15th Annual
Summer Student Research Symposium

July 28th, 2017
10:00am to 12:00pm
Administration and Conference Center (ACC)
University of the Virgin Islands
St. Thomas Campus

15th Annual Summer Student Research Symposium Abstract Book

Friday, July 28th, 2017
ACC Building
St. Thomas Campus
University of the Virgin Islands

Event Organized by

Emerging Caribbean Scientists Programs
College of Science and Mathematics
University of the Virgin Islands
2 John Brewer's Bay
St. Thomas, VI 00802
Phone: 340-693-1249
Fax: 340-693-1245
Email: ecs@uvi.edu
Website: http://ecs.uvi.edu

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.

Acknowledgements

Funding sources:

- National Science Foundation (NSF) - Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)
- Virgin Islands Experimental Program to Stimulate Competitive Research (VI-EPSCoR)
- UVI Title III grant
- ECS Honors Fund

Organization Team

Dr. Verleen McSween, *STEM Summer Programs Coordinator*
Dr. Robert Stolz, *HBCU-UP Program Director*
Dr. Teresa Turner, *MARC & MBRS-RISE Program Director*
Mrs. Resa Berkeley, Data Specialist
Ms. Aimee Sanchez, *Grants Manager*

Special thanks to Mr. Stevie Henry for assisting with poster printing.

Summer Freshman/ Sophomore Research Institute (SFRI/SSRI)	Summer Undergraduate Research Experience (SURE)	NASA Summer Research Program	Mathematics Behind the Science (MBS) Program	Sophomore Boost Program
Aisha Griffin Arl Polydore D'Shaunique Walters Hairol Breton Harmonie Hanley Jair Smith Kiwanee Smith K'Mari McClean Lawrence White Micaiah Bully Omori Wade Roberto Tirado, Jr. Ronell Brunn Samuel Jones	Bashiri Smith Carlan Romney Christian Soto Edwin Joseph Erlin Ravariere Jasiem Everington Joseph Williams Julienne Ekpe Keryl Liburd Kristina Diaz Makayla Peterson Nadia Blake Roosevelt Joseph Stephanie Bullock Yolanda Felix-Medina Jerome Philbert Brandon Manners Jasnique Allen	Amali Krigger Azhar Hussein I'Zhaneeh Deterville Kaylan Husband Marc-Anthony Colon Megan Grant Nikkoiya Cromwell Peter Jean-Baptiste Ruel Mitchel	Ajani Gordon Aliya Benjamin Elisha Brumant Gabriella Passee Jaydan Jacobs Jevon Henry Julia Boehman Kaheem Walters Kyanna Rantan Malik Alexander Michael Caracciolo Milan Philbert Mya Phillips Shania Joseph Zion Shaw	Derrick Thomas Jr Jahkara Jonas Zahaieda Lewis Anecia Matthew Sophy Marinez McKim Colaire Moesha Blyden

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 Freshman/Sophomore Research Institute (SFRI/SSRI) - A summer research program that allows 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.
- Sophomore Boost Program - Students participants receive training in creativity thinking, growth mindset, and work on an emerging technology project using the Internet of Things.

These programs are funded by the NSF HBCU-UP & ACE grants.
Additional support is provided by private donors and other organizations.

Mentors

Summer Undergraduate Research Programs

Noreen Michael
Brice Orange
Antonino Cucchiara
Robert Stolz
Bernard Castillo
Jennilee Robinson
Alice Stanford
Christopher Plyley
Stephen Ratchford
Marilyn Brandt
Dara Hamilton
Bruce Gendre
David Morris
Timothy Kentopp
Marc Boumedine
Celil Ekici
Janis Valmond
Jason Lewis
Kristin Wilson-Grimes

Math Behind the Science Program

Avon Benjamin
Andre Douglas
Brandon Rhymer
Aimee Sanchez
Krislen Tison
Shequana Slader
Robert Stolz
Teresa Turner
Linda Wymer

Sophomore Boost Program

Verleen McSween
Michael Smith
Teresa Turner
Nicolas Drayton

The organizers would like to thank the mentors for dedicating their time and energy to assist these student to prepare the presentations. You have made a huge contribution to the success of our students and the symposia. Your dedication to the advancement of young Caribbean scientists in this community is greatly appreciated.
Thank you!

TABLE OF CONTENTS

An Internship to Explore Coral Reef Health

Presenter(s): Jendahye Antoine
Mentor(s): Dr. Marilyn Brandt

Coral reefs are an immensely important marine ecosystem. They provide nutrients to the ecosystem, shelter/habitat for marine life, inland/shoreline protection from natural disasters and provide economic benefits in the tourism and medicinal industries. Unfortunately, coral reef abundance is declining rapidly for various reasons. Understanding what stressors affect coral reef health and how they vary in space and time is critical to protecting them for the future. The objectives of this internship were to gain training in coral reef monitoring and experimentation. The first half of my internship included working with field coordinator, Ms. Sarah Hile, of the National Coral Reef Monitoring Program (NCRMP), administered by the National Oceanic and Atmospheric Administration (NOAA) to organize and be exposed to the operations of a large scale coral reef monitoring data collection project. The other half of my internship was to assist in the facilitation of a National Science Foundation-funded research project which is investigating the effect of species diversity on coral immune response and disease susceptibility in the US Virgin Islands. There were many positive experiences in my internship. I was able to witness and be a part of two very important projects in the field of marine biology. I experienced many different scenarios, events and opportunities that only people with ten times my experience would be exposed to. For example, I was flown to St. Croix to be a part of NCRMP and shadow the field coordinator where I learned to plan dive sites, maneuver the ArcGIS system and input data and gain superior organization skills. The internship granted me a special insight on many different aspects of expertise in the marine biology field. I've learned so much about specializing in the coral field including several species names, their biology, handling/care, maintenance, ongoing research, etc. There were obstacles faced within each project like bad weather, boat issues and logistical juggling in NCRMP which led to 71 sites of the original 250 site goal not being completed. Fortunately, UVI's technical divers are being contracted in the fall to finish the remaining sites. The NSF project suffered a black bacterial growth outbreak in the water system causing the death of first set of corals collected aside from a few fragments. After cleaning the tanks, adding mesh filters over the pumping, and close maintenance of the water system, the issue was resolved and the two main experiments were successfully completed. NCRMP's ultimate goal data is to compile all the data into a single mapping database accessible by various organizations to simulate what exactly the reefs look like at any given site selected. The NSF EAGER project's ultimate goal is to be able to develop a model of what the Caribbean reefs will look like under the progression of global warming and further white plague exposure based on the effect of species diversity in disease susceptibility and immune response. With continued effort and funding, we hope to achieve these goals.

Acknowledgements: NSF INCLUDES Award #1649300, NSF EAGER AWARD #1712540, NOAA NCRMP

Apicomplexan Fish Blood Parasite-Isolation and Transmission

Presenter(s): Nadia Blake, D'Shaunique Walters, and Keryl Liburd
Mentor(s): Dr. Jennilee Robinson

Apicomplexa are intracellular protozoan parasites that infect a wide array of host animals including humans, other mammals, birds, reptiles, fish and invertebrates. Apicomplexa are responsible for severe human disease such as malaria, but little is known about other natural apicomplexan infections. Fish infections can be used as alternate model systems to study these parasites. In the Caribbean, some of the most abundant coral reef fish, *Stegastes* damselfishes, are infected with Apicomplexa parasites in their red blood cells. To characterize the lifecycle, host range, and transmission route of these parasites, our goal is to develop methods to isolate and detect them in infected fish samples. **We hypothesize that we can isolate parasites from fish blood using Percoll density step gradients to fractionate cells**. To test our hypothesis, we captured damselfish from their natural reef habitat, collect blood, and release them. Next, patterns of fractionated cells were compared from blood samples with varying degrees of infection. We also optimized various techniques for detecting parasites, including microscopy, PCR and western blot. We identified parasites in Giemsa-stained whole blood smears from 40% (4 of 10) *Stegastes adustus,* dusky damselfish, captured and released in Brewers Bay, St. Thomas in June 2017. We also were able to detect parasites in some fractionated blood cells using microscopy. PCR and western blot analysis will be used to confirm that some blood cell fractions are enriched with parasite DNA and proteins. PCR analysis followed by DNA purification and sequencing tested primer specificity for the parasite 18S rDNA. Sequences amplified from damselfish blood matched to other Caribbean fish apicomplexan isolates in the NCBI nucleotide database using BLAST. Our results suggest that we can fractionate fish blood, detect parasite DNA and visualize infected cells using microscopy. These techniques can be used for future experiments to identify the range of tissues and hosts infected, towards mapping the lifecycle and transmission routes of these apicomplexan parasites. The positive impact of our research will be significant, as our findings will facilitate the application of this naturally occurring infection to the study of human disease.

Acknowledgements: NSF VI EPSCOR mini Grant #1301755, NIH NIGMS-RISE #5T36GM10995-02, and NSF HBCUUP grant award #1137472

Identifying Tagged Sea Turtles

Presenter(s): Moesha Blyden and Anecia Matthew
Mentor(s): Dr. Paul Jobsis and Dr. Michael Smith

Marine animal tagging is a worldwide practice used by marine biologists to identify and study turtles and other sea animals. Our research focused on improving the tags used to track sea turtles in Brewers Bay, St. Thomas Virgin Islands. Many different methods of coloring the tags were attempted. In future research, we hope to find a solution to track when the turtles are leaving and returning to the bay, which will also provide valuable information on how long they stay within the bay.

Acknowledgements: Sophomore Boost Program funded by NSF ACE award #1623126

The White Plague: A Glimpse Into The Future

Presenter(s): Hairol Breton and Harmonie Hanley
Mentor(s): Dr. Robert Stolz and Dr. Marilyn Brandt

Coral reefs are essential to both aquatic life and man. They provide habitats to many marine organisms, protect coastlines from damaging effects, and are great for the economy. Sadly, due to many environmental factors, reefs in the Caribbean are experiencing bleaching events, making them more susceptible to diseases such as the white plague. Fortunately, a cellular automata can be used to assist in addressing this issue. A cellular automata (CA) consists of a collection of cells arranged in a grid, such that each cell changes its state as time progresses. In past years, they've been used to model many real world phenomena such as the spread of forest fires, the growth of crystals, and even the evolution of various biological lifeforms. With the usage of a cellular automata, scientists will now be able to determine whether or not disease among corals will continue to spread. Additionally, they will be able to even predict what coral reefs will look like in the future with the use of accurate data. For our CA, we created two versions that modeled the spread of a random distribution of corals in varying states. In our first version, we created a very simple model which included the following: the Von Neumann Neighborhood consisting of only four neighbors which could be either healthy or diseased, a neighborhood with an area of $1m$ 2 , and four simple rules that determined the outcome of the initial cell. From this model we observed that 17% (percentage of diseased corals) is the "tipping point" of whether the reef will remain relatively healthy or become sick all together. In our second cellular automata, our model became more complex. We incorporated 8 neighbors using the Moore Neighborhood which included neighbors that can now be either in a healthy, diseased, or empty/dead state, as well as six rules that governed the state of the corals as the number of steps progressed. In this model, we saw that the new "tipping point" was around 30% (percentage of diseased corals). The results from both cellular automatas are very informative. They gave us an accurate representation of what reefs will look like as time progressed; making these models stable guides in helping scientists improve the outcomes of the coral reefs in the Caribbean. In the future, we hope to make a third version in which we will create probabilistic rules to observe geometric patterns in the CA, look for multiple tipping points, and conscientiously look for different time periods where with scientists' intervention, would create the best outcomes for coral reefs.

Acknowledgements: NSF HBCU-UP Award #1137472

Talking behind your back? What your computer secretly says about you.

Presenter(s): Ronell Brunn
Mentor(s): Timothy Kentopp

In today's world, software is being developed to be useable on download by having a list of default settings for the user. While these default settings may make life easier for the user during the initial startup, many people remain unaware of what they do or how they operate. This is a dangerous concept as many of these settings may offer no benefit and may even harm the consumers of these products. The purpose of this research is to delve into the default settings you may find in a household and analyze what they do and how changing them can affect the device. By design, this research topic will lead student(s) into learning about potential risk that the devices may be exposed to and how some of these settings may hamper or help the device. This topic also comes with the flexibility for students to open and explore new avenues of threats that plague the internet and possible remedies they can use to defend themselves and others. On such avenue to explore, is the examination of the open and closed ports used by a device while it is functioning.

Acknowledgements: NSF HBCU-UP GRANT #1137472

An Examination of Risk Factors for Teenage Pregnancy in the United States Virgin Islands

Presenter(s): Candace Bryan
Mentor(s): Dr. Noreen Michael

Teenage pregnancy is an important public health issue in modern society. It is one of the key indicators in the Healthy People 2020 objectives. This research examined some of the risk factors for teenage pregnancy in the Virgin Islands in comparison with Puerto Rico, Florida, and the United States. Also, this research compared the territories frequency of teenage pregnancy and risk factors with the Healthy People 2020 Goals and serves the purpose of examining areas in which the territory requires improvement to meet the Healthy People 2020 indicators. Secondary Data was collected from Data Books originating from the Kids Count Data Center and the Community Foundation of the Virgin Islands' Kids Count U.S.V.I. for the years 2012 and 2013. Using Microsoft Excel, the data was analyzed and presented in graphs. The analysis of variables described the Virgin Islands as a community at risk in which 1 out of every 3 children lived in poverty. The median family income represented this disparity as the Virgin Islands and Puerto Rico communities trailed greatly behind the nation's average. Territorial risk factors such as large minority populations and increasing single parent families were identified. Many parents in the Virgin Islands also lacked a high school diploma. Using these results, the Virgin Islands' Community Foundations can focus their efforts to reduce the risk factors for teenage pregnancy in the Virgin Islands. Although the frequency of teenage pregnancy is decreasing and almost in range of the Healthy People 2020 goals, efforts are still needed to reduce risk factors for teenage pregnancies. Future research should include recent studies on risk factors and demonstrate longitudinal studies to determine the association between risk factors and teenage pregnancies in the Virgin Islands.

This research was funded by the Title III Grant Number 200824.

Antioxidant Properties of Algae in the US Virgin Islands

Presenter(s): Stephanie Bullock and Yolanda Felix-Medina
Torhera Durand, Naiema Durand, Erlin Ravariere, Michael Rosario and Marcia Taylor
Mentor(s): Dr. Bernard Castillo

Compounds high in antioxidant activity are generating a lot of interest with increasing consumer demand for such products and produce. These compounds counteract the formation of free radicals, which have been linked to many chronic and degenerative human diseases and certain cancers. Antioxidants can be found almost everywhere – in fruits, vegetables, spices, vitamin supplements and in algae. The objectives of this study were to quantify the hydrophilic antioxidant activity (HAA), lipophilic antioxidant activity (LAA), and the total antioxidant activity (TAA) of different species of algae in three families, namely, Rhodophyta (red algae), Chlorophyta (green algae), and Phaeophyta (brown algae). We hypothesize that for all species of algae collected, the HAA will be greater than the LAA. In this study, 28 species of algae were collected in St. Croix, Virgin Islands. The 2, 2-azino-bis-(3-ethylbenzthiazoline-6-sulfonic acid), H_2O_2, horseradish peroxidase (ABTS/H_2O_2/HRP) decoloration method was used to determine the antioxidant activity then scanned using a UV-VIS Spectrophotometer at 730 nm. The antioxidant activities were expressed as μmol trolox equivalent per gram dry weight (μmol TE/g DW). For all of the samples tested, *Caulerpa prolifera* had the highest TAA (97.281 ± 18.475 μmol TE/g DW) while *Dictyota jamaicensis* had the lowest TAA (1.999 ± 0.889 μmol TE/g DW). The green algae had the highest mean (23.754 ± 29.710 μmol TE/g DW) antioxidant activity among three families collected,followed by the red algae (18.346 ± 27.398 μmol/g DW) then brown algae (12.595 ± 11.861 μmol/g DW). Our study have shown that the HAA were generally higher than LAA. A one-way ANOVA test showed significant difference between the HAA and LAA (p = 0.0509). One-way ANOVA comparing all three groups revealed that there was no statistical difference between their TAA (p = 0.621). Based on these results, the data collected showed that different algae contain various ranges of antioxidant activities and generally HAA was higher compared to LAA. We did not find any significant difference between the antioxidant levels between the groups we tested. For future work, we plan to extract and identify the specific compound in each sample that is responsible for the levels of antioxidant activity using HPLC.

This research was funded by Emerging Caribbean Scientist and HBCU-UP Grant No. 1137472 and NSF through VI-EPSCoR IIA-1355437.

Characterizing Halophila stipulacea Invasion into the Coastal Waters of St. Thomas

Presenter(s): Micaiah Bully, Aisha Griffin, and Carlan Romney
Mentor(s): Dr. Alice Stanford

Seagrasses are essential to marine ecosystems, providing food, shelter, and nutrient cycling. Additionally, they aid in ecosystem services by reducing current speeds, maintaining the coast line, and stabilizing sediment. However, when invasive seagrasses inhabit regions outside of their native waters they can outcompete the native organisms there and become detrimental to the ecosystem. *Halophila stipulacea* is an invasive seagrass that is indigenous to the Indian Ocean and eastern coast of Africa and reproduces asexually outside of its native waters. While it has been apparent on many Caribbean islands for some time, it is relatively new to St. Thomas. Because of this, it is possible to use genetic haplotypes to create a map of *H. stipulacea's* spread to St. Thomas. The purpose of this study is to successfully create DNA libraries that can then be sequenced and used as a model. DNA was extracted from samples of *H. stipulacea* collected around St. Thomas. The ALF1 restriction enzyme was used to digest the DNA and unique DNA sequences were used to amplify. 2b-RAD genotyping was utilized in this study due to its accuracy and high rate of success in assessing genetic variability. It was found that proportional recipes for digestion, ligation, and amplification could be used to successfully create DNA libraries of the thirty-two base pair fragments needed for sequencing. 100% of the samples collected were made into libraries, having an average mass of 35.8 ng of DNA. It was concluded that the proportional recipes and methods utilized were most effective for preparing DNA libraries of *H. stipulacea* and that samples could be sent abroad to be sequenced.

Acknowledgements: VI EPSCoR, NSF HBCU-UP grant 1137472

Coral Reefcognition System

Presenter(s): McKim Colaire, Zahaieda Lewis, and Derrick Thomas Jr.
Mentor(s): Viktor Brandtneris, Dr. Tyler Smith, and Dr. Michael Smith

Algae is harmful to coral reefs and can lead to population reduction. To estimate the damage, researchers collect multiple samples of algae and coral to identify problem areas. The size of the image collections are large and require manual inspection to identify algae. Our research investigates the potential for automatic image classification through color and texture features.

Acknowledgements: Sophomore Boost Program funded by NSF ACE award #1623126

Comparing Hash & B-Tree Indexes with Application to Database Indexing

Presenter(s): Kristina Diaz
Mentor(s): Dr. Marc Boumedine and Dr. Stanley Jointer, II

Seagrasses are essential to marine ecosystems, providing food, shelter, and nutrient cycling. Additionally, they aid in ecosystem services by reducing current speeds, maintaining the coast line, and stabilizing sediment. However, when invasive seagrasses inhabit regions outside of their native waters they can outcompete the native organisms there and become detrimental to the ecosystem. *Halophila stipulacea* is an invasive seagrass that is indigenous to the Indian Ocean and eastern coast of Africa and reproduces asexually outside of its native waters. While it has been apparent on many Caribbean islands for some time, it is relatively new to St. Thomas. Because of this, it is possible to use genetic haplotypes to create a map of *H. stipulacea's* spread to St. Thomas. The purpose of this study is to successfully create DNA libraries that can then be sequenced and used as a model. DNA was extracted from samples of *H. stipulacea* collected around St. Thomas. The ALF1 restriction enzyme was used to digest the DNA and unique DNA sequences were used to amplify. 2b-RAD genotyping was utilized in this study due to its accuracy and high rate of success in assessing genetic variability. It was found that proportional recipes for digestion, ligation, and amplification could be used to successfully create DNA libraries of the thirty-two base pair fragments needed for sequencing. 100% of the samples collected were made into libraries, having an average mass of 35.8 ng of DNA. It was concluded that the proportional recipes and methods utilized were most effective for preparing DNA libraries of *H. stipulacea* and that samples could be sent abroad to be sequenced.

Acknowledgements: VI EPSCoR, NSF HBCU-UP grant 1137472

Mathematical Modeling and Estimation of the Basic Reproductive Number of Zika Cases in the U.S. Virgin Islands

Presenter(s): Julienne Ekpe
Mentor(s): Dr. Celil Ekici

The Zika virus is a mosquito-borne disease that has rapidly spread across the Americas and South Pacific since 2015. The aim of this study is to estimate the basic reproductive number for the Zika virus in the Virgin Islands. We leveraged Zika epidemic data from other Pacific Islands as a proxy for the estimated number of cases in the U.S. Virgin Islands. The basic reproductive number, also known as R(0), is a measure of the transmission potential of an infectious disease. R(0) in this research is estimated and shows that either the epidemic disease will continue to increase, (if R(0) > 1) or if the epidemic disease will eventually die out, (if R(0) < 1). This research intends to determine the estimated value of the basic reproductive number using two methods, the classic Ross-Macdonald formulation as a function of temperature and graphical analysis. Using these two methods, we found the basic reproductive number for all three islands were between 4.4-4.9. These results can help in the understanding of the pervasiveness of the Zika virus throughout the U.S. Virgin Islands and provide a framework for the analysis of future mosquito-borne diseases.

Acknowledgement: Funding provided by NSF HBCU-UP 1137472

The Nature Conservancy: Raising brand visibility throughout the U.S. Virgin Islands

Presenter(s): Regina Evans
Mentor(s): Jessica Wiseman

With growing concerns of global climate change and its negative effects throughout the world many organizations and researchers are robustly working towards methods and innovative ways that will 'seek to protect the lands and waters on which all life depends'. The Nature Conservancy whose mission reflects just that, is globally the leading organization committed to conservation work in 6 continents, over 70 countries and well throughout the Caribbean. With growing visibility throughout the US Virgin Islands, TNC owns and manages sites such as Jack and Isaac's Bay located on the east end of St. Croix open to all for its breathtaking scenery and hiking, a nature trail on St. Thomas at Magen's Bay and a historic plantation, Estate Little Princess also home to its USVI office. My aim is to increase brand visibility for The Nature Conservancy in the USVI and to educate about their conservation work which includes coral reef restoration, turtle protection and its "Reef Responsible" initiative. Through a series of public outreach, media broadcasting, and increasing brand visibility by adopting and beautifying areas and added educational signage throughout our sites I predict that these techniques used would aid to meet my main objective. I will discuss The Nature Conservancy's conservation projects while highlighting the organization's overall importance.

Acknowledgements: NSF INCLUDES Award #1649300

Hackers Roam the Cyber World

Presenter(s): Jasiem Everington
Mentor(s): Timothy Kentopp

My research project was focused around the idea of hackers penetrating computer systems. My research questions are; What vulnerable ports on my devices that are accessible to hackers?, What methods/computer commands could be used to strengthen my firewall?. For many decades, ethical and unethical hackers were battling through the virtual/cyber environment. However, ethical hackers are responsible to understand and secure the vulnerabilities computer databases may reveal. For instance, unethical hackers infect computer systems after they identify the susceptible tcp open ports. As my research progressed, I found out that some default settings like, for example the firewall, doesn't secure your computer system thoroughly. Additionally, when I used grc-shields-up this software identify three ports that were open on my computer. Moreover, one of the main open ports that my mentor and I targeted was the Microsoft Servicer which was caused because the file and Microsoft printer sharing & Ipv6 boxes were checked under the Wifi properties. My results were found using Grc-shields-up and Kali-Linux those software aided my total research quest. The Grc-shields-up software was used to target the vulnerabilities in my computer using my Ip address. In the Kali-Linux software, I used Nmap and HPinge to pinpoint my vulnerable tcp ports, and find secure commands to close them. For personal reasons, ethical and unethical hackers always grasped my attention; therefore, this research was done because I wanted to discover more about the dark secrets in the hacking ambiance. My gap of knowledge I was trying to fill before this research was: what tools/methods are used to access someone's personal information?. The results I found were very valuable because it keenly helped increase my knowledge of the cyber world attacks. The implication drawn from my result is that normal/natural computer users are comfortable with default firewall settings, without knowing that encryption codes can be used to crack through their databases. For future studies, I will continue using Kali-Linux and other programming software to discover information gathered like active listening, data packets, and other miscellaneous data being sent through computer communication.

Acknowledgements: NSF HBCU-UP grant #1137472

What is Our Footprint?
The Energy Consumption, Allocation, and Cost of UVI

Presenter(s); Megan Grant
Mentor(s): Nino Cucchiara PhD., Glen Jarvis Jr., and Greg Guannel PhD.

The University of the Virgin Islands (UVI) is one of the biggest consumers of energy in the Virgin Islands, and spends millions of its precious resources on electricity bills. However, despite our efforts, our energy consumption still isn't as efficient or as green as it could be. To create a model to test this theory we conducted an energy audit on a small building on the Albert A. Sheen campus. We tracked the energy consumption of the building using a data logger and we itemized all of the electrical loads in the building to calculate their relative consumption. After collecting total consumption data for 17 days we analyzed our data with respect to cost and time using the Python programming language. At this symposium we will present our findings and initial recommendations (material and behavioral) of potential cost savings.

Acknowledgement: NASA MIRO grant NNX-15AP95A

Initial Studies of 3D Magnetic Reconnection: Simulation and Engineering

Presenter(s): Peter Jean-Baptiste
Mentor(s): Dr. Brice Orange

Magnetic reconnection is an energy conversion process that depends on the diffusion of plasma across magnetic field lines. It is our understanding that in the solar atmosphere such processes are thought to be the main formation mechanism behind the solar wind and energetic particle events. Numerous laboratory experiments have been undertaken to study this fundamental plasma process in 2D. This summer's research relied heavily on the coding software known as Python. We used the Python version 2.7.13 supplemented with SciPy and NumPy packages which allowed us to integrate numbers, grids, and numbers into our simulations. Over the duration of our research, we focused on simulating the optimal form (shape, distance from null point, size, etc.) of the conducting coils that would be used in 3D experiments focused on allowing plasma to release energy in the form of outward jet propulsions while undergoing magnetic reconnection using 2D python generated images. We underwent this process by continuously editing the numerical values that were present in the "Biot Savart Solver. Py" python code which was the backbone of our generated images. By changing the values of the radius, size, increments, etc. within the code, we could generate several tens of images that demonstrate the different forms of the conducting coils. Our results have bettered our understanding of the various orientations that are possible for the conducting coils to be used in 3D experiments with magnetic reconnection.

Acknowledgement: NASA MIRO grant NNX-15AP95A

The Cooling System for the Etelman Observatory

Presenter(s): Samantha Jahkara Jonas
Mentor(s): Dr. David Morris and Dr. Michael Smith

The Etleman's Observatory is now owned by the University of the Islands. Why not upgrade and take care of what we rightfully own? As technology is being upgraded, the observatory should be upgraded in the needed ways to keep it going. I came up with the idea of adding a temperature sensor. I thought it was a good idea for putting in the observatory to keep it cool. When the room is closed, it is cooled inside, but when it's open what ever heat or temperature is on the outside comes inside. I had ideas of possible ways I could keep the room cool all the time. What are some efficient ways I can set up this system? More research is needed to be done with the ideas of adding a cool ventilation system. The play is not going to work because we don't want any light source bouncing back to the telescope which doesn't give a clear view or what the astronomers need.

Acknowledgements: Sophomore Boost Program funded by NSF ACE award #1623126

Promoting Server Awareness: How safe is your data?

Presenter(s): Samuel Jones
Mentor(s): Timothy Kentopp

Information is changing and becoming more diverse in today's world. The way in which we store different types of information on the web is constantly being refined. We use the Internet for many purposes, whether for work or for leisure as we log personal information onto various sites. This is then transferred and stored into servers for management and ease of use for many users. While the utilization of servers has proven convenient to many users, many risks are often involved in keeping the information on the internet. How well are sites securing our information? Also, how protected are the servers from attackers? The purpose of my research is to aid the understanding of proper network security in usage of data. My goal is to highlight the potential vulnerabilities associated with utilizing web-based servers. This topic aims to promote awareness about how users store their data on websites with poor security.

Acknowledgements: NSF HBCU-UP grant #1137472

A Dual Approach of Theoretical Mathematics and Computer Science to the Study of Zero-Sum Problems

Presenter(s): Edwin O. Joseph Jr. and Joseph Williams
Mentor(s): Dr. Christopher Plyley

Problems in combinatorial number theory are widely researched by mathematicians and have numerous applications, including cryptography and computer science. The aim of our research was to investigate the values of an important unknown constant in zero-sum theory, called T(n), by using a combined approach of both theoretical mathematics and computer programming techniques. More specifically, we aimed: to calculate, as high as possible, the values of T(n), to improve the theoretical bounds that describe the long term behavior of T(n), and to write computer programs with efficient algorithms that will allow us to determine the values of T(n) and other constants, such as the Olson's constant (Ol(n)). Upon completion of our research we found an improved upper-bound for T(n), we computed T(n) explicitly for all values less than 50, and we wrote a new computer algorithm which calculates Ol(n) with improved efficiency. To achieve our goals, we read articles published by number theorists so as to gain a better understanding of the history and nature of the problem, and we studied a program written by I. Dennie which used naïve recursion to find values of T(n), and wrote a new program which used recursion/pruning to more efficiently find values of Ol (n). This topic is of interest as the value of T(n) represents an invariant property of the finite cyclic groups, which are the fundamental building blocks of group theory. In the end, we concluded that the value of T(n) depends heavily on the prime factorization of *n.* In the future, we hope to find a function that bounds T(n) in terms of Ol(n), find larger values of T(n) and Ol(n) and improve the efficiency of the computer program in order to calculate larger values of T(n).

Funding was provided by NSF HBCU-UP Award No. 1137472.

Computational and Musical Genre Classification of Reggae

Presenter(s): Roosevelt Joseph
Mentor(s): Dr. Celil Ekici

Reggae is a musical genre that originated in Jamaica. Reggae has a distinct sound that allows it to be easily identified by ear. However, this prompts the question, “What makes reggae, reggae?” The distinct features of reggae can be determined using multiple classifiers based on computational and mathematical principles. Such classifiers could be the beat, rhythm, pitch, tonality and timbre. The purpose of this study was to determine if the tonality (specifically the key strength) and the BPM (beats per minute) in music could be used as classifiers of reggae. 125 Songs ranging from reggae, jazz, rock, and R&B were collected. The key strength of the sampled songs was determined using MATLAB and the MIR toolbox while the BPM of the sampled songs was determined using the Minim sound processing library in the processing ide. Based on the data collected it was determined what key strengths and BPM’s were more prevalent in reggae compared to other genres. It was hypothesized that the BPM and the tonality (key strength) could be used as effective classifiers for reggae music. In regards to the BPM, the data indicated that there were no significant differences among the mean BPMs of the four analyzed genres. With respect to the tonality, three keys within the reggae samples had the greatest strength and occurred most frequently.
Based on the results of the study, it was determined that the bpm data from our samples was too inconsistent to be used as a classifier of reggae. When the tonality of all the samples was analyzed, distinct key strengths were observed. It was determined that these key strengths could be used to classify reggae from amongst the other sampled genres.

Keywords: Musical Genre Classification, Computation Modeling, Sound Analysis, Reggae

This research was supported by NSF HBCU-UP grant #1137472.

Testing Methods To Achieve Ultra High Vacuum Levels (Extremely Low Atmospheric Pressures) Within Vacuum Chamber

Presenter(s): Amali Krigger
Mentor(s): Dr. David C. Morris

My research project is focused on analyzing methods that increase the rate at which the vacuum chamber pumps down to very high vacuum pressures (HVPs; 10^{-6} <= hPa <= 10^{-7}); also, enabling it to achieve ultra HVPs (10^{-7} <= hPa <= 10^{-8}) and extremely HVPs (hPa < 10^{-8}). UVI and our collaborators at NASA/GSFC are developing next generation X-ray detectors to detect astrophysical phenomena such as gamma-ray bursts and active galactic nuclei. Our vacuum will provide testing for capacity these detectors.

We attached heating straps to increase the chamber temperature. The heat liberates water vapor and other molecules adhered to the walls of the chamber; thus, forcing these liquids to evaporate and evacuate from the chamber. Data were taken manually and Python was used to create the data visualizations (graphs). We tested different strap configurations to quantify changes in pumping speeds and ultimate pressures.
We achieved 70% of the pressure without the heating straps (1 x 10^{-6} hPa). The chamber pumped down faster and lower with the additional straps covering more area. The new configuration achieved specific pressures 2 hours earlier than the previous set up at roughly 3 hours of the pump down.

Adding heating straps speed up the process and lowers the ultimate pressure within the chamber. Increasing the temperature does not make significant differences in the rate at which the chamber pumps down or in the value of the minimum pressure.

The authors gratefully acknowledge support for this project from NASA's Office of Education, NASA's MUREP Program, and NASA Grant NNX15AP95A.

Utilizing Random walks to locate the highest probable location of the groupers spawn aggregate

Presenter(s): Brandon Manners
Mentor(s): Dr. Robert Stolz

The *Mycteroperca venenosa*, better known as the yellow-fin grouper makes up a valuable part of the commercial fishery throughout the Caribbean. Research has shown that due to overfishing of the species they are now at risk of extinction. A grouper spawning aggregate was discovered at the edge of an underwater shelf a few kilometers south of St. Thomas, U.S. Virgin Islands, and two protected areas were established, the Hind Bank and Grammanik Bank, to prevent fishing around the spawning aggregate during mating season. A program was developed that utilizes data, collected by way of Acoustic Telemetry, to probabilistically produce the specific location of the spawning aggregate by generating multiple random walks of the groupers' movement between the time interval of each visit. The simulations will then be used to improve the efficiency of the Hind and Grammanik Banks by adjusting their current size and location to one that will be providing sufficient protection to the groupers' spawn while still allowing fishermen to make a living without harming the reproductive rate of the spawns.

Acknowledgements: NSF HBCU-UP grant #1137472

Devices and Social Networking Usages

Presenter(s): Sophy Marinez
Mentor(s): Timothy Kentopp and Dr. Michael Smith

Since its inception, newer upgrades of devices and social media apps has attracted over millions of users, many of whom have integrated these social networking sites into daily practices. This study is a survey with open and closed questions about how they spend their time in social networking and how they use their devices. The responses showed that many devices such as Smart Phones, Computers and Consoles were frequently used for texting and calls, games, and social media.

Acknowledgements: Sophomore Boost Program funded by NSF ACE award #1623126

Is Your Home Spying on You?
The Potential of Smart Home Devices to Serve As Evidence in Criminal Cases

Presenter(s): K'Mari McClean, Arl Polydore, Jair Smith, Roberto Tirado Jr., and Lawrence White
Mentor(s): Dr.Jason Lewis

In our modern society, technology has transformed the way we live. The Internet of things (IoT) has swept the world and created near-infinite possibilities. For example, your refrigerator may have an embedded computer that allows it to order milk when it is running low. Homes are now equipped with a wide range of devices that connect to the Internet, from light switches to kitchen sinks. Although the *Smart Home Devices* makes daily life and home surveillance for users much easier and almost effortless, they also contain sensitive information. This begs a question to the vanguard of law enforcement: can smart home devices serve as sensors for the law enforcement community and function as evidence in solving modern crimes?

We want to know if any information is stored directly on smart devices. Additionally, if information is stored on the devices, how can we access that information in order to use it as evidence in the event of a crime? We focused our research on the Amazon Echo and Google Home smart hubs, the D-Link 965 Wi-Fi Video Security Camera, the Logitech Logi Circle Wireless HD Video Security Camera, and the August Smart Lock. In order to find information about these devices, we used various tools of the “hacking community” to attempt to gain access to these devices. These tools allowed us to gain information on the devices such as open ports, operating systems, protocol, and the type of information being transferred between devices. This information now opens the door for future researchers to find vulnerabilities in these devices and initiate various hacking techniques such as penetration testing, especially on known ports.

Acknowledgments: Funding for this research is provided by a grant from the Department of Energy's National Nuclear Security Administration’s Minority Serving Institution Partnerships Program (DOE NNSA MSIP), through the Consortium Enabling Cybersecurity Opportunities and Research (CECOR).

Funding for SURE and SSRI is provided through Grant # 1137472 from the National Science Foundation's HBCU-UP program. Funding for SFRI is provided through Grant #1623126 from NSF ACE.

Baseline Assessment of St. Croix East End Marine Park Seagrass in the Face of an Invasive Species, Halophila stipulacea

Presenter(s): Selena Parrilla and Antonio Watts
Mentor(s): Caroline Pott and Ashley Ruffo

Halophila stipulacea is an invasive seagrass that has established itself in the Virgin Islands, most recently at the Altona Lagoon, September 2016, on St. Croix. A proactive response to the early stages of *H. stipulacea* colonization allows the park to monitor the rate at which it is spreading and determine the effect it is having on our marine ecosystem. We surveyed 57 sites in 3 bays with high boat traffic on the North side of the St. Croix East End Marine Park. We found that *H. stipulacea* was not present at any of our sites in northern boundaries of the EEMP, however we located and mapped sites that are vulnerable to future invasion. The next steps for the park is to revisit vulnerable sites to monitor for the arrival of the species. Further surveys surrounding the current *H. stipulacea* beds would help to understand the distribution of the species.

This research was funded by the National Science Foundation's (NSF) INCLUDES Program, Award No. 1649300.

Testing Personal Devices for Security Vulnerabilities

Presenter(s): Makayla Peterson
Mentor(s): Timothy Kentopp

There is an increasing amount of cyber-attacks being conducted in many personal devices such as phones, laptops and currently, cars. Due to the increasing amount of data these devices take up, this poses a big security issue for the end user. The purpose of this project was to expose these vulnerabilities at its default settings, check the settings that might leave the device vulnerable, then apply recommended manufacturer settings to ensure security of all devices being tested. Once these settings have been activated, penetration testing using software such as Zenmap and Kali Linux were used. Three devices were used during this project. They were a Samsung Galaxy S6 edge+, HP laptop, and the Sync application in a 2015 Ford Focus. Zenmap was used to run the diagnostics on the devices. It checked all the open ports that hackers may use. After reconfiguring security settings on all devices, the next step was to run the diagnostics again to see whether the ports were still open and then use Kali Linux to hack into those devices. So far, the laptop has been the most vulnerable to hackers being that it had the most open ports. Results have not been concluded, however it is expected that the security on these devices will hold true per the manufacturer's recommendation.

Acknowledgments: NSF HBCU-UP Grant # 1137472 funded this research.

The Evolution of the Behavioral Risk Factor Surveillance System Questionnaire

Presenter(s): Jerome Philbert
Mentor(s): Dr. Janis Valmond

In order to design plans for improving a nation's overall health, the government must first know the condition of its people. In large countries like the United States of America, this can be a challenge as it can be difficult to reach so many people. Additionally, it is sometimes necessary to distinguish information on one state from another. The Behavioral Risk Factor Surveillance System (BRFSS) aids with both of these issues. The BRFSS is a telephone/cellphone survey conducted within each state and territory, and consists of questions within core sections and optional modules. Over the years, the BRFSS has undergone many changes to maximize clarity and understanding for both the interviewer and the interviewee. This raises the question: "What changes have been made to the BRFSS sections?" To investigate, a content analysis was conducted on a randomly selected sample of BRFSS questionnaires from 1984-2016. A sub-sample of core sections (Asthma, Hypertension Awareness and Tobacco Use) from the selected questionnaires was also randomly selected. An additional recurring section (Immunization) was chosen for further comparison. There was no Asthma section in the 1994, 1997, or 2016 questionnaires. However, the 2000 questionnaire had two questions. In 1994, 1997, and 2000 the Hypertension Awareness section remained consistent. However, in the 2016 BRFSS questionnaire, there was no Hypertension Awareness section. The Tobacco Use section remained in each of the years. Only in 1997 and 2000 were the sections consistent. The Immunization section for 1994, 1997, and 2000 all consisted of two questions, but the 2016 section expanded to 5 questions. Changes were found across the years in each of the selected sections, with some questionnaires simply lacking the section entirely.

This research was made possible thanks to the SURE program and ECS Honors Fund.

Moisture Content and Antioxidant Activities in Algae

Presenter(s): Erlin Ravariere
Stephanie Bullock, Yolanda Felix-Medina, Torhera Durand,
Michael Rosario and Marcia Taylor
Mentor(s): Dr. Bernard Castillo

Algae, a group of freshwater or marine organisms has been found to be traditionally consumed in Asian countries but more recently Western countries. Apart from being known for their dietary fiber, essential fatty acids, vitamins, and minerals, algae are also a good source of antioxidants. Antioxidants are molecules that are known to prevent the free radical oxidation of compounds. It is also seen as the body's defense system due to its ability to prevent free radical damage in the body by providing the missing electrons to the free radical and then reducing it back to its stable form. Antioxidants can also be found in a variety of sources, such as fruits, plant foods, nuts, whole grains and in meat. Previous work on antioxidant activity has showed that dried samples had significantly higher antioxidant values compared to fresh samples. The two main objectives of this study were to determine and compare the antioxidant activities and moisture content of algae (N = 28) found in St. Croix, USVI. We tested algae from different groups namely, Rhodophyta, Chlorophyta and Phaeophyta. Total antioxidant activity (TAA) was determined using the 2,2-azino-bis-(3-ethylbenzthiazoline-6-sulfonic acid), H_2O_2, and horseradish peroxidase (ABTS/ H_2O_2/ HRP) decoloration method. The algae samples were dried in the oven at 60 ^oC for 3 hours and the difference in weight is the amount of moisture in the sample. Results for the TAA and moisture content analyses are reported as □mol trolox equivalence (TE) per gram dry weight (DW) and % water, respectively. We hypothesized that there is a correlation between the moisture content and the total antioxidant. Results have indicated that *Caulerpa racemosa* (Chlorophyta) (94.7 ± 0.16) and *Udotea flabellum* (Chlorophyta) (61.5 ± 5.20) had the highest and lowest moisture content, respectively. In terms of the TAA, *Champia salicornioides* (Rhodophyta) (97.281 ± 18.475 □mol per gram DW), had the highest TAA whereas, *Dictyota jamaicenesis* (Phaeophyta) (1.999 ± 0.889 □mol per gram DW), had the lowest TAA. One-way ANOVA showed statistical significance difference between moisture content and total antioxidant activity (TAA) (p = 0.000294). A Tukey post hoc analysis within groups did not show any difference for moisture content (p = 0.85175) and for TAA (p= 0.62053), respectively. Correlation analyses using Pearson (ρ = -0.009) and Spearman Correlation (ρ = 0.005) showed no correlation. Linear regression analysis between moisture content and TAA showed no linear relationship ($R^2 = 7.2 \times 10^{-5}$). From our study, we concluded that there was no correlation between TAA and moisture for our algae samples. In the future, we plan to study correlation between moisture content and TAA with other sources of antioxidants, like fruits, herbs, and vegetables.

This research was funded by the Emerging Caribbean Scientist Program,
HBCU-UP Grant No. 1137472, and NSF through VI-EPSCoR IIA-1355437.

A Demographic Analysis of VI Legislative Sessions

Presenter(s): Khefren Sackey
Mentor(s): Dr. Dara Hamilton

The purpose of this research was to examine the composition of legislative sessions of the Virgin Islands over time. This research hoped to identify trends or changes concerning demographic variables, including age, educational level, and political party amongst present and past Virgin Island senators over the past 10 legislative terms. In total, 147 cases were examined, comprised of 56 elected senators. Data were collected through several methods, including visiting the Virgin Islands' Legislature on St. Croix to procure public documents, electronic communication with the Virgin Islands' Board of Elections to collect the same and use of websites containing public information. Data were tested via chi square and simple regression analysis. The results demonstrated an increase in age of senators upon election over the past 10 sessions with a significance at the $p<0.01$ level while showing no significance for all but one demographic variable across the sessions. Results also showed the typical senator as a 48-year-old married male Democrat with a bachelor's degree that boasts a background in either business or criminal justice. It is concluded that the Virgin Islands legislature is aging. This is most probably due to aging persons who continue to be reelected into office amongst other possible variables. There was no evidence to support change in any other demographic variable, likely due to violations in assumptions of the chi square analysis which are possibly due to low sample size and homogeneity among the sample. Recommendations for future study include possible demographic comparisons between the typical Virgin Island senator and the typical US senator, as well as an analysis on the effectiveness of senators that are single termed versus senators that have won successive terms.

Acknowledgement: Title III Grant Number 200824

Weak Password Increase System Vulnerabilities

Presenter(s): Bashiri Smith
Mentor(s): Dr. Marc Boumedine

Although they may appear to be a distant dilemma, cyber-attacks are just a few bytes away. In 2016 alone, 1 billion yahoo email accounts were announced to have fallen victim to cyber-attacks. Additionally, within the same year, DNC (Democratic National Committee) emails were also publicly stated to have been compromised by the Russian government's cyber-assaults (citation needed). Crackers are discovering additional techniques to impersonate digital and network users – fooling authentication procedures. Although alternatives, such as biometric authentications, exist, passwords are the most used to access devices and services. This study introduces the concepts of authentication and authorization and focuses on system vulnerabilities associated with weak passwords which can be quickly cracked. Because most people create passwords that are easy to remember, hackers also find them simple to decipher using commercial dictionaries. This research uses various algorithms such as rainbow tables and brute-force approaches to demonstrate that weak passwords can be cracked almost instantaneously. Passwords using 8-10-character permutations can also be cracked off-line by brute force approaches. Furthermore, the purpose of this research is to provide a realistic overview of the attributes of a secure password, inform readers on how to maintain it as well as how to counter unauthorized access.

This research is partially funded the National Science Foundation (NSF) HBCU-UP grant #1137472 and supported by a grant from the Department of Energy National Nuclear Security Administration Minority Serving Partnership Initiative.

Reviewing the Binding Constant of Certain Metal-Ligand Complexes

Presenter(s): Kiwanee' Smith
Mentor(s): Dr. Stanley L. Latesky

The organic and biochemical research of ligands and metal binding constants and affinity helps to give insight into the structural set-up and dissociation of life-changing compounds and complexes. This research gives an overview of the binding constants of specific metal-ligand species and the absorption of these complexes. Details are provided on how this equation is used with a commonly used experimental technique, UV–visible spectroscopy. I used a Specord S600 spectrometer to measure the absorbance of the different complexes at different concentrations. I also will be using HypSpec, a computer application that will help to find binding constants using the information that I found/will find using the UV-Visible spectrometer. The metal half of the complexes consists of three different transition metals, which are Iron(II), Nickel(II), and Chromium(III) and the ligand that is being bound to them is 1,10 ortho-phenanthroline, a bidentate ligand (binds at two points on the molecule). So far, I have completed seventy-five samples of Iron(phenanthroline)$_3^{2+}$ and Nickel(phenanthroline)$_3^{2+}$ respectively and I am ready to input the data into the HypSpec application. I have not finished my sampling of the Chromium(III) and 1,10 ortho-phenanthroline at the time of the writing of this abstract, but I do know that in the future, many chemists/ future chemists would be able to continue on and eventually find the results for my research.

Acknowledgments: NSF HBCU-UP Grant # 1137472

Zika Confirmed Cases By Estate- U.S. Virgin Islands

Presenter(s): Christian R. Soto
Mentor(s): Dr. Janis Valmond

The United States Virgin Islands Department of Health has worked closely with several clinics and labs in providing free Zika testing at various locations in the U.S. Virgin Islands. Individuals can contract the virus when bitten by mosquito and through intimate partner interactions. Also, the Zika virus can be transmitted to the fetus during the stage of pregnancy. However, due to the fact that Zika is contracted by mosquito bites, it is possible that estates of higher population density and close to watersheds may have a higher number of confirmed Zika cases.This study aims to provide a graphical representation of the population density, watersheds, and the number of confirmed Zika cases, to show if there is a relation between Zika confirmed cases, watersheds, and population density. This study is a secondary analysis of datasets of confirmed cases from February 1 - May 31, 2017. Variables in this project include estates, county/island, and case status. Zika confirmed cases by estate were matched to population data by 2010 Census tract and estate and used to generate GIS maps depicting frequency of confirmed cases by estate, using ARC GIS. There were 621 cases on STT, 225 on STX, and 80 on STJ. The highest prevalence found was for Estate Adrian on St. John (2.1%); the lowest for Estate Williams Delight, St. Croix (0.32%). There was a non-significant, strong negative correlation between prevalence and population density for the top three (3) estates with the highest number of cases on each island (r = -.649, n = 9, p = .058). This is made possible with funding from the National Science Foundation's HBCU-UP program for the Summer Undergrad Research Experience program (SURE).

Acknowledgement: ECS Honors Fund and HBCU-UP Grant No. 1137472

Development of the Solar Eclipse Observing Package

Presenter(s): Noah Stolz
Mentor(s): Dr. Brice Orange

A formidable solar physics challenge is describing the energization processes that generate and sustain the Sun's hot corona, transition region, and solar wind. To advance our knowledge of coronal heating processes, we have developed the Solar Eclipse Observing Package (SEOP) for use during the August 2017 total solar eclipse, as a plugin for the free, open source digiCamControl Windows application. The SEOP has been designed specifically to leverage the pc-to-digital camera tethering capability in order to semi-autonomously observe the solar eclipse through linear polarizing and flash spectrum systems. The wealth of eclipse-unique magnetic field and plasma composition data yielded by these systems will significantly contribute to our knowledge of solar atmospheric physics of the complexity and physics of solar atmospheric magnetic energy redistribution processes. The SEOP, written in *Python* and *TCL* scripts, has been developed as a easy to use software package that relies on configurable settings and event based pc-to-digital camera tethered shooting. The software has been equipped with various debugging mechanisms, and user-inherited dynamic control of the camera's ISO, shutter speeds, and apertures used observing sequences.

Funding Sources: Etelman Observatory, University of the Virgin Islands, and OrangeWave LLC

High Concentration of Sunscreens Kills the Fertilized Sea Urchin Eggs

Presenter(s): Omori Wade
Mentor(s): Dr. Stephen Ratchford

Doctors recommend using sunscreens at the beach to protect the skin from the sun's ultraviolet rays; however, some sunscreens that contain oxybenzone are harmful to corals. I wanted to see if sunscreen might affect other organisms such as the rock boring urchin, *Echinometra Lucunter*. I collected the sea urchins from the shallow waters of Brewers Bay, injected them with Potassium Chloride (KCl) so that they would spawn sperm and eggs, and then placed the eggs and sperm in Petri dishes containing seawater with different amounts and types of sunscreens. I then measured the percent of cleaved eggs in each dish 1-3 hours after fertilization. I tested a variety of sunscreens (creams, sprays and sticks) with varying ingredients (oxybenzone, zinc oxide and titanium dioxide). All the sunscreens killed the developing eggs at high concentrations. I also measured percent cleaved eggs using different concentrations of two sunscreens. Increasing concentration led to decreasing cleavage. As sunlight causes oxybenzone to be even more toxic to coral, I repeated the concentration experiment in sunlight. Sunlight did not cause any additional toxicity to the urchins. I recommend that additional testing should be done using a wide range of sunscreens, more species of sea urchins, and the later stages of sea urchin development. I also want to test mosquito sprays because they are worn by people at the beach and may come off into the water.

Acknowledgements: This research was supported by UVI NSF HBCU-UP Award No. 1137472.

SPECIALIZING IN FUTURES

HISTORICALLY AMERICAN.
UNIQUELY CARIBBEAN.
GLOBALLY INTERACTIVE.

Emerging Caribbean Scientists Programs
College of Science & Mathematics

University of the Virgin Islands