



The University Of

T A M P A

CNIHS UNDERGRADUATE
research
SYMPOSIUM

April 27, 2018

**College of Natural and Health Sciences
6th Annual Undergraduate Research Symposium
April 27, 2018**

Schedule:

2:00 – 3:00 PM:

Keynote Presentation

Desika Narayanan, Ph.D.

"How the Brightest Galaxies in the Universe Formed"

Board Room, Vaughn Center, 9th Floor

3:00 – 5:00 PM:

Poster Presentations

Crescent Club, Vaughn Center, 9th Floor

Awards for best poster presentations will be announced immediately following the poster session.

Symposium Organizers: Dr. Eric Werner, Dr. Simon Schuler, and members of the Beta Beta Beta Biology Honor Society.

The CNHS Undergraduate Research Symposium provides an opportunity for students within the College of Natural and Health Sciences to present their current or recently completed research projects in a poster format. The research may have been performed as part of a course, an Honors Research Fellowship, or an independent project conducted with a faculty mentor. Abstracts for all poster presentations are included in this booklet and are listed in alphabetical order based on the presenting author's last name.

The Symposium was initiated in 2013 through a generous grant from the UT Board of Fellows. Further financial support from the Office of the Dean of CNHS, the Department of Biology and Department of Chemistry, Biochemistry and Physics is also acknowledged. Finally, the organizers would like to thank all presenters, faculty mentors, and faculty judges for their participation in this event.

Keynote Presentation

Desika Narayanan, Ph.D.
Assistant Professor of Astronomy
University of Florida

Biography: Desika Narayanan was raised just up the road in Gainesville. He enjoyed attending the University of Florida during Spurrier's greatest years, and then moved out west to the University of Arizona for graduate school. After a few postdoctoral appointments at Harvard and again at the University of Arizona, he moved to Haverford College near Philadelphia, where he was an assistant professor for 3 years. He's now back in Gainesville as an assistant professor at the University of Florida.

Seminar Abstract: We now know that the Universe is roughly 14 billion years old. In the last decade, we have begun to characterize galaxies forming at the earliest epochs, just 0.5 billion years after the Big Bang. These galaxies represent complex ecosystems. They are full of massive gas reservoirs, exhibit large rates of exploding stars, and drive powerful galactic winds. The brightest subset of these galaxies are especially perplexing. Despite the fact that they are forming stars at amazing rate of >1000 suns per year, their enormous output of visible light is entirely enshrouded by huge veils of obscuring dust. For decades, astronomers have tried to understand the origin of how these brightest galaxies in the Universe form. In this talk, I'll discuss the how these galaxies were discovered, what we know about them, and conclude with my own theory for the origin of the brightest galaxies in the Universe.

Submit your Research Paper to *Acta Spartae*!

Along with your poster for the CNHS Undergraduate Research Symposium, please consider submitting a 3-5 page research paper to *Acta Spartae*, UT's new journal of science and mathematics. *Acta Spartae* is an annually-published refereed publication of research articles authored by undergraduate students at UT. The Journal will be published in a printed bound volume once a year, as well as in electronic form on the *Acta Spartae* website on a continuous basis as papers are submitted and accepted. There is no charge for publishing, and each student who has a paper appearing in the Journal will receive a free copy of the bound volume.

Papers received and accepted from those students chosen as category winners at the CNHS Undergraduate Research Symposium will be published as *Highlighted Research* in the Journal!

To submit an article, please visit our website: <http://www.ut.edu/actaspartae/>, and visit our author instruction page: <http://www.ut.edu/actaspartae/authors/>.

Submission deadline for the September 2018 issue is June 1, 2018.

ABSTRACTS

* Denotes authors presenting at symposium

(1) The Effect of Parasite Load of *Agrobacterium tumefaciens* on Growth of Tomato Plants

Aubri Bearden*¹, Holly Caires*¹, Madi Ewing*¹ and Dr. Taegan McMahon¹

¹Department of Biology, The University of Tampa

This study analyzes the effects of *Agrobacterium tumefaciens* parasite load on tomato plant development, and how this bacterium may impact tomato plants in the agricultural industry. Here, we exposed tomato plants to 0, 3, or 6 *Agrobacterium tumefaciens* galls (galls were introduced with an *A. tumefaciens* filled pin prick; n = 3 plants/treatment). Each week the plants were watered on Tuesday and measured on Thursday. These measurements included stem length, number of leaves, number of flowers, number of galls, and size of galls, and were recorded weekly (for 4 weeks). At the end of the experiment surface area and leaf health will be recorded. Results suggest that parasite load has a direct negative effect on the overall health of the tomato plants. This study will provide further implications for future research involving *Agrobacterium* mediated transformations in the tomato crop industry.

(2) Metabolism of Seahorses (*Hippocampus zosterae*) with Increasing Fluid Velocity

Alexis S. Bernard*¹, Marissa B. Netti*¹, Maria J. Eshelman*¹ and Samantha E. Scrudato*¹

¹Department of Biology, The University of Tampa

Seahorses are morphologically unique among bony fishes; compared to their relatives, they are notoriously weak swimmers. So, to withstand ocean currents, seahorses will anchor themselves to plants and substrate to not get carried away. In this study, metabolic rate of seahorses was measured using a closed-system hydro flume with a dissolved oxygen probe submerged inside, measuring the rate of oxygen consumption over 20-minute intervals for no, low, medium, and high velocity currents. Due to their poor swimming abilities and body shape, metabolic rates should increase with increased drag forces created by increased fluid velocities.

(3) Sampling Study of *Donax* Clams on Beaches Varying in Human Activity

Logan Blascovich*¹ and Jaja Titus*¹

¹Department of Biology, The University of Tampa

The coquina clam, *Donax variabilis* is a widely dispersed coastal bivalve stretching from Virginia, around Florida, and then all the way to Texas in the Gulf of Mexico. These clams use wave energy to stir up nutrients and oxygen as they burrow into the sediment. An abundance of clams indicates there is enough primary production, space, and relatively stable conditions to support the swash riding population. Understanding the relationship between clam density and human activity as well as other environmental factors can be used to make assumptions of the health of the beach system; beaches that have a low amount of human disturbance and suitable environmental conditions will have the largest donax density. Core samples were taken to count clams at three beaches near Tampa, FL from different levels in the swash; above swash, in the swash, and fully submerged. The beaches were selected based on the amount of people present on average (Clearwater Beach has a high human density while Gandy Beach has almost none) The null hypothesis (H0), the relationship between clam and human density is insignificant, is consistent with the results found in the experiment. However, recent cold weather may have interfered with the usual donax density.

(4) Tacrolimus Dosing with Roux-en-Y vs. Duct-to-Duct Anastomoses

Nathan Bleckley*¹, Ann Dickey*¹, Dr. Drew Silverman² and Dr. Jacentha Buggs^{3,4}

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A vital component of organ transplantation consists of the recipient's immunosuppression treatment post-transplant in order to prevent graft rejection. The specific type of surgical connection can often impact the graft's absorption level of these immunosuppressive treatments. In-depth retrospective chart reviews were conducted on patients who had undergone deceased donor liver transplantation at Tampa General Hospital between the years of 2011 and 2016. The gender and age-matched cohort consisted of consecutive patients surgically connected with either roux-en-y biliary anastomoses or duct-to-duct anastomoses. By examining the transplant recipients' medications, the cumulative amount of tacrolimus dose required for patients post-liver transplantation to achieve therapeutic levels was calculated. Additionally, the number of days it took patients to achieve therapeutic levels were recorded. The one-week mean tacrolimus dose for the roux-en-y anastomoses group is 0.4134 (mg/kg) and the one-week mean dose for the duct-to-duct anastomoses group is 0.3402 (mg/kg). In comparison of therapeutic achievement, 22 of the 41 roux-en-y patients achieved therapeutic tacrolimus levels during week-one, while only 9 of the 41 duct-to-duct patients achieved therapeutic levels during week-one. These data suggest patients with roux-en-y anastomoses require higher mean tacrolimus doses than patients who receive duct-to-duct anastomoses in order to achieve therapeutic levels.

(5) Fishing for Disorder: Uncovering disordered proteins among copy number variants in *Danio rerio*

Anthony Brando*¹ and Dr. Kimberly Dobrinski¹
¹Department of Biology, The University of Tampa

Stretches of DNA vary within individuals. Known as Copy Number Variants(CNVs), these stretches may contribute to what makes individuals unique but also have been linked to many known diseases such as Cancer. Intrinsically disordered protein regions(IDPs) are proteins whose sequence allows for changes in 3-dimensional folding within proteins under varying cellular environmental conditions. For this study, Zebrafish was the model organism because it is highly copy number variable. Using a map of the zebrafish genome, genes in Copy Number Variable regions were searched using engines and databases such as Ensembl, PONDR, ANCHOR and IUPred, to discover their potential for disordered regions. These proteins were then examined to find their function and functional binding partners using the STRING database. The BLAST tool from NCBI was used to look for homologous proteins within humans. If this protein was found in the human genome, it was examined for disorder and functional binding partners and to see if the gene for the protein fell within the CNVs in humans by using data from the 1000 Genomes Project. Of the Copy Number Variants examined so far ~8% contained IDPs.

(6) Tissue specific compensatory regulation of gene expression associated with copy number variants in *Danio rerio*

Sherrea Brown*¹ and Dr. Kimberly Dobrinski¹
¹Department of Biology, The University of Tampa

This study seeks to compare copy number variants (CNVs) and gene expression levels as well as miRNA expression levels in the kidney and liver of *Danio rerio*, commonly known as zebrafish. CNVs refer to the loss or gain of stretches of DNA within the genome when compared to a reference genome. Array comparative genomic hybridization was used to determine regions of the zebrafish genome that contain CNVs. Expression arrays with probes for all zebrafish exons were completed for liver and kidney and Expressive quantitative trait loci analysis was used to explore associations between gene traits and CNVs. CNVs affect gene expression directly by overlapping where genes are present or indirectly if there is no overlap. Prior studies indicate there may be a high incidence of indirect associations indicating regulation associated with CNVs. To investigate mechanisms for regulation, microarrays were carried out to measure miRNA expression in liver and kidney. miRNAs are a type of non-coding, regulatory, RNA. Evaluation of these data will determine if CNV is associated with miRNA regulation of gene expression. An increase or decrease in copies of certain genes when not regulated may lead to heightened expression of genes that cause diseases, such as cancer.

(7) Crab Population Distribution Among Various Seagrass Densities

Jessica Buerger*¹ and Payton Lemoine¹
¹Department of Biology, The University of Tampa

The sea grasses in Tampa bay provide food for organisms as well as protection from predators where at the edges of the beds there tends to be a greater bivalve density. The center of the beds provides more protection; one type of organism that takes advantage of that protection is the crab. Most crabs are omnivores that can feed on plants as well as animals like bivalves that are common in seagrass beds, however, they are still vulnerable to predation. Because of their vulnerability, it was predicted that the general crab populations would be more concentrated in denser seagrass where they have more cover. To test this, a push net and quadrants were used to determine the crab density and seagrass density, respectively, at ten different sites throughout the Old Tampa Bay; 5 sites with high seagrass density and 5 with low densities. In more dense seagrass beds twice as many crabs were found as in the low-density beds. This suggests that the need for protection is more dominant than the need for higher prey abundance.

(8) Effects of Salinity Variations on the Reproductive Success and Egg Transfer in the Dwarf Seahorse, *Hippocampus zosterae*

Brittany Bulger*¹ and Emily Connor*¹

¹Department of Biology, The University of Tampa

Determining the effects that abiotic factors partake on animal species, particularly those in seagrass beds, is a great conservation tactic. Our research focused on the effect changes in salinity have on the reproductive success in the Dwarf Seahorse, *Hippocampus zosterae*, by evaluating a favorable salinity for successful mating and reproductive behavior to occur; based on the amount of time needed for male seahorses to become pregnant. To do so 24 seahorses were separated into male-female pairs and exposed to varying salinities (23, 27, 32 ppt). Behavioral observations were made during the time between the start of the trial and when a male seahorse became pregnant; noting mating opportunities. Based on statistical analyses and behavioral observations, it was concluded that salinity did not have a significant impact on pregnancy. There was a slight increase in the number of days needed for pregnancy as salinity increased, however this was not significant. The results outlined can be utilized in understanding which abiotic factors impact the reproductive success of Dwarf Seahorses and can be used to manage their current vulnerability status. As we continue to see how human impacts degrade seagrass beds it is important to understand how habitat loss is impacting marine ecosystems.

(9) Metabolic Rates of *Asteroidea* at Different Light Intensities

Samantha Byrne*¹, Bianca Garsys*¹, Lauren Danna*¹ and Rebecca Garcia*¹

¹Department of Biology, The University of Tampa

The species *Asteroidea*, commonly known as starfish, are sensitive to different levels of light intensities. Light has shown to have an effect on the activity level of these common aquatic organisms. In order to study the effect that light intensity has on the metabolic rate of *Asteroidea*, the concentration of oxygen dissolved in the water must be measured. The purpose of this experiment is to determine the relationship between the metabolism of *Asteroidea* and light intensity. It has been hypothesized that if the light intensity is low then the starfish will have an increase in basal metabolic rate (BMR) because they will expend more energy to move to areas of higher light intensity when predators are anticipated. This experiment was performed by placing a starfish in three chambers, each at different light intensities; high light, natural light, and dark. High light intensity used a lamp over the starfish, while the dark intensity was created by covering the chamber. The BMR was measured using a LabQuest and a DO probe to determine the amount of dissolved oxygen in the water. The levels of light intensity have a relationship to the metabolic rates of *Asteroidea*.

(10) The Effects of *Agrobacterium tumefaciens* on Husky Cherry Red and Early Girl Tomato Varieties

Matthew Cammett*¹, Madeline Feeney*¹, Koki Fujii*¹ and Dr. Taegan McMahon¹

¹Department of Biology, The University of Tampa

Agrobacterium tumefaciens causes Crown Gall disease in tomato plants by incorporating its bacterial genes into the host cell genome. Insertion of the gene causes the host to overproduce auxins and cytokinins resulting in growth malfunction and gall formation that eventually leads weakening, and possibly death, of the infected plant. Here, we determined if two varieties of *Solanum lycopersicus*, tomato plants, exhibited a difference in susceptibility to infections associated with *A. tumefaciens*. Two variants of tomato plants, Husky Cherry Red and Early Girl, were

pricked with *A. tumefaciens* at three sites on the stem and monitored for gall formation and size, leaf number and surface area, and stem length and diameter. The data suggest that the more robust and bigger variant, Husky Cherry Red, may suffer less from *A. tumefaciens* exposure than the smaller Early Girl variety. Knowing there are varieties of tomatoes that are more resilient to *A. tumefaciens* infection may be agriculturally beneficial in the event of a massive outbreak.

(11) How Temperature Affects the Host-Parasite System: *Caenorhabditis elegans*-*Batrachochytrium dendrobatidis*

Jysiane Cardot^{*1}, John Fernandes^{*1}, Zara McQuaid^{*1} and Dr. Taegan McMahon¹

¹Department of Biology, The University of Tampa

An infectious disease caused by the pathogenic chytrid fungus *Batrachochytrium dendrobatidis* (Bd), has been the cause of death and extinctions of many amphibians. In this experiment we observed the effects of temperature and the ability of Bd to parasitize the soil nematode, *Caenorhabditis elegans*. The nematodes were placed individually in agar wells and were dosed with either no Bd (controls) or 1×10^6 zoospores/mL of Bd (Bd treatment). The nematodes were then incubated at one of three temperatures: 17°C, 23°C, and 27°C. We monitored the nematodes daily for mortality, mobility, and fecundity. The nematodes incubated at 27°C had a higher mortality compared to the other nematodes (17°C and 23°C). This data suggests that temperature would influence the effectiveness of nematodes as reservoir hosts of Bd.

(12) The Impact of *Agrobacterium* on *Solanum lycopersicum* Growth and Development Under Different Chronic Water Levels

Amanda Callahan¹, Jessica Morton^{*1}, Jessica Testani^{*1} and Dr. Taegan A. McMahon¹

¹Department of Biology, The University of Tampa

Crown gall disease is a plant disease caused by the presence of *Agrobacterium tumefaciens*, a soil dwelling bacterium. This disease is often characterized by the presence of galls, an uncontrolled cell growth on the plant. These galls redirect water and nutrient flow effecting the overall health and growth of the plant infected. Systemic infections of *A. tumefaciens* in *Solanum lycopersicum* were investigated when exposed to different chronic water levels. The infection was analyzed for impact on host plant health, and development. During the experiment the stem length, quantity of leaves, quantity of flowers and size of tumors were measured weekly. At the end of the experiment the total surface area of the plant was measured. The plants that received an ideal amount of water, were defined as the 100% water treatment, had overall higher growth measurements than those that received half of the ideal amount of water, defined as the 50% water treatment. This low chronic water level could explain some of the delayed growth common in plants with crown gall disease, as galls lose water faster than the plants themselves.

(13) *Elysia subornata* breeding and observation of egg and larval development

Sara Casareto^{*1} and Dr. Michael Middlebrooks¹

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Elysia subornata is of the sacoglossan sea slug species native to the Caribbean and Florida. *E. subornata* typically hatch after metamorphosis, undergoing en-capsulated development, emerging as juveniles. Specimens from Tampa Bay may be exhibiting different developmental patterns. In order to better understand development, *E. subornata* were collected from Tampa Bay and bred in the laboratory. Egg masses were collected and uncleaved ova diameter, and yolk width were recorded. Once hatched, offspring did not exhibit the expected encapsulated development, but instead hatched as veliger larvae. Larva shell length was recorded after hatching. Mean uncleaved ova diameter was $87.51 \mu\text{m} \pm 6.37 \mu\text{m}$, and the mean egg yolk width was $32.71 \mu\text{m} \pm 8.59 \mu\text{m}$, both of which are much smaller than reported for *E. subornata*. Eggs had a mean larval shell length of $188.9 \mu\text{m} \pm 24.08 \mu\text{m}$, which is smaller than reported. Veliger larvae did not metamorphose in the presence of several species of *Caulerpa* sp. algae, which along with their small size suggests these are planktotrophic. This evidence shows that *E. subornata* displays developmental plasticity within its range. Additional studies should be conducted to explain this variation and how it affects *E. subornata* population dynamics and ecology.

(14) Many-body Convergence of the Interaction Energies in CO₂ Systems

Jasmine Cherry*¹ and Dr. Olaseni Sode¹

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The importance of CO₂ injection in enhanced oil recovery, sequestration using metal organic frameworks, and crystal structure prediction make the systematic study of carbon dioxide essential. Importantly, a clear description of the many-body properties of CO₂ is especially necessary when considering condensed phase applications. In order to address this issue, a hierarchy of wavefunction theory methods was used to clarify the energetic properties of carbon dioxide. We explore the many-body convergence of the electronic energy for clusters of carbon dioxide containing as many as five molecules up to the CCSD(T)-F12 level of theory with an aug-cc-pVDZ basis set. Also, we remark on the fast decay of the three-body and higher terms at increasing intermolecular distances in isomers of the carbon dioxide trimer, tetramer, and pentamer.

(15) It's a Fish! It's a Plane! No, It's a Hammerhead!

Taylor Cunningham*¹, Sara Casareto*¹, Dr. Daniel Huber¹, Kyle Mara², Jonathan Ford³ and Summer Decker³

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The hammerhead sharks are characterized by an extremely unusual head morphology, the cephalofoil (= “head wing”). Studies have demonstrated the cephalofoil’s use in maneuverability and improved sampling area for sensory systems, but the fluid dynamics of the cephalofoil has received little attention. In this study, six hammerhead species were examined to determine if cephalofoil shape affected fluid drag during locomotion. Head models were 3D printed from reconstructed CT scans and fluid drag measurements were performed at varying angles of attack in a recirculating flume, from which drag coefficients were derived. Results support the hypothesis that cephalofoil size and shape affect fluid drag, and ultimately swimming performance.

(16) The Effects of Prop Scars on Size & Abundance of Juvenile Blue Crabs

Taylor Cunningham*¹, Emily Lang*¹ and Haley Nagorsen*¹

¹Department of Biology, The University of Tampa

The effects of healthy seagrass ecosystems as nursery habitats has been widely studied throughout ecology. The negative impacts of boat traffic and their propeller scars have been suggested to reduce blade density. In this study, we examined the effects of prop scarring on the abundance and size of juvenile blue crabs, *Callinectes sapidus*, by comparing protected to scarred regions of seagrasses in Tampa Bay. Using pushnets and quadrats, we captured juvenile blue crabs and measured blade counts in each habitat. We analyzed the carapace area of crabs caught in both environments. We expected that areas of seagrasses exhibiting prop scars would have a lower blue crab abundance and have crabs with a smaller carapace area. However, we found that there was no significant difference in blue crab abundances between the two sites despite the differences in blade counts. There appeared to be a trend towards larger crabs being found in areas where prop scars were present but more data collection is required to confirm this. By continuing to study the relationships between seagrass health and abundances of populations, we can better determine the proper methods of conservation and examine the potential trophic cascade associated with bottom-up effects in seagrasses.

(17) Computational Investigation of Binding Energetics of a CMPO Ligand for Selective Lanthanide Extraction

Mikayla Y. Darrows*¹, Dr. Eric J. Werner¹ and Dr. Olaseni Sode¹

¹Department of Chemistry, Biochemistry, and Physics; The University of Tampa

The development of ligands that selectively bind to lanthanide (Ln) and/or actinide (An) ions found in nuclear waste is an important area of research. When isolated, lanthanides have various applications such as contrast agents in medical imaging and as advanced luminescent materials. In order to understand the selectivity of potential f-element extractants, computational tools were used to model a tripodal ligand containing three carbamoylmethylphosphine

oxide (CMPO) groups attached to a tris(2-aminoethyl)amine (TREN) or a tris(2-aminopropyl)amine (TRPN) cap bound to seven lanthanide ions (Ce^{3+} , Eu^{3+} , Gd^{3+} , Tb^{3+} , Dy^{3+} , Ho^{3+} , and Yb^{3+}). These structures were optimized with the NWChem electronic structure package using the PBE0 density functional, a 3-21G* basis set, and the Stuttgart RSC 1997 effective core potential. Each lanthanide, ligand, and Ln complex geometry was optimized individually and the binding energy was computed. The WebMO user interface was used to calculate bond distances between the ligand and lanthanide. Coordinating NO_3^- ions were also included and their effects on the binding energy and geometry are reported.

(18) Evaluation of the Feeding Preferences of Sea Urchin *Lytechinus variegatus*

Stephanie DeRuzzo*¹ and Heather Johnson*¹

¹Department of Biology, The University of Tampa

Lytechinus variegatus plays a key ecological role in shallow water habitats such as seagrass beds as well as being a model organism for developmental studies. The feeding preferences of *L. variegatus* were explored in order to maintain healthy populations both in the wild and in a laboratory setting. The evaluation of preferred food source was conducted using agar plates of three food options and a control (spinach, seagrass, and brine shrimp). Urchins were observed for a three hour window and left to feed for a 24 hour period. According to the results obtained, there was a significant preference in food source. The higher protein content food source (brine shrimp) was preferred over a vegetarian food source (spinach and seagrass). The data determined that a laboratory food source (spinach) was preferred over a natural food source (seagrass). Additional data showed that there was no statistical difference between the mass of urchin and its food preference. These results give important insights to how *L. variegatus* should be cared for in a laboratory setting and aid future conservation efforts.

(19) Discovering fungal strain differences: comparing morphology of several virulent strains of *Batrachochytrium dendrobatidis* (Bd) from Louisiana, California and Panama

Sarah E. Detmering*¹, Caitlin L. Nordheim¹, Dr. Stanley A. Rice¹ and Dr. Taegan A. McMahon¹

¹Department of Biology, The University of Tampa

Amphibians around the world are experiencing mass population loss and some species extinction due to a fungus called *Batrachochytrium dendrobatidis* (Bd). Bd is an aquatic fungus that attacks the keratin in the skin of amphibians. This is a highly researched fungus, but we still do not know much about the differences between the fungal strains. Here, we are examining the size of the infectious zoospores and the developing zoosporangia in four strains of Bd (measurements were made with on SEM images with ImageJ). The diameter of the zoosporangia, the number of discharge tubules and their diameter, and the diameter of the zoospores were then compared across four strains. Preliminary data shows that there are differences in strains in terms of zoospore and zoosporangia size and in terms of number of discharge tubules. Understanding the morphology of different Bd strains may further inform us about the differences in virulence and detectability among strains.

(20) Contribution of chlorination by-products in the water leading to the head and neck cancer prevalence in Tampa Bay

Dr. Kimberly Dobrinski¹, Dr. Michele Crosby², Dr. Matthew Mifsud³, Siara Isabella*¹ and Aaron Joseph*¹

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²Department of Chemistry, Biochemistry, and Physics, The University of Tampa

³University of South Florida

Trihalomethanes (THMs) are a group of four chemicals formed during the disinfection and chlorination of water. Unfortunately, these by-products accumulate in sources such as pipes for drinking water and have been linked to various fetal defects and cancers. Each of the four THMs are on the Environmental Protection Agency's published list of regulated concentrations for disinfection by-products. While human papilloma virus (HPV) is a main cause of oropharyngeal cancers within the tongue and tonsils, this study focuses on the oral cavity's susceptibility for DNA damage by carcinogenic chemicals in the water. Rates of head and neck cancers in Pasco and Pinellas counties are much higher than Florida's average rate. While smoking has decreased, head and neck cancer rates have not followed the trend. Analysis of the trihalomethane concentration via head-space gas chromatography will be used to

compare local concentrations to those regulated by the EPA. A spatial analysis comparing concentrations of THM to prevalence of head and neck cancers throughout 31 zip codes across the Tampa Bay area will be completed using Geographic information systems. Prospective studies will include correlation between the prevalence of head and neck cancers and levels of trihalomethanes.

(21) Population Structure and Genetic Differences Between Two Morphological Types of Eastern Mosquitofish (*Gambusia holbrooki*) in the Tampa Bay Area

Grayce Dyer*¹, Emily Williams¹, Dr. Natalia Belfiore¹, William Klingbeil¹ and Dr. Mark McRae

¹Department of Biology, The University of Tampa

Eastern Mosquitofish, *Gambusia holbrooki*, are small freshwater fish native to the southeastern United States and are often introduced to ponds and streams to control mosquito populations. Although they are widespread within their native range, the habitats in which they reside are often isolated, and sometimes seasonal, limiting gene flow between populations. In previous research, two morphological types of mosquitofish were identified in relation to predatory pressure. To better understand the relationships among local mosquitofish populations and a possible explanation for the morphological variance, we are using multiple microsatellite markers to compare populations with predators to those without. We sampled six different populations of *Gambusia holbrooki* in the Tampa Bay area, four with predators, and two without and used statistical analysis of these microsatellite markers to draw conclusions about the relationships among these populations.

(22) The Effect of Intermittent Noise on the Behavior of *Lagodon rhomboides*

Christa Edwards*¹, Claire Stites*¹ and Dr. Heather Masonjones¹

¹Department of Biology, The University of Tampa

Pollution is often thought of as a hard substance that enters the environment. It can, however, also be a form of energy such as light or noise. As development and technology advance, human settlement on the coast and access to the ocean increases causing more noise pollution throughout the marine environment. Organisms residing in the marine environment hear sound and may be affected by it. An experiment was performed to determine the impact of an intermittent sound burst on juvenile *Lagodon rhomboides* (pinfish). The fish were collected from seagrass beds in Tampa Bay and brought into the lab. The experiment consisted of two treatments: sound and no sound (control). The pinfish were treated with the intermittent noise of a boat horn using an underwater speaker (85.5 dB), and their behavior was recorded. Their behaviors included: hiding, darting, and total distance moved. The data suggest that sound bursts do not have an effect on pinfish behavior. While these findings may imply sound does not impact fish, future experiments could be conducted in the field for more accurate results. Knowledge gained from this experiment can be used to better manage waterways in order to protect valuable seagrass ecosystems from noise pollution.

(23) We're not the only population that parties all night long: A study of nocturnal behavior in Sweetings Pond seahorses, *Hippocampus erectus*

Jessica Elson*¹, Dr. Heather Masonjones¹ and Dr. Emily Rose¹

¹Department of Biology, The University of Tampa

The island of Eleuthera, Bahamas contains an unusual population of seahorses in Sweetings Pond, possessing a range of morphological characteristics that overlap between two species of seahorses found in the region. Our earlier research established that Sweetings Pond seahorses significantly differ in shape and size from either of their potential parent populations, but genetically are *H. erectus* (Rose, Masonjones, Jones, 2016). To continue our analysis of the possible sub speciation of this population, we investigated nocturnal behavioral and population attributes. This was accomplished through transects to quantify their population density, and observations of potential predators. Quantifying these aspects at day versus at night has never been reported before, allowing us to provide potentially taxonomically altering data. Seahorses were observed engaging in non-cryptic behaviors at night, including congregating in large social groups, and perching on the top of vegetation. This is very different to the behavior observed in the daytime, which was comprised of much smaller congregations and, sitting lower on holdfast vegetation. These unusual actions could be attributed to the lifestyle of octopus and spider crabs, both

potential predators active at night (Harasti et al., 2014). Considering *H. erectus* is listed on the IUCN Red List as Vulnerable, the identification of these pond seahorses as a unique subpopulation of *H. erectus* has crucial conservation implications.

(24) Foraging Depth of Whale Shark Opsins

Regan Ewald*¹ and Dr. Jeffrey I. Fasick¹

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Data is currently lacking on the foraging habits of *Rhincodon typus*, whale shark, due to their migration patterns and their rarity. Predicting foraging grounds in the attempt to find more whale sharks is limited and can be a long waiting game. Determining a preferred foraging level would improve the accuracy of location predictions, saving both time and money. Retinal visual pigments, rhodopsin and melanopsin, match foraging depths of marine animals. NCBI Blast and CLC Viewer were used to locate and examine rhodopsin and melanopsin sequences of *Rhincodon typus* within the genome. The genes were cloned and expressed to test absorbance maxima of rhodopsin and both absorbance maxima and deactivation kinetics of melanopsin. The resulting sequences were analyzed at positions 83, 292, and 299. Both absorbance maximas of *Rhincodon typus* matched terrestrial animals with rhodopsin at 500 nm and melanopsin at 480 nm. Melanopsin was predicted to deactivate similarly to vertebrates with color vision. Although, *Rhincodon typus* is a rod monochromat which lacks cones, the deactivation kinetics are predicted to be different from other rod monochromats e.g. whales.

(25) Temperature and Salinity Implications on Metabolic Rate in Native and Invasive Species

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Abiotic stressors such as salinity and temperature impact the fitness of organisms, specifically in aquatic organisms. Fish are extremely sensitive to variability in temperature and salinity because they are ectotherms that must conform to external temperatures, and their high skin permeability makes them sensitive to salinity changes. In this experiment, we will be observing how salinity and temperature impact metabolic rate as a measure of fitness in two fish species present in a stream within The University of Tampa's Plant Park. The mosquitofish (*Gambusia affinis*), a Florida native, and the green swordtail (*Xiphophorus hellerii*), an invasive species, co-inhabit the stream. The Plant Park stream is unique, because one side is fed from a freshwater, cold spring and the other receives backflow from the Hillsborough River, a warm, brackish water source. Changes in metabolic rate will be measured via levels of dissolved oxygen in multiple water buckets that vary in temperature and salinity. This will ultimately indicate the optimum ranges exhibited by both species. This experiment will provide insight into why the introduced species, the green swordtail, is able to successfully invade a proportion of the stream but not fully outcompete the native mosquitofish.

(26) Identifying Candidate Moving Groups in the Gaia Catalog

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Gaia is a European satellite mission recording positional and radial velocity measurements for a billion stars in order to create a three-dimensional map of the Milky Way Galaxy. Stars form in groups within giant molecular clouds and are gravitationally bound in what is known as an open cluster. The members of an individual cluster share similar kinematic properties as the cluster orbits the Galactic center. Over time open clusters dissolve due to equipartition or tidal encounters; however the former members still share common motions despite being spread out across the Galaxy. Dismantled members from a given cluster are collectively known as a moving group. Using Python, we calculated the three-dimensional space velocity components and their uncertainties for individual stars in the Gaia catalog. Once these values were determined, we developed a method to search through the catalog and identify stars with common kinematic properties that have potential to constitute a moving group. We have compiled a list of 450 candidate moving groups with at least five members; 38 of the groups contain ten or more members. These data will be used in the future to look for other indications to confirm the possible members are related, such as common metallicities.

(27) *Callinectes sapidus* Abundance Across the Salinity Gradient of Tampa Bay

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The abundance of Blue crabs, *Callinectes sapidus*, was studied in two areas of differing salinities to determine preference of Blue crabs in Tampa Bay. The two seagrass bed areas studied were Old Tampa Bay for low salinity and Fort DeSoto Park for high salinity. It was hypothesized that the higher salinity environment at Fort Desoto Park would be preferred by *Callinectes sapidus*. The data collected opposed the original hypothesis. Blue crabs were found at a density of 0.13 crabs/m² at the Old Tampa Bay Location where the salinity was 26 ppt and a density of 0.00 crabs/m² were found at Fort Desoto where the salinity was 30 ppt. A total of sixteen crabs were caught; ten male and six female averaging 2.56 cm and 2.9 cm in length, respectively. Based off this data it can be concluded that *Callinectes sapidus* prefer areas of lower salinity compared to higher salinity. However the natural environment is dynamic and a wide range of factors could have affected the results like water quality, temperature, seagrass bed size and overall health.

(28) Population Dynamics in Tampa Bay: a Spatio-temporal Analysis in Relation to Length and Salinity

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Fisheries are vital to the economy in the Tampa Bay estuary; which serves as a habitat for many species that utilize it throughout various stages in life. It is essential that these fisheries are regulated for the economic and ecological benefits they provide. In order to regulate the fisheries effectively it is necessary to understand what drives the movement of fish. Data for Black Drum, Red Drum, Pinfish, Mangrove Snapper, and Sheepshead, which all have varying life histories, were examined for spatio-temporal patterns using hot spot analysis of length and kriging of salinity in ArcGIS. Many patterns emerged from this analysis. Seasonal pinfish maps suggest that smaller pinfish are likely to be in salinities between 15 and 30 ppt – a known salinity range for optimal growth. Red drum are believed to spawn in late August to October and have dense aggregations of cold spots during fall and winter months indicating an increased presence of juveniles. It was also possible to track migrations in and out of the bay for multiple species. Understanding migrations of fish throughout their life cycles is vital to protecting them until maturity which allows for populations to reproduce and sustain the population which stabilizes the fishery.

(29) *Costoanachis avara*: an Assessment of the Effects of Climate Change on the Behavior of an Epifaunal Species

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Climate change is impacting oceanic ecosystems by causing changes in pH and temperature. Calcareous organisms have to adapt by reallocating energy from other activities to shell maintenance. In this experiment the movement of the greedy dove snail, *Costoanachis (Anachis) avara*, was monitored at future pH and temperature levels to determine if movement was reduced in future climate conditions. *C. avara* are epifaunal grazing organisms predominant in seagrass beds. They recycle nutrients into the system and remove epiphytes. Temperatures and acidity were raised to simulate the environment projected 100-years and 500-years in the future. Unpaired t-tests between the initial and final measurements of each treatment and an ANOVA across all initial and final conditions were conducted. The findings of the study imply that there was no significant effect on movement due to pH or temperature fluctuations or a combination of the two factors. Although temperature and pH are projected to change in the future, this study suggests that *C. avara* will be able to function at a similar capacity as it does now despite the additional environmental stressors. *C. avara* are projected to still work as a top-down control on the seagrass habitat and maintain overall seagrass health.

(30) Therapeutic Hypothermia in Post-Cardiac Arrest Patients

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Therapeutic hypothermia, an intervention implemented after cardiac arrest, is thought to preserve neurological function and improve survival rates among patients with out-of-hospital cardiac arrest. Therapeutic hypothermia includes three phases: induction, maintenance, and rewarming; following successful cardiopulmonary resuscitation and return of spontaneous circulation (ROSC), the process of therapeutic hypothermia is initiated. This process involves cooling the body by using an array of cooling methods such as ice packs, cold saline infusions, and cooling blankets. The goal is to cool the core body temperature to between 32° and 34° Celsius within four hours of achieving ROSC. Maintaining a hypothermic core body temperature for at least 24 hours may help to improve survival rates and minimize neurologic injury. By lowering the body temperature, ischemic reactions and cell death in the brain are slowed, and the blood-brain barrier integrity is maintained and preserved. When initiating hypothermia, hypoxia and cell death is reduced, which in turn, preserves brain function and may decrease mortality rates. Research indicated therapeutic hypothermia as a cost-effective intervention, demonstrating a 16% improvement in neurological function within a 6-month post-arrest period.

(31) The Effects of Temperature and pH on Sea Urchins

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Within the next 100 years, pH levels and temperature in seawater are projected to decrease from a pH of 8.1 to 7.9 and increase from a temperature of 20.5°C to 26.5°C in the worst case scenario. The causes of these increases are anthropogenic in nature, ranging from artificially increased nutrient addition in agricultural production to energy generation from non-renewable resources. These changes in environmental conditions can have detrimental effects on marine life. In this experiment, sea urchin calcium carbonate exoskeletons will be measured in terms of height, diameter, and mass, along with urchin basal metabolic rate and specific metabolic rate. This is done while being exposed to current and future temperature and pH conditions to quantify the degradation effects that pH and temperature have on calcium carbonate fixation and specific metabolic rate. It is hypothesized that the sea urchins in the tank that mimics the projected conditions in 100 years will have a significant difference in their mass, diameter, height, and specific metabolic rate due to decreased pH and increased temperature.

(32) Inorganics and the Search for Life outside Earth

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In this paper, we examine several of the most common inorganic materials used in life on Earth--specifically in the human body--and their primary purposes. Inorganic compounds are essential to life on Earth and therefore the presence or lack thereof could be an indicator of how likely it is that a world could be inhabited. By examining the functions of these compounds and how abundant they are on Earth, an outline could be formed to determine the probability that a world could be inhabited based on the abundances of these inorganic compounds on that world.

(33) FIFA Virus: Emory International Global Health Case Competition

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The case competition is an invited event in which interdisciplinary teams collaborate to present a solution to a public health problem. Teams have six days to define the global health issue, develop a feasible solution, and present to a panel of judges. The 2018 prompt described a coronavirus epidemic outbreak at the 2022 World Cup in Qatar. The UT team functioned as a consulting group to advise the Emir of Qatar. The team identified the following issues related to prevention of pandemic spread of the FIFA virus: treatment of the infected population, halting the spread of disease, mitigating fear related to the spread of an infectious agent at a major international event, strategies for minimizing economic impact, including both stress related to the games, as well as loss of income due to quarantining the viral host, and equitable treatment of vulnerable populations (i.e. migrant workers). The team solution included integrating the Facebook Safety Check and Amazon Cloud for real time data analysis. Pop up treatment facilities were placed around Qatar to treat the infected population, as well as prevent the spread of the virus. To minimize economic stress, the World Cup continued, and the camels that hosted the virus were quarantined and cared for.

(34) Manipulation of Circadian Rhythm of Brown Anoles

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Circadian rhythm is an internal process that is regulated by the ambient light in the atmosphere. Circadian rhythm can regulate internal processes like metabolic rate. Our research involves the manipulation in ambient light around brown anoles, and determining if there will be an effect on metabolic rate.

(35) Sensitizing Lanthanide Luminescence with CMPO-Based Ligands

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Due to the importance of lanthanides (Lns) in modern high-tech devices, Ln chemistry has become a growing body of research with an increasing focus on selective Ln extraction. The inherent luminescence properties of the Lns provide a tool for probing the solution behavior of relevant compounds and have become a focus in our group as we seek to understand extraction behavior. Current investigations include assessment of Ln luminescence of agents based on the carbamoylmethylphosphine oxide (CMPO) chelator. In this study, a monopodal phenacyldiphenylphosphine oxide (Ph-CMPO) ligand was studied and various Ln(III) complexes of Ph-CMPO were tested via quantum yield measurements and emission spectra. As supported by the emission spectra, the Tb³⁺ complex had the highest relative quantum yield at 14%. The Eu³⁺, Dy³⁺, and Sm³⁺ complexes were less efficient with quantum yields of 3.9, 0.7, and 1.0%, respectively. We also analyzed a dipodal CMPO-derivative for concentration and solvent effects on the intensity of the emission spectra. The ratio of ligand to metal for the Tb³⁺ and Eu³⁺ complexes of the dipodal ligand appeared to have a negligible impact on metal emission. Finally, complexes in acetonitrile exhibited stronger emission versus methanol and ethanol due to the quenching of O-H bonds.

(36) Life Beyond Carbon

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With the discovery of other potentially habitable exoplanets, it is a good time to consider what life could look like on these other planets. It has been assumed that any life we find will be carbon-based, however we seek to challenge that assumption. This report will explore research done on silicon-based complex structures with the intention of determining if silicon-based life is in fact possible.

(37) Human Impacts on the *Hippocampus zosterae* Mating System

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Seagrass beds serve as vital coastal ecosystem providing shelter and food resources for many marine species. Seahorses, with high site fidelity and small home ranges, are particularly vulnerable to habitat loss or changes in the seagrass distribution. The dwarf seahorse, *H. zosterae*, is a socially monogamous species with previous studies confirming that males prefer a larger female as a mate and the pair is genetically monogamous over a single breeding. Conversely, laboratory studies have shown that at high densities, males will abort their pregnancies to receive eggs from a more preferred female. This study utilizes microsatellites and parentage analysis of pregnant males and their offspring to test if *H. zosterae* is genetically monogamous at various densities in both natural populations in Tampa Bay and in controlled laboratory settings. *H. zosterae* are bioindicators of a seagrass ecosystem's health; therefore, degradation of seagrass is predicted to initially increase seahorse density and alter the dwarf seahorse's mating system. Ultimately, this will affect the species' reproductive biology, mating dynamics, and population size. By understanding social and genetic dynamics of the *H. zosterae* mating system in high densities, appropriate coastal seagrass management and protection can be implemented.

(38) The Effects of Nutrient Levels on Parasite Infections and Plant Development

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Agrobacterium tumefaciens is a bacteria that causes crown gall formation in plants, as it alters their gene expression. In this study, Bush goliath tomato plants were injected with the bacteria and exposed to three different nutrient levels (none added, low and high) to observe the effects on plant development. Four plants were used for each treatment - the control received no nutrients, the low and high treatments received nutrients every 7 and 14 days, respectively. The effect of *Agrobacterium* on the plants were measured every week for 5 weeks based on the number of leaves, stem length and flowers produced. The effects were seen between average stem growth and number of leaves as the control group had the highest number of leaves, followed by the high and then the low treatment. For stem growth, the control group had the highest length, followed by the low and then the high treatment. For the duration of the experiment, the formation of tumors were also measured based on their number, size and mass. The results of this experiment are beneficial to the agricultural industry as it provides insight on managing the incidence of *Agrobacterium* in relation to plants grown in various nutrient levels.

(39) Orbital Mechanics: Exploring the Solar System

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Early space exploration was plagued with many difficulties related to the technology of the time and lack of experience in spaceflight; the first spacecraft to escape the orbit of earth did so only because it missed its intended target of the moon in 1959. Years of trial and error have highly refined every aspect of spaceflight, leading to probes successful enough to explore the solar system by 1972. A deep understanding of orbital mechanics is needed to successfully deliver any craft to Earth's orbit, let alone anywhere beyond. Here we will explore the types of trajectories and spacecrafts necessary to reach various outer solar system bodies.

(40) Cancer Risk by County of Trihalomethane Exposure in Drinking Water in Florida

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Trihalomethanes are compounds found in common drinking water, byproducts of the chlorination, purification process. The main Trihalomethanes (THMs) that are found in drinking water include: Dibromochloromethane (0.6 µg/l to cause a 10-6 cancer risk increase), Tribromomethane (4 µg/l), Trichloromethane (6 µg/l), and Bromodichloromethane. THMs interact with different compounds in the water, especially seen with Magnesium to cause potentially compounded effects. Studies have shown that cancer location is correlated with water exposure area, with many skin cancers developing from recreational water and throat and neck cancer from drinking water. It has also been shown that sex affects cancer location with males developing stomach, liver, lung, prostate, and bladder cancers and females developing stomach, pancreas, breast and ovarian cancer. Additionally, age has been correlated with cancer risk. An Age Dependent Adjustment Factor (ADAF) has been developed to more accurately determine cancer risk. Significance of THM exposure in local water can be determined by systematically analyzing individual THM and water hardness levels by county and correlating cancer rates for prevalent body locations by gender and age. This data could have substantial implications going forward with greater public awareness and possible large-scale solutions implemented.

(41) The Effect of BD Fungus on *Daphnia* Fitness: a Dose Response Experiment

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Batrachochytrium dendrobatidis (Bd) is a fungus responsible for the death of numerous amphibian populations and entire species around the world. Its fungal spore is extremely durable and spreads very quickly when introduced into a new environment. The species (*Daphnia magna*) is a very small herbivore found to feed on zoospores. *Daphnia*

may function as a biological agent for pathogen control, the *Daphnia* can feed on the free swimming and infections BD spores, lessening the risk of infection by amphibians. Here, we asked the question, will different concentrations of Bd significantly affect the survivability and fitness of *Daphnia*? *Daphnia* should be able to consume the fungus, allowing them to live on it long term. However, Bd is also known to parasitize similar freshwater invertebrates causing a high fungus concentration to become potentially detrimental. This was tested by measuring the survivability, shedding, movement, and fecundity of *Daphnia* daily (n=16/treatment). The treatments included a control (no Bd; 30μL water), low Bd (20μL water, 10μL Bd), medium Bd (10μL water, 20μL Bd), and high Bd (30μL Bd). This *Daphnia* treatment is a biologically responsible method that could be implemented on a wide scale to successfully fight a very significant cosmopolitan ecological problem.

(42) The Effects of Testosterone Booster on Blue Crab Growth

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With constant changes in the ocean environment, it's very important that water chemistry is monitored so effective conservation methods can be put in place. One of these concerning behaviors is the increasing use of synthetic androgens in human populations. This experiment was composed to investigate the effects of testosterone boosting, using a male supplement product, "Bucked Up" on growth in the common blue crab *Callinectes sapidus*. The hypothesis formed was that the increase of testosterone would cause a greater increase to size and mass over time for the experimental group, compared to that of the control group. These crabs were placed in 2 conditions; 6 crabs were placed in the "normal" condition, where they were kept at consistent water conditions on a daily diet. The same was provided for the 'experimental' condition, however a daily dose of 0.15μL of Bucked Up. Using t-tests and averages from the data compiled over the 3 week period, it was found that there was no significant difference found in the analysis of mass change, carapace length and width. Though it did not affect the crabs in this experiment, it is unsure of how putting chemicals like this into the water systems will affect organisms.

(43) Grooming Setal Morphologies in Mantis Shrimp: Smashers and Spearers

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Mantis shrimps are marine crustaceans that have several unique features that have gained them much attention. Mantis shrimps are divided into two different groups based on the shape of their feeding appendage. Smashers have club-like appendages whereas spearers have knife-like appendages. Mantis shrimp vary with how they feed and where they are active. Smashers are generally located in shallow waters, living in rocks near coral reefs, and are active during daytime; spearers are normally in deeper waters, living in murky burrows, and are active during nighttime. Behavioral research on mantis shrimps has concluded that smashers groom much more frequently and for more time compared to spearers. However, both shrimps groom the same sensory areas' frequently. Complexity, type, and density of setae may be related to the frequency of grooms that remove fouling from the body regions. Thus, investigating the amount of fouling located on the grooming appendage setae, as well as frequently groomed body regions will allow us to compare how the two groups groom. In addition, the comparison of grooming efficiency of the two mantis shrimp groups can be important in understanding how behaviors and morphological characteristics are conserved in crustaceans, as well as how environmental factors influence behaviors.

(44) Simulated Effects of Climate Change on Blue Crab Metabolism

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The purpose of this experiment is to study the long-term effects on the shells of blue crabs living in an environment with a changing pH level and temperature. This study will help us visualize what the future holds in terms of the physiological changes that the organism might undergo when exposed to various combinations of ocean acidification. To perform the experiment, we will be using one control variable at a pH level of 8.1 and 21°C, followed by five other trials. The other trials consist of three different pH levels, each tested with a high (27°C) and a low (21°C) temperature. We hypothesize that the lower pH and higher temperature will cause the crab shell to

degrade. We believe so because when the organism is put under acidic conditions, physiological stressors will tamper with their metabolic activity. This will affect the growth of the shell as the organism is utilizing its energy to restore homeostasis. This experiment is important as it gives us an insight into the future on what might happen to organisms, such as the blue crab, if ocean acidity increases over the next 500 years.

(45) The metabolites produced by *Batrachochytrium dendrobatidis* alter amphibian development, but not growth in the absence of infection

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Amphibian decline poses a serious threat to global biodiversity and ecosystem stability. *Batrachochytrium dendrobatidis* (Bd), a pathogenic fungus, has contributed to the extirpation and extinction of hundreds of amphibian species worldwide. Bd causes chytridiomycosis and ultimately death in many adult amphibians, but it does not typically cause mortality in tadpoles. Non-lethal exposure to Bd or the metabolites Bd produces may have adverse effects on tadpole growth and development. In this experiment, Cuban tree frog (*Osteopilus septentrionalis*) tadpoles were exposed to one of three treatments (live Bd, Bd metabolites alone, or an artificial spring water (ASW) control; n = 31 tadpoles/treatment). Cuban tree frog adults were exposed to one of two treatments (Bd metabolites alone or ASW; n = 30 adults/Bd metabolites, n = 20 adults/ASW). Growth (for both life stages) and development (for the tadpole) were monitored weekly for a month and mortality was observed daily. Tadpoles exposed to Bd metabolites alone developed faster than those exposed to live Bd or ASW (p < 0.001). However, there was no difference in mortality, tadpole length or weight change between treatments ($\chi^2_1=5.05$, p=0.08; $\chi^2_1=1.28$, p=0.53; and $\chi^2_1=1.67$, p = 0.44, respectively). There was no effect of treatment on adult growth or mortality ($\chi^2_{12}=0.11$, p=0.74; $\chi^2_{12}=0.05$, p=0.83, respectively). These results indicate that tadpoles developing in Bd contaminated water may be adversely affected during development even when they are not directly exposed to Bd, while adults are not impacted by Bd metabolites.

(46) The Answer is in the Dirt: Ideal Sediment for High Density *Thalassia testudinum* in Tampa Bay

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In this study, levels of soil organic carbon content and sediment size in *Thalassia testudinum* (turtle grass) seabeds in Tampa Bay were analyzed and areas of high and low density were compared in order to determine an “ideal” substrate for *Thalassia testudinum*. In recent years, Tampa Bay has had major success regenerating decimated seagrass beds to historically healthy levels. Seagrasses are one of the most biologically important ecosystems in the world. They are a major source of oceanic primary productivity, a vital habitat and nursery, and an important carbon sink. By examining the substrate where high densities of *Thalassia testudinum* are found it will allow furthering of seagrass restoration in the future. In comparing the amount of organic carbon content and sediment size between areas of high density and low density of *Thalassia testudinum*, we found that there was no significant difference between levels of organic carbon in areas of high and low density of *Thalassia testudinum*, and no significant difference in percentage of sediment larger than 26 OPN. There was, however, significantly more sediment between 9 and 26 OPN in high density seagrass beds, and significantly more sediment smaller than 9 OPN in low density beds.

(47) Human Physiology: Evolution in the Space Age

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With the increasing leaps in the development of technology, the possibility of humanity expanding its habitat beyond Earth is a fast-approaching reality. The focus of this paper is a permanent colony in Mars, the most likely candidate to be colonized by humanity. If a permanent colony in the heavenly body is a reality, humanity will have to consider the alien planet’s long-term effects on human biology. This project will attempt to contemplate some instances of these issues that will have to be dealt with if humankind aspires to reach for the stars.

(48) Commensal Associates of Marine Sponge Hosts in Tampa Bay

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Species richness and abundance of commensal sponge associates were examined and related to sponge host volume. Collections took place in approximate three month intervals at a jetty in Tampa Bay near the South end of the Sunshine Skyway Bridge. *Haliclona (Reniera) tubifera* (George & Wilson, 1919), *Cliona celata* (Grant, 1826), and *Spheciospongia vesparium* (Lamarck, 1815) were the sponge hosts examined, in order of increasing volume. Preliminary data from the fall collection resulted in species richness values of 6 for *H. (Reniera) tubifera*, 3 for *C. celata*, and greater than 9 for *S. vesparium*. Species abundance values for the same collection were 14 for *H. (Reniera) tubifera*, 7 for *C. celata*, and 112 for *S. vesparium*. As expected based on sponge volume, *S. vesparium* had the highest numbers of species richness and abundance. Surprisingly *H. (Reniera) tubifera* had higher species richness and abundance values than *C. celata* despite *C. celata* having a volume about 5.7 times higher than *H. (Reniera) tubifera*. Further investigation into the effect of sponge volume, season, salinity, temperature, and pH changes will be conducted to understand the complex relationships between sponge hosts and their associates.

(49) Salinity Tolerance of Invasive Green Swordtail *Xiphophorus helleri* in Tampa, Florida

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The effect of salinity on the behavior and food consumption of the wild fish species *Xiphophorus helleri* (green swordtails) was analyzed in this study. A total of 18 fish were collected from the Plant Park stream in Tampa, Florida. Seven (7) fish tanks were filled with water set at salinities of 2 ppt, 7ppt, and 15ppt and 2-3 fish were randomly placed in each tank. Over a period of five (5) days (March 23, 2018 - March 27, 2018), scan sampling was used to record the behaviors of the fish in each tank and the number of Mysis shrimp each fish ate was recorded. The study shows there was not a significant relationship between food consumption and salinity, however, salinity does affect the behavior of the green swordtails. Green swordtails have been introduced to water bodies across the United States through the aquarium trade. The impacts of these fish on the areas they are introduced to is still largely unknown. Understanding the salinity tolerances of this species could help predict their range expansion and lead to a better understanding of the impact they have on native communities.

(50) *Batrachochytrium dendrobatidis* Can Cause Mortality and Affect Fecundity of *Caenorhabditis elegans*

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Batrachochytrium dendrobatidis (Bd) has been determined to cause the extinction of numerous amphibian species. A Nematode, *Caenorhabditis elegans* is an ideal alternative host to the fungus and is utilized to study the effects of Bd on the organisms. Bd breaches the nematodes cuticle, deteriorates it and can kill the nematode. We tested if varying the concentration of Bd exposed to each nematode would result in a change in motility/mortality. Three trays containing a total of 36 *C. elegans* were inoculated with varying amounts of Bd concentration and observed for 10 days. After seeing no difference in the motility/mortality of the nematodes, the focus of the experiment pivoted to measure fecundity. Concentration differences did not result in a change in mortality rate, but it did appear to affect the rate at which the nematodes reproduced. Based on current in-study observations we expect to find an increase in the nematode population in proportion to the level of chytrid fungus that was originally cultured (None, Low, High). By learning how nematodes can play a role in the life cycle of Bd, biologists and researchers will have a better picture of the ecological systems that contain Bd and how to better control it.

(51) Bioactivity of allelopathic metabolites extracted from sponges and slugs on brine shrimp

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Shaped by strong interactions between species and their community, marine ecosystem dynamics are some of the most intricate on the planet. Even though the ocean is vast, there are limited resources available to marine life and thus, competition is often a driving factor in survivability of some marine organisms. In response to these pressures, some organisms such as marine slugs and rocky intertidal sponges, have the ability to produce and excrete allelopathic metabolites. In this experiment, allelopathic metabolites were extracted from slugs collected in the Florida Keys as well as sponges collected in the rocky intertidal areas of the Tampa Bay and used as treatments in brine shrimp bioassays in order to observe bioactivity. Some extracts were observed to have minimal toxicity on the brine shrimp compared to control groups, however, majority of the extracts had no significant influence on the brine shrimp. Although the results show no significance, it may be that a greater concentration of treatment extracts in the brine shrimp assays is needed. Ultimately, more research of this nature needs to be further executed in order to obtain a more representative sample size.

(52) The influence of allelopathic sponges on surrounding species richness

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Shaped by strong interactions between species and their community, marine ecosystem dynamics are some of the most intricate on the planet. Sponges in these communities are known for their efficient water filtering capabilities as well as the allelopathic metabolites they produce. Therefore, presence of these sponges in dynamic habitats is hypothesized to have a strong influence on ecosystem function. In this experiment, photos were taken of the area surrounding sponges in the rocky intertidal zone of Tampa Bay in order to determine species richness in the respective region of the sponge. There was no observed significant influence of sponges on the surrounding species richness. There was neither a significant difference between species richness in the presence or absence of sponges ($p > 0.05$) nor between different distance intervals away from the sponge ($p > 0.05$). This study demonstrated that allelopathic metabolites produced by sponges studied either do not have any influence on species richness or there are other unknown variables with more influence on species richness in the rocky intertidal zone of Tampa Bay.

(53) The Effects of pH and Temperature on the Metabolic Rate of *Costoanachis avara*

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Since the industrial revolution there has been an enormous increase in atmospheric carbon dioxide (CO₂). As carbon dioxide in the atmosphere increases, it causes an increase in temperature. In addition, part of it is absorbed into oceans, which causes a decrease in pH. These environmental changes can have a negative effect on marine organisms, such as gastropods, which are pH conformers. Gastropods are important organisms in seagrass beds. They are involved in clearing seagrass blades of epiphytes and facilitate nutrient cycling. For this experiment, pH and temperature were projected for 100 and 500 years from the present. The snail, *Costoanachis avara* was exposed for five weeks to these different temperature and pH treatments. Physiological changes were monitored by measuring metabolic rate as a function of dissolved oxygen. It was hypothesized that snails exposed to the pH and temperature of projected 100-year conditions would have a decreased metabolic rate compared to snails under present day conditions, and snails in projected 500-year conditions would have a lower metabolic rate than both the snails under present conditions and 100-year conditions. It's biologically important to understand the impact of anthropogenic climate change in order to mitigate its effects on marine organisms.

(54) Exploring of the Molecular Vibrations of Small Carbon Dioxide Clusters with Ab Initio Electronic Structure Methods

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The societal impacts of the carbon dioxide molecule—from its industrial applications to its environmental consequences—make its behavior of particular interest to the scientific community. In order to explain this behavior in the gas, liquid, solid and supercritical phases, understanding the interactions between CO₂ molecules is crucial. Notably, molecular vibrations are sensitive to these intermolecular interactions, and they have been used to

determine the structure of small molecular clusters. We address the vibrational structure of the CO₂ monomer, dimer and two trimer isomers (the cyclic and barrel-shaped structures). Traditional wavefunction theory (WFT) methods, including Hartree-Fock (HF), second-order Møller-Plesset perturbation theory (MP2), and coupled cluster singles doubles and perturbative triples [CCSD(T)] are used with increasingly large basis sets (up to the aug-cc-pVQZ) within the harmonic approximation to determine the vibrational energy levels for the CO₂ systems.

(55) Hemiparasitic plants increase the diversity of alpine plant communities and reduce the colonization of arbuscular mycorrhizal fungi in dominant plant species

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Hemiparasitic plants increase plant biodiversity by reducing the abundance of dominant plant species through their ability to parasitize resources from surrounding plants. Hemiparasites may reduce resources in hosts by directly removing resources through modified root structures, but also by disrupting host interactions with symbiotic root fungi, like arbuscular mycorrhizal fungi and dark-septate endophytes. Here we explored how a common hemiparasite, *Castilleja*, influences plant diversity, community composition, and mycorrhizal colonization across an elevational gradient in the Western Rocky Mountains. We found that *Castilleja* presence increased plant diversity by 9% and increased plant species richness by 11%. However, we found that *Castilleja* had minimal effects on overall plant community composition, suggesting *Castilleja* was a generalist hemiparasite, broadly reducing plant abundance, allowing for rare species to colonize and co-exist. Additionally, we found that *Castilleja* reduced arbuscular mycorrhizal fungal colonization of dominant plant species by 18%. Surprisingly, we found that the increase in plant diversity and reduction of mycorrhizal colonization did not change across our elevational gradient, suggesting that climate contexts do not dampen or exacerbate *Castilleja* effects. Taken together, our results suggest that hemiparasites can regulate plant community composition and ecosystem function across a broad array of ecosystems.

(56) Understanding The Dietary Preferences of The Sea Slug *Elysia papillosa*: A Story of Conflicting Observations

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Several species of sacoglossan sea slugs can sequester chloroplasts from their algal food sources and incorporate them into specialized cells in order to undergo photosynthesis. Due to their ability to photosynthesize, sacoglossans have been a frequent target for research in recent years. Despite this, little is known about their feeding preferences. *Elysia papillosa* is a sacoglossan sea slug native to Florida and the Caribbean known to consume a few closely related species of siphonous algae. The goal of this study was to tease apart the dietary preferences of *E. papillosa* between two main food sources: *Penicillus lamourouxii* and *P. capitatus*. To do so we conducted time-lapse food preference surveys in conjunction with photosynthetic degradation experiments. Initial results suggest that under laboratory conditions slugs do not show a preference for either algal species. This is interesting as *E. papillosa* is significantly more likely to be found on *P. capitatus* in field surveys. To better understand how *E. papillosa* and other sacoglossans shape algal communities and what role they play in ecosystems within the Gulf and Caribbean further research is suggested.

(57) Spectral Tuning of Rhodopsins of Fish from Tampa Bay

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Rod visual pigments in marine fish rely on amino acid substitutions to adapt their spectral sensitivities to light at different depths in the ocean. Here, we examined the key amino acid substitutions involved with spectral tuning of

rhodopsins from *Halichoeres bivittatus*, *Epinephelus morio*, *Rhomboplites aurorubens*, *Acanthostracion quadricornis*, *Haemulon plumieri*, *Prionotus scitulus*, *Diplectrum formosum*, *Eucinostomus gula*, *Opsanus beta*, and *Chilomycterus schoepfii*. Retinal dissections were conducted to obtain RNA that was then reverse transcribed into cDNA. Primers were designed to amplify the rhodopsin gene and sequence analysis was performed. Amino acid substitutions at positions 83, 292, and 299 are responsible for a shift in absorbance spectra of this retinal pigment. Preliminary results from the ten species above resulted in estimated absorbance maxima ranging from 493-501 nm, which strongly correlates with the depth of their habitat. *Bos taurus* rhodopsin, whose absorbance spectrum and absorbance maximum being previously defined, was used for comparison. Based on molecular modeling of the rhodopsin proteins, our data shows amino acid substitutions occurring between the Tampa Bay fish and the control sequence. Characterization of fish rhodopsin provides a greater understanding of how aquatic rhodopsins are selected for particular underwater photic environments.

(58) The Effect of Copper Pesticide on Treating Crown Gall Disease in Tomato Plants

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Members of the genus *Agrobacterium* are components of the soil microflora and this bacterial species induces tumors where the plant has been wounded. Here, we examined the effectiveness of a liquid copper pesticide in treating and preventing crown gall disease in young tomato plants. There were a total of 12 tomato plants in the study: 3 were exposed to *Agrobacterium* and treated with copper pesticide before disease, 3 were exposed to the bacteria and treated with copper pesticide after disease formation, 3 were not exposed to *Agrobacterium* and treated with copper pesticide before disease, and 3 were not exposed to *Agrobacterium* and treated with copper pesticide when galls formed on the other plants. Preliminary results from the 12 tomato plants showed no significant difference in stem growth and number of new leaves formed among the treatment groups. Additionally, no gall formation has been observed in any of the plants. Application of the copper pesticide before and after disease formation will allow for a greater understanding of how tomato plants resist *Agrobacterium* transformation and gall formation.

(59) Primary production is greener on the other side: Influence of hurricanes on the West Florida shelf

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In late 2004, three hurricanes crossed Florida and increased the discharge of water onto the shelf to ~20 times the normal volume. Associated with this was a subsequent pulse of fertilizer containing nitrogen nutrients. Because nitrogen is the limiting reactant for phytoplankton, pulses of nutrients can cause phytoplankton blooms, which can yield decreased oxygen, marine life mortality, and negative economic impacts. A red tide initiated in January 2005 and persisted until January 2006, which is unusually long-lived for this phenomena. After the third hurricane, a research expedition mapped sea-surface nutrients. Satellite estimations during the red tide indicate that the average chlorophyll concentration was 1.00 mg chlorophyll/m³ over an area of 67,500 km² and a depth of 50 m. The average nitrogen concentration over the expedition area of ~3,600 km² and a depth of ~21 m could support 1.64 mg chlorophyll/m³. When this amount is diluted into the area of the satellite estimations with a depth of 25 m, the concentration is 0.0751 mg chlorophyll/m³, therefore runoff could be responsible for ~7.5% of the red tide. The sea-surface analysis agrees with the conclusion of the satellite estimations that runoff doesn't provide enough nitrogen to sustain the red tide that occurred.

(60) Discerning Photosynthetic Pigments of Codium and Sargassum Algae and Photosynthetic Rate to Variable Wavelengths

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Photosynthetic pigments that are critical to photosynthetic processes vary among different types of algae. Pigments that contribute to the photosynthetic chemistry within autotrophic organisms are able to interact with different wavelengths of solar energy. This study utilized *Codium*, a green algae, and *Sargassum*, a brown algae, to explore

their ability to harvest light energy at various wavelengths. Because the instruments utilized were not able to detect phycobilins, red algae was not able to be studied. Green, red, and blue films were placed over the light source to test the wavelength variables and white light acted as the control. Photosynthetic rate per mass was determined via rate of dissolved oxygen concentration at a constant light intensity of 50 $\mu\text{mol quanta/m}^2/\text{s}$. Photosynthetic pigments were extracted with a DMF solvent and their concentrations per mass were determined via spectrophotometry. *Codium* is expected to have a higher concentration of chlorophyll A than other pigments, therefore it can be expected that photosynthetic rate will be higher when under green and blue light. Alternatively, it can be expected for sargassum to have a higher photosynthetic rate under green light because of an expected higher concentration of carotenoids.

(61) Full Genomic Comparison of Three River Otter Species to Understand Embryonic Diapause in *Lontra Canadensis*

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The goal of our research project is a full genomic comparison among three river otter species to better understand the process of embryonic diapause in the North American river otter, *Lontra canadensis*. We have used Next Generation Sequencing to obtain approximately 30x coverage of each genome. We cleaned up and processed the raw data using bioinformatics tools, including FASTQC and Trimmomatic. We are generating a draft assembly using a distantly related scaffold species. I will review the skills I developed while working with new computer programs to analyze and interpret raw genomic DNA sequences.

(62) Does Temperature Among *Batrachochytrium dendrobatidis* Have an Effect on the Morbidity of *Daphnia magna*?

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Batrachochytrium dendrobatidis (Bd) is a deadly fungus that is responsible for causing an amphibian global mass extinction that resulted in major losses of biodiversity. Bd is at pandemic levels and there is new evidence that supports that human actions are furthermore increasing the incidence rates of this pathogen. To assess how temperature and climate change has impacted Bd, we exposed *Daphnia magna* and incubated them in three different temperatures. We placed one *Daphnia* in a well (96 well plates were used) and monitored how the *Daphnia* would respond to the Bd pathogen in three different temperatures treatment of 18, 23, and 30 degrees Celsius. We monitored *Daphnia* survival, and their health (based on movements) monitored. Preliminary analyses suggest, *Daphnia* exposed to the Bd pathogen molted their exoskeleton, potentially as an attempt to remove the Bd pathogen from its body. The *Daphnia* in the warmest temperature treatment were the first to succumb to the pathogen and had the highest mortality rate. Our findings are concerning given the continual increase in global temperatures.

(63) Survival Rate of *Daphnia magna* in Correlation with Microbial Water Quality

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Daphnia magna, also referred to as water fleas, are known to feed on bacteria within aquatic communities. *Daphnia* are known to demonstrate a predisposition for biofilms and the nutrients that are provided by the bacteria within them. In this experiment, scintillation vials were used to create miniature mesocosms to host *Daphnia magna*. Each mesocosm was spiked with specified amounts of liquid cultures of *Escherichia coli*, *Staphylococcus aureus*, and/or a fish food broth. The *Daphnia* were monitored over time to determine rates of mortality and total egg production within the systems. Mortality was assessed each day and the presence of molts within the scintillation vials was also observed. Total egg production was measured by counting the number of eggs present in the *Daphnia* at the conclusion of the experiment and subtracting the initial number of eggs that were present before the *Daphnia* were introduced to the spiked waters. The goal of the experiment was to determine the threshold of contamination, from parasitic bacteria, that *Daphnia* could survive and reproduce in. If *Daphnia* can grow and feed within bacterial

contaminated waters, *Daphnia* could be useful as water quality indicators and for reducing water contamination rates.

(64) Possible life on Europa

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Jupiter's moon Europa is unique. The surface is covered with ice, and there exists a subsurface ocean of liquid water. Due to the location of Europa as the second moon of Jupiter, it is constantly subjected to tidal forces. These tidal forces can create hydrothermal vents in the subsurface ocean. With the presence of liquid water and an energy source caused by the hydrothermal vents, there exists a possibility for the formation of life in the subsurface ocean of Europa. One of the possible types of life forms that could exist in Europa's subsurface ocean is Methanotrophes or methane producing bacteria.

(65) Does Precipitation Rate and Temperature among Counties in California, USA have an Effect on the Number of Cases of West Nile Virus?

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West Nile Virus (WNV) is a mosquito-borne virus that has spread throughout the United States and has caused disease and death in humans. Mosquitos are vectors for WNV and other arboviral diseases like the Zika Virus that are impacted heavily by many environmental factors that include temperature and precipitation. The purpose of this study was to track the number of cases of West Nile Virus over time and to determine whether there was a relationship in the number of West Nile Virus cases to annual temperature and precipitation rates among counties in California. This analysis used data collected from www.weatherunderground.com from 2006 through 2017, and was examined spatially using ArcGIS. Statistical analysis was conducted in the program R version 3.3.3. It was concluded that the number of cases of WNV increased over time. The average annual temperature also increased over time among counties. The precipitation rate was insignificant when compared to the number of WNV cases. The spatial analysis showed a greater number of WNV cases and greater mean temperatures (°F) in southern California. Climate change has raised global temperatures and decreased precipitation rates, which, puts millions of people annually at a greater risk of contracting sylvatic diseases.

(66) Use of Nabiximols (Sativex) for Spasticity in Adults with Multiple Sclerosis (MS)

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A significant portion of patients living with multiple sclerosis (MS) report muscle spasticity at some point in the duration of the disease process. Although first-line medication treatments are available to treat spasticity, research has shown that not only do these medications serve few functional benefits, the majority of MS patients find these treatments to have minimal effectiveness. Delta-9-Tetrahydrocannabinol-Cannabidiol (THC-CBD) is the main component of nabiximols (Sativex), an oromucosal spray, which not only has been shown to decrease spasticity in patients with MS who have not responded to first-line treatments, but also initiates few adverse effects. The purpose of this research project is to examine current research on the use of Sativex for MS-related spasticity in order to support the efficacy of this treatment modality. Numerous studies have researched the efficacy and safety of Sativex; overall, Sativex demonstrated clinically significant results in comparison to first-line treatments. In addition, Sativex demonstrated a high level of safety and tolerability, exhibiting minimal adverse events and showing no likelihood for abuse, dependence, tolerance, or cognitive decline. Future research should evaluate the effectiveness of long-term use of Sativex, as well as which patient populations would benefit most from its use.

(67) A Meta-analysis of Astrobiology in Undergraduate Curriculum

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While the ability to tailor one's class schedule to individual career goals excites most incoming freshman, most universities recognize the benefits of a well-rounded baccalaureate education. Astrobiology, the study of life in space, incorporates many disciplines of science, including Physics, Astronomy, Biology, and Chemistry. This paper analyzes the results of past studies to show how Astrobiology's unique interdisciplinary nature can provide the benefits of a well-rounded transcript in a way more tailored to Biology, Chemistry, and Physics majors. This paper also describes how colleges and universities can incorporate Astrobiology into an undergraduate degree.

(68) The Scaling Relationship of Metabolic Rate with Respect to Body Mass and Temperature of Goldfish (*Carassius auratus*) and Black Phantom Tetras (*Hyphessobrycon megalopterus*)

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The metabolic theory of ecology (MTE) utilizes one equation to express the effects of body size and temperature on an organism's metabolic rate. This equation can be modified to analyze a wide scope of data. In this experiment, the focus is placed on the effects that body size and environmental temperature have on the metabolic rates of goldfish (*Carassius auratus*) and black phantom tetras (*Hyphessobrycon megalopterus*). The masses and basal metabolic rates (BMR) will be measured weekly over the course of five consecutive temperature increases. These measurements will then be used to calculate the activation energies of both species. The results of this study will indicate the scaling relationship of metabolic rate with respect to body mass and temperature, as well as the metabolic activation energy for goldfish and black phantom tetras. Both of which vary with a variety of phylogenetic and environmental characteristics.

(69) The Impact of Microplastics on *Crassostrea virginica* Filtration

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There has been increasing concern among biologists about whether or not microplastics are affecting the health of marine organisms and human health. While some studies have shown microplastic effects on juvenile *Crassostrea virginica*, there are few studies which focus on how adult *Crassostrea virginica* are affected. This experiment focuses on the ability of adult *Crassostrea virginica* to filter and dispose of different densities of microbeads. *Crassostrea virginica* were collected in Tampa Bay and once acclimated, were exposed to treatment levels of 100 and 200 microbeads at a density of 1g/cc over a two hour time interval. An examination of adult oyster clusters exposed to different amounts of microbeads showed the adult oyster's ability to take in microplastics. A Wilcoxon/Kruskal-Wallis test was conducted producing a result that was not statistically significant ($\chi^2=4.2857$, $p=.1173$). Some oysters did filter in microbeads, demonstrating the potential for microplastics to impact oysters and human health. This issue is prevalent in oyster populations and can impact higher trophic level organisms through bioaccumulation. These results demonstrate the issues associated with microplastics and encourage future research to be conducted.

(70) Magnet Status Hospitals' Influence on Patient Outcomes and Nurse Work Environment

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This literature review compares Magnet and non-Magnet hospitals regarding nursing work environment and patient outcomes. Some research suggests that the accreditation of Magnet status by the American Nurses Credentialing Center (ANCC) influences patient outcomes and nursing work environment in a positive manner; however, there has been insufficient research conducted and evidence discovered with the 400 Magnet accredited hospitals nationwide to fully support this claim. The purpose of this study was to determine if current research supports that Magnet hospitals have improved patient outcomes and an enhanced nursing work environment. The methods included reviewing multiple research studies and systematic reviews of data collected retrospectively and cross-sectionally. The results revealed that Magnet-accredited hospitals exhibited lower thirty-day mortality rates, decreased failure to rescue rates, reduced surgical mortality rates, and less missed nursing care. Magnet-accredited hospitals also

demonstrated better nurse to patient ratios, more nursing autonomy, and decreased nursing burnout. In conclusion, the literature showed that Magnet status hospitals may benefit patients with enhanced patient outcomes and improved quality of health care, while also providing a more positive work environment for nurses.

(71) **Mobile Phones and Their Role in Infection Transmission to Patients in Acute Inpatient Care**

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The following systematic review investigates the relationship between the use of mobile phones in acute care settings and the alarming increase in nosocomial infections among patients. Mobile phones are necessary for the coordination of care between healthcare workers. Despite their necessity, mobile phones are prime breeding grounds for deadly pathogenic bacteria. Nosocomial infections cost the healthcare system 20 billion dollars annually. Infections can affect patient hospital length of stay, morbidity and mortality rates. The Center for Disease Control has recommended a range of standards for healthcare facilities to implement, thereby decreasing the spread of pathogens within institutions. Healthcare facilities have protocols in place for clothing changes, jewelry removal, hair coverings, hand hygiene, and personal item storage, yet there are few policies that regulate the use and cleaning of mobile phones within a hospital environment. These issues are addressed in detail and an analysis is provided. Cost effective cleaning regimens such as isopropyl alcohol or ethyl alcohol wipes are realistic for implementation within healthcare facilities and are recommended for practice. Suggested guidelines also include consistent cleaning regulations and restricted use of personal mobile phones. Additional research is needed to further explore the relationship between mobile phones and infection transmission.

(72) **Biochemical Exploration of the Chytrid Fungus, *Batrachochytrium Dendrobatidis***

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Batrachochytrium dendrobatidis (Bd) is widely studied by biologists due to causing Chytridiomycosis in amphibians. Chytridiomycosis has been linked to the endangerment and extinction of amphibian species such as tree frogs. Despite wide biological studies of Bd, extensive chemical studies have not been carried out. A project was created to develop an assay for the activity of Bd on model organisms to reproducibly study the toxic effects of Bd. This assay will provide the means for further chemical study of the biologically active secondary metabolites of Bd that may be the cause of Chytridiomycosis.

(73) **Electromagnetic field application effects on recovery and power after sport-specific exercise intervention: feasibility study**

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Electromagnetic field application (EFA) has demonstrated increased vasomotor function of vessels throughout the body and thus on microcirculatory blood flow regulation in the clinical population. It is unknown if EFA can positively influence recovery and improve physical conditioning in tennis players. PURPOSE: To determine if EFA optimizes recovery and improves anaerobic/power parameters in female college tennis players. METHODS: Subjects for this study consisted of female NCAA Division II tennis players (n=7, age 19.7±1.3 y.o., weight 65.7±9.7 kg, height 168.1 ±2.04 cm). EFA was used 22 times across a 4 week period after sport-specific training or after matches. EFA protocol included 8 minutes of laying on the BEMER EFA, which transmitted weak electromagnetic field of flux density 35-50 µTesla (highest level). Subjects were also required to express their Rate of Perceived Fatigue (RPF scale 0-10) before and after every application. Standardized 30 s Wingate tests were performed before the 1st week of the application, 1 week after, 3 weeks after, and 4 weeks after EFA recovery protocol. Heart rate (HR), O₂ saturation and blood lactate (BL) were analyzed pre, post, post-1 min, post-3 min, post-5 min, and post-10 min after the Wingate tests. RESULTS: Absolute Peak Power (APP) increased after 22 EFA applications from 428.7±118.5 W to 491.5±113.4 W (p=0.063) and Relative Peak Power (RPP) increased from 6.5±1.2 W/kg to 7.5±0.9 W/kg (p=0.063). BL levels decreased post-1minute from 11.2±1.15 mmol/L to 9.8±1.5 mmol/L (p=0.063).

Δ RPF before and after application decreased significantly from 2.57 ± 0.79 to 1.43 ± 0.79 ($p=0.034$). Although APP, RPP, and BL post-1minute improved, it was not significant ($p=0.063$) possibly because of the relatively small sample size. Changes in other anaerobic/power parameters were not as notably expressed. CONCLUSION: Improved microcirculatory blood flow could suggest that APP and RPP increased over the span of a 4-week period in female tennis players. Significant decrease in RPF suggests that EFA might be an effective tool to use for recovery after sport-specific training and/or matches for tennis players. Considering the observed changes in 4 weeks, supplementary studies using a larger sample size should be explored.

(74) Milliken Oil Drop Experiment

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In this experiment, we determined the electric charge of the electron. We did this by observing small charged drops of oil and measuring the time the drops took to fall a given distance in air, which enabled us to calculate the mass of a drop. We then observed the drops in an electric field, and in measuring the rise of the drops in this field, it was possible to determine the electric force on the drop and then calculate the charge carried by the drop. Drops that rose and fell slowly were used to be certain that the drop had a small number of excess electrons. By using an ionization source, the charge on a single drop was changed a multitude of times in order to confirm that these charges were integral multiples of some fundamental charge, thus providing further evidence of the atomic nature of electricity.

(75) A Comparison of Phototaxic Behavior in Photosynthetic and Non-Photosynthetic Sacoglossan Sea Slugs.

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Sacoglossan sea slugs are a group of herbivorous marine gastropods. Several species of sacoglossan engage in kleptoplasty, the process of sequestering chloroplasts stolen from algae inside of the slugs own cells in order to photosynthesize. Because they gain energy from sunlight through photosynthesis it is expected that photosynthetic slug species will spend more time in direct light than non-photosynthetic species. To test this phototaxic experiments were conducted on two species of long term photosynthetic sacoglossans and three species of non-photosynthetic sacoglossans. The photosynthetic species were significantly more likely to spend in the light, suggesting that photosynthesis provides a strong incentive for light exposure despite potential risks of predation. On the contrary, non-photosynthetic species either prefer shade or do not exhibit strong phototaxic behavior. Examining differences between these two groups of slugs provides valuable insight into the impact that the evolutionary novelty of kleptoplasty has on the ecology and behavior of these animals.

(76) The Metabolic Effects of Crayfish Placed in Stressful Environments of Gasoline and Phosphate-Based Fertilizer Pollutants

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Anthropogenic influences have a large impact on the health and success of a given ecosystem. The purpose of this experiment was to analyze the effects of pollutants at different concentrations and how they affect the metabolic rates of crayfish. The pollutants at two different concentrations were gasoline and phosphate based fertilizer. These were chosen in order to mimic two major pollutants found in Tampa Bay. The higher concentration could mimic the animals found closer to the source of the pollutants and the least concentrated pollutant would be more at the center of the bay. The objective of this experiment is to determine how these metabolic rates will be affected due to pollutants based on the stress they experience in the polluted water. The crayfish were kept in four separate, ten-gallon tanks and the crayfish metabolic rates and overall stress were measured using a dissolved oxygen probe. This allowed a greater understanding of how pollutants affect organismal health and fitness based on anthropogenic influences. This can aid in public understanding of human effects on marine environments.

(77) Total Alkalinity Trends and Troubles in Tampa Bay

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Water samples were analyzed at the USGS Carbon Analytical Laboratory in St. Petersburg Florida for carbon system parameters and at the University of Tampa Atmospheric and Environmental laboratory for dissolved nutrients. Total alkalinity calculated using from measurements of dissolved inorganic carbon and pH was found to be less than the measured total alkalinity indicating the potential influence of organic alkalinity species on measured values. Covariance was evaluated for relations to photosynthesis, tidal movements, impacts of dissolved nutrients, and the position within Tampa Bay. The average difference in measured and calculated total alkalinity, without correcting for influences of nutrients to total alkalinity, in the lower bay in May 2015 was 13.0 $\mu\text{mol/kg}$ seawater with a range of -45.2 to 42.3 $\mu\text{mol/kg}$ seawater. Using the same strategy, the upper bay average difference was -21.0 $\mu\text{mol/kg}$ seawater with a range of -183.8 to 40.5 $\mu\text{mol/kg}$ seawater. Including nutrient corrections in the calculated total alkalinity the lower bay average difference between measured and nutrient corrected calculated total alkalinity was 0.4159 $\mu\text{mol/kg}$ seawater with a range of 0.1169 to 0.7681 $\mu\text{mol/kg}$ seawater with a standard deviation of 0.1944. The upper bay average difference between measured and nutrient corrected calculated total alkalinity was 2.618 $\mu\text{mol/kg}$ seawater with a range of 1.974 to 4.191 $\mu\text{mol/kg}$ seawater and a standard deviation of 0.6931.

(78) The Effect of Sleep Deprivation on the Immune System of Patients in the Acute Care Setting

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Adequate amounts of restful sleep are considered essential to maintain proper circadian and homeostatic functions, such as immune response. Basic immune cells are synthesized during sleep periods, which directly relate to the effectiveness of the immune system. Patients should receive greater than eight hours of restful sleep per night to support adequate immune cell activation, proliferation, and differentiation. In the intensive care setting, however, patients' sleep schedules are often compromised by essential health care interventions during normal sleep hours. Ineffective sleep patterns and sleep deprivation weaken the immune system. As a result, immune function is suppressed. This may cause an increase in the patients' length of stay and increase the risk of complications during their hospitalization. While these interruptions may seem unavoidable in a setting of such high acuity, nurses must translate interventions into practice to improve sleep quantity and quality for patients. Interventions may include use of earplugs and eye masks for patients, clustering of care, providing rest periods, reduction of noise and light exposure of patients, and adequate pain relief. These interventions could contribute to improved sleep, the healing potential of each patient, ultimately improving health outcomes.