

1) Internship Title: Estuary EDventures at Tampa Bay Watch

Student Author(s)

Kathryn McCullough
Environmental Studies (B.A.)

Internship Mentor(s)

Jordan Findley
Tampa Bay Watch

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: My Estuary EDventures internship was completed at Tampa Bay Watch, located in Tierra Verde, Florida under the supervision of Jordan Findley. Between September and December 2017, my responsibilities consisted of educating our students on the estuarine environment, lesson preparation for our various labs, and maintenance of our educational tanks. These tasks have contributed to my career goals by empowering me with the tools to educate the younger generation on the importance of various ecosystems. It is vital to encourage students to become future stewards for our natural resources by facilitating a passion for science and the natural world.

2) Research Title: Assessing the impact of a hurricane on Sabal palmettos in Southwest Florida

Student Author(s)

Biology (B.S.)Kailani Mena
Biology (B.S.)

Jaclyn Horton
Biology (B.S.)

Amy Auerbach
Biology (B.S.)

Faculty Mentor(s)

Randall Cross
Biological Sciences

Anna Goebel
Biological Sciences

Abstract: There is an abundance of different species of Arecaceae (palm trees) in Southwest Florida. The Sabal palmetto is characterized by its fan of numerous leaflets and the abundance of leaf sheaths on the tree trunk. The fruit is a single black seed found on inflorescences in plethora. Sabal palmettos can withstand extreme weather conditions which makes it an ideal tree to

landscape. The purpose of this study was to assess how well *Sabal palmettos* stand up to hurricane winds and rain. Two plots were set up on campus at different locations: the plot on the south side of campus, behind parking garage 2, and the food forest plot. We took measurements of tree height, diameter at breast height (DBH), canopy radius, number of seeds, leaves, inflorescence, and leaf sheaths. We collected the data four months before the hurricane and one month after the hurricane. Hurricane Irma struck September 10, 2017 and caused minor damage to the trees in the study plots and there were no mortalities. Minimal breakage of large branches probably led to the recovery of most trees (Walker 379). The minimal damage that was observed was slight bending of the petioles and patches of missing sheaths on a few of the trees. The local flora of the plots changed, from a relatively dry environment with abundances of grasses and wax myrtle trees to a wet environment with approximately a foot of standing water and the growth of several water associated plants such as water lilies and ferns.

3) Research Title: Comparative Chloroplast Genomics of Eleven Hydrocotyle Species

Student Author(s)

Biotechnology (B.S.) Darianna Colina
Biotechnology (B.S.)

Faculty Mentor(s)

Takashi Ueda
Biological Sciences

Abstract: Chloroplasts have a significant and crucial role in sustaining life on earth. Knowledge and proper annotation of their sequence has led to multiple advances in science, including evolutionary biology and genetic engineering. Such advances have been facilitated by the vast progress in genome-level sequencing and bioinformatics tools. This study aims at using these advances to conduct preliminary comparative genomic analyses on species of the pennywort genus *Hydrocotyle*. Ten new chloroplast genomes from multiple clades of the genus were sequenced, assembled, annotated, and compared to identify the most informative regions of the genome. Phylogenetic trees were constructed using the maximum likelihood method in Garli and times of divergence were estimated using Bayesian inference in BEAST. Only *H. gerannifolia* showed an expansion at the inverted repeat with a significant increase in the length of the *ycf1* pseudogene. Most relationships in the tree were fully supported (100% bootstrap analyses), However the number of parsimony informative characters was low (0.92%), which makes the use of individual markers insufficient, especially within young clades like the Pan-American Clade. The relationship among the areas between genes was examined and a correlation found in % of GC and AT content in those areas.

4) Research Title: Identification and Isolation of Methicillin Resistant *Staphylococcus aureus*

Student Author(s)

Biotechnology (B.S.) Alexa Ashi
Biotechnology (B.S.)

Faculty Mentor(s)

Jan DeJarnette
Biological Sciences

Abstract: Staphylococcus aureus is a gram-positive microbial organism that is capable of surviving in the nasal cavity of healthy humans and are can be responsible of causing infections. It is common for Staphylococcus aureus to develop antibiotic resistance, specifically towards methicillin. Due to this characteristic, methicillin resistant Staphylococcus aureus (MRSA) will emerge. MRSA is known for its constantly changing resistance patterns which causes treatment for infections to become increasingly more difficult. This reason alone has sparked an interest in studying MRSA. Knowing that there are many strains of MRSA, calls for more knowledge of each individual strain so that they can become identifiable and treatable. This study observes different isolates of MRSA. Anonymous samples of nasal swabs were plated onto blood agar and are observed for hemolytic colonies. The hemolytic colonies were then purified by streaking and then gram stained. Following this, they were then tested for coagulase and ORSAB which contains mannitol, salts, and methicillin. The samples were then monitored for 3 days to observe for growth (methicillin and salt resistant) and fermentation of mannitol. Identification of the MRSA strains were then configured with 16s rDNA sequencing.

5) Internship Title: Everglades Wonder Gardens

Student Author(s)

Eduardo Rodriguez
Environmental Studies (B.A.)

Internship Mentor(s)

Leslie Stout
Everglades Wonder Gardens

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: This internship was completed at the Everglades Wonder Gardens that is located in Bonita Springs, Florida. The internship was conducted under the direction of Leslie Stout, who is the curator of collections on site. This internship consisted of learning about and caring for unique species both native and invasive to Florida. The establishment and integration of a database containing the biodiversity found on site was also used to facilitate animal care for future use. These responsibilities contributed to my career goals by gaining experience in the management and care of wildlife both exotic and commonly found in Florida ecosystems. The establishment and implementation of a database housing the information of each species on site will also help to get administrative experience for the management of wildlife. These experiences will directly influence the expected career path for the future as a park ranger because it will help deal with interactions and management of wildlife found on the land. Florida Gulf Coast University has provided and emphasized the importance of sustainability and conservation which are a necessary part of any career path within the Environmental Studies major.

6) Internship Title: Narrow Ridge Earth Literacy Center

Student Author(s)

Julie McAllister
Environmental Studies (B.A.)

Internship Mentor(s)

Mitzi Wood- Von Mizner
Narrow Ridge

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: This internship was completed at Narrow Ridge Earth Literacy Center in Washburn, TN under the direction of Mitzi Wood- Von Mizner. Narrow Ridge is a non-profit organization as well as an informal community of like-minded individuals with the intent to live sustainably. The Narrow Ridge Land Trust leases land sites to individuals to construct residences within the Trust under specific guidelines while setting aside preservation areas that will never be built upon. Narrow Ridge also provides programs aimed at connecting and learning from nature while demonstrating numerous ways to live sustainably. This internship offered housing in a tiny cabin made from about 80% reclaimed material that is completely powered by solar panels with a composting toilet. This internship consisted of working in their organic garden, grounds maintenance, supervising programs, administrative tasks, and attending weekly staff meetings. These responsibilities contributed to my career goals by giving me first-hand experience in environmental education, sustainable building and living, as well as creating and maintaining an organic garden.

7) Research Title: The Florida Gulf Coast University Campus Biodiversity Project

Student Author(s)

Environmental Studies (B.A.)Eduardo Rodriguez
Environmental Studies (B.A.)

Faculty Mentor(s)

Edwin Everham
Marine & Ecological Sciences

Abstract: Florida Gulf Coast University (FGCU) has approximately half of the campus in conservation areas and has established policies of minimizing exotic plants species in their landscaping. The primary focus for this project is to facilitate the monitoring of biodiversity found on the FGCU campus and to explore ways to manage and display these data. Biodiversity loss is an ever-growing issue with development encroaching on the habitats of multiple species that call this campus their home. Students will be asked to aid in the collection and location of relationships (feeding or other interaction) occurring on campus. These data will be used to initiate a pilot project to manage biodiversity data and generate a food web for the relationships

noted in the database. Alternative software will be assessed toward the accurate and effective display of the interspecies relationships. This project is the first step in what could be an ongoing effort to fully integrate the exploration of biodiversity on the FGCU campus with our curriculum, offering future students the ability to continue to develop the database and support the maintenance of native diversity.

8) Research Title: Culture and Environmental Attitudes

Student Author(s)

Environmental Studies (B.A.)Julie McAllister
Environmental Studies (B.A.)

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: This study examined three different human communities to unravel how their cultural backgrounds affect their environmental attitudes. Environmental attitudes express the evaluation that an individual places on the natural environment. The two most common environmental attitudes are anthropocentric which regards humans as being the most important component of existence with the natural world only considered in the sense of how it affects the human population, and ecocentric which regards all life as being equally important with the natural world having fundamental value for its own sake. The study involves three populations selected to compare individuals living in a community with a focus on sustainability (Narrow Ridge), individuals living in the same region but not in a sustainable community (Maynardville, TN) and students at FGCU with sustainability as part of its university mission. Random samples in each population were asked to participate in a survey that will determine whether they have an anthropocentric vs. an ecocentric world view. This study will help determine some of the influences on the establishment of a worldview, specifically access/exposure to nature during childhood and current living conditions.

9) Research Title: Diversity Index and Rank Abundance Curves to Show Change Over Time (2008-2016) on Three Colonial Nesting Rookery Islands in Pine Island Sound, Florida

Student Author(s)

Environmental Studies (B.A.)Alexa Trenk
Environmental Studies (B.A.)

Faculty Mentor(s)

Arielle Taylor-Manges
Marine & Ecological Sciences

Abstract: The wading bird population has been an issue of concern since the 19th century, when their population declined drastically from being hunted for their plumes. Both Charlotte Harbor Aquatic Preserves and J.N. Ding Darling National Wildlife Refuge conduct monthly surveys for the Colonial Water Bird Rookery Monitoring program using double observer direct count

method throughout the nesting season to capture the peak nesting effort for fourteen wading and diving bird species. Focusing the three islands: Hemp Key, Useppa Oyster Bar, and Broken Islands (Pine Island Sound Aquatic Preserve, Lee County, Florida) data will be summarized by calculating the Shannon's Diversity Index to compare change in time and amongst islands, concentrating on the five state-listed Species of Concern: brown pelican (*Pelecanus occidentalis*), reddish egret (*Egretta rufescens*), little blue heron (*Egretta caerulea*), tricolored heron (*Egretta tricolor*), and the snowy egret (*Egretta thula*). Further, rank abundance curves will be made for each island and to interpret over time how species richness and evenness has changed. It is expected that, despite the observed decline in overall nesting effort during the study period, there may not be a significant change in diversity among species.

10) Research Title: An evaluation of the growth requirements, productivity, and the nutritional, medicinal and economic values of 5 subtropical, edible perennial plants

Student Author(s)

Environmental Studies (B.A.) Naajiya Tatyanna Bintu Raqib
Environmental Studies (B.A.)

Faculty Mentor(s)

Brian Bovard
Marine & Ecological Sciences

Abstract: My research is a review of 5 edible plant species grown in subtropical regions around the world. Each of the following species is agriculturally important in subtropical regions, especially in areas of low affluence: *Moringa oleifera*, *Ipomoea batatas*, *Manihot esculenta*, *Cajanus cajan*, and *Cnidioscolus aconitifolius*. These five-plant species, often considered to be "miracle crops" are well-known for having health benefits in the climates in which they thrive. However, there is no information regarding which species is best suited for any given situation. In this study, the primary literature was surveyed for information on the economic value, nutritional value, medicinal value, other ethnobotanical values, productivity, as well as temperature, nutrient and pesticide requirements. Originally, a meta-analysis was planned for this species, however there was not sufficient data for such an analysis. Instead, each species was ranked according to the 8 traits/values listed above to determine which species are best suited for particular situations. I concluded that having a thorough on these 5 perennial plants, will help farmers and backyard gardeners throughout the world know which plant species is most productive in each area based on a series of given information.

11) Internship Title: Hoofstock Intern

Student Author(s)

Emily Wolfe
Environmental Studies (B.A.)

Internship Mentor(s)

Jessica Deering
Naples Zoo Volunteer Coordinator

Cindy Hall
Hoofstock Supervisor

Cindy Watson
Hoofstock Mentor

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: This internship was completed at Naples Zoo at Caribbean Gardens under the direction of Jessica Deering and Cindy Hall. This internship consisted of assisting with daily care and exhibit maintenance of animals in the hoofstock area, including giant anteater, red-rumped agouti, giraffe, zebra, gazelle, etc. This also includes assisting with enrichment activities and observe operant conditioning training, as well as routine record keeping and routine animal observations. The hoofstock internship will take place between August and December 2017. The responsibilities included within this internship are related to my major by increasing my knowledge on animal conservation and the genetics of breeding programs, as well as animal care. These responsibilities contributed to my career goals by allowing me to further my knowledge in animal care, AAZK certified zoo qualifications and procedures, and increase my ability to work under frequently changing conditions.

12) Research Title: Probing Multidrug ABC Membrane Transporters in Single Living Triple Negative Breast Cancer Cells Using Single Ag Nanoparticle Optical Probes

Student Author(s)

Biology (B.S.)Luisa Cortes
Biology (B.S.)

Morgan Cooney
Biology (B.S.)

Faculty Mentor(s)

Kerry Lee
Biological Sciences

Lyndsay Rhodes
Biological Sciences

Abstract: Probing Multidrug ABC Membrane Transporters in Single Living Triple Negative Breast Cancer Cells Using Single Ag Nanoparticle Optical Probes Luisa Cortes, Morgan Cooney, Lyndsay Rhodes and Kerry J. Lee Biological Sciences Department, Florida Gulf Coast University, Fort Myers, FL 33965 Currently, multidrug ABC (ATP-binding cassette) membrane transporters in triple negative breast cancer (TNBC) cells leads to multidrug resistance and

survival of these cells. In this study, we targeted ATP-binding cassette (ABC) membrane transporters by inhibiting their function with orthovanadate, an ATP binding efflux inhibitor. We synthesized and characterized silver nanoparticles (Ag NPs) that are known to be stable in cancer cell media. Utilizing their size dependent localized surface plasmon resonance (LSPR), we measured the size-dependent transport efficacy of ABC membrane transporters in TNBC (Bt549) cells when exposed to orthovanadate in real time using dark-field optical microscopy (DFOM). The results indicate that Bt549 cells exposed to orthovanadate have a lower Ag NP efflux rate and thus a decreased ability to remove cytotoxic Ag NPs from their cytoplasm. This study suggests that orthovanadate can reduce multidrug resistance demonstrated by Bt549 cells by inhibiting their ABC membrane transport function.

13) Research Title: Determining Effects of Landfill Leachate on Biological Nutrient Removal in Wastewater Treatment

Student Author(s)

Shane Herman

Environmental Engineering (B.S.Env.E.)

Alex Brawley

Environmental Engineering (B.S.Env.E.)

Sandra Un Jan

Environmental Engineering (B.S.Env.E.)

Kendall Karcher

Environmental Engineering (B.S.Env.E.)

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Environmental Engineering (B.S.Env.E.)

Faculty Mentor(s)

Ashley Danley-Thomson

Environmental and Civil Engineering

Grant Support

Whitaker Center Summer Research

Abstract: Wastewater treatment plant managers have the difficult job of converting our wastewater into clean, safe water to be distributed back into the water table. One challenge these managers experience is managing landfill leachate loadings. The size of the challenge varies with the size of the POTW, the ratio of leachate to flow, leachate composition, regional differences, and regulatory challenges. Leachate is known to cause ammonia removal inhibition and can upset biological treatment. These potential issues can be found in the activated sludge process of the treatment train where biological nitrogen removal occurs. The effect of landfill leachate on biological nutrient removal, nitrification, and effluent quality is assessed by adding leachate to batch reactors that mimic treatment processes in wastewater treatment. Six sequencing batch

reactors are operated in duplicate and each duplicate set of reactors receive a continuous flow of leachate consisting of 5%, 10%, 15%, or 20% v/v leachate to activated sludge ratio. Controls are also being operated (100% leachate as positive control, 100% activated sludge as negative control). After steady state, reactors will receive a slug load of 30% v/v leachate to analyze if activated sludge can adapt to handle a leachate load that is known to be toxic.

14) Research Title: Biomechanical Analysis of Fatigue State When Performing First Arabesque en Pointe

Student Author(s)

Carolyn Keinath
Bioengineering (B.S.)

Korin Kirkpatrick
Bioengineering (B.S.)

Samantha Pellegrino
Bioengineering (B.S.)

Faculty Mentor(s)

Derek Lura
Bioengineering

Abstract: The purpose of this research is to investigate the mechanisms of injury development in the ankle and foot structures of ballet dancers. This area of research is of particular interest due to the high rate of injury among ballet dancers performing en pointe. The study will observe the effects of increasing muscle fatigue on pressure distributions in the foot while the dancer is performing First Arabesque en pointe. The position of the center of mass will be monitored using a Qualisys motion capture system and compared with the shifting pressure concentrations occurring during the fatigued state. This will allow for isolation of the structures most impacted by compensatory mechanisms resulting from the onset of fatigue. The pressure maps will also be obtained using a pressure sensor array embedded in an insole placed inside the ballet shoe. The data from the Qualisys system and pressure sensor array will be processed in Matlab using custom programs and analyzed for statistical differences in Excel.

15) Research Title: Study of the Efflux Function of Multidrug ABC Membrane Transporters of Single Live Gonococci Cells Using Ag Nanoparticles as Optical Probes

Student Author(s)

Biology (B.S.) Kailah McCray-Townsend
Biology (B.S.)

Faculty Mentor(s)

Kerry Lee
Biological Sciences

Abstract: Efflux pumps, which are also known as multidrug ABC transporters, are located in both eukaryotic and prokaryotic cells. These pumps are responsible for multiple resistant diseases and play an important role in extruding the antibiotics out of a bacterial cell, which will provide a protective efflux defense against the antibiotic activity. This accounts for multidrug resistance. By using silver nanoparticles (Ag NPs) as an optical probe, the kinetics of the Azithromycin-resistant bacteria, *Neisseria gonorrhoeae*, ABC pumps were studied. This experiment will include the non-treated and treated cells of the ABC pump inhibitor, Orthovanadate, which will be incubated with the Ag NP's. Once incubated, the cells were placed into microchambered slides then observed under dark field optical microscopy (DFOM) for imaging. The images displayed Ag NP's as red, blue, or green in color, which is based on their size. This allows the location of the size-dependent Ag NP's to be observed as they enter and exit the cells. The cells that contain Ag NP's were analyzed and documented over time.

16) Research Title: Cytotoxicity Analysis of Lipidic Ionic Liquids for Biomedical Applications

Student Author(s)

Samantha Pellegrino
Bioengineering (B.S.)

Christopher Norber
Bioengineering (B.S.)

Carolyn Keinath
Bioengineering (B.S.)

Faculty Mentor(s)

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Bioengineering

Arsalan Mirjafari
Chemistry & Physics

Grant Support

Whitaker Center Summer Research

Abstract: Lipidic ionic liquids are a class of amphiphilic organic salts exhibiting remarkably low melting points below ambient temperatures. These low melting points are the result of structural asymmetry introduced into the lipid tails of the cation, which prevents dispersion forces from generating an ordered, linear array of hydrocarbon chains. Inspired by natural fatty acids, their amphiphilic structures form micelles and liposomes that are especially promising for applications in biomedicine such as gene transfection and drug delivery. The present study introduces a novel class of methimazolium-based lipidic ionic liquids bearing two aliphatic tails appended to methimazolium cationic headgroup. The aim of this study is to examine the cytotoxicity of two ionic liquid variants employing different side chains to fully evaluate the structure-activity relationship. The synthesized ionic liquids were tested on the HeLa cell line using the MTT proliferation assay at a broad concentration range for thorough characterization. Additional

assays were performed using Lipofectamine2000 as a control and test solutions prepared at lower concentrations to reflect the quantity used in gene transfection protocols. The results of the cytotoxicity studies suggest that these cationic lipids do not exhibit significant cytotoxicity at concentrations below 100 µg/mL, which is 20 times the maximum concentration used in transfection protocols.

17) Research Title: Imaging of Biocompatibility, Toxicity, and Transport of Single Ag Nanoparticles in Semi-Aquatic Plants, *Hydrocotyle bowlesioides* and *Hydrocotyle sibthorpioides*

Student Author(s)

Richard Lane
Biology (B.S.)

Faculty Mentor(s)

Kerry Lee
Biological Sciences

Antoine Nicolas
Biological Sciences

Abstract: Nanotechnology has been critical in driving advancements in many fields, especially in medicine and pharmaceutical therapies. Nanotechnology involves working with substances or structures that are at nanoscale, or 1 to 100 nanometers in size. At such small sizes, nanoparticles or nanostructures exhibit unique behavior and characteristics. These unique characteristics have raised the concern of their possible unknown toxic impacts on living organisms and the environment. The purpose of this study was to evaluate the impact of silver (Ag) nanoparticles (NPs) on two semi-aquatic plant species, *Hydrocotyle bowlesioides* and *Hydrocotyle sibthorpioides*. A dose-dependent toxicity study was performed and demonstrated that at even the lowest treatment dose (0.2nM Ag NPs), toxic effects were observed in as little as 24 hours. This toxicity data correlated with the imaging of transport of Ag NPs into the roots, stem and leaves of the plants.

18) Research Title: The Microbial Load and Diversity on the Campus of FGCU

Student Author(s)

Joseph Lang
Biology (B.S.)

Arlena Tapia
Biology (B.S.)

Emily Belcher
Biology (B.A.)

Faculty Mentor(s)

Jan DeJarnette
Biological Sciences

Abstract: The aim of our research was to examine the number, distribution, diversity, and pigmentation of airborne bacteria in the outdoor atmosphere of Florida Gulf Coast University's (FGCU's) campus. The sampling sites included the courtyard immediate to the Cohen Center and the grass field outside South Village Residence Hall. Neutec Spin Air, a common air sampler, was used to collect microbial samples on various media. The sampling sites mentioned are decorated with outdoor spray fountains, making them probable reservoirs for the pathogen *Legionella pneumophila*. Therefore, we cultured some of our air samples on buffered charcoal yeast extract (BCYE) agar to check for the presence of *Legionella*. The samples were taken for 1 minute on different days during the 2017 spring semester. The number and color of bacterial colonies found at the two collection sites were recorded. Pigmented bacterial colonies made up 52% of the total bacterial colonies. To provide a better description of the microbial diversity on campus, our research team also isolated and identified several bacterial species. In addition, examination of BCYE media proved negative for *Legionella pneumophila*.

19) Research Title: Geochemistry of relic spinel and silicate minerals from serpentinite of the Ingalls ophiolite complex, central Cascades, Washington

Student Author(s)

Marine Science (B.S.) Kristy Zalud
Marine Science (B.S.)

Faculty Mentor(s)

James MacDonald
Marine & Ecological Sciences

Grant Support

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

Abstract: The Ingalls ophiolite complex, central Cascades, Washington, primarily consists of ultramafic rocks. The ultramafic rocks consists of lherzolite to the north that is separated from dunite and harzburgite to the south by mylonitic lherzolite and hornblende peridotite. This mylonitic ultramafic zone has been interpreted to be a fracture zone. Serpentinite is ubiquitous in the ultramafic rocks. Relic spinel is commonly preserved in serpentinites, with lesser pyroxene and olivine also being preserved. We analyzed these relic minerals by electron probe micro-analyzer from the Florida Center for Analytical Electron Microscopy, to better understand the lithology and original tectonic setting of their protoliths. Serpentinites have mesh, hourglass, and interlocking textures in thin section. Relic olivine and pyroxene have hypidiomorphic-granular textures. Spinel can be well preserved in serpentinites, or, totally replaced by magnetite. We were careful not to analyze replacement magnetite. Relic spinels (n=44) have very low SiO₂ and Fe³⁺, indicating serpentinization did not affect the data. The spinels range in composition from Al-chromite to Cr-spinel. Cr# range between 38 and 85, Mg# between 24 and 68, Al₂O₃ between 12 and 35, while TiO₂ is between 0.01 and 0.21. Spinel from two samples plot in arc

fields on discriminations diagrams, while all other samples plot in arc and abyssal peridotite overlap fields. Relic pyroxene are primarily enstatite (n=13), with minor diopside (n=3) and augite (n=1). Relic olivine (n=17) are forsterite, have Fo90 to Fo92, NiO from 0.38 to 0.43, and plot along the olivine mantle array. Relic spinels have compositions similar to the northern lherzolite and southern dunite. They also plot near or in fields defined by the northern lherzolite and southern dunite on discrimination diagrams. Relic silicate minerals have compositions similar to the northern lherzolite. Although limited by relic minerals persevered well enough for analysis, we conclude the northern lherzolite and southern dunite were the protoliths for the serpentinite we analyzed. The original tectonic setting for these relic minerals was transitional between arc and mid-ocean ridge settings. This tectonic setting is similar to the Late Jurassic crustal rocks from this ophiolite. </div>

20) Internship Title: Koreshan Historic National State Park Internship

Student Author(s)

Michaela Reidy
Environmental Studies (B.A.)

Internship Mentor(s)

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: Not Available

21) Internship Title: River Raft Guide: Adventurous Fast Rivers Rafting

Student Author(s)

Matthew Hale
Environmental Studies (B.A.)

Internship Mentor(s)

Sue Matz
Employer, Owner and founder of AFFR

Steven Matz

Employer, Owner and founder of AFFR

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: Matthew Hale completed an internship at Adventurous Fast Rivers Rafting (AFRR) in Topton, North Carolina from May 17th, 2017 - August 15th, 2017. Under the direction of Sue

and Steven Matz, 140 hours of guiding and safety instruction were completed. The itinerary of a trip down the Nantahala River consisted of prepping guests with safety instruction and life - vest fitting; on the water paddling instruction; and a two hour guide down the river through class one (numerous), class two (about four), and class three (two) river rapids. My responsibilities during this internship were first and foremost to bring guests down the river safely and secondly to provide an exciting, fun, and educational experience for guests. These responsibilities contributed to my career goals by enhancing my leadership and communication skills as well as contributing to an amazing amount of experience through living.

22) Research Title: Limnological study of seven stormwater ponds (City of Sanibel Island, Florida)

Student Author(s)

Cayden Lawn
Environmental Studies (B.A.)

Faculty Mentor(s)

Serge Thomas
Marine & Ecological Sciences

Abstract: Sanibel Island contains as many as 80 stormwater ponds scattered throughout the island. Most are beginning to show signs of cultural eutrophication. This study assessed the health of seven of these stormwater ponds by examining their bathymetries via SONAR mapping, water physicochemistry via vertical profiling, water nutrients contents, sediment/flocculent layer characteristics (thickness, organic, total phosphorus, nitrogen and carbon contents) via coring and high spatial resolution sediment mapping via SONAR (which is experimental at this stage). Data are not only used to determine ponds eutrophication levels, ponds morphometric relationships, sediment mapping and whether sediment dredging is necessary but also to conduct more elaborated correlations such as i) the linkages between eutrophication levels and the sediment characteristics and ii) the actual sediment thickness as measured by coring and the SONAR sediment mapping. Water quality data collected suggests thus far that 6 of the 7 ponds sampled are already eutrophic and even hypereutrophic. Of the ponds deemed to be eutrophic, all showed correlations between the sediment and water nutrient contents. While still in the experimental stage, bottom hardness data collected via SONAR technology proved to be accurate when compared to actual coring data being verified by the overall sediment thickness at each coring location.

23) Research Title: Soil Induced Differential Gene Expression of *Capsicum annum* Var. *glabriusculum* and its Relation to Resistance of *Trialeurodes vaporariorum*

Student Author(s)

Kenneth Vander Linde
Environmental Studies (B.A.)

Faculty Mentor(s)

John Griffis

Marine & Ecological Sciences

Abstract: Plant growth/development is influenced by soil conditions/typology. Examination of *Capsicum annum* Var. *glabriusculum* [Chiltepin] under controlled soil & moisture conditions was conducted in a gridded series. Under these conditions Chiltepin maintained the same germination rate as *Capsicum annum* [Grand Bell]. Expression of phenotypic genes varied on soil typology with respect to the sandiness of soil composition (presumed stress induced). Chiltepin successfully germinated in sandy loams showed purple colorations in stem and leaves. 10% of Chiltepin cultivated showed purple expression in leaves, 26% in stems. Chiltepin cultivated under sandy conditions exhibited stunted growth in comparison to those in organic soils. When exposed to *Trialeurodes vaporariorum*[White Fly], Chiltepin exhibiting purple coloration in leaves were not affected. Purple expression in Stem alone showed no difference in predation than those in organic soils. Chiltepin cultivated in organic soils experienced 100% mortality after exposure to *Trialeurodes vaporariorum*. Conclusion, soil typology affects differential gene expression in *Capsicum annum* Var. *glabriusculum*, trials indicate a possible correlation in phenotypic expression of purple leaf coloration and *Trialeurodes vaporariorum* predation resistant gene expression. Identification of genes & triggers, require further testing.

24) Research Title: Department of Environmental Protection

Student Author(s)

Olivia Hilfiker

Environmental Studies (B.A.)

Faculty Mentor(s)

L. Donald Duke

Environmental and Civil Engineering

Abstract: The internship was completed at the Department of Environmental Protection from May to July in 2016. It was the South District of the Department of Environmental Protection located near downtown Fort Myers. Most days were spent in an office at this location Monday through Thursday from 9:00 AM to 4:00 PM. The internship focused on the permitting department, where much was learned about how air, water and land regulations are enforced regarding pollution. In the office setting, meetings were attended to see how the Department of Environmental Protection operate. Out of the office, educational field trips were attended. Overall, the internship was a great experience to see how the South District of the Department of Environmental Protection runs.

25) Research Title: Designing an Environmental Literacy Programs for Elected Officials in Southwest Florida

Student Author(s)

Kelsey G. Parsons

Environmental Studies (B.A.)

Faculty Mentor(s)

Edwin Everham
Marine & Ecological Sciences

Abstract: Environmental education emerged as a subject in the 1970s. Although programs vary in definitions, origins, objectives and goals, they always involve a goal to better balance economics and the environment, and to encourage more environmentally literate citizens. Although environmental education has reached classrooms ranging from kindergarten through college, and has become an extracurricular activity through programs like Florida Sea and Master Naturalist, no programs exist to those running for or already in office. A program for elected officials would be beneficial not only in campaign marketing, but because it is important for decision makers to be educated on environmental subjects. This project is intended to initiate the design of a literacy program for politicians in southwest Florida. In this first phase, interviews with environmental professionals and politicians were conducted to begin a framework for the program. A survey was also created and sent to a variety of people to gain qualitative data on topics and delivery. This project will continue with additional interviews, media relations, and ultimately the delivery of an environmental literacy program curriculum.

26) Research Title: Do differences in methylation of a transposable element influence development in *Brassica oleracea*?

Student Author(s)
Jose Daniel Morales
Biology (B.S.)

Chris Bredding

Faculty Mentor(s)
Marilyn Cruz-Alvarez
Biological Sciences

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

Abstract: *Brassica oleracea* is a plant species that includes vegetables such as broccoli, cauliflower, Brussels sprouts, and cabbage. The varieties of *B. oleracea* show developmental differences despite being the same species. In our research, we are trying to identify specific genes that affect these developmental differences. Recently, a transposable element was found in the genome of *B. oleracea*, which might be involved in determination of differences among varieties. Movement of the transposable element and/or silencing of this element through DNA methylation may change chromatin structure and affect expression of nearby genes. Further investigation of the transposable element will be used to ascertain if differences in methylation have any effect on the species development. This is done by treating the DNA of different varieties with bisulfite, which converts non-methylated Cs to Ts in the DNA. The transposable element sequences are then amplified by PCR and the amplified fragments are sequenced in order to compare methylation between varieties. Preliminary results show that there is a lower degree of methylation in cauliflower. We are trying to quantify these methylation differences.

Advancement in the understanding of differences among varieties could allow varieties to be grown in wider geographical regions as well as increase their production.

27) Research Title: Virtuix Omni Gait Analysis

Student Author(s)

Ryan Greenplate
Bioengineering (B.S.)

Anthony Grippo
Bioengineering (B.S.)

Christopher Stevens
Bioengineering (B.S.)

Faculty Mentor(s)

Derek Lura
Bioengineering

Abstract: To evaluate the gait mechanics of the Virtuix Omni treadmill, gait data through marker data will be collected from participants as they walk over ground and on the Omni while navigating a virtual reality (VR) environment using the Oculus Rift display. Reflective tracking markers will be placed on the participants during the experiment, and marker position will be recorded with the Qualysis motion capture system. Evaluation of gait mechanics will focus primarily on cadence, stride length, walking speed, and knee joint angle of the gait cycle. Cadence is the number of steps per minute. Step length is the distance between the right and left foot at heel strike of the specified foot. Walking speed is commonly measured by stride length, sum of right and left step length, divided by stride period. Finally, knee joint angle is the angle between the thigh and shank. The results of this comparison will assist in evaluating similarities and difference between over ground and VR Omni walking. This data will also be used to help determine if VR Omni will be a viable option for gait rehabilitation.

28) Research Title: Can the Readily-Available Species, *Carica papaya*, be Used to Demonstrate the Self-Thinning Rule for Plants Within the Time Frame of a Semester Course?

Student Author(s)

Kimberly Perez
Biology (B.A.)

Paula Marrugo Herrera
Biology (B.A.)

Faculty Mentor(s)

Randall Cross
Biological Sciences

Abstract: Competition is an ecological interaction that limits population growth and the size of individuals in a population. In plants, self-thinning is driven by intraspecific competition which determines how individuals grow and survive due to density-dependent effects. The self-thinning rule is used to describe the relationship between individual mass and density in populations of evenly-aged individuals growing at relatively high densities. The slope of this linear relationship has been described through regression models that consistently produce linear functions with slopes that approximate either $-3/2$ or $-4/3$ for a variety of species. This study investigated whether the readily available papaya (*Carica papaya*) could be used to demonstrate the self-thinning rule within the time frame of a semester course. The papaya seeds were sown in plots in trays containing top soil, and placed in direct sunlight, and watered every day they did not receive at least 4 cm of natural rain. After two weeks, seedlings in each tray were thinned to intended densities (from 2 to 16 individuals per plot) in plots that were randomly selected within the trays. The seedlings were grown for another eleven weeks under the same conditions. After eleven weeks, the seedlings were harvested and weighed. The log-log regression of the relationship between average fresh and dry mass against density was determined. The resulting slopes were less than predicted by the standard regression models for other species. These results suggest that the initial plant densities were not high enough to successfully demonstrate the self-thinning rule over the time frame of the experiment.

29) Research Title: Evaluating the potential of the Florida bay scallop (*Argopecten irradians*) as a tool to reconstruct the past environment of Southwest Florida

Student Author(s)

Savannah Myers
Marine Science (B.S.)

Faculty Mentor(s)

Joelle Richard
Marine & Ecological Sciences

Grant Support

Seidler Scholarly Collaborative Fellowship

Abstract: Florida's modern bay scallops can be found in isolated populations in near-shore coastal and estuarine environments along the Gulf of Mexico Coast of Florida from Pine Island Sound in Lee County to St. Andrew Bay in Bay County (Geiger et al., 2015). Archaeological shells of Florida's bay scallops can be found in shell middens along the Gulf of Mexico coast of Florida due to the exploitation of marine resources by prehistoric Floridians. Bivalves, like the Florida bay scallop, use calcium carbonate in the water to grow their external shells, making daily or annual growth lines that are strongly influenced by environmental conditions (Jones and Quitmyer, 1996). Therefore, the Florida bay scallop as a proxy has the potential to provide us with a high resolution environmental record. Archaeological and modern Florida bay scallop shells were photographed using a high resolution digital camera and were cross-sectioned using a high-powered saw to later calibrate growth rate. One archaeological shell and one modern shell were drilled for calcium carbonate powder samples used for later oxygen and carbon isotope analysis. Once we have determined the growth rate of *Argopecten irradians*, we can use the

archaeological shells to reconstruct past environmental conditions in Southwest Florida. This can potentially provide us with an environmental record that goes farther back into the past than the records we have today.

30) Research Title: Microbial Load, Diversity and Antibiotic Resistance in the AMP at Four Different Sites on the Campus of FGCU (GROUP 2)

Student Author(s)

Hayley Rafidi
Biology (B.S.)

Leanna Gardner
Biology (B.S.)

Rachel Davalos
Biology (B.S.)

Faculty Mentor(s)

Jan DeJarnette
Biological Sciences

Abstract: Florida Gulf Coast University has a large amount of environmental diversity on-campus. The air could vary from place to place due to a variety of factors. The air quality of four sites on-campus (Sovi, Cohen Center, North Entrance road and North Entrance fountain) was sampled. Using the air sampler, we were able to determine the existence of different types of microbes in the air over various time frames. From the samples we isolated a plethora of bacteria. The bacteria were then identified via a Bio-log and it was determined by fellow peers if antibiotic resistance existed in any of the isolates. We concluded that our groups isolates were soil dwelling but external factors could have potentially allowed them to disperse in the air at a higher frequency than usual. Our research lead us to believe that the majority of the microbes we identified were favorable to the environment versus causing harm or destruction.

31) Research Title: Examining the Correlation between Diversity of Winged Insect Orders and Water Levels in Cypress Domes on the FGCU Campus

Student Author(s)

Garrett Martinez
Environmental Studies (B.A.)

Faculty Mentor(s)

Kara Lefevre
Marine & Ecological Sciences

Abstract: Water level is the main factor driving species diversity in cypress domes for organisms such as insects. Water has an important influence on the reproduction cycles of insect populations, with some species of insects using it only as a main way or production. However,

this assertion has not been tested on winged insects. Thus, this study aims to examine the effect of water level on winged insects species diversity within a cypress dome located on FGCU campus, Fort Myers, FL. The objective of the study was to see if water is major factor when dealing with diversity of insect species within cypress dome. I surveyed three insect orders — Diptera, Lepidodiptera, and Hymenoptera — in two cypress domes the months of May to August which are considered the wet seasons in Southwest Florida. I counted the population of each order observed, and then did a correlation analysis to evaluate the potential relationship between insect diversity and stagnant water levels at the two sites each having factors that can contribute to the rise and fall of water and diversity. Data shows that whether or not survivorship of some of the insects order were enhanced could actually survive more due to the abundance of the water or saw a decrease in population due to higher water levels. Through visual observation of predations and interactions with other orders of the Insecta was also conducted, and this clearly affected insect diversity. This kind of study enhances our understanding of the importance of hydrology and insect ecology in cypress domes.

32) Research Title: Synthesis of a naphthalene based ligand for the construction of Metal-Organic Frameworks

Student Author(s)

Megan McCormack
Biochemistry (B.S.)

Faculty Mentor(s)

Gregory McManus
Chemistry & Physics

Grant Support

Whitaker Center Mini- Grant- Travel

Abstract: Metal-Organic Frameworks (MOFs) are crystalline structures that can contain many pores and large surface areas. These pores are formed from metal ions link together with organic ligands to create the porous three-dimensional structures. MOFs have various applications in gas storage, catalysis, gas purification, and drug delivery. In terms of gas storage, the pores of some MOFs have demonstrated the ability to expand and contract under certain conditions and are referred to as breathing MOFs. In this work, a series of flexible dicarboxylic acid containing ligands were synthesized from 1,5-dihydroxynaphthalene. These novel organic molecules have been characterized via melting point, ¹H NMR and ¹³C NMR. Subsequently, the coordination chemistry of these molecules has been explored in an attempt to generate a novel breathing MOF. Our efforts to characterize these metal-organic crystalline products using powder X-ray diffraction, single-crystal X-ray diffraction, gas sorption, and thermogravimetric analysis are described herein.

33) Research Title: Identifying behaviors of certain bacteria collected from soil samples

Student Author(s)

Brenda Hernandez

Biology (B.S.)

Faculty Mentor(s)

Jan DeJarnette
Biological Sciences

Abstract: Bacteria in soil environments are required for the establishment of plant communities as they play roles of decomposers, nitrogen fixers, sulfur oxidizers, and most importantly disease suppressors. Scientists are concerned on how fast deadly bacteria are becoming resistant to antibiotics. Millions of uncultured soil bacteria species can be the source of new antibiotic compounds. This study will focus on the investigation of soil samples collected in order to identify certain bacteria that perform antibiotic characteristics. With several of tests performed, we can dictate which bacterium is most dominant for the distinct plant species. Specifically, eight different soil samples from different plant species were used to retain specific bacteria resistant to staphylococcus, methicillin-resistant staphylococcus aureus, Escherichia coli, and Listeria.

34) Internship Title: Wildlife Rehabilitation

Student Author(s)

Soren Hegener
Environmental Studies (B.A.)

Internship Mentor(s)

Pamela Defouw
Wildlife Center of Venice

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: This internship was completed at the Wildlife Center of Venice, in Venice, FL. The internship involved filling the position of part-time wildlife rehabber at the center. Responsibilities included patient intake and evaluation, triage and treatment, upkeep, and release, as well as facility maintenance, and occasional rescue in the field. Rehabbers receive patients from people that find injured, orphaned or sick animals, volunteer rescuers, or animal services. Patients must be logged in, evaluated, treated, and set up in a cage or other habitat. Patients require daily upkeep until they are released, transferred, or euthanized. In addition to caring for patients, rehabbers must also keep equipment, cages, enclosures, and the property clean and organized. The internship also included rescue- on off-days, a rehabber may be called to capture a distressed animal in the field and bring it to the center. These responsibilities gave me valuable experience dealing with animals, as well as experience working with medical equipment, which will come in handy when I pursue a career in the environmental/wildlife/animal related fields.

35) Internship Title: Early morning post-hatchings of loggerhead sea turtle (Caretta caretta) hatchlings in Lee County, FL

Student Author(s)

Dustin Erdek
Environmental Studies (B.A.)

Internship Mentor(s)

Eve Haverfield
Turtle Time Inc.

Faculty Mentor(s)

Edwin Everham
Marine & Ecological Sciences

Abstract: My internship was with Turtle Time, Inc., on Bonita Beach in Lee County, Florida under the direction of Eve Haverfield. I examined loggerhead, *Caretta caretta*, sea turtle hatchling emergences on Bonita Beach and Fort Myers Beach between July and October 2017. Hatchlings emerge from their nest approximately 55-65 days after the eggs have been deposited in the sand. I examined and measured the tracks made in the sand as they headed west into the Gulf of Mexico. My internship involved responding to early-morning post-hatching events to gather crawl orientation statistics. I also entered all nesting data pertaining to false crawls, hatched nests, relocated nests and unhatched nests into ArcGIS Collector using my phone. A record number of nests were laid this year; however, Hurricane Irma along with record rainfall (68.9 inches from June to September) negatively impacted nest success. This internship gave me valuable field and data management experience.

36) Research Title: Factors impacting the orientation of loggerhead sea turtle (*Caretta caretta*) hatchlings in Lee County, FL

Student Author(s)

Dustin Erdek
Environmental Studies (B.A.)

Faculty Mentor(s)

Edwin Everham
Marine & Ecological Sciences

Abstract: Long-term conservation of sea turtles will be dependent on success on the nesting beaches. Such success includes: minimizing light pollution possibly disorienting adults or nestlings, protecting nest sites from predators, impacts of storm events, moon phases, and particle size (beach sand). Previous work on hatchling misorientation (not heading directly to the ocean) and disorientation (frequently changing direction) has explored the impact of both artificial light and moon phases. This research was to quantify possible misorientation using the angle of the hatchlings crawl paths from the nest and to compare this angle among moon phases and along regions of the beach that can be associated with sand particle sizes. Data were collected along Bonita Beach road in Lee County. Monitoring the nest was responded to in the mornings. The furthest tracks from the direct path to the ocean were identified and, the angle

between the two widest spread tracks was determined (misorientation angle = MOA). Mean MOAs were compared among different moon phases, and along different beach segments that corresponded to beach particle size. The results of this study could help inform both beach lighting policies and guide beach renourishment efforts.

37) Research Title: Regulation of FePer1, Gene Encoding 1-Cys Peroxiredoxin in Buckwheat (*Fagopyrum esculentum*): A Transgenic Study

Student Author(s)

Kathryn Koirtzmann
Biotechnology (B.S.)

Faculty Mentor(s)

Takashi Ueda
Biological Sciences

Grant Support

USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: FePer1 encodes an antioxidant protein belonging to the 1-Cys peroxiredoxin family found in buckwheat (*Fagopyrum esculentum*) that is expressed during the desiccation process and seed development. Peroxiredoxins are a super family of thiol-specific antioxidant proteins that are evolutionarily conserved throughout all kingdoms. These enzymes neutralize harmful free oxygen radicals and multiple peroxide substrates by the use of catalytic cysteine residues to protect against environmental and other external stresses. The FePer1 gene encodes a seed-specific antioxidant protein in buckwheat. Its 5' regulatory region is responsible for turning on the gene under stress conditions. FePer1 mRNA and the corresponding polypeptide have been identified in buckwheat using northern and western blot techniques, respectively. In this study, the 525-bp regulatory region of the FePer1 region has been isolated, and fused to the beta-glucuronidase (GUS) reporter gene and introduced into the genome of *Arabidopsis thaliana* plants. Transcriptional regulation of the FePer1 gene will be examined in various tissues in the *Arabidopsis* plants by monitoring GUS gene expression using histochemical GUS assays.

38) Research Title: Identification of genes involved in drought tolerance of ball moss (*Tillandsia recurvata*)

Student Author(s)

Tara Axelrod
Biology (B.S.)

Faculty Mentor(s)

Takashi Ueda
Biological Sciences

Grant Support

USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: As global temperatures increase, desiccation tolerance becomes critical to study especially in relation to crop survival. *Tillandsia recurvata*, an epiphytic plant species commonly known as ball moss, serves as a useful model organism in this study. *T. recurvata* can survive without water for long periods of time during dry seasons. They can be found on high perches such as power lines, where water cannot be held easily. This species also does not possess a “tank” for water storage. Very little is known about the mechanism by which *Tillandsia* is able to survive in habitats with little water. We will investigate how its response to changes in water availability is related to its gene activities. Our goal is to identify genes that play important roles in its drought survival.

39) Research Title: Novel Resveratrol Analogue Synthesis, Striving Toward Treatments For Degenerative Diseases

Student Author(s)

George Chapa
Biology (B.S.)

Faculty Mentor(s)

Daniel Paull
Chemistry & Physics

Grant Support

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

Abstract: Resveratrol (trans-3,5,4'-trihydroxystilbene), a stilbene derivative, is one of the most biologically active polyphenols contained in wine. Resveratrol has been highly popularized in recent years because of some of its observed health benefits. The analogues of resveratrol synthesized were tested on mesenchymal stem cells and breast cancer cells through our collaboration in hopes of developing a treatment for degenerative diseases, such as osteoporosis and cancer. The synthesis of resveratrol analogues requires several steps, specialized laboratory equipment, and the utilization of methods that are environmentally harmful. Additionally, established methods to produce resveratrol often result in a mixture of both the cis and trans alkene, while many times only the trans alkene is desired. Our aim is to develop new and efficient synthetic methods for producing these compounds through a single pot tandem reaction of a Sonogashira coupling reaction to form an asymmetric alkyne and then selectively reducing that to the E or Z stilbene derivative. This new synthetic method will make the overall process more efficient and will allow us to create a comprehensive scope of analogues that were not readily able to be produced through traditional means.

40) Research Title: Synthesis of Enantiospecific Pharmaceutical Compounds using Ketenes as Building Blocks

Student Author(s)

Ryan Williams
Chemistry (B.A.)

Faculty Mentor(s)

Daniel Paull
Chemistry & Physics

Grant Support

Seidler Scholarly Collaborative Fellowship, Whitaker Center Mini- Grant- Travel, Whitaker Center Mini- Grant- Research, USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: With the ever-increasing demand for newer and more effective pharmaceutical drugs, there has been much research focused on developing new reactions and methods for synthesizing these complex molecules. Many drugs currently on the market incorporate halogens, particularly fluorine, and include many stereocenters. Ketenes are an interesting and potentially extremely useful route due to them being a highly reactive class of molecules that are underutilized for synthesizing pharmaceutical agents. We have focused on using both mono and disubstituted ketenes as substrates for enantiospecific α -halogenation reactions to form many carboxylic acid derivatives. In many drugs, a racemic mixture of the molecules can lead to devastating side effects, as one enantiomer can have radically different impacts on the body from the other. In other cases, one enantiomer of a drug may have no effect and is therefore not dangerous, but halves the overall yield of the useful product. We have developed methods to synthesize enantiospecific molecules by testing the effects of various catalysts and nucleophiles on the chirality of the final products. One of the methods we have employed uses a unique binol-based bifunctional catalyst to provide various ketene products in enantiomerically pure form; this approach has shown promising results.

41) Research Title: Assessment of Habitat and Disturbances of Migratory Shorebirds on Fort Myers Beach Residential Areas

Student Author(s)

Kylar Johnson
Environmental Studies (B.A.)

Amanda Bradley
Environmental Studies (B.A.)

Faculty Mentor(s)

Kara Lefevre
Marine & Ecological Sciences

Abstract: Conducting systematic shorebird surveys on Fort Myers Beach is critical for preserving the habitats of migratory species who use the populated beach as both a loafing and breeding area. Shorebirds can be influenced by many potential sources of disturbance along the coastline, which make it difficult for them to get the rest they need to continue their extensive migrations.

For example, the Piping Plover is one of several threatened species that migrate here during the winter months. Our research objective is to assess sources of anthropogenic disturbance that are influencing these populations, to ultimately create an enhanced habitat for the birds to recuperate during their stopovers at FMB. Off-road vehicle traffic, improperly restrained canines, and abundance of trash or litter on the beach were thought to be primary sources of disturbance. By monitoring these factors we are able to quantify their relative importance, and to see how they influence trends in shorebird populations. Our surveys demonstrated that shorebird populations are inversely proportional to the frequency of disturbances and regular migration patterns. The resulting data will help to shape policy and procedure in the Town of Fort Myers Beach, in terms of how the beach habitat is managed in the future.

42) Research Title: Asterina Starfish: Good Luck Charm or Pest?

Student Author(s)

Natalie Harvey
Marine Science (B.S.)

Faculty Mentor(s)

Toshi Urakawa
Marine & Ecological Sciences

Grant Support

USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: There are over 2,000 species of starfish worldwide, many of which are coveted by aquarist to put in their tanks. Asterina starfish however have been labeled by aquarists as both pests and beneficial tank mates but it is unknown which label holds true for these starfish. Asterina starfish have become a common household tank pet since they hitchhike in on corals bought at local aquarium stores. A total of 97 Asterina starfish were collected and monitored to determine if the starfish are friends or foes through observation of behavioral traits and patterns as well as trials involving testing the starfishes' abilities to flip over and move around the tank. The green 7-armed starfish appear to be those that are perhaps considered foes by aquarists as they showed more preference for the shrimp than the red 6-armed starfish. The 6-armed starfish however were able to flip themselves over much quicker and more efficiently than their green tank mates. Overall, these starfish do not appear to multiply and spread as rapidly as people have claimed which thus negates any fears of excessive multiplication and tank domination.

43) Research Title: Comparing the Energy Generated From MFC Powered by E.coli, Shewanella Oneidensis, and Bacteria Present in Urine

Student Author(s)

Renan Reis
Thelma Martinez
Jessyka Ueno
Edouane Jules

Faculty Mentor(s)

Abstract: Microbial fuel cells (MFC) are currently being studied as a possible alternative source of energy. The fuel cells use various organic materials, such as microbes, soil, wastewater and sewage to conduct electrical current. In this experiment Escherichia Coli, Shewanella Oneidensis, and multiple bacteria colonies produced from urine were used to evaluate which of the microbial communities conducted more electrical current. The microbes in the MFCs generate electrical current through a redox reaction, which allows data to be collected using an analog multimeter. The data collected was evaluated and resulted in the microbial fuel cell containing Shewanella produced some current after the second week of the set up, and peaked at the seventh week with 0.222 A. The fuel cell that contained E. coli was the slowest of the three microbial fuel cells, it remained constant at a low current for the first six weeks. The MFC that contained urine was a faster producer of current, within the first week it was conducting electrical current. The data obtained showed the multiple bacteria colonies produced from the urine were more efficient producers of electrical current. Although, it was evaluated that urine microbes conducted current more rapidly, the restricted time span did not allow for a proper evaluation of which microbial colony sustained a high current.

44) Research Title: The Synthesis, Stability, and Compatibility of Gold Nanoparticles in Biological Systems

Student Author(s)

Natalie Harvey
Marine Science (B.S.)

Adam Essler
Biochemistry (B.S.)

Amy Walker
Biology (B.S.)

Faculty Mentor(s)

Ju Chou
Chemistry & Physics

Kerry Lee
Biological Sciences

Lyndsay Rhodes
Biological Sciences

Grant Support

Whitaker Center Summer Research

Abstract: Our research focuses on the green chemistry synthesis of highly stable and size-controlled gold nanoparticles which are tested in biological systems for biological compatibility. The nanoparticle solutions are all natural and made from fruit extract from bananas, kiwis, apples, and peaches. These nanoparticle solutions are then tested in various trials using breast cancer cells to view the uptake of the nanoparticles into the biological system. The manipulation of particle size and concentration of the nanoparticle solutions allows us to find the most applicable size for consumption into the biological systems. Benefits to this research include attaching essential nutrients and medicines to the nanoparticles which then in turn are able to be absorbed by the organism and potentially save the system. Data for this study includes trials testing the stability of the nanoparticles as well as their behavior within the cancer cell media. The two biological systems currently being tested are MCF7 and BT549 cancer cells, as six trials have been analyzed to determine the absorption rate of the nanoparticles into the cancer cells. Our research shows that each cell line has different rates of absorption of gold nanoparticles at different time stages within a 2 hour period.

45) Research Title: Phylogenetic correlation with the presence of the CCE1 transposable element in cultivars of Brassica oleracea

Student Author(s)

Devonique Brissett
Biology (B.S.)

Faculty Mentor(s)

Marilyn Cruz-Alvarez
Biological Sciences

Abstract: Brassica oleracea contains many common vegetables such as, cabbage, broccoli, kale, and cauliflower, which have several health benefits. The phylogenetic relationships between these varieties are still under investigation. Understanding these relationships and what makes these vegetables produce their edible parts could have future applications in agriculture. A B. oleracea transposable element (TE) has been found, which is copied into RNA only in cauliflower but not in broccoli. Analysis of a locus on chromosome 2 of B. oleracea has shown that cultivars of either variety can be homozygous for the presence of the TE (+/+), homozygous for the absence of the TE (-/-), or heterozygous (+/-). Interestingly, polymorphism has been observed in the sequences flanking the TE. Analysis of these sequences in (-) alleles has shown that there is a higher homology between cauliflower and broccoli cultivars than between cultivars of the same variety, so we hypothesized that cauliflower has evolved from broccoli in multiple occasions. The sequences of the (+) alleles are now being analyzed by conducting PCR with DNA of different cultivars, purifying amplified fragments and fragment sequencing. Sequence comparisons should help determine if our hypothesis on the divergence of cauliflower from broccoli is correct.

46) Research Title: The Microbial Load, Diversity, and Antibiotic Resistance in the AMP at Two Different Sites on the Campus of FGCU

Student Author(s)

Ardit Bala
Biology (B.S.)

Brittany Smith
Biology (B.S.)

Gina Bonacasa
Biology (B.S.)

Joy-Anna Bryan
Biology (B.S.)

Faculty Mentor(s)
Jan DeJarnette
Biological Sciences

Abstract: The incidence of antibiotic resistance genes in the environmental resistome is increasing and putting a strain on current medicines used to combat them. Air samples were taken at two FGCU campus locations and ten isolates were identified. All ten isolates were tested for their antibiotic resistance and susceptibility to seven antibiotics; including ampicillin, streptomycin, rifampicin, gentamycin, chloramphenicol, erythromycin, and tetracycline. Of the isolates, isolate 7 showed the most resistance to a broader number of the antibiotics while isolates 1, 6, 9, and 10 showed the least. The results need to be compared with past and future samples to show an increased rate of antibiotic resistance in these FGCU campus locations. The origin of these resistance genes would also require further study of the surrounding environmental factors.

47) Internship Title: Internship with Natureland Wildlife Trust: Learning and Educating in New Zealand

Student Author(s)
Alexandra Elliott
Environmental Studies (B.A.)

Internship Mentor(s)
Meg Rutledge
Natureland Wildlife Trust

Faculty Mentor(s)
Mary Kay Cassani
Marine & Ecological Sciences

Abstract: The internship was completed at Natureland Wildlife Trust in Nelson, New Zealand under the direction of Meg Rutledge. The internship consisted of animal care, visitor education, and wildlife rehabilitation between May and July 2017. These responsibilities contributed to my career goals by allowing me to develop skills in caring for a variety of animal species, speaking

publicly to educate a diverse audience, and assessing and rehabilitating wildlife with intent to release. I intend to use and further develop these skills pursuing a career in the National Park Service.

48) Internship Title: Human Impact on the Hydrology and Water Quality of the Estero Bay.

Student Author(s)

Ryan Allen
Environmental Studies (B.A.)

Internship Mentor(s)

Kelsey Lang
FDEP Estero Bay Aquatic Preserve

Abstract: Estero Bay is an estuary located in Fort Myers. It was Florida's first aquatic preserve. To protect the water quality and the land the bay went into conservation to save it from the increasing urbanization occurring around it. Even under protection though there has been much human intrusion causing significant impact on the overall quality of the bay. Working with Estero Bay Aquatic Preserve water samples and field readings were collected at five different tributaries. Spring Creek, Mullock Creek, Imperial River, Hendry Creek, and the Estero River. YSI Pro Plus meters were used for the subsurface field readings and a Van Dorn was used to collect the water samples at a depth of five feet and sent to the Lee County Environmental Lab which the data belongs to the public domain. Taking current and past data, dating back to 2010, we formatted them in data sheets and statistics (Average, Standard deviation, Min and Max) were ran to identify any reading not within acceptable range. These points will be correlated to any possible human impacts on the bay such as over use of chemicals or any illegal dumping to determine if there is an outside cause of the readings.

49) Research Title: The relationship between litter behaviors and demographic information in San Carlos Park, Florida

Student Author(s)

Felicia Nudo
Environmental Studies (B.A.)

Faculty Mentor(s)

Nora Demers
Biological Sciences

Abstract: Litter is a human source of pollution that could be simple to fix if connections between demographic information and litter behaviors were better understood. The importance of understanding this relationship is key in educational outreach efforts on keeping our planet free of trash. The goals and objectives from this research were to cleanup 16 sites in San Carlos Park, record what was collected, and make possible connections between where the highest amounts of trash were located and the surrounding demographic information. Cleanup sites were selected from within the East Mulloch Drainage District, in San Carlos Park. Site selection included

culverts (and one bridge) with road crossings, and one site included open lots (not built, and very trashed in the culvert). After the sites were selected, volunteers from FGCU assisted in the litter collection at each site. Litter data was analyzed for quantitative purposes and was put into GIS software for comparison of the U.S. Census data of the people living near the cleanup sites. This allowed for connections to be drawn in relation to the demographic information of the San Carlos Park residents and litter behaviors (renters vs. homeowners, property values, education level, etc.).

50) Research Title: The Microbial Load, Diversity, and Antibiotic Resistance in the AMP at 4 Different Sites on the Camus of FGCU

Student Author(s)

Aidan Kenney

Faculty Mentor(s)

Jan DeJarnette

Biological Sciences

Abstract: Throughout the world, bacterial microbes live in nearly every part of it as well as inside all living organisms. However, one thing that puzzles some people with bacteria is how they survive being present in the air so long. In the case of bacteria that move with the flow of air currents, they need to have some type of protection so that they are able to survive the amounts of sunlight that they are exposed to throughout the day in order to live (Tong 1997). Some bacteria that travel through the air use this mode of transportation to find aquatic environments that will allow them to grow in them. However, the effect that the bacteria have on the aquatic environment can be either helpful, harmful, or no effect at all (Ferguson 1996). This experiment will examine the air borne microbes in different locations around the campus of FGCU, and determine what possible effects they could have on said water areas.

51) Research Title: Development of Novel Methimazolium-based Dicationic Ionic Liquids: Integrating the Protic and Aprotic Ionic Liquids Properties.

Student Author(s)

Melissa Reardon

Biology (B.S.)

Faculty Mentor(s)

Arsalan Mirjafari

Chemistry & Physics

Grant Support

Whitaker Center Mini- Grant- Travel

Abstract: The use of an anti-Markovnikov product formation with thiol-ene click chemistry described in this study contains a rich H-bonding network. This facile synthetic strategy of dicationic methimazolium ionic liquids/ molten salts with C3-C11 tails and a thioether linker has

a very low apparent vapor pressure with a bridge between the aprotic and protic ionic liquid. The nine different compounds constructed proved show quantitative yields.

52) Research Title: Collection and Molecular Characterization of *Corynespora cassiicola* Isolated from Papaya in Florida, USA. and Misiones, Argentina

Student Author(s)

Ted Soares

Faculty Mentor(s)

Dr. Diana Schultz
Biological Sciences

Abstract: The Food Forest (FF), located at Florida Gulf Coast University, is a model of sustainability & permaculture, with species adapted to organic farming conditions, conditions that in combination with high humidity and temperature, also favor the development of diseases. The objective of this work was to obtain isolates of *Corynespora cassiicola* (Cc) present in papaya (*Carica papaya*) in the FF, characterize them, and compare them with Cc isolates present in Argentina. Leaves and fruits of papaya with ringed spots, were collected and photographed. Disinfested tissue samples were cultured on potato dextrose agar in order to isolate the causative agent. The isolations were identified through macroscopic characteristics (color and appearance of the colony), microscopic (morphology of hyphae and spores) and molecular characteristics. DNA extracted from pure cultures using extraction columns with silica-based membrane was amplified through PCR using universal primers (ITS) and specific for Cc and for *Cercospora* spp. DNA was also compared to DNA extracted from isolates from papaya and several horticultural species from Misiones, Argentina. The amplicons were separated through agarose gel electrophoresis. The fungal isolates obtained in the FF amplify with both sets of primers, Cory1 and Cory2, specific for Cc, while isolates from Argentina, only amplify with the set Cory2. Positive Cory isolations, which were negative for amplification with specific primers for *Cercospora*, were classified as *C. cassiicola*, and will be sequenced in order to complete phylogenetic studies and develop specific primers. We continue working on the collection and characterization of new isolates, both in Florida, USA, and Misiones, Argentina.

53) Research Title: Paleogeological Study of Mound Key and the Resource Implications on Calusa History

Student Author(s)

Antonio Aidan Arruza
Marine Science (B.S.)

Erica Krueger
Marine Science (B.S.)

Faculty Mentor(s)

Michael Savarese
Marine & Ecological Sciences

Grant Support

Whitaker Center Summer Research

Abstract: The Calusa occupied Mound Key in Estero Bay, southwest Florida, from approximately AD600 to the 1700s, with this location serving as a cultural and political center since ca. AD950. The Calusa were a coastal dwelling, hunter –gatherer society. It is important to study the past environmental conditions because they lived in a different Florida with less people. This study looks at the historical geological context of the Mound key area in relation to effects on the Calusa through coring in Estero Bay’s center, and one near the mouth of the Estero River. Differences were noted in the historical environment of two locations immediately next to Mound Key, with salinity playing a major role in the mollusks found and possibly their preservation condition. West of Mound Key were vermetiform gastropod reefs with a graminoid marsh east of Mound Key, around the timing of Calusa arrival. These gastropods are less tolerant of low salinities compared to oysters, suggesting shifts in the community. The present environment around Mound Key represents late-Calusa conditions but relates to a more anthropogenic coastal environment. This historical account provides insight on the timing of the changes in salinity and what caused them.

54) Research Title: A Comparative Analysis of Surface Waters and Their Chemical Concentrations in a Dense Community with Septic Tanks
Internship Title:

Student Author(s)

Lucas Doran

Alecia Sabourin

Faculty Mentor(s)

Abstract: Water quality problems can arise from excess nutrients and other chemicals. The problematic chemicals may be from septic tanks, surface applications on lawns and agricultural fields, or insufficient waste water treatment practices. The community of San Carlos Park, Lee County Florida provides a good model to examine potential sources and fates of these chemicals. The community has about 2200 residences, over 90% of which are using septic tanks for wastewater treatment. We are examining whether there is a measurable presence of the compounds atrazine, parabens, or sucralose (as an indicator of presence of human impact) in the surface waters along the East Mulloch Drainage District. Nutrients were analyzed at Lee County Hyacinth Control Lab using an automatic analyzer (AQ2 by Seal Analytical) and chemicals including sucralose were analyzed at FIU Southeast Environmental Center using solid phase extraction liquid chromatography. Atrazine, simazine, propazine, and cyanazine were analyzed at FGCU. A comparative analysis will be conducted using the results of the samples collected in March 2017 and September 2017, which will indicate if there is problematic chemicals in the surface waters of the East Mulloch Drainage District, in San Carlos Park Florida. Our results show that there were significant differences in ammonia, total nitrogen, and nitrate/nitrite levels between March 2017 and September 2017. However, there were no levels of any nutrient that were above the EPA’s acceptable contaminant levels, and the differences observed can be attributed to seasonality.

55) Internship Title: Lake and Wetland Management Inc.

Student Author(s)

Samantha Colome
Environmental Studies (B.A.)

Internship Mentor(s)

Jennifer Bustos-Fitz
Lake and Wetland Management Inc.

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Grant Support

Abstract: This internship was completed at Lake and Wetland Management Inc., Boynton Beach under the direction of Jennifer Bustos-Fitz. During my time there, I identified invasive species, places and photographed ecosystem monitoring sites, chemical treatment of invasive plant species and helped with paperwork between May 2017 to August 2017. These responsibilities contributed to my career goal by teaching me a large number of invasive species, both aquatic and terrestrial plants. This internship showed me how much I like working outside, even in the heat of the summer, and gave me valuable knowledge I can take with me to a variety of careers.

56) Research Title: Late Holocene Oyster Reef Development and Its Impact on Calusa Natural Resource Utilization, Estero Bay, Southwest Florida

Student Author(s)

Kylie Palmer
Marine Science (B.S.)

Erica Krueger
Masters in Environmental Science

Jonathan Wittig
Marine Science (B.S.)

Antonio Arruza
Marine Science (B.S.)

Faculty Mentor(s)

Michael Savarese
Marine & Ecological Sciences

Grant Support

NSF Grant

Abstract: The Horseshoe Keys are an extensive oyster reef ecosystem within manageable paddling distance from Mound Key, Estero Bay, Southwest Florida, the site of the Calusa's political center beginning ~AD950. The Calusa thrived in this bay, partially due to the natural resources available, including these oyster reefs. Sediment cores from this region show a rich history of reef development dating to ~2200 yBP. The reefs exhibit an ecological succession shifting from a vermetiform gastropod community to oysters ~600 yBP, a time when Calusa exploitation of oysters began at Mound Key. Reef history varies between the northern and southern regions of Horseshoe Keys. Northern reefs developed upon mangrove peats and began their history with a rich molluscan fauna indicative of a higher, near marine salinity. Alternatively, the southern reefs developed upon a graminoid marsh with subsequent bay and reef faunas dominated by brackish mollusks. These differences suggest that the Estero River was a formidable freshwater source near Mound Key with more marine conditions located short distances away within the reef tract. Studying these gradients from the geological perspective combined with findings from the archaeology of Mound Key allows for a holistic understanding of environmental change and resource utilization by the Calusa.

57) Internship Title: Sea Turtle Technician on Cayo Costa Island

Student Author(s)

Victoria Fields

Environmental Studies (B.A.)

Faculty Mentor(s)

Phillip Allman

Biological Sciences

Abstract: This internship was completed at Cayo Coasta State Park under the direction of Dr. Phillip Allman and Florida Fish & Wildlife Conservation Commission. This internship consisted of monitoring the island for sea turtle nests, setting up nest protection, and collecting data on each nest and false crawl for FWC records. It was from May 1 to July 31 with long hours and multiple days a week. These responsibilities contributed to my career goals by providing me with experience in the field, as well as giving me a stepping stone into my desired field of sea turtle rehabilitation.

58) Internship Title: Lake and Wetland Management Inc.

Student Author(s)

Samantha Colome

Environmental Studies (B.A.)

Internship Mentor(s)

Jennifer Bustos-Fitz

Lake and Wetland Inc.

Faculty Mentor(s)

Mary Kay Cassani

Marine & Ecological Sciences

Abstract: My internship was completed at Lake and Wetland Management Inc., Boynton Beach during May 8th to August 11th, 2017. During my time there I helped identify invasive species, treat them, file paperwork, create paperwork and communicate with clients and other offices. At FGCU, I've heard a lot about invasive plant species overtaking native species, however it was extremely different to see it in person. I plan on continuing in the Environment field throughout my career and have found the work at Lake and Wetland Management interesting and useful.

59) Research Title: Internship Title: CREW Land and Water Trust Environmental Education Internship

Student Author(s)

Savannah DeBarr

Environmental Studies (B.A.)

Internship Mentor(s)

Jessi Drummond

CREW Land and Water Trust

Faculty Mentor(s)

Mary Kay Cassani

Marine & Ecological Sciences

Abstract: This internship was completed with CREW Land and Water Trust under the direction of Jessi Drummond, starting in April with a Family Fun Day event and ending in August. This internship consisted of assisting with, as well as leading, guided hikes through the CREW Marsh Trails for various summer camp groups, creating and implementing lesson plans, and assisting with other projects such as trail cleanups. These responsibilities contributed to my career goals because I was able to gain valuable knowledge about environmental education, as well as the different habitats here in Southwest Florida.

60) Research Title: Sixteen Years of the Southwest Florida Frog Monitoring Network

Student Author(s)

Savannah DeBarr

Environmental Studies (B.A.)

Victoria Fields

Environmental Studies (B.A.)

Faculty Mentor(s)

Edwin Everham

Marine & Ecological Sciences

Abstract: Amphibians can provide insight into long-term landscape changes, particularly changes in hydrology. The Southwest Florida Frog Monitoring Network is a citizen-science effort established in 2000 to collect long-term data on frog communities within the Southwest Florida watersheds. Routes consisting of 10-15 stops each are monitored monthly during the rainy season (June – September). Environmental data is collected at each stop, as is information on habitat changes. Data on all frogs heard calling during a three minute period are recorded using a three-level intensity code. In this project, data from seventeen years of monitoring, encompassing 23 routes with over 7600 sampling events are examined. Changes in populations of individual species across the region, interactions among species, and site-specific changes that may be driven by landscape alteration are studied. Measures of biological diversity, community classification, and community ordination, as techniques for exploring the factors that explain the differences in frog communities among routes, sites, and over time are used to treat the data gathered. Changes in frog populations and communities may provide opportunities to detect the environmental implications of altered hydroperiods and landscape changes in our watershed, regional and global climate alterations, and possibly the positive responses to restoration efforts.

61) Research Title: Study of Single Silver Nanoparticle (Ag NP) Toxicity, Biocompatibility, and Transport in Human Breast Cancer Cells

Student Author(s)

Naina Sharma
Biology (B.S.)

Zachary Allen
Biology (B.S.)

Shane McMahon
Biology (B.S.)

Deep Kalariya
Biology (B.S.)

Faculty Mentor(s)

Kerry Lee
Biological Sciences

Lyndsay Rhodes
Biological Sciences

Grant Support

Departmental Funds, ORGS FGCU and UCF College of Medicine funds.

Abstract: We studied the impact of single silver nanoparticles (Ag NPs) on toxicity, biocompatibility, and transport in human breast cancer cell lines. Triple negative breast cancer cell lines (ER-, PR-, and HER2- cell lines: BT549 and MDA-MB-231) are more likely to

become resistant to anti-cancer drugs due to P-Glycoprotein and BRCA1-IRIS expression which increase aggressiveness and drug resistance causing efflux of Ag NPs outside of the cells through active transport pumps. Thus, we observed higher Ag NP concentrations and more cytotoxic effects in the positive cell lines (ER+, PR- and ER+, PR+ cell lines: MCF7 and ZR751, respectively). We exposed the cell lines to Ag NPs over 72 hours and collected data every 24 hours to study the effects including transport, viability, growth rate, and cytotoxic effects such as multi-nucleation. We viewed Ag NPs by using dark-field optical microscopy (DFOM) to measure their size-dependent localized surface plasmon resonance (LSPR) scattering intensity. We demonstrated that Ag NPs accumulate in the cells in a time-dependent, as well as a concentration-dependent manner and cause greater multi-nucleation in the positive cell lines, MCF7 and ZR751. The results showed that the MCF7 and ZR751 cells undergo nuclear division but fail more often to complete cytokinesis, resulting in multinucleated cells, which subsequently lead to cell death. The BT549 and MDA-MB-231 cell lines demonstrated less multinucleation and greater nuclear efflux of Ag NPs over time and over increasing Ag NP concentrations. This study provides insight into the potentially therapeutic activities of Ag NPs within cancer cells with defective mechanisms to efflux toxic Ag NPs. Evaluating the relationship of cell multi-nucleation and the number and location of NPs within cells is critical to gain a better understanding of Ag NP transport and its inhibitory mechanisms on the growth of cancer cells.

62) Research Title: Piloting of a Hybrid Continuous, Live, Virtual, and Traditional Energy Audit Methodology

Student Author(s)

Courtney Gammon
Environmental Engineering (B.S.Env.E.)

Faculty Mentor(s)

Simeon Komisar
Environmental and Civil Engineering

Tom Strumolo
Engineering

Grant Support

Whitaker Center Summer Research

Abstract: Florida Gulf Coast University spends approximately \$3.5 million annually on electricity for both academic and residential buildings. Concerns about campus sustainability are exacerbated by ongoing campus expansion and expanding enrolments. It is imperative that overall efficiency be increased. This research aims to locate specific sources of high energy usage and address them accordingly. Not only will this allow for FGCU to become more sustainable but direct savings can be measured. We chose to focus solely on one building for this summer to develop a cohesive process for performing energy audits. We selected the Campus Support Complex building due to its consistent daily population. To date the research is not completed and we are currently waiting for meters to be installed in the CSC to allow for review of real-time data. Historical data from 2014 to present, in the form of FPL power bills and

monthly chilled water readings, have been analyzed thus far, showing an increasing trend over the past three years in both electricity and chilled water usage and occasional equipment malfunctions. Identification of these energy sinks and infrastructure issues on a campus wide basis will improve overall energy efficiency as part of FGCU's long-term commitment to sustainable practice.

63) Research Title: Ectopic Expression of a Buckwheat Fagopyritol Synthase Gene in Arabidopsis thaliana Plants: Developing Means for Enhancing Stress-Tolerance in Crops

Student Author(s)

Karolina Czarnecki
Biotechnology (B.S.)

Eugenio De Sanctis
Biotechnology (B.S.)

Pedro Ramirez
Biotechnology (B.S.)

Katlyn Sullivan
Biotechnology (B.S.)

Faculty Mentor(s)

Takashi Ueda
Biological Sciences

Abstract: Fagopyritol synthases (FeGolS) are galactinol synthase (GolS) homologues from common buckwheat (*Fagopyrum esculentum* Moench). GolSs catalyze the condensation of UDP-galactose and myo-inositol to synthesize galactinols, which have been shown to accumulate during seed desiccation and imbibition periods in plants. In addition, GolS transcripts have been found to be elevated in plants exposed to various environmental stress conditions including desiccation, and salt tolerance. This suggests that GolS genes play a role in mediating the oxidative damage resulting from environmental stress. The goal of this research is to examine the role of fagopyritols in stress-tolerance. For this, the coding region of FeGolS gene (FeGolS-1) was inserted into an expression vector to attain constitutive expression of the gene in plants. Subsequently, the synthetic gene was successfully introduced into Arabidopsis plants, and ectopic expression of the gene in leaf tissues was confirmed. Tolerance capabilities of these plants to various stressors such as desiccation and high salinity are being tested. So far, our preliminary results indicate that the transgenic plants have enhanced stress tolerance as compared to wild-type plants.

64) Research Title: In Vivo Study of Biocompatibility and Toxicity of TiO₂ Nanoparticles in Early Development of Zebrafish (*Danio rerio*) Embryos Hailey Davis, Destiny Branchen, and Kerry J. Lee Biological Sciences Department, Florida Gulf Coast University, Fort Myers, FL.

Student Author(s)

Hailey Davis
Biology (B.A.)

Destiny Branchen
Biology (B.A.)

Faculty Mentor(s)

Kerry Lee
Biological Sciences

Abstract: Nanoparticles are a common ingredient contained in many beauty and hygiene products and are characterized by their nanoscopic size of 0-100 nanometers. These nanoparticles are so small they are capable of diffusing into cells of any living organism and have the potential to cause damaging effects such as deformities, DNA damage, or death. To investigate the affects of nanoparticles on the development of a living organism, zebrafish (*Danio rerio*) embryos were exposed to a solution containing various concentrations of titanium dioxide, TiO₂, nanoparticles from a commonly used liquid skin foundation and incubated for up to 120 hours. Every 24 hours, embryos were imaged and characterized in real-time using a bright field optical inverted microscope (BFOIM) equipped with a CCD camera. This helped us to visualize toxic affects and to determine the biocompatibility and toxicity of TiO₂ on embryo development, specifically whether exposure to TiO₂ was dosage-dependent. Fully developed zebrafish larvae were then preserved in formalin and prepared for a histological protocol. The results produced by the histology report will help determine correlation of deformities to embryos and accumulations of TiO₂. The data generated from this study will help us to understand the effects nanoparticles have on aquatic organisms and their environment.

65) Internship Title: Environmental Entrepreneurship Internship at Fruitscapes LLC. Bokeelia, FL

Student Author(s)

Marshall Nathanson
Environmental Studies (B.A.)

Internship Mentor(s)

Steve Cucura
Fruitscapes LLC

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: Fruitscapes LLC. upholds Florida's tropical and subtropical agricultural heritage. Located at Bokeelia, Pine Island, Florida, the fruit tree nursery hosts mango, lychee, jack fruit, longan, and sapodilla orchards, a remarkable landscape that serves to remind visitors of Pine Island's one hundred year long mango growing history. The nursery owners, Steve and Jessy, are environmental entrepreneurs and landscape architects, consequently, the propagation techniques,

harvesting strategies, delivery/installation experiences, and plant byproduct processing skills I learned during this apprenticeship will contribute to the creation of my own social and environmental enterprises after graduation. As an ecologist, I view entrepreneurship as a means to reunify economics and ecology. The experiential learning that I conducted between March and November 2017 at Fruitscapes LLC. provided with fundamental knowledge to explore careers in these sectors: tree nursery, regenerative tropical agriculture, produce market, landscape design/installation/management, horticultural waste recycling, and artisan small-batch brewery.

66) Research Title: Characterizing microbial communities across the Imperial River salinity gradient

Student Author(s)

Megan E. Feeney
Marine Science (B.S.)

Faculty Mentor(s)

Toshi Urakawa
Marine & Ecological Sciences

Haruka Urakawa
Marine & Ecological Sciences

Grant Support

USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: Estuaries create complex plankton communities consisting of heterotrophic bacteria, cyanobacteria and eukaryotic algae along a salinity gradient formed by the mixing of freshwater and saltwater. The health of estuarine ecosystems is heavily influenced by these planktonic communities that decompose organic matter and recycle nutrients for primary production. We performed high-throughput sequencing of 16S rRNA and chloroplast 23S rRNA genes to determine the usefulness of this combined technique for describing spatial patterns of microbial and algal diversities in the Imperial River Estuary. Bacterial communities determined by 16S rRNA gene sequencing showed that upstream sites were dominated by Betaproteobacteria and Actinobacteria while downstream sites were dominated by Alphaproteobacteria and Flavobacteriia. Cyanobacteria were abundant throughout the river. Algal communities determined by plastid 23S rRNA gene sequencing showed that most sites were dominated by diatoms (Bacillariophyta) and cyanobacteria (Chroococcales). With increasing salinity, the relative abundance of heterokont algae (Synurophyceae), green algae (Chlorophyceae, Pedinophyceae), and dinoflagellates (Dinophyceae) decreased while cyanobacteria (Synechococcales) population increased.

67) Research Title: Pollinator Diversity at Four Polyculture Orchards in South Florida

Student Author(s)

Marshall Nathanson
Environmental Studies (B.A.)

Faculty Mentor(s)

Marine & Ecological Sciences

Abstract: This study examines the diversity of pollinators interacting with polyculture orchards in Lee County and Broward County, Florida. These pollinator interactions are embedded within unique microclimates that emulate Mediterranean, Subtropical, and Tropical bioclimates. An eight-month observational field study was conducted at four polyculture orchards to record wild pollinator interactions occurring at each field site. Berger-Parker, Shannon, and Simpson-Yule diversity indices are calculated using pollinator orders. According to diversity indices, polyculture systems biomimicking late successional hardwood forest ecosystems have several ecological niche spaces (e.g., vine, ground cover, rhizosphere, herbaceous, shrub layer, lower canopy, upper canopy) that attract the widest range of pollinator taxa. Field sites that provide increased temporal and spatial availability of vegetal forage demonstrate an increase in total taxa evenness according to the Simpson-Yule index ($D=1.47, 1.80, 2.25, 3.00$) and Shannon's index ($H=0.50, 0.64, 0.94, 1.21$). Pollinator plant interactions ensure the full maturation of fruit and are potentially relevant for climate resilience not only in Florida, but also for subtropical and tropical zones in general. In order to sustain ecological health conducive to the expansion of Florida's nascent environmental entrepreneurship sector, efforts should be directed towards bolstering agro-ecological conditions within preexisting orchards.

68) Internship Title: Avian Research and Conservation Institute (ARCI)

Student Author(s)

Danielle Shepard

Environmental Studies (B.A.)

Internship Mentor(s)

Ken Meyer

ARCI

Gina Kent

ARCI

Faculty Mentor(s)

Kara Lefevre

Marine & Ecological Sciences

Abstract: This internship was completed at Avian Research and Conservation Institute (ARCI). The establishment is in Gainesville, Florida and is focused on conducting research on important bird species to better our understanding on how to protect them. The work done is focused throughout most of Florida, with some into The Keys, Bahamas and South Carolina. This internship is directed by Dr. Ken Meyer and specific work in the field was directed and conducted with Gina Kent. This internship consisted of a variety of tasks ranging from trapping different species of birds to administer satellite telemetry devices, riding air boats to determine

water quality using snails and vegetation species as our indicators, logging data entries, and vegetation surveys. These tasks allowed me to enhance my skills derived in diverse field work by this hands on experience approach and several new techniques that ultimately will be crucial in furthering my career toward trapping and banding birds for conservation.

69) Research Title: An Analysis of the Oral Health Status of a Rural Nicaraguan Community

Student Author(s)

Addison Hendricks
Biology (B.S.)

Faculty Mentor(s)

Payal Kahar
Health Sciences

Grant Support

USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: Background: Sociodemographic variables and oral hygiene practices contribute to oral disease experience and are good indicators of a population's oral health condition. Purpose: To examine patterns of oral hygiene and dental visits across gender, age and educational levels; to quantify dental caries and periodontal status using DMFT and CPI indices. Methods: This cross-sectional study included 94 individuals (18-64 years) in the rural community, Potrerillos, Nicaragua, during their participation in a health-relief clinic. Participants' oral hygiene behaviors and demographics were surveyed. Intra-oral examinations noted gum conditions and teeth affected by decay. Results: More females than males brushed ≥ 2 daily, ($\chi^2=3.94;p=0.054$) yet had a higher mean DMFT (11.8 ± 6.9 versus 9.0 ± 6.5) than males ($F=3.8;p=0.054$). However, females' mean CPI score was lower than males. More younger adults (18-34 years) than older adults (35-65 years) sought dental care within the last year ($\chi^2=14.02;p=0.029$) and displayed the lowest mean DMFT ($F=10.2;p<0.05$) and CPI ($F=9.9;p<0.05$) scores. Individuals with a secondary or higher educational level brushed more often and had the lowest mean DMFT (7.6 ± 5.4 vs 12.4 ± 7.1 ; $F=3.6,p=0.031$) and CPI (1.6 ± 0.9 vs 2.6 ± 1.0 ; $F=5.4,p=0.006$) than individuals with either no or elementary school education. Conclusion: Oral diseases disproportionately affect older adults, individuals with lower educational levels and both males and females.

70) Research Title: Vegetative propagation of American Beautyberry (*Callicarpa americana*)

Student Author(s)

Sofia Saiz
Biology (B.A.)

Faculty Mentor(s)

Anna Goebel
Biological Sciences

Grant Support

USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: American Beautyberry (*Callicarpa americana*), is an attractive native plant from southwest Florida that can be cultivated by vegetative propagation. Different vegetative propagation techniques were explored for growing American Beautyberry cuttings. Although American Beautyberry is commonly used in the landscaping industry, little has been published about its propagation. One hundred and twenty six-inch cuttings were collected from 20 Beautyberry plants from one population at the FGCU, Buckingham Campus. Treatments of soil, light, watering regime, and rooting hormone (indole-3-butyric acid treatment) were kept the same for all plants. Cuttings varied by genotype (six cuttings from each plant), type of cutting (terminal or on the stem), and apical meristem presence. The influence of the apical meristem was measured as one out of three terminal cuttings per plant had it removed. The cuttings were examined weekly for twelve weeks for survival rate, and growth parameters such as stem and leaf growth. We found that all cuttings from 2 parent plants did survive. The number of leaves varied between 0 and 16. Some cuttings died as early as 2 weeks, while 47% survived the full 12 weeks. The baseline data presented here should help identify critical factors that can lead to efficient propagation by rooting cuttings.

71) Research Title: Cytoskeletal Changes in HeLa Cells After Exposure to Fluid Shearing Stress

Student Author(s)

Stephen Johnson

Roshonda Knight
Bioengineering (B.S.)

Jack Mohanty

Julien Thomas

Christine Weber

Faculty Mentor(s)

Derek Lura
Bioengineering

Abstract: During the malignant transformation of a healthy cell, there are two changes; 1. Disorganization into a cancerous cell, and 2. Re-organization of the membrane's actin [1]. The actin filament reorganization can influence the motility, the adhesion, and the mechanical stability of the cell; forming identifiers [2]. These identifiers are unique to each cell line, giving insight into how the cell goes through the transformation, and how the changes in actin density (pactin) can act as precursors for disease and disease state progression [2]. Current literature has been primarily focused on understanding how normal physiological activities, such as shearing stress, in epithelial tissues effects the mechanical properties of cells. In this study, HeLa cells were cultured, placed into a microfluidic chamber and exposed to shearing stresses of 7

dynes/cm and 10 dynes/cm in DMEM for 1 hour. Following exposure to fluid shearing stress (FSS), cells were stained with Trypan Blue to numerically represent cell vitality as exposure to FSS may affect cell health, averaging to 85% [3]. Micropipette aspiration was applied to represent changes in cell stiffness following FSS, which indicated that cells were significantly stiffer after exposure to FSS [2], [4], [5]. Samples were also stained with actin to visualize changes in density as it correlated with the Young's Modulus and visualized to understand the relation between FSS and cell detachment from the surface [6], [7], [8], [9], [10]. These studies provide significant insights into the mechanism by which some cancer cells may survive in the circulation, ultimately leading to metastasis at distal sites and how environmental stressors may affect their physiological state [11], [12].

72) Research Title: Nanofiber Scaffolds Fabricated via Airbrushing

Student Author(s)

Roshonda Knight
Bioengineering (B.S.)

Erica Visness
Bioengineering (B.S.)

Faculty Mentor(s)

Jiehong Liao
Bioengineering

Grant Support

Honors Program, USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: Three-dimensional (3D) fiber networks mimic the native extracellular matrix in connective tissues and offer a high degree of interconnected porosity for cell and tissue infiltration. Although electrospinning is a common technique to fabricate fiber scaffolds, as fiber diameters approach the nanoscale, the structure is too tightly packed for cell ingrowth [1]. This work investigates a novel application of airbrushing, using compressed nitrogen gas to release a polymer solution, as a means to form highly porous fiber scaffolds with loosely packed bundles of nanofibers. Airbrushed nanofiber scaffolds were assessed for porosity, fiber morphology and alignment, and the ability to support attachment and proliferation of fibroblasts. Furthermore, a method of forming aligned nanofiber scaffolds was explored using a rotating mandrel to collect airbrushed fibers. The capacity to tailor the structure of the cellular microenvironment enables the design of more physiologically representative scaffolds, both to guide cell function for tissue engineering applications and to serve as models for studying cellular processes in vitro.

73) Research Title: Mineral Geochemistry and Geothermobarometry of the Eocene Granite Falls Stock, Bald Mountain Pluton, and Mount Pilchuck Stock, Washington State

Student Author(s)

Glenn Thompson
Marine Science (B.S.)

Faculty Mentor(s)

James MacDonald
Marine & Ecological Sciences

Grant Support

USSSA (Undergraduate Student Scholarship Support Award) Mini Grant

Abstract: The Bald Mountain pluton (BMP) and Mount Pilchuck stock (MPS) are located in the Cascade Mountains, Washington State. The Granite Falls stock (GFS) is located to the west of the Cascades in the Puget lowlands. All three igneous bodies have similar Eocene ages (44–50 Ma), intrude the western mélangé belt, and are in contact with faults (Tabor et al. 2002; Dragovich et al. 2016). The BMP and MPS are S-type peraluminous granites whereas the GFS is metaluminous granodiorite. Mineral geochemistry was determined by electron probe micro-analyzer, Florida Center for Analytical Electron Microscopy, on amphibole, biotite, muscovite, and feldspar. Amphiboles (n=7), found only in the GFS, are calcic and primarily edenite. Micas occur only in BMP and MPS. Biotite in the BMP (n=22) and MPS (n=18) are primary and have peraluminous compositions. Muscovite in the BMP (n=10) and MPS (n=9) have primary compositions. GFS plagioclase (n=8) range from oligoclase to labradorite; MPS (n=12) from albite to andesine; BMP (n=4) are albite. Potassium feldspar (Or65–Or96) are restricted to the BMP (n=8) and MPS (n=5). Utilizing mineral geochemistry, pressure and temperature estimates were determined. Luhr et al.'s (1984) biotite thermometer for the BMP and MPS yield temperatures of $629^{\circ}\text{C} \pm 23$ and $652.8^{\circ}\text{C} \pm 17$, respectively. Massone and Schreyer's (1987) phengite barometer for the BMP and MPS yield pressures of $4.5 \text{ kb} \pm 0.3$ and $5.4 \text{ kb} \pm 0.8$, respectively. Ridolfi et al. (2010) amphibole geothermobarometer for the GFS yields a temperature of $820^{\circ}\text{C} \pm 10$ and a pressure of $0.69 \text{ kbar} \pm 0.07$. These P and T support the interpretations the BMP and MPS crystallized at depth from melted continental crust; whereas, the GFS formed much shallower. This suggests a large amount of vertical displacement for the BMP and MPS occurred along their border fault, the Pilchuck River Fault, a probable regional transtensional fault, prior to 45 Ma. This depth information is consistent with mapping by Dragovich et al. (2016) that suggest transtensional structures controlled the emplacement of the shallow GFS continental arc and its coeval extrusive rhyolitic magmas. Mid-Eocene extension, uplift, and crustal melting support Farallon Slab breakoff following Siletzia accretion, all being responses to hot asthenosphere upwelling through a gap in the slab.

74) Research Title: Data Entry Techniques Analysis

Student Author(s)

Blair Littwiller
Environmental Studies (B.A.)

Lindsey Paul
Environmental Studies (B.A.)

Faculty Mentor(s)

Edwin Everham

Marine & Ecological Sciences

Abstract: The world is continuously emerging with new technology to increase the ease of collecting and analyzing data. Specific types of this technology include phone applications. The purpose of our study is to analyze the effectiveness of phone application technology using ArcGIS data collection tools for university students. The program used for the data entry was Survey123 through ArcGIS. Following Hurricane Irma, students assessed damage on a portion of a long-term tree study plot on Florida Gulf Coast University's campus. We developed a phone based application to facilitate data collection. The plot was finished using this new application. On half of the plot, the students' data was collected on paper and the other half collected through the application. This allowed us to compare application based data collection to traditional pencil and paper field notes. We also created a survey to measure the applications effectiveness through students. Results may guide future technology facilitated field research.

75) Research Title: Designing flexible linkers for the synthesis of breathable Metal-Organic Frameworks

Student Author(s)

Xhensila Xhani
Chemistry (B.A.)

Faculty Mentor(s)

Gregory McManus
Chemistry & Physics

Grant Support

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

Abstract: The interest in metal-organic frameworks (MOFs) has risen dramatically over the past decade. These potentially porous materials consist of metal ions or clusters linked together by organic ligands. MOFs have attracted considerable attention because of their promising applications related to gas sorption, catalysis, and drug delivery. Some MOFs containing flexible ligands have the ability to expand and contract the size of their pores in response to external stimuli. These breathing MOFs have shown potential for storing gas molecules possessing weak intermolecular forces like methane. This study, involved the design and synthesis of a series of flexible dicarboxylic acid ligands starting from 2,7-dihydroxynaphthalene. These new ligands were all characterized by melting point, FTIR, ¹H NMR and ¹³C NMR. Solvothermal methods were employed to investigate the coordination chemistry of these new ligands in an effort to synthesis a breathable MOF. Our work towards characterizing these metal-organic materials via powder X-ray diffraction, single-crystal X-ray diffraction, thermogravimetric analysis, FTIR, and gas sorption are outlined.

76) Research Title: Identification of Active Resveratrol Analogues on Triple-Negative Breast Cancer Cell Viability and Morphology

Student Author(s)

Xylia Horgan
Biology (B.S.)

Hannah Tatum
Biology (B.S.)

Faculty Mentor(s)

Lyndsay Rhodes
Biological Sciences

Grant Support

Honors Program

Abstract: While breast cancer is becoming more commonly diagnosed, various subtypes make treatment options limited depending on what kind of cancer cell causes the tumor. The triple-negative breast cancer (TNBC) subtype lack receptors targetable by current therapies making them much more difficult to treat. Plant-derived compounds known as stilbenes have been shown to have many health benefits including treatment of metabolic disorders like diabetes and obesity, as well as increasing cardiovascular health. Resveratrol, a stilbene compound, has been found to have anti-cancerous effects in various types of cancer, including breast. However, few experiments have been conducted with this compound on TNBC cells. In this experiment, twenty-seven analogues of resveratrol were tested on three TNBC cell lines to determine effects on cell viability and morphology. Eight analogues were further tested for dose effects, with the majority showing marked decrease in cell viability with increasing concentrations. Effects for several of the compounds were observed at low concentration indicating high potency. Sixteen additional analogues, similar in chemical make up to the analogues identified as active were tested to determine key functional groups corresponding to increased anti-cancer activity. The results obtained suggest significant anti-cancerous effects of resveratrol analogues on TNBC cells in both viability and morphological endpoints. These results support pursuing advanced studies into the mechanisms of action within TNBC cells.

77) Internship Title: Six Mile Cypress Slough vs. invasive plant species.

Student Author(s)

Jeffrey Sharpe
Environmental Studies (B.A.)

Internship Mentor(s)

David Mitchell
Six Mile Cypress Slough

Robert Repenning
Six Mile Cypress Slough

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: My internship was completed at the Six Mile Cypress Slough (Lee County Park & Recreational) under the direction of David Mitchell and Robert Repenning. My internship originally started out as repairing the damage from Hurricane Irma. Eventually leading into treating invasive plant species within Six Mile Cypress Slough. This also leads me into treating other locations within (own by) Lee County. These responsibilities contributed to my career goals by having a better understanding on how to treat the different plant species.

78) Research Title: Mineral chemistry of the Camas Land diabase, central Cascades, Washington: a sill within the Eocene Chumstick Formation

Student Author(s)

Madison Easterbrook
Marine Science (B.S.)

Faculty Mentor(s)

James MacDonald
Marine & Ecological Sciences

Grant Support

Whitaker Center Mini- Grant- Research

Abstract: The undated Camas Land Diabase consist of dark colored diabase with lesser gabbro. It occurs as a sill within the Eocene Chumstick Formation. These rocks are finer-grained near the base, and are folded. To determine the petrogenesis of the Camas Land Diabase we analyzed plagioclase (n=21) and pyroxene (n=18) from two diabase and a fine-grained gabbro by an EPMA at the Florida Center for Analytical Electron Microscopy. The diabase is primarily ophitic to subophitic, while the gabbro is ophitic to slightly poikilitic. Plagioclase commonly crystallized before pyroxene. None of the analyzed minerals display chemically zoning. Plagioclase feldspars have compositions that range from An₃₉ to An₇₂, and average An₅₈. They are mostly labradorite (n=17), with two andesine and two bytownite. The pyroxene from two samples are all augite, while coexisting augite and three pigeonites were found in a diabase. The augite range from En₄₃ to En₅₀ and Wo₃₁ to Wo₄₀, and pigeonite ranges from En₆₅ to En₆₇ and Wo₆ to Wo₈. Pyroxene from all three samples plot as subalkaline and tholeiitic. Ti and Cr suggest the samples are predominately orogenic. Pyroxenes plot in the volcanic arc and ocean floor overlap fields on tectonic discrimination diagrams, whereas the pigeonites plot primarily in the volcanic arc fields. The An% of plagioclase decreases as the Mg# of the pyroxene decreases. The plagioclase and pyroxene compositions suggest the sill's magma was low-K tholeiitic, as well as transitional between mafic and intermediate. This agrees with whole-rock data from previous researchers. The pyroxene compositions suggest the Camas Land Diabase has both volcanic arc and non-arc affinities. Based on this data, the possibility of the sill forming through normal subduction can be eliminated. It is likely the samples formed with an arc influence while also recording decompression melting where MORB can occur. The chemical composition of the pyroxene shows that either ridge subduction, slab breakoff, or a combination of the two, may be

the process that occurred to form the sill. These arc and non-arc affinities could be due to Siletzia accretion. The Siletzia terrain accretion, and associated ridge subduction and/or slab breakoff, occurred around the same time as the formation of the Chumstick Formation, which this sill intrudes.

79) Research Title: Fagopyritol Transformation of Soybean Plants

Student Author(s)

Alyssa Fatic
Biotechnology (B.S.)

Faculty Mentor(s)

Takashi Ueda
Biological Sciences

Grant Support

Whitaker Center Mini- Grant- Research

Abstract: Diabetes is a disease that affects millions of lives and can lead to serious health impingements. The objective of this research is to develop an alternative therapeutic drug for treatment of non-insulin diabetes mellitus. The therapeutic compound of interest is Fagopyritol Synthase (FeGolS), which has similar chemical structure to the putative mediator in the insulin pathway. This is the targeted area of interest because Type II diabetic patients are deficient in the putative mediator of the insulin pathway. The current goal is to transform soybean cells with FeGolS-1 and FeGolS-2; two gene isolates from buckwheat seeds that are responsible for Fagopyritol synthesis. Cultured soybean cells were transformed using a vector, Agrobacterium, to deliver the FeGolS-1 or FeGolS-2 genes. Due to low transformation rates, this process was performed on approximately 575 cell samples. Selective media was utilized to only allow growth of cells with the antibiotic-containing plasmid. Twenty-two cell samples survived this selective process. DNA Analysis was then performed via PCR to amplify gene presence. No target gene amplification of FeGolS DNA was visualized when samples were observed on agarose gel. Ultimately, success of genetically-engineered soybeans containing Fagopyritol synthase may offer individuals with Type II diabetes a new alternative therapeutic treatment.

80) Internship Title: FGCU Intern

Student Author(s)

Kelsey Orr
Environmental Studies (B.A.)

Internship Mentor(s)

Heather Skaza-Acosta
Conservancy of Southwest Florida

Katie Ferron
Conservancy of Southwest Florida

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: I am Kelsey Orr and completed my internship at Conservancy of Southwest Florida under the direction of Heather Skaza-Acosta. This internship consisted of school programs, public programs, and caring for animals between August and December 2017. These responsibilities contributed to my career goals by educating the public on the importance of the environment and understanding the importance of different animals.

81) Research Title: Comparative Gait Rehabilitation with Virtual Reality Headset

Student Author(s)

Kristin Ladia
Bioengineering (B.S.)

Josiah Keime
Bioengineering (B.S.)

Briana Corlew
Bioengineering (B.S.)

Jay Shah
Software Engineering (B.S.)

Faculty Mentor(s)

Derek Lura
Bioengineering

Grant Support

Whitaker Center Mini- Grant- Travel

Abstract: Gait rehabilitation is a type of rehabilitation focused on improving gait performance and restoring walking function. This research project aimed to analyze the effects of virtual reality (VR) on a patient's gait parameters as a means of validating the use of VR in rehabilitation. The method is validated if the patient's gait parameters show no significant difference between the use and non-use of a VR headset. It was hypothesized that there would be no significant deviations in gait parameters between overground walking with or without a virtual reality headset. To obtain the selected gait parameters (gait speed, step length, and stride length), an eight camera Qualysis motion capture system was used to track reflective markers that were placed superior to the first metatarsal head on each shoe or foot, each calcaneus, and posterior to the fifth lumbar vertebra. Participants were asked to participate in 3 different exercises (Without VR, Active VR, and Passive VR), in randomized order. From the data collected, it was found that gait parameters of a participant differ significantly when wearing a

VR headset. Our findings are supported by other research that found that the use of virtual environments on a treadmill decreases a patient's gait stability.

82) Research Title: Flexible Tricarboxylic Acid Linkers as a Design Platform for Metal-Organic Frameworks

Student Author(s)

Nicole Giorgi
Biochemistry (B.S.)

Faculty Mentor(s)

Gregory McManus
Chemistry & Physics

Grant Support

Whitaker Center Summer Research

Abstract: Metal-Organic Frameworks (MOFs) are porous structures in which organic linkers are coordinated to metal ions. MOFs have promising applications in areas such as catalysis, gas sorption, and drug delivery due to their incredible porosity and high surface areas. In this study, a family of flexible tricarboxylic acid molecules were synthesized and subsequently investigated as ligands towards the development of novel porous MOFs. This family of flexible tricarboxylic acid ligands is expected to adopt cis,cis,cis or cis,trans,trans conformations with respect to the orientation of the carboxylic acid groups around the aromatic ring. These organic linkers were synthesized from phloroglucinol using methods adapted from the literature and have been characterized by ¹H NMR and ¹³C NMR. The coordination chemistry of these linkers with a number of metal salts has been investigated through solvothermal synthesis in order to obtain novel MOFs. Our efforts to characterize these products via single-crystal X-ray diffraction, powder X-ray diffraction, thermogravimetric analysis, and gas sorption will be delineated.

83) Internship Title: Internship at Calusa Nature Center and Planetarium

Student Author(s)

Jackelin Marquez
Environmental Studies (B.A.)

Internship Mentor(s)

Larry Aguilar
Calusa Nature Center and Planetarium

Faculty Mentor(s)

Mary Cassani
Biological Sciences

Abstract: The Calusa Nature Center and Planetarium is a private, non-profit organization located in Fort Myers, Florida. This beautiful 150 acre site has a museum, nature trails, a planetarium,

butterfly and bird aviaries and bonfire/picnic areas. As an environmental education intern (August-December 2017), I got to follow the environmental education coordinator, Walter C., and assist in teaching children of all ages the importance of Southwest Florida's environment. We worked with local and non-local schools, and worked with children in ESE programs to make sure everyone receives environmental education. In addition to that, I also worked with the volunteer coordinator, Erica Waller, and helped in developing the volunteer database and filing volunteer applications and information. This internship has given me insight into the world of non-profit organizations and on the importance of the community. Having a university close to the organization allows students from FGCU to complete service learning hours, and spread word of the Calusa Nature Center.

84) Research Title: Using a vegetative plot survey to determine how manual restoration affects habitat at Barefoot Beach Preserve, Collier County, Florida.

Student Author(s)

Jackelin Marquez
Environmental Studies (B.A.)

Anna Breeden
Environmental Studies (B.A.)

Faculty Mentor(s)

Nora Demers
Biological Sciences

Abstract: Barefoot Beach Preserve is located in Collier County, Florida. It is home to a large population of Gopher Tortoises, a keystone species that is protected across the state listed as threatened. Gopher tortoises forage on different types of vegetation like grasses, cacti, fruits, seeds, etc. Restoration efforts have been done in areas of the preserve – such as removing overgrown ragweed and sea grape leaves to create open space for the tortoises to forage and bask. A vegetative plot study was done two years after the restoration to determine if plant diversity is present. Methods using excel allowed us to create plot points in both the controlled site and treatment site, plots were located using a GPS, once located we used quarter meter plots and collected information on the vegetation present and percent coverage. Using the data, we calculated average percent coverage between the two sites and calculated Shannon Weiner's Index to understand and compare the diversity in the two sites. The data showed that the ragweed is still present and thriving; the average percent coverage is higher than any other plant species that was found in the study sites. The treatment site showed higher diversity than the controlled site, which tells us that restoration efforts should continue at Barefoot Beach Preserve in order to maintain the Gopher Tortoises in a stable and safe environment

85) Internship Title: Rookery Bay National Estuarine Research Reserve

Student Author(s)

Rebecca Thomas
Environmental Studies (B.A.)

Internship Mentor(s)

Dita O'Boyle

Education specialist at Rookery Bay National Estuarine Research Reserve

Jeannine Windsor

Education specialist at Rookery Bay National Estuarine Research Reserve

Faculty Mentor(s)

Dita O'Boyle

Educational Leadership and Technology

Abstract: I, Rebecca Thomas, completed this internship at Rookery Bay National Estuarine Research Reserve, under the leadership of Dita O'Boyle. This internship consisted of educating, mainly fourth grade children, on the environment, particularly the estuary of Rookery Bay. I assisted on field trips to the reserve by informing the children on the importance of oysters, and familiarizing them with plankton. I selected this internship to get acquainted amid children, and evaluate my patience for a prospect career specifying to environmental education.

86) Research Title: Biomechanical Analysis of Gait Asymmetry in Patients Post-Stroke

Student Author(s)

Natalia Nunez Paz

Bioengineering (B.S.)

Alexander Delle Monache

Bioengineering (B.S.)

Ely Perez Manzano

Bioengineering (B.S.)

Maria Ramon

Bioengineering (B.S.)

Faculty Mentor(s)

Derek Lura

Bioengineering

Abstract: 750,000 individuals experience a cerebrovascular accident every year and one of the major effects of the accident is paralyzation to half of the body causing an asymmetrical gait [1]. Asymmetrical gait can increase the risk of falls, energy expenditure, and bone loss. This study was created to determine which gait parameters exhibit a higher increase in asymmetry in post-stroke patients compared to healthy young adults, such as students, and elderly persons with no stroke history. The non-stroke participants of the study will come to Florida Gulf Coast University for gait analysis for one session and be encourage to wear comfortable shoes when performing the study. The spatiotemporal and kinematic gait data obtained from these

individuals will be compared to anonymized data collected from post stroke patients acquired from a recent Florida Gulf Coast University research study. The data analysis performed will determine which gait parameter experienced the highest increase in asymmetry. The results of this study could help improve gait rehabilitation methods giving researchers and clinicians more data on the prevalence and magnitude of gait asymmetries post stroke.

87) Research Title: Glyphosate Effects on Native and Invasive Apple Snails

Student Author(s)

Julian von Kanel
Biology (B.S.)

Amber Elalem
Biology (B.S.)

Faculty Mentor(s)

Randall Cross
Marine & Ecological Sciences

Grant Support

Departmental Funds

Abstract: Florida Apple Snails (*Pomacea paludosa*) are a native species of snails found in wetland ecosystems throughout Florida. They were once very abundant around the lakes of FGCU; however, the population has declined drastically in recent years. The most likely factors for their downfall are the introduction of invasive Island Apple snails (*Pomacea canaliculata*) and environmental pesticides and herbicides containing harmful toxins sprayed around campus. This research focuses on determining the succession of the native and invasive species in terms of growth rate and understanding how the toxins are affecting the snail colonies. To do this, egg clusters of native and invasive species will be hatched and grown, juveniles will be exposed to toxins to analyze the effects it has on the growth, and the weights will be compared via a linear regression analysis. The results aim to determine why the native populations on FGCU are declining and how we can restore them. We were able to conclude that the glyphosate does not cause mortality or affect the growth rate of both snail species, so they may have adapted to resist the toxins.

88) Research Title: Study of Biocompatibility, Toxicity, and Transport of Single Ag Nanoparticle Optical Probes in *Hydrocotyle umbellata* and *Hydrocotyle verticillata*

Student Author(s)

Khawla Farah
Biology (B.S.)

Faculty Mentor(s)

Kerry Lee
Biological Sciences

Abstract: The growth of nanoparticle technology is steadily increasing. It has been used in pharmaceutical advancements for alternative drug treatments, household products and even in sunscreens and cosmetics. The uncontrolled release of nanoparticles into the environment can pose a threat to living organisms. In this study water plants, *Hydrocotyle umbellata* and *Hydrocotyle verticillata* were used to determine the biocompatibility, toxicity and transport of silver (Ag) nanoparticle optical probes at high and low concentrations of 0.2 and 1.0 nanoMolar (nM), respectively. The plants were submerged in both concentrations and demonstrated toxic effects. Using dark field optical microscopy, samples from the root, stem and leaf were taken and observed for traces of Ag nanoparticles. The images showed the signs of Ag nanoparticles accumulating in the plants cells concluding their ability to transport nanomaterials. The Ag nanoparticles accumulated in the stem, root and leaf over the 72-hour treatment period.

89) Research Title: Evaluating the Reactivity of Cyclopropanones

Student Author(s)

Claudine Bolsen
Biology (B.S.)

Faculty Mentor(s)

Gregory Boyce
Chemistry & Physics

Grant Support

Honors Program

Abstract: Cyclopropanone is the simplest aromatic structure in organic chemistry. Due to the high degree of ring strain, it is very reactive and is capable of highly chemoselective and regioselective additions depending on the coupling partner's reactivity. It is an amphiphilic molecule, meaning it reacts readily with both nucleophilic and electrophilic reagents which allow for more diverse reaction pathways. Cyclopropanone is also reactive toward dipolar reagents and compounds that contain a reactive π -system. Acrylates are commonly used as monomers in polymer synthesis and as synthetic intermediates of biologically relevant products. My research focused on the synthesis of acrylates from cyclopropanones, to gain a more thorough understanding of the fundamental reactivity of this moiety. Acrylates are used to produce a wide variety of useful products ranging from adhesives, coatings, leather, textiles, plastics and chemical intermediates.

90) Research Title: Exposure to natural environments and self perceived health

Student Author(s)

Yenlee Hernandez
Biology (B.S.)

Dairon Lago
Biology (B.S.)

Faculty Mentor(s)

Edwin Everham

Marine & Ecological Sciences

Abstract: The origin of the human species thrived due to our intimate relationship with nature, we are dependent on its production and protection. In today's society, our relationship with the natural world has shifted to a more coordinated relationship in which people have to intentionally seek out interactions with nature. The purpose of this research is to determine if contact with the natural world impacts self-perceived health. We will explore this idea through an anonymous survey given to students of various majors at the FGCU as well as the elderly population at an assisted living retirement community. The results of this survey will determine if the exposure to the natural environment impacts self-perceived physical and mental health. In addition, we will compare data between the different age groups as it could provide new insight of patterns shared or excluded throughout generations.

91) Research Title: Post Fire Recovery of Herpetofaunal Communities in Florida's Mesic Flatwoods Habitat

Student Author(s)

Colin Lewis

Biology (B.S.)

Faculty Mentor(s)

Phillip Allman

Biological Sciences

Grant Support

Whitaker Center Summer Research

Abstract: Historically, naturally-occurring wildfires in Florida were common disturbance events that proved essential to maintaining low vegetative undergrowth in many habitat types. Human encroachment and subsequent suppression of natural fire regimes has altered the frequency and strength of fires, which are important factors for native species that inhabit fire-prone areas. This could result in a decrease in biodiversity and a reduction of naturally occurring populations of wildlife. In this study, we conducted herpetofaunal surveys of mesic flatwoods habitats in Highlands Hammock State Park that had been managed using varying intervals of prescribed burning. Surveys were conducted using a practice known as drift fencing, which uses artificial barriers to funnel target species into traps set along the fence line. Three sites were chosen that represented varying degrees of vegetation succession: Site 1 had been burned just prior to surveying (Spring 2016), Site 2 had been burned 2 years prior (Spring 2015), and Site 3 had not been burned for over 10 years and was well past the natural cycle range of 1-5 years. Site 2 had the highest biodiversity (Simpson's Reciprocal index = 3.186) followed by Site 3 (Simpson's Reciprocal index = 2.347), and lastly Site 1 (Simpson's Reciprocal index = 1.411). While this was the expected trend, significance in biodiversity between Sites 2 and 3 was not found and may be attributed to the Jaccard coefficient of community similarity with a value of .727. A

strong correlation was found between the proportions of nonnative species at each site with Site 1 having the lowest percentage (1.69%) followed by Site 2 (47.52%) and lastly Site 3 (65.96 %). This study shows that maintaining natural fire cycles in mesic flatwoods is an influential factor in the biodiversity of an area and may be an effective mechanism to control the spread of nonnative species.

92) Internship Title: Recreation Technician Intern

Student Author(s)

Collin Siberz
Environmental Studies (B.A.)

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: My name is Collin Siberz, my internship was done throughout the Eastern Interior of Alaska while being stationed in Fairbanks. This summer 2017 position as a recreation technician intern was with the Bureau of Land Management in conjunction with the Student Conservation Association and AmeriCorps. From May through August my responsibilities included water and firewood delivery, as well as general maintenance of two campgrounds and five waysides spread along a 90-mile stretch of the rugged and majestic unpaved Taylor Highway. Weekly meetings with Bureau of Land Management Eastern Interior staff in Fairbanks provided a great view of the federal land management process, while numerous training opportunities were provided to enhance my experience and give me a solid foundation for a future in an environmental position.

93) Research Title: Assessing the Evolving Environmental Perspectives among FGCU Students

Student Author(s)

Beach Cutler
Environmental Studies (B.A.)

Faculty Mentor(s)

Edwin Everham
Marine & Ecological Sciences

Abstract: A challenge for all environmental professionals is to maintain a positive, hopeful attitude, and avoid sliding into despair. I want to observe and document the perspectives of incoming and outgoing FGCU students who are in the Environmental Studies program. My goal is to determine whether a) these students are walking away with a deeper appreciation of the natural world and b) if they have not, the best course of action for the University to better facilitate the growth, maturity, and passion for nature among the FGCU students. Toward this goal, I developed a survey instrument to collect both quantitative and qualitative data. I administrated this survey to incoming environmental studies majors and graduating seniors. I compare the responses of these two groups to determine the impact of the environmental studies curriculum. It is my hope that, in the future, through the work I am and will continue to do at

Florida Gulf Coast University, we will not only be grooming students to become consummate professionals, but also conscientious stewards of Planet Earth.

94) Internship Title: Conservation Associate Internship

Student Author(s)

Jessica DeYoung
Environmental Studies (B.A.)

Internship Mentor(s)

Jennifer Hecker
Charlotte Harbor National Estuary Program

Elizabeth Donley
Charlotte Harbor National Estuary Program

Allison Conner
Charlotte Harbor National Estuary Program

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: Jessica DeYoung completed her internship at the Charlotte Harbor National Estuary Program under the direction of the main staff. She was granted three major projects to fulfill during the three-month contract from May through July of summer 2017. The Oyster Monitoring Project revealed how scientists continue the observation phase after a project implementation. The Microplastics Project was new in scientific findings and material, in which experience was devoted to finding out how scientific projects are commenced through multiple partners. The Department of Environmental Protection's RESTORE Act portal update was crucial from a political and communication standpoint. In addition to those projects, she assisted with technical, vocational, and organizational material to promote communication, education, and outreach as outlined in the Comprehensive Conservation and Management Plan. These responsibilities contributed to her career by granting an understanding of how restoration and conservation become plausible. There were a certain amount of cross-organization networking, political involvement, and technical backgrounds that concocted an environmental scale career. The experience was a step in the door, whereas additional political "language" and technological understanding will be developed throughout the remainder of her education.

95) Research Title: The Development of Interactive Interpretation of Invasive Species in a Southwest Florida Nature Center

Student Author(s)

Skylar Ralph
Environmental Studies (B.A.)

Faculty Mentor(s)

Heather Skaza-Acosta
Marine & Ecological Sciences

Abstract: Environmental education and interpretation is critical to teaching learners of all varieties about the natural world. The Conservancy of Southwest Florida encourages education for sustainability through interpretation, as well as a variety of family-friendly activities. A primary goal is educating the public about invasive species in Southwest Florida. The current interpretive space is underutilized and requires docent guidance. The purpose of this project is take a first step toward the development of the interpretive space by relying upon literature support and the design of existing interpretive displays to inform the design of an interactive interpretive piece that can be utilized by learners of all ages. Existing research and interpretive displays will be reviewed and analyzed for emerging themes in both interpretation design and content. Identified themes and design guidance will be applied to the content of Southwest Florida's invasive species. The outcome of this research will be a recommended interpretive plan for the existing space that engages all audiences. Also discussed are next steps that should aim to evaluate the usage of the space for articulated learning goals.

96) Internship Title: Lee Country parks and recreation Conservation 20/20

Student Author(s)

Jared Wilkey
Environmental Studies (B.A.)

Internship Mentor(s)

Kathy Cahill
Lee County parks and Recreation

Jason Boeckman
Lee County parks and Recreation conservation 20/20

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: This internship was completed under the direction of the Conservation 20/20 team from the Lee Country parks and recreation facility located at Terry Park in Ft. Myers. The internship took place between August 21 and December 22. Activities performed included invasive species identification and control, preserve maintenance, controlled burns, and water quality monitoring at two preserves and one park on Pine Island. These activities contributed to my career goals by teaching me how to work with a large group of government employees towards the same goal. As an environmental studies major, this internship gave me crucial experience working in the environment towards sustainability.

97) Research Title: Development of Thermistor Array for Residual Limb Temperature Mapping

Student Author(s)

Abel Perez de Alderete
Bioengineering (B.S.)

Faculty Mentor(s)

Derek Lura
Bioengineering

Grant Support

Other Grant

Abstract: “Many lower limb amputees experience thermal discomfort as a result of wearing a prosthesis. The development of new prosthetic technology to address thermal discomfort requires an understanding of how activity affects residual limb skin temperature” [1]. The purpose of this project was to develop a portable temperature sensor device for use in a prosthetic socket for individuals with "Below the knee" amputations. The Thermoresistive properties of thermistors were used, along with the Feather Addaloger circuit board, to create a skin surface thermistor array that will take 10 separate readings at the same time. The development and execution of this project included the design and manufacturing of the connections within the circuitry, the development of the code from an existing device that used a different board, and the development of the device enclosure. [1] G. Klute, E. Huff and W. Ledoux, "Does Activity Affect Residual Limb Skin Temperatures?" Clinical Orthopaedics & Related Research, vol. 472, (10), pp. 3062-3067, 2014. Available:

<https://login.ezproxy.fgcu.edu/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=98054424&site=ehost-live>. DOI: 10.1007/s11999-014-3741-4.

98) Internship Title: Biotech Consulting Firm Internship

Student Author(s)

Kyle Philpot
Environmental Studies (B.A.)

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: This internship was completed at Biotech Consulting Firm in Orlando, Florida. under the direction of Jon Avance. This internship consisted of surveying conservation areas, spraying invasive plant species, tortoise evacuation, and bald eagle monitoring. These responsibilities contributed to my career goals by teaching me hands on what it would be like to work as a biologist for most companies.

99) Research Title: Lightcurve Analysis of Main Belt Asteroids

Student Author(s)

Austin Brown

Forensic Studies (B.S.)

Faculty Mentor(s)

Micheal Fauerbach
Chemistry & Physics

Grant Support

Nasa Space grant

Abstract: This study was done to find the rotational periods of three main belt asteroids. The asteroids we chose to observe were chosen due to a large uncertainty in the previously found rotational periods, and our goal is to lessen the uncertainty in the rotational period, and compare our data to previous observation results. We gathered our data using the Cerro Tololo Inter-American Observatory telescope, and produced high quality imaged of the target asteroids, and analyzed the changes in produced light to find a repeating pattern over time (the rotational period) through a process known as light-curve photometry. We do this method of rotational period analysis because the observed asteroids are too small to look for landmark features that would appear every rotation, and using surface features would be less precise when compared to photometry.

100) Internship Title: Herc Rentals Environmental Affairs Intern

Student Author(s)

William Lange
Environmental Studies (B.A.)

Internship Mentor(s)

Michelle Cevallos
Herc Rentals

Faculty Mentor(s)

Mary Kay Cassani
Marine & Ecological Sciences

Abstract: My name is William Lange and I am working as an intern at Herc Rentals facility support center in Bonita Springs under the supervision of Michelle Cevallos. As the Environmental Affairs Intern my responsibilities include researching and managing city, county, state, and international environmental policy regulations. All which pertain to the daily business functions of the company and its required compliance. This experience provides ongoing projects with a multidisciplinary relationship of understanding environmental regulations and policy that can impact the daily nature of business and cause harm to the environment. Some of these responsibilities are procuring vendor services for the reconditioning of aboveground and underground storage tanks. Reviewing and compiling a working list of regulatory agencies responsible for reporting and enforcing laws; primarily which pertain to daily branch operations for above ground and underground storage tanks. I review applications for permits at the city, county and state level; paying those invoices as needed. I maintain branch compliance for the

storage, handling, and transportation of hazardous materials used by Herc Rentals. I review and investigate Phase I and Phase II environmental reports and see the process for which due diligence is assured on new branch locations. Use Google Earth Pro as a GIS system for branch layouts and pertinent information related to future and current branch locations. Work with contracted vendors who provide environmental services related to federal and state compliance associated with Spill Prevention Control Countermeasures. As well as, clarification of policy and other environmental regulations as needed in the absence of Environmental Manager.

Oral Presentation: Research Title: Dark Matter at the LHC and Beyond

Student Author(s)

Anthony Grippo
Bioengineering (B.S.)

Faculty Mentor(s)

Jeffrey Hutchinson
Chemistry & Physics

Grant Support

Seidler Scholarly Collaborative Fellowship

Abstract: Since the 1930s scientists have known about an elusive presence in the universe known as dark matter. Different than anything observed at the time, dark matter minimally interacts with the fundamental forces of physics, with the exception of gravity, making it nearly impossible to detect with standard methods. Currently, scientists are trying to artificially create dark matter by using large particle accelerators across the globe. This research simulates theorized dark matter signals in particle accelerators by using open-source software to generate and analyze simulated events. This project examines models of dark matter where it interacts with leptons (electron like particles) through lepton like particles referred to as “partners”. Dark matter particles, although directly undetectable, are inferred from the amount of energy and momentum that cannot be attributed to detectable particles after a collision. There are currently known physical processes that can generate “dark matter like” signals, one focus of this project is to simulate true dark matter signals and find methods in which to differentiate these signals to understand the sensitivity to current and future colliders to dark matter signals.

Oral Presentation: Research Title: A Machine Learning Approach to Where's Waldo

Student Author(s)

Chance Hamilton
Mathematics (B.S.)

Joshua Teeter
Mathematics (B.A.)

Faculty Mentor(s)

Erik Insko
Mathematics

Grant Support

Seidler Scholarly Collaborative Fellowship

Abstract: Join us, as we discuss how we utilize machine learning to teach a computer how to play Where's Waldo. We will explore how we are able to combine existing machine learning and image processing techniques to create a simple algorithm that can successfully locate Waldo every time. We then integrate this simple program with our version of a Neural Network to address some of the short comings in the original program. We will conclude with the final results of this program, which I am pleased to report has maintained a success rate of 100%.