hernandez Isidro, Bioengineering (B.S.)

Faculty Mentor(s)
Derek Lura, Bioengineering

Grant Support
Sheffield/Blair/Brodie Summer Research Scholarship

Abstract: Powered wheelchairs (PWCs) tend to be bulky, leading to limitations in environments that require navigating narrow spaces or uneven terrain. This study aims to develop a PWC that can be compact and maneuver through a wider range of terrains; including ascending and descending stairs. The PWC base was simulated ascending and descending stairs within Solidworks to test the track geometry. The distance from the combined center of mass to the right-most contact point of the device and stairs was measured in Solidworks to determine stability. The results of the simulation showed that the device was not stable while climbing stairs with the anticipated location of the user's COM. This simulation is limited because one is assuming that the base is composed of rigid bodies. A physical prototype was built to determine how the simulation matched real-world testing. The prototype was able to move on an even surface. However, the torque in the motors was not enough for stair climbing. Calculations done determined that the motors had sufficient torque for stair climbing, however, it is believed that due to the total friction in the system stronger motors, or a system with less total friction, is needed.

139) Research Title: Development and troubleshooting of a pilot microbrewery at Florida Gulf Coast University

Student Author(s)
Thomas Strauss, Chemistry (B.A.)

Faculty Mentor(s)
John Reilly, Chemistry & Physics

Grant Support
USSSA (Undergraduate Student Scholarship Support Award) Mini Grant
Whitaker Center Mini-Grant- Research

Abstract: We are developing a bench-top beer brewing process to mimic what is found in industry. It involves developing and troubleshooting the process for 8 types of beer: Indian Pale Ale, American Strong Ale, Wheat beer (Hefeweizen), Pilsner, Amber Ale, Red ale, and a Stout. The general structure of the process will be written as a student-friendly laboratory, or process manual, for anyone to use and will highlight the process for the 8 types of beer brewed. We have created a pilot microbrewery which highlights the fundamentals and techniques of beer brewing such as temperature control, pH control, and mimicking the microbrewery process as closely as possible. While the process of brewing is very similar for all 8 types, each type has its own unique steps. Techniques of dry hopping, decoction, etc. have all been practiced where applicable within the 8 kinds of beer.