



Thirteenth Annual

Summer Student Research Symposium

**July 31st, 2015
10:00am to 12:00pm
St. Thomas Campus
University of the Virgin Islands**

13th Annual Summer Student Research Symposium Abstract Booklet

Friday, July 31st, 2015
Administration & Conference Center (ACC)
St. Thomas Campus
University of the Virgin Islands

Event Organized by

Emerging Caribbean Scientists Programs
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The **Emerging Caribbean Scientists Programs** increase research training and promote excellence for STEM (science, technology, engineering, and mathematics), psychology, and nursing students at the University of the Virgin Islands.



Summer 2015 Participants

Mathematics Behind the Science	Summer Sophomore Research Institute	Summer Undergraduate Research Experience
Chelsea Aubain Rhea Bryan Cristen Creighton Sojourna Ferguson Deyjah Foster Jhara Irish Edwin Joseph Quianah Joyce Samuel Liburd Kendel Mason Orett Morton Khadijah Oneill Emanuel Ramos Janea Simon Bashiri Smith Grace Spencer Jenisha Stapleton Kyrelle Thomas Colleen Toussaint DShaunte Walters Kamille Willis	Paul Anderson Christopher Buttarro Ajodie Dasent Austin Dubbs Antonio Farchette Asenee Flaharty Villisha Gregoire Kyle Jerris Ruel Mitchel Shanaliz Natta Genique Nicholas Semonie Rogers Zola Roper Danelly Samuel Brianna Scotland Ryan Shaw Kymberli Simon Muhammad Thuneibat Leon Wheeler	Lauren Arnold Matthew Fortenberry Jamisha Francis Denine Hurtault Sudi-Ann Lewis-Dawkins Calwyn Morton DeWein Pelle Candace Petersen Ashley Thomas

Summer Program Descriptions:

- Math Behind the Science (MBS) Program - A residential, summer bridge program designed to enhance the mathematics readiness of college-bound STEM students by preparing them to enter the introductory calculus course and provide an enriching experience for transition to college life.
- Summer Sophomore Research Institute (SSRI) - A summer research program that allows current UVI students to work with faculty on a research project and participate in workshops to learn basic research methods and techniques.
- Summer Undergraduate Research Experience (SURE) - A program that provides research experience for mature undergraduates to work closely with UVI faculty on challenging scientific research projects across a variety of STEM disciplines.

These programs are funded by the NSF HBCU-UP grant at UVI and additional support is provided by private donors and other organizations.

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*Mathematics Behind the Science
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Project Abstracts

A

Effectives of Marijuana on Epilepsy

By Colleen Toussaint and D'Shaunte Walters

Abstract: Research has indicted Epilepsy, a chronic disorder which causes convulsions, can be treated by medical marijuana. Multiple research experiments completed in the United States have shown that different Cannabidiol can help reduce the number of seizures in epileptic people through anticonvulsant properties which are located in the cannabis plant. Medical marijuana is a controversial topic in the medical field which, in turn, has impacted research timelines.

B

Nuclear Fusion: Harnessing the Power of the Stars

By Rhea Bryan and Quianah T. Joyce

Abstract: By compacting nuclear fusion, companies can store and release energy in a controlled manner to produce usable power thus providing energy to domestic and developing countries, augmenting aircraft and sea vessel performances, and speeding up space travel. The Princeton Plasma Physics Laboratory, the National Lawrence Livermore Laboratory, and Lockheed Martin are a few of the many facilities seeking to use nuclear fusion as a power source. Nuclear fusion is the future for the world's energy.

C

Vehicular Infrastructure

By Kyrelle Thomas and Kamille Willis

Abstract: Vehicular infrastructure involves transmitting data from vehicle to vehicle through the use of Intelligent Transportation Systems (Kuhn 9). The transmission of data improves safety, mobility, and efficiency in the roadways worldwide. Current and future vehicular elements can be used to warn passengers of upcoming roadway hazards. Understanding how vehicular elements can be enhanced will improve the transportation systems.

A

Shark Migration

By Chelsea Aubain and Grace Spencer

Abstract: Climate change is a major factor impacting shark migration due to the temperature changes and rising of the ocean. According to the founder of Ocearch.org, Chris Fischer, feeding and breeding periods occur during shark migration as a variety of sharks move along the coast in shallow waters looking for groups of fish to feed on as well as places to mate and give birth. His observations include a variety of sharks at different locations during different times of the year.

B

Tackling HIV: Gene Therapy and Cell Therapy

By Deyjah Foster, Samuel Liburd Jr., and Jenisha Stapleton

Abstract: Discovered by both Dr. Gallo and Dr. Montagnier in 1983, the Human Immunodeficiency Virus (HIV) is a retrovirus that attacks the immune system's CD4 + cells also known as white blood cells (Rainey par. 28). HIV commonly occurs in two stages: the Initial Stage where people rarely show symptoms, and the Chronic Stage where symptoms are seen and HIV antibodies multiply uncontrollably (Healthwise par. 7). Most people get HIV by having unprotected sex or sharing drug needles with someone infected with the virus, however, HIV is also transmitted during pregnancy, birth, or breast-feeding by an infected mother (Healthwise par. 8). Effective treatments include gene therapy and cell therapy. Gene therapy involves replacing immune cells with genetically modified T-cells. Cell therapy involves the administration of stem cells into infected cell populations (ASCGT par. 2).

C

The Impact of the Automobile Industry on the Environment

By Jhara Irish and Ja'nea Simon

Abstract: The automobile industry manufactures and markets motor vehicles. The hazards created by this manufacturing can have an impact on the environment. The increase in vehicle manufacturing and usage contributes to air pollution, and accidents. Californian cities have been affected by pollution caused by vehicle manufacturing. The smog level (ground level-ozone) has increased susceptibility to asthma attacks and other health related problems.

A

The Importance of Computer Technology

By Edwin O. Joseph Jr and Orett J. Morton

Abstract: Computer technology can be used to improve the lives of people.

Computer technology has helped students improve their skills, increase productivity, teach and learn more efficiently, save time and money, and make problem solving easier as compared to a time without technology assistance. Students and teachers are able to communicate and to collaborate on projects or attend class from anywhere and at anytime with technology and internet access.

B

The Prevalence of Mental Illness in College Undergraduates

By Cristen Creighton, Sojourna Ferguson, and Khadijah O'Neill

Abstract: Mental illness is a prevalent problem especially among today's college undergraduates. These illnesses can impact how a person may feel, think, communicate, and function on a daily basis. Undergraduates, from ages 17-24, are the typical ages for the first signs of mental illness. Depression and anxiety are the most predominant.

Mental illness is not just caused by one problem but by overlapping problems.

The biggest instigators are from the everyday stress of college life. These stressors are the pressure of good academic performances, being financially stable, inadequacy in social life, and the imposing barrier of stigma. The American College Health Association (ACHA) implemented health services, such as counseling and psychiatry, on campuses to assist in helping college students.

However, that is not enough. Students must also seek outside help from organizations, like JED Foundation and the National Suicide Prevention Hotline, in trying to lower the rate of mental illness in college. There must be a team effort to help students succeed in life by overcoming the challenges that come with college life.

C

Learn to Play

By Kendel Mason, Emaunel Ramos, and Bashiri Smith

Abstract: There is a controversy as to the benefits of gaming. However, virtual learning has a positive impact on acquisition of knowledge. To determine the difference in which gaming contributes to the human mind, three different types of games have been studied and shown to improve comprehension: playing strategy games, violent games, and role-playing games.

*SURE/SSRI Programs &
Undergraduate Student Research*

Abstracts

Labyrinthula sp. Possible hidden killer in *Thalassia testudinum* (Turtle grass)

Paul Anderson

Mentor(s): Dr. Teresa Turner and Dr. Sandy Wyllie-Echeverria
College of Science and Mathematics
University of the Virgin Islands, St. Thomas

Seagrass *Thalassia testudinum* is a vital part of the marine ecosystem; it's a large food source for local Green sea turtles, as well as a fishery habitat, all while helping to stabilize the sea bottom. The purpose of this research is to identify if seagrass *Thalassia testudinum* in Brewers bay has any *Labyrinthula sp.* present. *Labyrinthula* is a protist marine slime mold responsible for seagrass wasting disease. In the 1930's over a two year period 90% of *Zostera marina* (eelgrass) was killed off along the Atlantic coast by what was believed to be *Labyrinthula*. *T. testudinum*, the only local species believed affected by *Labyrinthula*, once dominated Brewers Bay and has made a slow recovery since hurricane Earl 2010, and with the introduction of the invasive seagrass *Halophila stipulacea* any disease that effects only the native *T. testudinum* could make the slow recovery nearly impossible. Over the last year turtle grass around St. Thomas has shown signs of seagrass wasting disease, and this disease was identified in the spring of 2015 in Honeymoon Bay on Water Island. I set up a permanent transect in a bed of *T. testudinum* located in Brewers Bay. After establishing the transect I used a random number generator to select nine quadrats, that I used to calculate the shoot density within the seagrass bed. Then I selected nine individual seagrass blades inside the seagrass bed that were displaying signs of *Labyrinthula*, which are black-brown dots or streaks on the leaves. These nine samples were then plated on a medium of agar and left to grow for four days in the lab. After the four days the samples were checked and any growth was placed on an individual microscope slides and analyzed using a Zeiss microscope. Pictures were taken of all the findings and sent off to Dr. Lisa Muehlstein at Friday Harbor Labs to positively identify the *Labyrinthula*. At this time all nine samples have come back negative for the presents of *Labyrinthula*.

This research was made possible by funding from UVI NSF HBCU-UP Grant #1137472.

Comparison of benthic assemblages in native vs. invading seagrass beds.

Lauren Arnold

Mentor(s): Dr. Stephen Ratchford

University of the Virgin Islands

Halophila stipulacea is a non-native seagrass, which was introduced into the Caribbean at Grenada in 2002 from the Western Indian Ocean. Since then it has been recorded in many Eastern Caribbean islands including St. Thomas. One study concluded that this invading seagrass could outcompete the native seagrasses. *Syringodium filiforme* and *Halodule wrightii* are seagrasses native to the Caribbean Sea and found in the shallow waters of Brewers Bay. The purpose of this research was to determine some impacts of this invasion by examining the possible differences in the benthic fauna in the native and invading seagrasses. We suction sampled 0.1m² areas haphazardly in 10 native, invading and mixed seagrass beds. In the lab, the samples were thoroughly examined; the organisms and seagrasses were extracted. The organisms were identified by major taxonomic group. The seagrasses were identified by species and separated into detritus “brown” and live “green”, the dry weights of each sample were taken. There was no significant difference in the number of organisms and the faunal diversity in the different seagrass habitats. Fauna included clams, crabs, shrimp, worms, fish, snails, and many more. There was more detritus in *Halophila* beds than in *Syringodium* beds. Sampled fauna still need to be more precisely classified. The effects of *H. stipulacea* on turtle grass *Thalassia testudinum*, bare sand patches and deeper areas need to be studied.

This research was funded by NSF HBCU-UP Grant #1137472.

Algal dominance and herbivore preferences in the tropical intertidal: a comparison of organisms near Brewers Bay, St. Thomas.

Francheska Brenes-Rivera and Joshua Hazell

Mentor(s): Dr. Edwin Cruz-Rivera

University of the Virgin Islands

The intertidal is considered a model ecotone for the study of how gradients in biotic and abiotic factors shape species abundances and distributions. While many temperate studies have focused on temperate intertidal areas, there is surprisingly little on the effects of herbivores on tropical intertidal areas. This study focused on the feeding preferences and algal distributions of two tropical bays: Brewers Bay and Perseverance Bay. Benthic surveys showed significant differences in the amount of total algal cover and high variance in the dominance of different algal species at five transect points within these bays. The area of bare substrate varied significantly among sites, with Brewers East and Perseverance Bay having the highest amount of uncolonized space, while Black Point beach had the lowest. Brewers Bay east showed a high abundance of the cyanobacterium *Lyngbya majuscula*, which was not detected or occurred at very low cover in all other sites. In contrast, the brown alga *Sargassum polyceratum* dominated at Brewers Bay west, but was only found at lower amounts in Perseverance Bay, and was absent from the other three sites. The seagrass *Thalassia testudinum* and the red alga *Laurencia papillosa* occupied similar areas at Brewers Bay West, while none of the other sites showed similar cover from a seagrass. However, *L. papillosa* was also found in high amounts at a second site. The most diverse community in terms of algal cover was found at Black Point Beach, where the brown algae *Padina sanctae-crucis* and *Dictyota ciliolata*, and the red algae *Jania rubens*, *Laurencia papillosa*, and mixed crustose corallines occurred at similar abundances that were significantly higher than those of other algae. At Perseverance Bay, the brown algae *Padina sanctae-crucis* and *Dictyota guineensis* occupied the most space, but their densities were statistically equivalent to those of *Sargassum polyceratum*. Between site comparisons of the dominant primary producers found significant differences for all species compared, except the green turf alga *Cladophoropsis membranacea*. Although numbers of sessile and motile fauna were overall very low, a high and significantly different density of the rock-boring urchin *Echinometra lucunter* was found at Black Point Beach. Feeding preferences for five common algae and cyanobacteria (*C. membranacea*, *J. rubens*, *P. sanctae-crucis*, *L. majuscula*, and *Schizothrix* sp.) varied among the grazers tested, with the sea hare *Dolabrifera dolabrifera*, and the amphipod *Ampithoe* sp. showing no preference among diets. The urchin *Echinometra lucunter*, in contrast, significantly rejected the cyanobacterium *L. majuscula*, but consumed all other algae and cyanobacteria at similar amounts. The congeneric crabs *Mithraculus sculptus* and *M. coryphe* showed an interesting contrast, with the former strongly and significantly preferring the cyanobacterium *Schizothrix* sp. over all other foods, and the latter significantly consuming *C. membranacea* and *P. sanctae-crucis* above other foods.

This research was supported in part by National Science Foundation's Virgin Islands, Experimental Program to Stimulate Competitive Research (VI-EPSCoR award #1355437) and the Center for Marine and Environmental studies at the University of the Virgin Islands.

What influence do summer science camps have on their participants? An assessment of the 2015 Virgin Islands Coral Reef Discovery Week

Christopher Buttarò
Mentor(s): Howard Forbes
University of the Virgin Islands

Virgin Islands Coral Reef Discovery Week is a summer science camp for children generally between the ages of 12 and 16. The program focuses on enhancing local youth's environmental awareness, knowledge of marine science, and attitudes towards higher education. Throughout the week students participate in several activities to include: snorkeling, observing and identifying marine life, performing a lab experiment, boating, and listening various to talks from marine science experts. To gauge the effectiveness of these activities the children are given pre and post examinations which test their knowledge and attitudes concerning marine science, environmental awareness, and higher education. By recording the student's answers and using chi squared tests we were able to determine which questions the students as a whole improved on statistically.

This project was supported by UVI's Title III Grants.

Implementation of the Table Access Protocol at the Etelman Observatory

A.jodie Dasent

Mentor(s): Dr. Bruce Gendre
University of the Virgin Islands

Communicating data and observations is the key role of Astronomical Observatories. This is however a complicated task as each observatory has its own archive structure. The purpose of the Virtual Observatory TAP (Table Access Protocol) is to ease this process of communication. I will present in this poster the work I have done for the implementation of this protocol at the Etelman Observatory. The server will run on the Observatory main computer, running a Fedora 22 system with Java, MySQL, and PHP software. I have used pre-constructed software, where few have to be done for a fully functional data server. The coding was performed under the Eclipse IDE, and tested in a Virtual Machine sandbox for security purposes.

Aim = The Etelman Observatory will serve as way for other observatories to view data unique to the Caribbean region that will help other astronomers solve problems and other phenomenon

This research was funded by NSF HBCU-UP Grant #1137472.

Impacts of Fishing on Parrotfish Grazing

Austin Dubbs

Mentor(s): Dr. Marilyn Brandt
University of the Virgin Islands

Coral reefs worldwide have changed dramatically over the past few decades. Overfishing on a variety of herbaceous organisms has been shown to change the coral reef ecosystem due to the removal of macroalgae control agents. In the US Virgin Islands, overfishing of several species of parrotfish has resulted in detrimental impacts to the health of the local coral reefs by allowing overgrowth of coral by various species of algae. An overabundance of algae on coral reefs can also result in decreased coral growth and recruitment. Various parrotfish species control the abundance of algae but it is not known how this varies with species. The point of interest in this study is comparing the feeding behavior among these different parrotfish species. This project used observational behavioral analyses to quantify and compare parrotfish feeding behaviors among species. Parrotfish of different species were followed for twenty minutes and every action taken by the fish, including the number of bites and the substrate targeted, was recorded during that timeframe. Benthic surveys were also performed to determine the availability of algae on the reefs compared with algae known to be preferred food by parrotfish. We expect that grazing rates and food preferences will vary by species and that some parrotfish species will have a greater impact on algae cover. This project is a crucial step in understanding the species-specific roles parrotfish play on coral reefs, and will contribute to our understanding of these important fishery species and their habitats.

Acknowledgments: VI-EPSCoR and NOAA CRCP

Abundance and Diversity of Seagrass on the North Side of the St. Croix East End Marine Park

Antonio Farchette

Mentor(s): Marcia Taylor
University of the Virgin Islands

Seagrass plays an important role in the ocean and coastal ecosystem. Seagrass helps to keep coastal water clean, protects coral reefs, and provides food and shelter for a number of marine species. Yet they face many threats such as boating, pollution, and global warming. The loss of seagrass can cause problems, especially in marine protected areas as they rely on having a healthy ecosystem to operate. Having the proper information will help to regulate high risk areas and ensure protection. This study used ArcGIS and aerial photos, as well as field observations, to map out the locations of the seagrass beds and determine which areas need more regulations. This creates a baseline in which to compare against future changes. This study found that the main seagrass species located on the north shore are *Thalassia testudinum* and *Syringodium filiforme*, covering approximately 4174075 m². *T. testudinum* was the dominate species in many of the bays and covered the majority of areas sampled. In addition, many areas contained the macro-algae *Penicillus capitatus*, *Halimeda incrassata*, and *Dictyota divaricata*. This information can then be used to manage the areas which provide both food and habitat for a number of species such as *Tripneustes ventricosus* and *Strombus gigas*.

This research was funded by UVI Title III grant and NSF HBCU-UP Grant #1137472.
Research made possible with help from Dr. Alan Lewit, Dr. Avram Primack, John Farchette III, Marcia Taylor, Carlos Alloyo, and Howard Forbes Sr.

Evaluating the differences of bat habitat use and activity patterns using captive and passive methods

Asenee Flaharty and Muhammad Thuneibat

Mentor(s): Dr. Renata Platenberg
University of the Virgin Islands

Bats are the only native mammals of the Virgin Islands. There are five species, which are comprised of three fruit eaters (*Artibeus jamaicensis*, *Brachyphylla cavernarum*, *Stenoderma rufum*), one insectivore (*Molossus molossus*) and one fish eater (*Noctilio leporinus*). Our research evaluated the differences in habitat use of different species using three methods: capture of flying bats using mist nets, visual observation of flying bats, and ultrasonic recordings of echolocation calls. We utilized sound processing software to analyze the recordings. We conducted five netting and observation surveys in four different locations on St. Thomas (Hendrick's Bay, Humane Society, Magen's Bay and Neltjeberg Bay). The ultrasonic recorders were placed in two different locations (Hendrick's Bay and Neltjeberg Bay) and left for three nights. We evaluated bat use of three different habitats (closed forests, guts and open woodlands). All five species of bats were identified using mist nets, with a mean of 2.0 ± 1.0 species per survey. We were only able to identify two species (*M. molossus* and *N. leporinus*) using either the recorders or visual observations. We identified the activity times using the recorders and the spatial and temporal separation of the two species by observations. Different methods provided different pieces of information that collectively showed niche partitioning between *M. molossus* and *N. leporinus*. Despite overlapping in activity time and habitat, these two species showed separation in their use of habitat. Our methods used were unable to assess separation between the fruit-eating species due to their similarities.

Funding for this program is provided through a grant from the National Science Foundation's HBCU-UP program Grant #1137472, with additional support from the Community Foundation of the Virgin Islands.

Use of N-Gram and Frequency-Inverse Document Frequency in Extracting Features for Malware Classification

Alexander Fortenberry

Mentor(s): Dr. Marc Boumedine
University of the Virgin Islands

Malware is a software which is installed on a machine with the intention of executing undesired tasks. These tasks or processes can have a large range effects on the system and may spread to other systems on the network. With over 100,000,000 new malware created in the past year alone, the detection of these variants is essential to protect user privacy and secure critical infrastructures.

Current anti-virus programs typically use a signature based detection system. This system compares files contents to a database of signature which have been identified as malware. Signature detection can take a significant amount of time and cannot identify new variants before companies have a chance to analyze them. Our approach is based on machine learning techniques that will train and build models to automatically classify processes as safe or non-safe (malware). The main goal is to be able to identify sequence of low level commands in a program that are likely to result in an undesirable manner. In order to build the classifiers, we must first determine what features will be extracted from the programs to be analyzed in order to discriminate between safe and non-safe processes. These features are derived using the n-gram analysis method on the low level (assembly or hexadecimal) representation of the programs. A term frequency-inverse document frequency calculation (tf-idf) is applied to trim the list of features. Tf-idf is a statistical measure used to quantify the significance of each feature. The most relevant features will then be used for building the classifiers. This work presents the current results of n-gram analysis and the tf-idf calculations derived using the Python programming languages.

This work is funded by the NSF HBCU-UP Grant #1137472 and partially funded from the Minority Serving Institutions Partnerships Program of the U.S. Department of Energy, National Nuclear Security Administration.

Modification of Existing General Chemistry Labs using MicroLab™ Data Acquisition Systems

Jamisha Francis, Denine Hurtault, and Shanaliz Natta

Mentor(s): Dr. Stanley Latesky

University of the Virgin Islands

Two of the most useful types of experiments that can help emphasize to students lecture concepts are titrations and calorimetry. Recently, the Department of Chemical and Physical Sciences at UVI (St. Thomas) has purchased eight MicroLab™ data acquisition stations and the associated sensors that can be used to perform a variety of different experiments, including titrations and precise temperature measurements. We have successfully modified three types of experiments (acid-base titration, redox titration, and specific heat determination) currently part of our existing curriculum such that they can be performed using MicroLab™ systems. The results include standardization of reagents, experimental determination of unknowns, and statistical analysis of the data. In particular, the results demonstrate no statistical difference between calibration of droppers and rate of reagent addition for the titration results. Future work will include adapting more laboratories to be used with these systems and begin to use these systems in other courses in the curriculum (e.g. analytical and physical chemistry).

This research was funded by NSF HBCU-UP Grant #1137472.

Differential success of primers on tissue samples extracted from populations of *Molossus molossus* on St. Thomas

Villisha Gregoire, Semonie Rogers, and Danelly Samuel

Mentor(s): Dr. Alice Stanford
University of the Virgin Islands

Velvety free-tailed bats (*Molossus molossus*) are widely distributed throughout tropical Central and South America and the islands of the Caribbean. *Molossus molossus* are regarded as commensal insectivorous species, which occupy human habitats and aid in reducing insect populations in ecosystems. The overall objective of this study is to evaluate the genetic diversity of *M. molossus* between populations in St. Thomas and populations in St. John. Understanding the genetic diversity of the bats will aid in their possible conservation and restoration. Specifically, the aim of our project was to evaluate the success of the primers on the bats' DNA samples. The study sites involved in this research included Stumpy Bay, Magen's Bay, Smith Bay and Vessup National Park. Tissue samples and primers were collected and tested for DNA extraction and gene amplification of specific microsatellites. To unveil which primers work best with the DNA extract, various conditions such as DNA concentrations, annealing temperatures and different primers were manipulated for the amplification of the DNA. The primers which depicted the most amplification were H12, A10 and D15. We also concluded that the work strength of the primer was not dependent upon the DNA concentration, DNA purity, and the nucleic acid purity of the extraction. Statistical testing will be done in the future to determine the genetic diversity of the *M. molossus* on St. Thomas and St. John.

This research was funded by NSF HBCU-UP Grant #1137472.

The West Indian Sea Egg (*Tripneustes ventricosus*) is negatively impacted by the invasive seagrass *Halophila stipulacea*

Kyle Jerris

Mentor(s): Dr. Teresa Turner
University of the Virgin Islands

The West Indian Sea Egg (*Tripneustes ventricosus*) is one of the most prominent grazers on Caribbean seagrass beds. On some Caribbean islands such as Martinique and St. Lucia, there is a commercial fishery for it. Because Caribbean seagrass beds are being invaded by the Indian Ocean seagrass *Halophila stipulacea*, *T. ventricosus* is a prime candidate to control it. This study conducted on St. Thomas United States Virgin Islands, aimed to determine whether *Tripneustes* can act as a biological control for *Halophila* as well as what effects this seagrass might have on the urchin. To determine site preference, surveys were conducted at three habitat types. These surveys showed that these urchins preferred turtle grass (*Thalassia testudinum*) beds and rock substrate over *Halophila* beds (ANOVA $p=0.0022$) Only one urchin was found in a *Halophila* bed, suggesting it might not control the invasive seagrass. A multi choice feeding experiment was then conducted to determine preference among the seagrass species found on the island. The experiment showed that *T. ventricosus* greatly preferred *T. testudinum* over any of the other seagrasses. (Friedmans test $p=0.0001$) To further determine if the West Indian Sea egg would be a suitable biocontrol for *H. stipulacea*, urchins were fed either *Halophila* or *Thalassia* for five weeks. At first some of the urchins in the *Halophila* treatment refused to eat. After some time, more urchins started to eat the *Halophila*, which suggests that they can eat *Halophila* in natural conditions. As a proxy for health, I observed the urchins' righting behavior. The majority of the *Halophila* treatment urchins had a dropping behavior when righting themselves, suggesting that they have poor health on this food. Thus *Tripneustes* probably cannot control *Halophila* and indeed its population might be negatively impacted by the invasion.

This research was supported in part by the National Science Foundation's Virgin Islands Experimental Program to Stimulate Competitive Research (VI-EPSCoR award #1355437) and the Center for Marine and Environmental Studies at the University of the Virgin Islands.

Prevalence of Childhood Obesity in the East End Area on St. Thomas

Sudi-Ann Lewis-Dawkins

Mentor(s): Dr. Gloria Callwood

University of the Virgin Islands - Caribbean Exploratory Research Center

Introduction: Obesity, specifically in children and adolescents, may lead to serious health problems in the future. The aim of this study was to obtain the Body Mass Index (weight in kilograms divided by the square of height in meters) of the students located on the East End area on St. Thomas and compare to Texas students. With this data, the percentage of East End students' BMIs that fall into the categories of underweight, healthy weight, overweight or obese were determined. *Methods:* The East End students BMI status was acquired using the School Physical Activity and Nutrition Project survey. A stadiometer and a medical digital scale were used to obtain the measurement of the students' weight and height. The BMIs of the students were calculated manually using the BMI formula taken from the Center for Disease Control and Prevention and clarified with an EXCEL BMI calculator (metric version). The BMIs were later interpreted using charts that were separated by gender and age. *Results:* As a result of completing this research it was determined that the East End area had a higher percentage of students that were overweight and obese than Texas. East End percentage normal weight: 4th graders: 51.5%, 8TH:58.9%, 11TH:56.7%. East End percentage overweight: 4th graders: 16.9%, 8TH:19.6%, 11TH:13.4%. East End percentage obese: 4th graders: 31.6%, 8TH: 21.4%, 11TH:30.1% *Discussion/conclusion:* The results of this research may be used in the future to support efforts to improve school food choices and integrate an environment that is conducive to physical activity.

This research is funded by the UVI NSF HBCU-UP Grant #1137472. This study is supported through a Memorandum of Agreement between the Caribbean Exploratory Research Center (CERC) and the St. Thomas East End Medical Center Corporation (STEEMCC), funded by a grant from the United States Department of Interior's Office of Interior Affairs.

Magnetic Energy Coupling Across Solar Atmospheric Plasma Conditions

Ruel Mitchel

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Investigations of solar variability and its magnetic energy coupling are paramount to solving many key solar and stellar physics problems. Particularly, understanding the temporal variability of magnetic energy redistribution and heating processes. Using five years of observations, covering the ascending and beginning of the descending phases of Cycle 24, *Solar Dynamics Observatory's* Atmospheric Imaging Assembly (AIA) and Helioseismic Magnetic Imager (HMI), radiative and magnetic fluxes, respectively, were measured from coronal hole (CH), quiet Sun (QS), active regions (ARs), active region cores (ARCs), and at full-disk (FD) scales. Radiative flux modulations and magnetic energy couplings reveal a self-similarity throughout CH, QS, ARs, and FD features; consistent with notions of a similar central engine. ARCs, though consistent with previous suggestions, provide evidence of a runaway self-organized criticality of flaring activity -- a heating component married to the magnetic field distribution. In relation to the ascending phase of Cycle 24, a mathematical formula describing temporal thermal variability of our feature set is suggestive to a coupling of such to the solar atmospheric activity cycle. From this data we also present, and mathematically describe, the coupling of radiative fluxes, across broad regimes of the electromagnetic spectrum (covering photospheric through coronal plasmas), to the available magnetic energy. A comparison of the typical approach describing solar atmospheric radiative to magnetic coupling is performed against our extended description, which utilizes a broken power-law. This work reveals the entanglement of thermodynamic and magnetic energy contributions in previous works utilizing strict linear relationships describing magnetic to radiative energy redistribution processes across small energy ranges of the electromagnetic spectrum. Currently it is underway to investigate whether our established mathematical descriptions of solar atmospheric radiative to magnetic energy coupling hold across a descending solar activity phase.

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How *Halophila stipulacea* came to the Caribbean

Calwyn Morton

Mentor(s): Dr. Avram Primack

University of the Virgin Islands

Halophila stipulacea is an invasive species of seagrass that has recently been found in the Caribbean. The purpose of my research was to investigate how *Halophila stipulacea* may have migrated to the Caribbean. I tested the hypothesis of Lipkin (1975) that *Halophila stipulacea* could have moved on board a small boat, and the hypothesis that it could have arrived in the water transported by currents. To test these hypothesis I took samples of *H. stipulacea* and exposed them to the conditions that would be experienced under each hypothesis. The health of the samples was monitored using a portable fluorometer. I observed that plant health declined slowest when left floating on the water's surface while health declined faster when removed from the water, exposed to freshwater, and when kept in a damp cloth.

This research was funded by NSF HBCU-UP Grant #1137472.

Antioxidant Activity in Fresh Herbs

Genique Nicholas

Mentor(s): Dr. Bernard Castillo II
University of the Virgin Islands

Antioxidants are substances believed to prevent oxidation of substances within a cell. Recent research has shown that antioxidants are used to prevent degenerative diseases such as cancer, cardiovascular and neurological diseases. Some examples of foods with antioxidant are apples, berries, potatoes, grapes and herbs. The main objectives for our research were: 1) to determine the total antioxidant activity in the fresh herbs and 2) to determine which herb would be the best source for antioxidants. Our hypothesis was that the hydrophilic antioxidant activity (HAA) would be higher than the lipophilic antioxidant activity (LAA) in all of the fresh herbs tested. There were 9 different herbs tested, namely sage, parsley, thyme, 2 types of oregano, basil, chives, mint and rosemary. These plants were planted and grown at the UVI Greenhouse in the Albert A. Sheen campus. Antioxidants from these herbs were extracted in both an aqueous (HAA) and organic (LAA) solvents, using an aqueous buffer and ethyl acetate, respectively. In order to determine the antioxidant activity, the ABTS/H₂O₂/HRP decoloration method was used and scanned at 730 nm using a UV-VIS spectrophotometer. The antioxidant activity was reported as Trolox equivalent per grams dry weight of fresh herbs. From the results, HAA was generally higher than the LAA in all herbs. From our study, mint (12,032.13 μmol Trolox Equivalent per gram dry weight) had the highest total antioxidant activity. It was also observed that parsley (57.97 μmol Trolox Equivalent per gram dry weight) had the lowest total antioxidant activity.

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Probability Distributions of Yellowfin Groupers within the Grammanik Bank

DeWein Pelle

Mentor(s): Dr. Robert Stolz
University of the Virgin Islands

This project, is a continuation of a University of the Virgin Islands study conducted by Richard Nemeth, PhD and Jonathan Jossart, MS which sought to assess a probable location of habitation by the *Myteroperca venenosa*, yellowfin grouper, within the Grammanik Bank seasonal closure.

The yellowfin grouper is a coral reef fish that is prevalent within the western Atlantic Ocean, the Caribbean Sea as well as the Gulf of Mexico. Additionally, the grouper species is believed to live in reef areas with significant depth; however, migration to shallower areas are seasonally common. The aforementioned study utilized passive acoustic telemetry to track and monitor several factors of copious specimens. This current project seeks to utilize existing data to extend the abovementioned study through the application of several probability distribution functions (PDF's), operations used to define the probability of any quantifiable information and its possible outcome, to analyze plausible location for fish spawning. Uniform distribution shows a constant prospect from two foci, or otherwise two locations, in a set area of relatable distribution. Multivariate-normal distribution, a generality of the univariate normal to two or more variables, was also applied. Utilizing these methods with the dataset, we were able to identify probable fish location. Furthermore, the completion of this project assists in the zoning of the *Myteroperca venenosa* for proper cultivation whilst finding an amendable agreement to allow sustainability for the fishing industry in an avid attempt to avoid the yellowfin grouper's extinction within the Virgin Islands territory.

This project was funded by NSF HBCU-UP Grant #1137472 grant and while the deploying and maintaining of an acoustic array were funded by numerous agencies including Puerto Rico Sea Grant (#R-31-1-06), NOAA Saltonstall-Kennedy program (#NA09NMF4270068), the Virgin Islands Experimental Program to Stimulate Competitive Research (VI-EPSCoR #NSF-814417) and the Guy Harvey Research Institute.

Climate Data Analysis

Candace Petersen

Mentor(s): Dr. Avram Primack

University of the Virgin Islands

This study examined climate data collected by National Climate Data Center at National Oceanic and Atmospheric Administration between 1951 to 2013 for the Territory and the larger Caribbean for seasonal and long term patterns. We choose to use data from 1972 to 2013 because it has the most continuously operating stations that recorded MAX and MIN temperature and precipitation. At many of the stations data was recorded by hand. At others mechanical devices were set by hand. Both of these can result in errors and missing entries in the data series. I reviewed the data and constructed criteria in order to determine which were likely errors. The remaining data was reviewed and analyzed for patterns over the chosen years. As a result, it appears that from 1972 to 2013 that temperatures are steadily rising.

This research was funded by NSF HBCU-UP Grant #1137472.

Epibiotic community found on heavily fouled *Strombus costatus*

Jahnelle Rivera

Mentor(s): Dr. Stephen Ratchford

University of the Virgin Islands

Strombus costatus, also known as the milk conch, is a fairly large Caribbean gastropod that is found in seagrass meadows, sand beds, and algal flats at a depth up to 20 meters. A snorkel survey in Brewers Bay in summer 2014 revealed a large number of the milk conch in the Bay and that many of them were heavily fouled by sponges and macroalgae. This study was conducted this summer to find out the types of organisms that live on these heavily fouled conch. 23 fouled conch were collected haphazardly from Brewers Bay, then brought to the lab where the algae and fauna were removed, sorted and identified. 15 species of algae, several sponges, and 2 coral species were found fouling the conch. The algal species most commonly found and providing the highest biomass were *Laurencia*, *Acanthophora spicifera*, *Hypnea* spp, *Dictyophaeria cavernosa* and *Spyridea* sp. Annelids (worms) were the most common faunal organisms inhabiting the algae, sponges and tunicates fouling the conch. A variety of other fauna including fish, crabs, amphipods, anemones, snails, and bivalves live in this heavy fouling. Approximately 50% of conch in the bay are fouled. Why some conch are fouled and others are not is not understood. The fouling may somehow protect the conch against predators or it may be due to disease.

Support provided by VI EPSCOR.

Food has no significant effect on color of *Elysia crispata*, the solar powered lettuce sea slug, in a short term study

Zola Roper

Mentor(s): Ariel Hawkins and Dr. Teresa Turner
University of the Virgin Islands

Elysia crispata is a common herbivorous benthic marine invertebrate known as the lettuce sea slug studied because it has the unusual ability to sequester chloroplast from algal cells and utilize them for energy and coloration. These sequestered chloroplast are taken up by the digestive diverticula. This slug is a sacoglossan species that feeds on green macroalgae by scraping through their cell walls and ingesting the internal cytoplasm. I hypothesized that there would be different changes in coloration of the slug when fed different colored species of green algae, *Bryopsis pennata* and *Caulerpa racemosa*, or when it is starved. Thirty (30) slugs ranging between 2 cm to 5.5 cm were collected by snorkel in Brewers Bay, St. Thomas in May 2015. Ten (10) slugs were chosen for each treatment to include the green algae (*Bryopsis pennata*, *Caulerpa racemosa*) or starvation. The experiment was ran for 24 days (June 16, 2015 to July 9, 2015). Slugs were photographed before and after the experiment using a digital camera and then images were imported into Image J to obtain RGB (Red Green Blue) values. Additional initial and final weights of the slugs was also taken in grams. The slugs in all three treatments lost weight, but starvation slugs lost the most weight although this was not significant (Kruskal Wallis, $P > 0.05$). All slugs in each treatment changed Green values. The Green values became lighter in all three treatments but the starvation treatment had the greatest difference although not significant (ANOVA $P > 0.05$). These results suggest that coloration may not come from the food or that the experiment was too short for changes in coloration to occur.

This research was supported in part by the National Science Foundation's Virgin Islands Experimental Program to Stimulate Competitive Research (VI-EPSCoR award #1355437) and the Center for Marine and Environmental Studies at the University of the Virgin Islands.

Antioxidant Activity in Local Algae

Brianna Scotland

Mentor(s): Bernard Castillo II, Ph. D.
University of the Virgin Islands

Antioxidants provide many benefits to the human body. They protect the cells against damages caused by oxidation reactions. Antioxidants act as a reducing agent that stops oxidation, which cause free radicals. Prevention of cancer, heart diseases and aging signs are just some benefits of antioxidants. Antioxidants can be found in varieties of foods such vegetables, fruits and algae. The objectives of this experiment were to: 1) determine the antioxidant activity in local algae and 2) correlate the macroalgae phyla with antioxidant activity. Our hypothesis was that the algae within the phylum Phaetophyta would have the higher total antioxidant activity than the algae within the phyla Rhodophyta and Chlorophyta. The methodology used to determine the antioxidant activity was the ABTS/H₂O₂/HRP decoloration assay. The drop in absorbance was scanned in UV-VIS spectrophotometer at 730 nm. The antioxidant activity was reported as μ mole Trolox Equivalent (TE) per gram dry weight for algae. *Codium isthmocladum* (Chlorophyta) had the highest total antioxidant activity (872.96 μ mol TE per gram dry weight), relative to all samples. *Penicillus capitatus* (Chlorophyta) had the lowest total antioxidant activity (56.79 μ mol TE per gram dry weight). In conclusion, antioxidant activity was found in the six local algae and Phaetophyta did not have the highest antioxidant activity.

This research was funded by NSF HBCU-UP Grant #1137472.

Antioxidant Activity in Hybrid Sorrel

Ryan Shaw

Mentor(s): Dr. Bernard Castillo II
University of the Virgin Islands

Antioxidants are substances that are believed to prevent the destructive unwanted oxidation of substances in a cell. Research shows that antioxidants play a role in the prevention of multiple degenerative and neurological diseases. Anti-oxidants are found in fruits and in plants. Sorrel is a tropical plant that produces a red fleshy calyx that is used to create a local drink. Sorrel is known to be a rich source of anthocyanin. Recent work from the UVI-Agricultural Experimental Station on different sorrel breeds produced hybrids that are potentially more potent and resistant to harsh weather, droughts and pests. This study aims to investigate the different anti-oxidant activities of different hybrid sorrel. We hypothesized that the darker colored sorrel samples would have a higher Total Antioxidant Activity (TAA) compared to lighter colored sorrel. Seven different sorrel samples were used in this study, which were grown at the University of the Virgin Islands Albert A. Sheen campus. Anti-oxidants were extracted separately in aqueous phosphate buffer solution (Hydrophilic) and in ethyl acetate (Lipophilic). We used the azino-bis-(3-ethylbenzthiazoline-6-sulfonic acid/H₂O₂/horseradish peroxidase (ABTS/ H₂O₂/HRP) decoloration method to determine the TAA. The samples were monitored at 730 nm in a UV-VIS Spectrophotometer over the course of 5 minutes. All antioxidant activities were in units of μmol of Trolox equivalent per grams of dry weight. Our results showed that in general, the Hydrophilic Antioxidant Activity (HAA) of all the sorrel samples tested were significantly higher than the Lipophilic Antioxidant Activity (LAA). Sorrel sample (DWx100)xK had the highest TAA (45,965.91 μmol of Trolox equivalent per grams of dry weight) and sample 245xK R23P13 had the lowest TAA (14,823.8 μmol of Trolox equivalent per grams of dry weight).

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Exploring Themes in Recruitment for an Intimate Partner Violence Intervention Study with Women in the U.S. Virgin Islands

Kymerli Simon

Mentor(s): Dr. G. Callwood and Dr. J. Valmond
University of the Virgin Islands - Caribbean Exploratory Research Center

Introduction: Presently in the U.S. Virgin Islands, the lifetime prevalence of intimate partner violence (IPV) among women is significantly high at 32.8%. The purpose of this study was to explore themes associated with recruitment for an ongoing intimate partner violence intervention study. Recruitment into an intimate partner violence study may be challenging and discussing some themes why women did not participate may provide insights as to why enrollment into an IPV study is below projected numbers. *Methods:* Secondary data were extracted from the study recruitment logs which recorded how many females were approached, screened and accepted into the study. Data were placed into an excel spreadsheet. The data were analyzed quantitatively and qualitatively. *Results:* Over the course of 11 months of recruitment, a total of 429 women were approached and of that only 41 women agreed to be screened for the intimate partner violence study. Of the 41 women screened for the study only 17 women were accepted into the study. Seven themes for not participating in the study were highlighted. The key themes included time factors, personal factors, and displayed no interest. *Discussion:* Examining the themes given for not participating in the study may help researchers understand why enrollment is low. This examination can also help researchers propose strategies that can help increase recruitment.

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Analysis of the time spent feeding and moving by the lettuce sea slug

Ashley Thomas

Mentor(s): Dr. Stephen Ratchford
University of the Virgin Islands (UVI)

The lettuce sea slug, *Elysia crispata*, is a sacoglossan (sap-sucking) sea slug that steals chloroplasts from the algae on which it feeds; these chloroplasts continue to photosynthesize within the body of the slug. The movement and feeding behavior of this organism (which also can get energy from sunlight due to the stolen chloroplasts) was studied using time-lapse video recording of the slugs in 18x17x6cm trays for a twenty-four hour period. The amount of time spent moving, being still and being still on algae was measured. The species of algae included *Bryopsis pennata*, *Caulerpa racemosa*, and *Udotea flabellum*. Some slugs were given one species of algae, all three species or no algae at all. At least 7 replicates of each treatment were successfully completed. The majority of the slugs, despite their treatment, spent very little time moving. The slugs in algal treatments spent marginally less time moving at night than during the day and early evening. Except for one sluggish slug, the slugs spent far more time on *Bryopsis* than on the other algae. Starved slugs spent no more/less time moving than slugs with algae. The experimental results could be challenged since we used a weak light at night to videotape the slugs. Much of the work supports the conclusions from research of UVI graduate student, Ariel Hawkins.

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The Chaser

Leon M. T. Wheeler

Mentor(s): Dr. Andrew Gard

University of the Virgin Islands - Research and Technology Park

First studied in 1732 by Pierre Bouguer, a pursuit curve is a path traced by a point (interpreted as a fox, for example) that always moves directly towards a moving target (a rabbit, for example). In this research, we have added an underlying vector field (wind or a water current, for example) and analyzed the changes to the pursuer's path. Using Octave, we solved the resulting differential equations numerically and compared the results for varying relative speeds. This work lays the foundation for analysis of more complex pursuit scenarios.

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