

Eighteenth Annual Summer Student Research Symposium



ABSTRACT BOOK



**July 31st, 2020
1:00pm to 3:00pm
University of the Virgin Islands**

18th Annual Summer Student Research Symposium

University of the Virgin Islands
Concurrent Online Sessions
Via Zoom Meetings
Friday, July 31st, 2020

Event Organized by

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



Schedule - *Registration is required to get access to the virtual sessions.*

Session 1: Marine Biology (Moderator: Allie Durdall)

- 1:00-1:10 pm Introduction
- 1:10-1:20 pm Genetics of the invasive seagrass- *Halophila stipulacea* by Emely Henriquez
- 1:20-1:30 pm Assessing herbivory of three common reef grazers and potential affects on newly settled coral recruits by Samuel Gittens Jr.
- 1:30-1:40 pm Diel variation in number of fish visits to anemone cleaning stations by VerNele Callwood
- 1:40-1:50 pm Fish client species showing a wide variety of posing behaviors towards anemone cleaner shrimps by Kahlifah Powell
- 1:50-2:00 pm Cleaner Shrimp have Preferred Client Fish Species for Cleaning by Janae Bruce
- 2:00-2:10 pm Quantifying the Spread of SCTLD in the United States Virgin Islands by Alanica Canonier and Carissa Moses
- 2:10-2:20 pm Quantifying the Spread of the Stoney Coral Tissue Loss Disease: Random Walk Simulation by Xaver Richardson
- 2:20-2:30 pm Effectiveness of Antibiotics against Stony Coral Tissue Loss Disease by Tia Rabsatt
- 2:30-2:40 pm Coral Restoration Methods: What works? By Bill Bacon
- 2:40-2:50 pm Effects of Saharan dust on the growth of Juvenile and Adult Corals by Nicholas Durgadeen
- 2:50-3:00 pm Closing remarks/Q&A

Session 2: Environmental Science (Moderator: Renata Platenberg)

- 1:00-1:10 pm Introduction
- 1:10-1:20 pm Comparing St. Croix East End Beaches by Makayla Cariño
- 1:20-1:30 pm Lindbergh Bay Coastal Erosion Analysis through Wave Propagation Modeling by Tione Grant
- 1:30-1:40 pm Rays and Ecotourism by Adina Browne
- 1:40-1:50 pm Training Acoustic Analysis Software to Identify Frogs Using Machine Learning by Sarai Hutchinson
- 1:50-2:00 pm Design & Manufacturing of Low-cost Hardware to Benefit Precipitation Monitoring by Ne'Kye George
- 2:00-2:10 pm One Year Biological and Chemical Water Quality Assessment at the UVI Albert A. Sheen Campus Drinking Fountains by Anelia Austria

- 2:10-2:20 pm Solar Energy Sustainability in the US Virgin Islands by Kiwanee Smith
- 2:20-2:30 pm Kale Leaf Growth and Water Content by Dazonte Mathurin-Phaire
- 2:40-3:00 pm Closing remarks/Q&A

Session 3: Biomedicine & Community Health (Moderator: Lavida Rogers)

- 1:00-1:10 pm Introduction
- 1:10-1:20 pm Meta-analysis of Gene Expression Data by Naomi Douglas
- 1:20-1:30 pm Meta-analysis of Gene Expression Variability in Asthma by Ellaina A. Wyllis
- 1:30-1:40 pm Finite Element Modeling of the Electroporation Phenomenon using Microfluidic Devices by Deidre Lee
- 1:40-1:50 pm Late Viral Or Bacterial Respiratory Infections In Lung Transplanted Patients: Impact On Respiratory Function by Khyesha Jean-Baptiste
- 1:50-2:00 pm Dietary Intake & Ovarian Cancer Risk by Cequoyah George
- 2:00-2:10 pm Could Easy Access to Fast Food Restaurant Lead to Childhood Obesity by Elkanah Acuna
- 2:10-2:20 pm Blood Pressure and Perceived Racial Discrimination may be a predictor of Episodic Memory Among Older Black Caribbean Adults by Alexanne Carr
- 2:20-2:30 pm Depression and Prevalence of Types of Intimate Partner Violence against Afro-Caribbean Women in St. Croix and St. Thomas by Ashley T. Challenger
- 2:30-2:40 pm Racial Disparities in Prostate Cancer Research by Brittney Anderson and Briana Cromwell
- 2:40-2:50 pm Relationship between Subjective Social Status, Perceived Discrimination, and Late-Life Depression on Executive Functioning in Older Afro-Caribbean Adults by Azriel A. Williams
- 2:50-3:00 pm Closing remarks/Q&A

Session 4: STEM Education & Social Science (Moderator: Diana Bowen)

- 1:00-1:10 pm Introduction
- 1:10-1:20 pm Pilot Study of Taking the English Proficiency Exam during English 201 by Laurie Armstrong
- 1:20-1:30 pm Exploring How STEM Instructors at a Public University in the Caribbean Transitioned to Online Teaching by Yudis C. Rodriguez

- 1:30-1:40 pm A Good 'tude Makes the Future's Mood: Integrating Research to Improve Attitudes towards Science by Esonica Charles
- 1:40-1:50 pm Analyzing Student's Attitudes Towards STEM IN STX by Melissa Ferreras
- 1:50-2:00 pm Limitations for Parental Choice of Preferred Childcare Facilities, Ages 0-5, in the US Virgin Islands by Ariana Athanase
- 2:00-2:10 pm Challenging experience centered around a hurricane for undergraduate students at the University of the Virgin Islands by Angelisa Freeman
- 2:10-2:20 pm Preparing Students and Communities for Natural Hazards in the U.S. Virgin Islands by Bethany Good
- 2:20-2:30 pm An Investigation of the Voting System Used in the U.S. Virgin Islands to Elect Members of the Legislature: Bloc Voting by LeAnn Horsford and T'Leah Serieux
- 2:40-3:00 pm Closing remarks/Q&A

Session 5: COVID & Chemistry (Moderator: Neelam Buxani)

- 1:00-1:10 pm Introduction
- 1:10-1:20 pm Structure-based virtual screening methods to determine the inhibitory potential of compounds isolated from caribbean marine natural resources against main protease of SARS-COV-2 by Juchara Margetson
- 1:20-1:30 pm Structure-based virtual screening methods to determine the inhibitory potential of compounds isolated from caribbean marine natural resources against main protease of SARS-COV-2 by Taquanna Baron and Jada Roberts
- 1:30-1:40 pm Modeling Infection Rates in the USVI by Teh'Rhon Rabsatt
- 1:40-1:50 pm The Effects of Temperature and Humidity on COVID-19 by Sheneka Patrick
- 1:50-2:00 pm COVID effects on marine ecosystems by Laesha Hobson
- 2:00-2:10 pm Computational Analysis of 1,4-diphosphabicyclo[2,2,2]octane in Comparison to 1,4-diazabicyclo[2.2.2]octane by Xuxa Garroden
- 2:10-2:20 pm Constructing caged ligands using sulfur containing amino acids with metals by Makayda Gustave
- 2:20-3:00 pm Closing remarks/Q&A

Session 6: Astrophysics & Technology (Moderator: Timothy Kentopp)

- 1:00-1:10 pm Introduction
- 1:10-1:20 pm Searching for Merging Galaxies Using Ground and Space Base Telescopes by Princess Atemazem
- 1:20-1:30 pm Investigating Merging Galaxies by Derrick Thomas Jr.

- 1:30-1:40 pm Algorithm Optimization for Fast Transient Identification in the Deeper Wider Faster Data by Michael Dow Jr.
- 1:40-1:50 pm Detecting Transient Sources by Joshua Parris
- 1:50-2:00 pm Automatic Signal Detection and Analysis by Joel Mwambungu
- 2:00-2:10 pm Simulations through Geomega by Jordina Pierre
- 2:10-2:20 pm Producing A Dust Emission Synthetic Observation by Silene Prentice
- 2:20-2:30 pm Requirement Traceability Matrix for UVI-GREAT by Kaheem Walters
- 2:30-2:40 pm Management of Sensor Networks by Stephanie Bullock
- 2:40-2:50 pm Detection, Assessment, and Mitigation of Public Network Exposures in the USVI by Javier Galiber
- 2:50-3:00 pm Technical Infrastructure for Systematic Management of VIRT Scientific Productivity by Darren Paul

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Racial Disparities in Prostate Cancer Research

Brittney Anderson and Briana Cromwell

Mentor(s): Dr. Zanna Beharry
University of the Virgin Islands

Session 3: Biomedicine & Community Health (2:30-2:40 pm)

Prostate cancer affects men of all racial backgrounds; however, men of African descent face a higher risk of diagnosis. Despite this, black men remain underrepresented in prostate cancer research introducing the apparent anomaly that men mostly affected by prostate cancer are the least represented. We reviewed 393 prostate cancer clinical trials, but only 198 studies had racially identified its participants. We also scrutinized 33 prostate cancer cell lines for quantitative data on the availability of samples from men of African ancestry. Additionally, a few literary articles were evaluated to re-enforce our theory on the deficiency in utilization and availability of black resources. A collective analysis was made on racial disparities in diagnosis and mortality of prostate cancer in men of African descent. The 198 clinical trials were performed on 77,028 racially identified patients, but only 8,408 (11%) were of African ancestry. Of the 33 prostate cell lines available, 20 were acquired from Caucasian men, 2 from Black men and the remaining 11 samples were unspecified. Most of the literature for prostate cancer in black men focused on the disparities rather than actual research involving black patients. Our results suggest that although prostate cancer is predominant in black men they are constantly being underrepresented in research. To better improve prostate cancer treatment for all males it is essential that future studies focus on diversification in representation amongst all samples. Diversifying these studies will provide the best measures to properly counteract the evident racial disparities in prostate cancer research.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model grant award #1623126

Pilot Study of Taking the English Proficiency Exam during English 201

Laurie Armstrong

Mentor(s): Dr. Aletha Baumann
University of the Virgin Islands

Session 4: STEM Education & Social Science (1:10-1:20 pm)

The English Proficiency Exam (EPE), a 90-minute essay examination, is the mechanism by which the University of the Virgin Islands determines students' English proficiency which is a graduation requirement for undergraduate degrees. Students are not allowed to take the EPE until they pass ENG 201 or are certified by the advisors. A pilot study conducted in spring 2017 allowed students enrolled in ENG 201 to take the EPE. The purpose of this pilot study is to suggest a policy change based on whether taking the EPE during or after ENG 201 makes a difference in the EPE performance. 102 participants from St. Croix and St. Thomas out of 182 had viable data. Pearson product-moment correlations were run to determine the relationship between the time the EPE was taken (during or after ENG 201) and campus with the EPE performance. Neither showed a statistical significance. Then a regression analysis was used to determine whether where and when the EPE is taken predicts the score of the EPE. Both were not significant predictors of the EPE score. However, data showed the overall pass rate of 75%. Variables such as sex, ethnicity, teaching styles, and testing before ENG 201 should be investigated. Other pilot tests should be conducted to determine the efficacy and efficiency of using methods other than essay writing, such as degree-specified essays or portfolios, should be conducted.

Acknowledgements:

NIH RISE grant award #2R25GM061325

Searching for Merging Galaxies Using Ground and Space Base Telescopes

Princess Atemazem

Mentor(s): Dr. Teresa Ashcraft
REAP AEOP (University of the Virgin Islands)

Session 6: Astrophysics & Technology (1:10-1:20 pm)

This project is specifically important in finding new objects in space that are different. Finding these objects can help us identify the ways these objects, galaxies, change. It helps us look back at the past, to understand how these objects were formed. In this project I have been using softwares such as DS9 and NED database to search for objects in different telescopes and filters and learn more about them. I have found twenty-five objects that looked irregular. For these objects, I have found their redshifts (distance), what spectral region it was located in, and its points in the sky. There are several that I suspect are merging galaxies due to each of the galaxies having similar redshifts. A chart was created to note these important features of these galaxies, and later on discussed with my mentor. This was all part of my Apprenticeship “AEOP REAP Program”.

Acknowledgements:

REAP AEOP

Limitations for Parental Choice of Preferred Childcare Facilities, Ages 0-5, in the US Virgin Islands

Ariana Athanase

Mentor(s): Dr. Noreen Michael
University of the Virgin Islands

Session 4: STEM Education & Social Science (1:50-2:00 pm)

Early childhood development consists of the physical, socio-emotional, cognitive and motor development skills of children between the ages of 0-8. It is important to focus on the early developmental stage of a child's life because it becomes the foundation of their adulthood. Education carries an essential role in their future development; recognizing the limitations that prevent parents from giving their children access to early childhood education programs assists in circumventing these barriers. In the US Virgin Islands, three early childhood education programs exist- these include the following: Head Start, Early Head Start, and Private/Parochial school programs+. The factors that limit parents from sending their child, or children, to one of these programs are proximity, finances, government benefit/subsidies, and a lack of resources. Using GIS mapping creates the visuals required to identify the accurate proximal distance between public housing and childcare facilities. A secondary data analysis from the Caribbean Exploratory Research Center and Department of Human Services provides the data necessary to compare annual finances between households along with government benefits and subsidies. Surveys and interviews provide primary data for collection along with qualitative data in this mixed- method design research. Acknowledging the factors that limit parental choice of preferred childcare facilities for their children, ages 0-5, will have the benefit of creating an environment of positive change for the various early childcare programs in the US Virgin Islands.

Acknowledgements:

NIH RISE grant award no. 2R25GM061325-15

One Year Biological and Chemical Water Quality Assessment at the UVI Albert A. Sheen Campus Drinking Fountains

Anelia Austrie

Kynoch Reale-Munroe, Naomi Douglas, Deon St.Jules and Stephanie Bullock

Mentor(s): Dr. Bernard Castillo

University of the Virgin Islands

Session 2: Environmental Science (2:00-2:10 pm)

All life depends on water but less than 1% is fresh water. Drinking contaminated water can cause many health issues, some examples include, gastrointestinal problems, and even death. The United States Safe Drinking Water Act passed in 1974 – to protect public health by regulating the nation’s public drinking water supply because of poor water quality that was endangering public health. The US Environment Protection Agency (EPA) has established protective drinking water standards for more than 90 contaminants. These standards are known as Maximum Contaminant Level (MCL), which, indicates the highest level of contaminant accepted in water. Contaminants are classified as physical, chemical, and biological. At the University of the Virgin Islands Albert A. Sheen (AAS) campus majority of students do not drink from the on-campus water fountains, however, previous studies showed that the basic water quality parameters tested were similar compared to commercial water. In this project, water quality was tested from six drinking fountains on the AAS campus for a period of one year. The objective in this project was to analyze data collected throughout Summer 2019-Spring 2020. The HACH test kits and the spectrophotometer were used to test all water quality parameters from all six water fountains. Locations included, Residence Hall (RHC), Melvin’s Evan’s Center (EVC), and Northwest Wing (NWW). Our results showed that Arsenic (0 ppb) and Total Coliform were absent. Copper (0.34 ± 0.072 mg/L), Lead (0.01 ± 0.006 mg/L) and Phosphorus (4.48 ± 2.002 mg/L) were highest at the NWW. Nitrate (13.83 ± 8.845 mg/L) and Chlorine (0.07 ± 0 mg/L) were highest at EVC. There were significant differences for Copper ($p = 0.016$), Nitrate ($p = 0.026$) and Phosphorus ($p = 0.028$) in all EVC samples. There were no statistically significant differences ($p > 0.05$) found for all other parameters in all locations. Nitrate levels were above the EPA standards in EVC only. Copper, Arsenic, all non-metal contaminants, and total coliform were below EPA limits. Based on the results of our study, it is safe to conclude that the water at the AAS campus is safe for consumption based on the parameters which were tested.

Acknowledgements:

This research was funded by NSF HBCU-UP ACE Grant Award No. 1623126.

Structure-based virtual screening methods to determine the inhibitory potential of compounds isolated from caribbean marine natural resources against main protease of SARS-CoV-2

Taquanna Baron and Jada Roberts

Mentor(s): Dr. Neelam Buxani
University of the Virgin Islands

Session 5: COVID & Chemistry (1:20-1:30 pm)

There is limited information on treatment for immunization against the virus COVID-19, our goal is to create potential antiviral therapeutic agents against SARS-CoV-2 main proteases (Mpro) by using the antiviral potential of marine natural products. For present study, 71 marine compounds isolated from algae (brown, green, red), sponges, corals, tunicates, dinoflagellates and cyanobacteria collected from Caribbean places (US Virgin Islands, Jamaica, Barbados and others) were selected to assess their inhibition potential of active site of Main protease of SARS CoV-2 (PDB code: 6W63) through structure based Virtual screening methods mainly Docking via Glide software. Based on docking score (in XP mode), 22 compounds showed significant inhibitory potential, out of that 3 compounds have shown better results than co-crystallized ligand found with protein crystal (used as positive control). We ranked the compounds based on their Glide docking scores (GDS), and promising Caribbean marine compounds were identified as algae (Dieckol; GDS= -11.952, Diphlorethohydroxycarmalol; GDS= -10.076, and 6,6'-bieckol; GDS= -8.676) and sponges (Ribavirin; GDS= -7.225) and we believe that these marine compounds are appropriate leads for the development of therapeutic drugs against SARS-CoV-2. One limitation in our investigation was some marine compounds provided bad docking glide scores which did not apply any sufficient results to our findings. Also, ADME properties of all these compounds were also studied and their drug likelihood was evaluated to better conclude our findings.

Keywords: Marine natural products, COVID-19, docking, Caribbean

Acknowledgements:

ECS Honors Fund through generous private donations to the university

Cleaner Shrimp have Preferred Client Fish Species for Cleaning

Janae Bruce

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

Session 1: Marine Biology (1:50-2:00 pm)

Cleaner shrimp, such as *Periclimenes yucatanicus* and *Ancylomenes pedersoni*, are marine organisms that are known to clean ectoparasites off the client fish that visit the shrimps' anemone residence. Researchers that have studied these shrimps focus more on their cleaning behaviors and successful fish cleanings while dismissing unsuccessful cleanings. This dismissal seems to imply that all clients are cleaned on every visit with no preference, an idea our preliminary observations suggests is not true for all areas. We wanted to know whether cleaner shrimp had preferred clients, that is, clients that they clean a greater percentage of the time when they visit. To determine this, we placed underwater cameras near different corkscrew anemones inhabited by cleaner shrimp. From the video we were able to gather data related to each client's visit such as the fish's species, whether the fish got cleaned or not, and how long the visit lasted. Afterwards, we summarized that data to determine which client species was visiting most often and which had the highest percentage of cleans. Overall, we watched over 240 hours of video from the underwater cameras and saw great variation in the types of clients that visited the anemones. Fish such as damselfish, rock hinds, and angels that did not visit very often had a high percentage of cleans. Conversely, the fish that visited most often, such as butterfly fish, parrots and grunts, had a lower percentage of cleanings. We concluded that the rarer the fish, the more likely it was to get cleaned. One of the reasons why non-preferred client fish might visit so often is because they want to get cleaned so they come back repeatedly in an effort to be cleaned. Also, clients that visit rarely may have a different set of parasites that provide the shrimp a varied diet.

Keywords: Cleaner Shrimp, Anemone

Acknowledgements:

Research funding provided by NSF HBCU-UP ACE Implementation Project: The UVI Growth Model (Grant No: 1623126)

Management of Sensor Networks

Stephanie Bullock

Mentor(s): Leigh Torgerson and Amalaye Oyake
NASA Jet Propulsion Lab, California Institution of Technology

Session 6: Astrophysics & Technology (2:30-2:40 pm)

the seasonal melting of ice, seismic activity, and remote imaging. One of the main challenges faced by scientists is collecting data from these remote locations and very often, some of the most intriguing places of study are some of the most difficult places to deploy sensors. The objective of this study is to demonstrate a solution to this data collection problem using Delay/Disruption Tolerant Networking (DTN) protocols on a sensor network and monitoring and controlling the network with the AMMOS Instrument Toolkit. DTN enables the retransmission and automated relaying capabilities of sensor data and will enable advanced data management and sensor autonomy applications. In this study, remote sensors will be deployed and connected via long range radio frequency links (RF), and collect data using JPL developed protocols. These bundles are routed between three nodes (Raspberry Pi 3's) and are then networked by sending space packets over LoRa (Long Range) networks. Simple messaging applications were created to test the sending of discrete data between a client and server, then using DTN ION and AIT Monitor and Control Framework, the sensor data collected will be transmitted between nodes and the main system for evaluation.

Acknowledgements:
NASA Space Grant

Diel variation in number of fish visits to anemone cleaning stations

VerNele Callwood

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

Session 1: Marine Biology (1:30-1:40 pm)

The corkscrew anemone *Bartholomea annulata* is the center of a symbiotic relationship between cleaner shrimps (*Ancylomenes pedersoni* and *Periclimenes yucatanicus*) and fish. Fish visit the anemone where the resident cleaner shrimps leave the anemone to clean them. The shrimp gets a meal while reducing the parasite load on the fish. There is no evidence that shrimp clean fish at night. Otherwise no study has shown a difference in the cleaning behavior of shrimp or fish over the course of a day during daylight hours. Given that parasite load should be highest in the morning, one would expect fish to be most likely to visit in the morning to reduce that parasite load. I explored if there is variation in the number of fish visits to anemone cleaning throughout the day. I counted the number of fish visits at several anemones that were filmed continuously from 5:30 am through 7:15 pm. Fish visits were very high at 3 of the 4 anemones in the early mornings, while a secondary peak was noted in the late afternoon. Both peaks were mostly due to the family Acanthuridae, a group made up of blue tangs, ocean surgeons and doctor fish. Other studies that reported no difference in cleaning had few Acanthuridae and did not report visitation rates; thus diel variation in fish visits may be species-specific and vary by study site.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model grant award #1623126

Quantifying the Spread of SCTLD in the United States Virgin Islands

Alanica A. Canonier and Carissa S. Moses

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

Session 1: Marine Biology (2:00-2:10 pm)

Coral Reefs are essential to the ecosystem of the U.S. Virgin Islands. The Stony Coral Tissue Loss Disease (SCTLD) is a disease that kills the tissue of corals, leaving behind white lesions. SCTLD was initially found in the U.S. Virgin Islands in January 2019, and ever since, it has affected the coral reefs located on St. Thomas and St. John. In this study, we investigate the quantifiable spread of SCTLD throughout several reef sites in the U.S. Virgin Islands from December 2018 to June 2020. We plan to use the diffusion advection equation to model how SCTLD spreads through the region mathematically. To create this model, we started with an initial estimate of the diffusivity constant. We then developed a code using MATLAB to simulate how the disease's range expands from a closely infected reef site and the initially infected reef site. For each month, the average minimal distance between the closest infected reef sites and newly infected reef sites was measured. We determined a 95% confidence interval for the average distance the disease traveled per month. We also created a model of the relationship of the distance the disease traveled from the initial outbreak versus time. The diffusivity estimates and the ocean current will be used in the second part of this study, which will use the diffusion advection equation to build a connectivity graph of the reefs. By quantifying the spread of SCTLD, plans for the restoration of the affected coral reefs can be devised using connectivity graphs.

Acknowledgements:

NIH MARC at UVI: A Holistic Approach (Grant Award No. 5T34GM008422-26); NSF HBCU-UP ACE Implementation Project: The UVI Growth Model (Grant Award No. 1623126)

Comparing St. Croix East End Beaches

Makayla Cariño

Mentor(s): Caroline Pott
St. Croix East End Marine Park

Session 2: Environmental Science (1:10-1:20 pm)

The eyes can be deceiving when determining the topography of beaches. Sandwatch, A global education program published by the government of Denmark, UNESCO, in collaboration with the University of Puerto Rico, allows students, teachers, and the local communities to work together in monitoring the coastline environment and the changes of the topography of the beaches. The goal of this research is to use the Sandwatch program to determine if there is a difference in topography between southside and northside beaches. We hypothesized that southside beaches have an unfavorable topography and reduced human use, as compared to the northside beaches. To test this hypothesis we observed four beaches, (Chenay Bay, Turner's Hole, Cramer's Park and Robin Bay) and analyzed their slope, the accumulation of sargassum, and human use. To determine the slope of each beach, we used an Abeney level, a magnifying glass, and telescopic rod at each reference on the four beaches. This method will help us determine how much the beach has changed over time. This change can be daily or yearly (Cambers, 2010). To quantify the amount of sargassum we used a telescopic rod, a regular rod, and a transects tape measure to determine the width and depth of the sargassum along the beach. Human use was assessed by observing the beach to see if and how much human activity is taking place. Beach composition also plays an important role in the topography of beaches. The beach composition was analyzed by using sifters (5mm, 10mm, 35mm, 60mm, 120mm), and a scale to determine the stability and distribution of the beach. Based on our preliminary results, we observed that the slope on southside beaches, Turner's Hole and Robin Bay, were shorter than the northside beaches, Chenay Bay and Cramer's Park, contained no human use and had a large accumulation of sargassum. To conclude our results were not conclusive enough to support the hypothesis that the south shore beaches have a longer slope with no human use and a large accumulation of sargassum. Further research and analysis would be required to determine a conclusion.

Acknowledgements:

NSF SEAS Island Alliance, National Science Foundation INCLUDES Program Award #1930991

Blood Pressure and Perceived Racial Discrimination may be a predictor of Episodic Memory Among Older Black Caribbean Adults

Alexanne Carr

Mentor(s): Dr. Aletha Baumann
University of the Virgin Islands and Boston University Medical School

Session 3: Biomedicine & Community Health (2:10-2:20 pm)

Elevated blood pressure and perceived racial discrimination in older African Americans can be a source of poor cognition. This study investigates the impact of blood pressure and perceived racial discrimination on episodic memory in Afro-Caribbean people aged 50-80 years. Afro-Caribbean people are identified as Black individuals of African descent residing in the Caribbean and, for the purpose of this research, we are limiting our focus to people of African descent residing most of their lives on St. Croix, USVI. We predict poorer episodic memory performance with higher blood pressure and greater perceived racial discrimination. This study is part of a larger study being headed by Dr. Karin Schon of Boston University School of Medicine, funded by the Alzheimer Association, entitled "Perceived Racism as a Chronic Stressor and Cognition in Black Seniors". Episodic memory is the ability to recall personal experiences from a specific time and location, and is assessed with the National Alzheimer's Coordinating Center UDS Neuropsychological Battery's "Craft Story 21 Recall" and "Category Fluency", the "Mnemonic Similarity Task", and the "Rey Auditory Verbal Learning Test". Perceived racial discrimination is the perception of different or negative treatment of people based on their racial categorization or identification, and will be measured using the "Index of Racial Related Stress" survey. Recruitment and data collection were completed on three people before the Institutional Review Boards at both universities suspended face-to-face research in March 2020. Once the suspension is lifted, we will continue with recruitment and data collection until we have compiled data from 60 Crucians of African descent. A linear regression equation to determine if episodic memory of this population can be predicted from blood pressure and perceived discrimination will be calculated. This study will help bring an understanding to the challenges that are faced among the older Afro-Caribbean population on St. Croix.

Acknowledgements:

Funded by a grant from the Alzheimer's Association and UVI RISE grant award #2R25GM061325

Exploring How STEM Instructors at a Public University in the Caribbean Transitioned to Online Teaching

Yudis C. Rodriguez

Mentor(s): Dr. Diana Bowen
University of the Virgin Islands

Session 4: STEM Education & Social Science (1:20-1:30 pm)

Due to the current pandemic, COVID19, it is pertinent to study how STEM instructors at a public university in the Caribbean transitioned to online teaching. Hence, the main purpose of this project is to know and begin to understand, the experiences and challenges that STEM instructors faced through this difficult time. The aim of this project is to have a clear notion of the strategies and techniques used, and how instructors adjusted to online teaching. This study also explores the factors, beliefs, and previous knowledge pertinent to online teaching. The findings have the potential to provide evidence of techniques and resources that may support STEM instructors to better transition to online teaching and to teach online. In addition, we want to study and identify, the trends and commonalities across STEM faculty, with regards to the resources, strategies, tools, and attitudes adopted during the transition to online teaching. Particularly, this online teaching transition is remarkable due to the mid-semester interruption caused by COVID19, and whether the instructors were prepared or unprepared, all instructors had to make this transition. Furthermore, the findings may be used to help STEM instructors make a smoother transition to online teaching and enhance online teaching in terms of resources and strategies. This study uses an online survey to collect data from STEM instructors and the question types include short answer, choose all that apply, multiple choice, and questions using a Likert Scale.

Acknowledgements:

Grant award #1619859-1

Depression and Prevalence of Types of Intimate Partner Violence against Afro-Caribbean Women in St. Croix and St. Thomas

Ashley T. Challenger

Mentor(s): Dr. Aletha Baumann
University of the Virgin Islands

Session 3: Biomedicine & Community Health (2:20-2:30 pm)

This study will further examine data collected by the Caribbean Exploratory Research Center about Black women aged 18-55 who have experienced intimate partner abuse (IPA) in the previous two years. The subset of data that will be used includes 1,059 Afro-Caribbean women between 2009 and 2011 who attended St. Thomas or St. Croix public clinics for prenatal, family planning or primary care and reported being abused by an intimate partner. There are three aims of this study: (1) determine the prevalence of IPV in St. Thomas versus St. Croix; (2) find the relationship between IPV and depression; and (3) look at the relationship between type of IPA and depression. Three categories of intimate partner abuse (emotional only, physical only, and physical combined with sexual) were determined. The Severity of Violence Against Women Scales was used to determine physical and sexual abuse, while emotional abuse was measured by the Women's Experiences with Battering Scale. The Center for Epidemiological Studies' Depression Scale was used to measure depression. Island was based on the location of clinic where the survey took place. The frequency of any type of IPA, types of IPA, depression, and island will be reported. Chi-squares will be calculated to determine if there are relationships between prevalence of IPV and island, occurrence IPV and depression, and type of IPV and depression. This research is derived from the NIH-funded "*Abuse Status and Health Consequences for African American and Afro-Caribbean Women*" grant to University of the Virgin Islands Caribbean Exploratory Research Center. Based on the data taken from the initial study a large amount of the women cited sexual abused, whereby forced sexual intercourse/activity. Physical abuse was significantly lower than the sexual abuse reported. Based on what was reported the data indicates that there is no significant relationship between type of abuse and island, as each form of abuse occurred sporadically on each island. The types of abuse and depression did show some significance in the physical and sexual variables. The participants who reported those two forms of abuse, had significantly higher depression numbers; however, because types of abuse did not specifically appear on one island depression by island did not show a significant relationship in the IPV rates of these women.

Keywords: intimate partner violence, depression, Virgin Islands, physical abuse, sexual abuse, psychological abus

Acknowledgements:

NIH-funded grant, "Abuse Status and Health Consequences for African American and Afro-Caribbean Women" to UVI's Caribbean Exploratory Research Center and UVI RISE grant award #2R25GM061325-15

A Good 'tude Makes the Future's Mood: Integrating Research to Improve Attitudes towards Science

Esonica Charles

Kynoch Reale-Munroe

Mentor(s): Bernard Castillo II, Ph.D

University of the Virgin Islands

Session 4: STEM Education & Social Science (1:30-1:40 pm)

There is no one way to learn, but instead learning is a multidimension spectrum of integrating information to create new long-lasting connections. Research and teaching are used to reinforce learning processes, such as, imparting knowledge and creating knowledge as complementary activities. Applied research is dedicated to answering a specific research question. In the University of the Virgin Islands Albert A. Sheen Campus General Chemistry (CHE) 151 & 152 laboratory courses from Fall 2018 to Spring 2020, applied research was integrated into the curriculum. The research topic chosen was water quality testing on drinking water. -We hypothesized,- that if applied research is introduced to the curriculum, then students should show a more positive attitude towards science. To test our hypothesis, we asked students registered in the courses to anonymously answer a Students Attitudes towards Science Technology Engineering and Mathematics (S-STEM survey), which is a series of questions used to collect data on students' attitudes towards STEM fields. We administered the survey during the semester, before and after the students conducted research in the laboratory. Results were collected then analyzed using SPSS Analytics, specifically using the Whitney-Mann Test. A total of 87 students participated in the study, 62 students in CHE 151 and 25 students in CHE 152. Our results showed that there was a significant difference ($p = 0.017$) in CHE 151 for the question "I will need science for my future work" However, there was no significant difference in students' responses in CHE 152 and when CHE 151 and 152 responses were combined. To conclude, only students in CHE 151 were impacted with the science career question and no statistical impact was made on students in CHE 152 ($p > 0.05$). Currently, there is no clear trend to what changes in attitudes could be proved in this experiment.

Acknowledgements:

This research was funded by NSF HBCU-UP ACE Implementation Project: The UVI Growth Model Award No. 1623126.

Meta-analysis of Gene Expression Data

Naomi Douglas

Mentor(s): Dr. Lavidia Rogers
Biological Sciences Department, University of the Virgin Islands

Session 3: Biomedicine & Community Health (1:10-1:20 pm)

Tuberculosis (TB) is a lung disease caused by *Mycobacterium tuberculosis*. *Mycobacterium tuberculosis* is spread via airflow from person to person and dispersed into the air when the infected person(s) cough, sneeze, or simply speaks. According to the World Health Organization (WHO), this disease is one of the top 10 causes of death, and over 95% of cases and deaths are in developing countries. WHO reported one million children fell ill with TB in 2017 with 233,000 deaths. Our research goal was to determine how disease state, age, gender, and ethnicity affect gene expression for Tuberculosis infections. We conducted a meta-analysis of TB and healthy cohort gene expression, using microarray expression datasets that we curated from the National Center for Biotechnology (NCBI) database, Gene Expression Omnibus (GEO). Our meta-analysis utilized GEO datasets that reported disease status, age, sex, and race of all subjects. We also focused on the Illumina microarray platform which resulted in us curating 5 datasets and a total of 250 samples. We preprocessed the microarray raw data by performing background correction, normalization, summarization and probe annotation. To identify genetic variation in the data across ages, sex, race, and disease state we performed an ANOVA. In result, there were 1,790 genes that were differentially expressed by disease status. Of these 1,790 genes, 2 genes ("AHCYL1" "ANGEL2") had disease and age interactions, 34 genes had disease and race interactions, and we found no disease and sex interactions. Statistically significant data ($p < 0.05$) were further analyzed to identify enriched Reactome and KEGG pathways as well as gene ontology (GO) terms. We found genes enriched in GO terms such as immune system process, response to stimulus, cell killing, locomotion, metabolic process and the Reactome pathways such as Infectious disease. Our findings highlighted potential gene targets for TB and genes to further explore how race and age may influence disease outcomes.

Acknowledgements:

Funding provided by NIH MARC at UVI: A Holistic Approach grant award #5T34GM008422-26.

Algorithm Optimization for Fast Transient Identification in the Deeper Wider Faster Data

Michael Dow Jr.

Mentor(s): Dr. Antonino Cucchiara
National Aeronautics and Space Administration (NASA)

Session 6: Astrophysics & Technology (1:30-1:40 pm)

Fast transients are astronomical objects whose brightness drastically increase and decrease over a short period of time, from a few minutes to fractions of a second. These events are particularly difficult to study because of their fleeting nature. The Deeper Wider Faster Survey is designed to discover these elusive objects and allow us to collect a large sample to study. Our goal is to develop a Python-based algorithm to be run on a supercomputer that will be able to run in real time with the DWF observations, build light curves that display these brightness spikes versus time, and quickly identify those objects that resemble fast transients of interest. We developed a Python-based code that allows us to model different light curves with mathematical equations and extract useful parameters for subsequent classification. The next steps include the creation of a large sample of light curves, their accurate modeling, and the collections of the fitting parameters that best describe these objects. This work will allow more powerful, dedicated facilities focus on these objects once they are identified, hoping to further our understanding.

Acknowledgements:

MIRO Grant # NNX15AP95A

Effects of Saharan dust on the growth of Juvenile and Adult Corals

Nicholas C. Durgadeen

Mentor(s): Dr. Robin T. Smith
The Nature Conservancy

Session 1: Marine Biology (2:40-2:50 pm)

During the month of June 2020, the US Virgin Islands experienced the largest Saharan dust plume it's had in decades. This brought about questions on the effects that this natural phenomenon may have on the health of coral ecosystem. The significance of Saharan dust has been researched extensively with regards to the weather patterns, and some propose that it may have a negative impact on coral reefs, affecting growth rates in both adult and juvenile corals. To evaluate this possibility, micro-fragments from colonies of the hermatypic coral, *Orbicella faveolata* and *Diploria labyrinthiformis*, were incubated in two separate tanks. One tank was, dosed with, .2grams of Saharan dust, the quantity estimated to be the amount that natural coral populations of St. Croix experienced during the height of the Saharan dust event. These estimates were performed using data from Earthschool.net, which provided the amount of dust per unit area. The second tank was absent of dust and acted as the experimental control. Interestingly, the results did not support the hypothesis that dust may impact growth in adult corals. The results of this study disproved the first part of my hypothesis but was consistent with the part that believed the poly's budding process would be stunted. The corals incubated with the Sahara dust weighed almost (two times) as much as the corals that were not in the water mixed with Saharan dust. One possible explanation for these results could be due to the mineral content of the Saharan dust. One of the most prominent minerals found within Saharan dust is iron (Fe), and there is recent evidence demonstrating its importance in coral-algae symbiosis which ultimately plays a role in coral calcification.

Acknowledgements:

NSF SEAS Island Alliance, National Science Foundation INCLUDES Program Award #1930991 and The Nature Conservancy

Analyzing Student's Attitudes Towards STEM IN STX

Melissa Ferreras

Mentor(s): Dr. Christopher Plyley
University of the Virgin Islands

Session 4: STEM Education & Social Science (1:40-1:50 pm)

There is a consensus in the United States that educational entities are falling short in producing the next generation of STEM talent for the workforce. Further, racial and ethnic minorities are underrepresented in STEM occupations, and many students at the high school level are diverting from STEM fields because they aren't comfortable or they don't believe they can succeed in math and science. In order to increase the amount of students that go into STEM careers, community-based STEM research projects have been implemented with the hopes of improving both student attitudes and student knowledge in STEM fields and careers, by showing students that STEM careers and STEM research involve more than just the math and science they know from school. In St. Croix, USVI, the Department of Education implements an intensive summer STEM research program where students are paired with a teacher to research various STEM projects. This research analyzes the results of three years (2018, 2019, and 2020) of student STEM attitude and STEM interest surveys. Surprisingly, the results show that many students suffered a significant decrease in their attitudes towards STEM after the research projects. Further analysis highlights the importance of the individual teacher and the project design in student experience. A general of current student attitudes and interests towards STEM in STX is also discussed.

Acknowledgements:

This research is proudly funded by the NSF HBCU-UP ACE Implementation Project: The UVI Growth Model grant award# 1623126.

**Challenging experience centered around a hurricane for undergraduate students
at the University of the Virgin Islands**

Angelisa Freeman

Mentor(s): Dr. Michele Guannel
University of the Virgin Islands

Session 4: STEM Education & Social Science (2:00-2:10 pm)

This research project investigated the challenging experiences before, during, and after a hurricane. This study includes 26 Caribbean hurricane essays written by undergraduate students in the SCI 100 course at the University of the Virgin Islands. The study used a phenomenological approach to analyse data for common themes, or codes. These codes were utilized as a starting place in which 13 common themes that were coded in the essays. These themes were then analyzed and the most cited challenging experiences before, during and after were identified. The lack of knowledge about hurricanes was the most cited challenging experience before a hurricane. Lack of knowledge about the hurricane includes no knowledge and underestimating the destructive potential. The emotional state and damages were the most cited challenging experience encountered during a hurricane. Everyone possessed different emotional dispositions and endured various levels of damages. Emotional loss and physical loss were the most cited challenging experience after a hurricane. Loss that is, emotional and physical loss, was the most challenging of all experiences. Many lost possessions and lives due to the hurricane. Some recommendations include building shelters and homes to withstand major hurricanes, implement hurricane drills and having alternative communication techniques to ensure people are better prepared. Everyone should have an emergency plan for each household and adequate counselling services for persons with post-traumatic stress disorder. A hurricane is a potential danger to all thus, is it important to be prepared.

Acknowledgements:

ECS Honors Fund through generous private donations to the university

Detection, Assessment, and Mitigation of Public Network Exposures in the USVI

Javier Galiber

Mentor(s): Timothy Kentopp
University of the Virgin Islands

Session 6: Astrophysics & Technology (2:40-2:50 pm)

Initial research of a public network in the USVI revealed that tens of thousands of consumer and business systems exhibited needless system exposures. Most users are unaware that smartphones and tablets have no firewalls to protect them on Wi-Fi and the Internet. The latest Internet Protocol version (IPv6) includes security enhancements the previous version (IPv4) lacks. It may be possible to reduce network exposure by configuring selected devices on the same network to use different IP versions. Two locations were used to investigate the extent of public network exposures with open source tools. After initial results, three different trials were devised to test if devices using different IP versions would be less accessible. A device was configured with only IPv6, a second device with only IPv4, and a third device with both. An unexpected outcome of the public network assessment revealed three times the number of systems on business Internet were exposed than on residential Internet. In local trials to enhance security, results validated proof of concept as only devices configured alike could interact with each other. It was discovered default settings in network equipment provided by the ISP allowed unrestricted access to the home network gateway, and that no provider offers IPv6. Therefore, hackers could gain access to a local Wi-Fi, leaving mobile devices without firewalls at greater risk of compromise. While security can be enhanced using different IP versions, this promising method cannot be tested yet in the USVI. More research is needed to investigate exposures likely caused by unchanged service router defaults in our territory, and this new method can be tested where IPv6 is available.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model grant award #1623126

Computational Analysis of 1,4-diphosphabicyclo[2,2,2]octane in Comparison to 1,4-diazabicyclo[2.2.2]octane

Xuxa Garroden

Mentor(s): Dr. Stanley Latesky
University of the Virgin Islands

Session 5: COVID & Chemistry (2:00-2:10 pm)

Chemical Computational analysis refers to computational methods where theoretical models are used to generate algorithms that can model the properties and electronic structures of molecules. In this research of 1,4-diphosphabicyclo[2,2,2]octane was studied and analyzed using Spartan for IOS. The molecule generated was ellipsoidal in shape. This software made it possible to produce a model of the molecule being studied and variations for the adjustments. Hartree-Fock theory is a fundamental electronic structure theory. It is one of a number of computational models which can be used to generate molecular orbital (MO) schemes. It is the basis of molecular orbital (MO) theory, which posits that each electron's motion can be described by a single-particle function (orbital) which does not depend explicitly on the instantaneous motions of the other electrons. In this research the Hartree-Fock method was used at 6-311g* basis set, the aim has been to determine a variational method that provides the wave function of this many-body multi-electron system. The removal of one electron (chemically or electrochemically results in the formation of a radical cation. All spectroscopic evidence for the dinitrogen analogue indicates electron delocalization via the sigma framework and not its pi delocalization. Our goal is to see whether similar behavior can be found in the di-phosphorous analogue.

Acknowledgements:

ECS Honors Fund through generous private donations to the university

Design & Manufacturing of Low-cost Hardware to Benefit Precipitation Monitoring

Ne'Kye George and Ulric Baptiste

Mentor(s): Dr. Brice Orange and Dr. Marshall Parsons
Etelman Observatory, University of the Virgin Islands

Session 2: Environmental Science (1:50-2:00 pm)

The University of the Virgin Islands' Etelman Observatory is home to several innovative technologies that support research in the fields of climatology and ground-based astronomy. For this project, we increased the technology readiness level of a long-range (LORA) and line-of-sight (LOS) radio communicator system designed to benefit the Etelman Observatory's Virgin Islands Robotic Telescope (VIRT), and the USVI Climate Monitor Program (USVI-CM). The process behind creating this technology, and our project was separated into two groups. The first was power management, output, and internal structure, which includes wiring, battery, nodes, etc. The second was its design and manufacturing, which takes into account durability and deterioration over the lifetime of the entire system. Our project built upon the first-generation designs behind these specific technology sub-groups, and improved the interface between components and external entities (solar, antenna, rain sensor, etc.), and detailed the on-board power budget to optimize solar-power requirements. When manufactured, these units will be strategically placed in multiple locations throughout the United States Virgin Islands (USVI) to provide advanced warning of rain events to the Etelman Observatory, and initiate autonomous shutdown procedures for VIRT. In the future, we plan to branch the basic design of this technology to simultaneously benefit the USVI-CM.

Acknowledgements:

OrangeWave Innovative Science

Assessing herbivory of three common reef grazers and potential affects on newly settled coral recruits

Samuel Gittens Jr.

Mentor(s): Dr. Robin Smith

The Nature Conservancy and University of the Virgin Islands

Session 1: Marine Biology (1:20-1:30 pm)

Grazing is a significant process for healthy coral reefs. It is valuable for coral resilience and coral/macroalga interactions which may benefit corals by increasing coral recruitment. The goal of this summer project was to evaluate which species of grazers are optimal for use in land-based coral nurseries containing both adult and newly settled coral recruits. The three different species of common reef grazers selected for the experiments were: *Clibanarius tricolor*, *Paguristes cadenati*, and *Turbinidae* sp. The coral species utilized in some of the experiments was: *Diploria labrythiformis*. In the first set of experiments, rates of herbivory were estimated by constructing incubation enclosures of the same size for each species. Enclosures were placed over a lawn of algal turf and five of each species were placed in an enclosure and left to graze for sixteen hours. Herbivory was estimated by analyzing photos taken before and after the incubations. Images were imported into Image J software to calculate the areas grazed in the final images. Results indicate that *P.cadenati* had the highest rates of herbivory, followed closely by the *Turbinidae* snails. *C. tricolor* showed much lower rates of herbivory than either of the above. In the second set of experiments, grazing intensity was evaluated by placing a substrate with 25 newly (~1-month) settled coral polyps into a chamber containing five of each herbivore species. Grazers could interact with the polyps for two hours, after which the substrates were analyzed using a stereomicroscope to assess presence or absence of the coral polyps. Results demonstrated that all coral polyps were all accounted for during the *C.tricolor* and *Turbinidae* incubations, however one was missing following the incubation with *P.cadenati*. In the last set of experiments, feeding preferences were evaluated by collecting three different algae species (*Sargassum*, *Caulerpa sertularoides*, *Jania* spp) and estimating starting quantities using buoyant weighing. Algal species were then placed into nets with each herbivore species individually for a 24-hour incubation. After feeding incubations, final weights were calculated to evaluate feeding preferences between grazers and algal species. Results indicate that both *C.tricolor* and *P. cadenati* preferred *Sargassum*, whereas *Turbinidae* preferred *Caulerpa*. *Jania* was the least preferred algae for all three herbivore species. A possible explanation is that *Jania* may be too brittle for the herbivores to eat, while *Caulerpa* and *Sargassum* have a softer texture which can be more easily grazed. A reason that may explain why *C.tricolor* did not eat as much as the other two species for rates of herbivory can be because the species were mostly focused on escaping the enclosure than eating. For the missing polyp during the *P.cadenati* incubation, I cannot assume if it was due to grazing or natural causes because I did not set up sufficient controls with the experiment.

Acknowledgements:

This research was funded through the National Science Foundation INCLUDES Program (Award #1930991). Special thanks to SEAS Islands Alliance and The Nature Conservancy.

**Preparing Students and Communities for Natural Hazards
in the U.S. Virgin Islands**

Bethany Good

Mentor(s): Dr. Michele Guannel and Dr. Christopher Plyley
University of the Virgin Islands

Session 4: STEM Education & Social Science (2:10-2:20 pm)

After Hurricanes Irma and Maria severely impacted the U.S. Virgin Islands in 2017, it became evident afterwards that people were unprepared for the magnitudes of such disasters. This study is focused around STEM education research in the Science 100 class on the St. Thomas campus of UVI, a course that focus on natural disasters and ecosystems of the Caribbean. The objective of the study is to answer the question of how well students are prepared for a natural hazard to occur. The foundation of the research uses survey data and students' hurricane experiences. The study includes analysis of students' answers to pre- and post-surveys related to Disaster Preparedness and Safety, including sources students use to learn about natural hazards that may impact the USVI. To analyze the results of the 53 students who completed both the pre- and post-surveys, a paired t-test was performed for True and False questions and a McNemar Chi-Square test to determine significance in the natural hazard sources cited by students. Results indicated there was an overall significant ($p < 0.001$) increase in correct answers related to disaster safety, and a significant increase in the number of students who cited disaster response organizations ($p < 0.00001$) as sources of information about natural hazards in the VI, after the semester concluded. In addition, 26 hurricane essays, analyzed for emergent themes, revealed elements of survival preparedness, structural preparedness, and organizations, which were important to VI students who experienced Hurricanes Irma and Maria. This suggests that during the semester, students gained important knowledge to become better prepared in the event of natural disasters, as well as a recognition that their lived experiences of hurricanes increased their awareness of the need to be prepared.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model award no. 1623126

Lindbergh Bay Coastal Erosion Analysis through Wave Propagation Modeling

Tione Grant

University of South Florida

Mentor(s): Dr. Gregory Guannel and Ariel Stolz
University of the Virgin Islands; Caribbean Green Technology Center

Session 2: Environmental Science (1:20-1:30 pm)

Waves are an important factor in determining beach geography, so recognizing their formation and propagation patterns is essential to understanding their effects on nearshore areas and building inferences on events such as coastal erosion. It has been speculated that the Lindbergh Bay area is experiencing significant erosion due to the airport expansion project from the early 1900s. The goal of this project is to use modeling and propagation analysis to investigate wave behavior around the dredging site and theorize on the bay's erosion. Data profiles replicating the surrounding dredging site were modeled within Matlab, and different variations of wave components were inputted to mimic wave behaviors over these seafloors. The profiles were then manipulated and interpolated to remove the dredged hole and the exact wave variations were rerun over the new seafloors. After running different waves variations over both profiles, it was clear that filling the hole would reduce the bay's erosion, especially when it came to larger waves. And when the possibility of increase water levels was observed, the erosion levels were lower when the hole was filled. Future work seeks to examine the area using 2-dimensional modeling and implementation of SWAN modeling analysis to help build a greater understanding for the waves effect on the Lindbergh Bay area.

Acknowledgements:

Funding for this project was provided by the NSF HBCU-UP ACE Implementation Project: UVI Growth Model grant award #1623126

Constructing caged ligands using amino acids containing sulfur with the addition of metals

Makayda Gustave

Peter J. Stang, Danh H. Cao, Kuanchiang Chen, Gary M. Gray

Mentor(s): Dr. Stanley Latesky

University of the Virgin Islands

Session 5: COVID & Chemistry (2:10-2:20 pm)

Sulfur contains amino acids Methionine, cysteine, homocysteine, are the common sulfur-containing amino acids, but only the first 2 are incorporated into proteins. Proteins are constructed by amino acids linking together to form a polypeptide chain, which codes for various functions and can be directed toward tissues and organs; essentially proteins are utilized for growth and repair. These caged ligands act as oxygen transporters which are vital in the production of hemoglobin, a protein in red blood cells. Histidine, an essential amino acid, positively charged imidazole functional group, due to functional group it is usually part of enzyme-catalyzed reactions. All enzymes are proteins, however, not all proteins are enzymes. Methionine can be converted to sulfur-containing molecules, to regulate cell function; tissue protection; modification of DNA. Your body cannot produce this on its own. It comes from the consumption of fish, pork, tofu, and other high methionine containing foods. Cysteine, a sulfur-containing amino acid, usually appears when a disulfide bond is formed between two cysteine residues, a function to stabilize the protein. The question that is being answered is whether the manipulation of the structure of these elements by the means of computational chemistry programs such as Gaussian, ISpartan, and Hartree Fock 6-311G*(p,d) will change its identity. We were able to achieve a tetrahedral structure with only the carboxyl chains remaining trigonal planar. These alterations in structure allowed the molecule to become more water-soluble, less electronegative, and gain flexibility.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model grant award #1623126

Genetics of the invasive seagrass- *Halophila stipulacea*

Emely Henriquez Pilier
Shantae Lewis
Mentor(s): Dr. Alice Stanford
University of the Virgin Islands

Session 1: Marine Biology (1:10-1:20 pm)

The invasion of the seagrass, *Halophila stipulacea*, may cause changes in local marine ecosystems and species. *Halophila stipulacea* originated in the Indian Ocean, then migrated towards the Caribbean and propagated throughout the region. Our research tested the genetic structure and clonal variation of the invasive seagrass and we wanted to know what could genotypes tell us about the invasion of *Halophila stipulacea*. We believed that once *H. stipulacea* invasion occurred, the rate of expansion was not related to genotype. To know the various genotypes, PCR and 2bRAD DNA sequencing was used, then genclone was used to analyze the data. During my research, old and stored leaves were used from previous years, therefore I wanted to know if there were any differences in the quality of extraction in previous years (2016 and 2017) and with my extractions (summer 2020). An ANOVA was done of the three different years and their extraction quantities and it was found that 2017 had the best extraction quantity, while 2016 and summer 2020 showed similar but lower extraction quantities. This showed that even though old leaves were used, the extraction quality was not horrible, and the extractions could be used for decent results.

Acknowledgements:

NIH MARC at UVI: A Holistic Approach grant award #5T34GM008422-26

An Investigation of the Voting System Used in the U.S. Virgin Islands to Elect Members of the Legislature: Bloc Voting

LeAnn Horsford and T'Leah Serieux

Mentor(s): Dr. Adam Parr
University of the Virgin Islands

Session 4: STEM Education & Social Science (2:20-2:30 pm)

Bloc voting is a method for multi-member district voting that is utilized in the USVI. This is a system in which voters can select as many candidates as there are open seats. Voters do not have to use all of their votes. Ten states utilize multi-member district voting however not all of them use bloc voting. While having some advantages, such as ease of implementation, this method is not proportional, a small majority or even a large minority can effectively choose all the winners, and often it's in the voter's best interest to not use all their votes.

In this study, we investigated further on this uncommon method that is used to elect members of the legislature from the St. Thomas/St. John district and St. Croix district. This study was done by gathering data from the USVI Board of elections website for the years 2010 to 2018 and analyzing this data from the various years to determine if there is any relationship between the STT/STJ district and STX district in terms of the results from the elections and general distribution of votes.

When analyzing the certified election results, several key indicators were calculated and studied. To see how voters utilized their votes, we looked at the average votes per voter. It was found that there was no significant difference between the two districts, the average number of votes per voter was always less than 7 with the average number of votes per voter in all districts each election year being consistently close to the overall average of 4.8. When examining the percent of voters for the 1st and 7th place winners, it was found that only 1st place winners in the St. Thomas district had more than 50% of voters. Comparatively, in the St. Croix district, all but 1 election year have 1st place winners with close to or more than 50% of voters. 7th place winners ranged from 26% to as high as 42% of the voters. This implies that there may be enlarged groups that dominate the elections, as well as sizable minority blocs who lack representation due to the non-proportional nature of the bloc method. When looking at the voting gaps, it was found that there was a difference between the districts. In the St. Croix district, there is a significant gap in the number of votes with an exception to the year, 2016. Comparatively, the gap in the number of votes in the St. Thomas district is quite small. This implies that there is a more cohesion in the St. Croix district vote, and that small groups on St. Thomas could improve their results by utilizing fewer votes.

We can conclude that there are some patterns in the results of the elections from 2010 to 2018, and some differences between the STT/STJ district and STX district results. This study is a preliminary step for a much bigger study. In this study, we were able to obtain background information as well as preliminary evidence. With the analysis discussed above, it can be understood that if a different voting method was utilized the election results obtained would have been different. If a voting method such as the ranked choice (a more proportional multi-seat method) was used, the winning threshold would be about 14.3% of voters. This implies the existence of nonproportionality. Although, it is to be noted that it is highly likely that the 1st place winners would win no matter the voting method. Also, when relating both the average votes per voters and the vote gap, if 64 of the 7th place voters had not voted for the winner, then it is highly likely that the results would have been different. From this, we were able to ask many questions and gather information that will be used in future research.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model , Award number: 1623126

Training Acoustic Analysis Software to Identify Frogs Using Machine Learning

Sarai Hutchinson

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

Session 2: Environmental Science (1:40-1:50 pm)

Frogs are important to ecosystems as they control insect populations and are a food source for other animals. They are also important indicators of ecosystem function. They communicate through loud sounds that we can locate and monitor, and the use of bioacoustics, where recorders are placed to capture these sounds, is helpful in collecting large volumes of data. However, processing these acoustic files is tedious and incorporating automation into acoustic studies is important. The goal of this research project is to develop an automated classifier to identify different sounds within acoustic recordings and determine if frogs can be accurately identified using these classifiers. The hypothesis is that there is no difference in machine learning versus manual identification of frogs. The analysis software, Kaleidoscope, was used to sort the vocalizations according to acoustic patterns that were then used to create identification classifiers for four frog species. The classifier output was then tested against manually processed reference data. The classifiers did not identify each species consistently within the reference recordings because of the high variation within the vocalizations of each species. While the classifiers did aid in identifying frog species in this set of recordings, not all frog vocalizations were detected when compared against the reference data, resulting in an underestimation of the frogs present within the recordings. However, despite this, these findings mean that the workload for processing large volumes of data can be reduced through automation. Identifying sounds quicker and easier is the foundation for many other forms of analysis and can answer many more questions about frog ecology and environmental quality. Frog vocalizations are not the only things that can be recorded. Different species of animals and other types of sounds can also be located and monitored to maintain biodiversity.

Keywords: Machine learning Frog vocalizations Accuracy Kaleidoscope

Acknowledgements:

ECS Honors Fund through generous private donations to the university

Finite Element Modeling of the Electroporation Phenomenon using Microfluidic Devices

Deidre Lee

Mentor(s): Jeffery D. Zahn, Christopher Kidchob and Upasana Ghosh
Rutgers University

Session 3: Biomedicine & Community Health (1:30-1:40 pm)

Electroporation is a technique in which an electric pulse is applied to cells which generates a membrane potential difference and induces temporal pores in the cell membrane; allowing access for molecular delivery into the intracellular space. However, the task of obtaining efficient delivery without compromising cell viability is crucial when using this technique. A microfluidic platform is a unique way to electroporate flowing cells in an automated and controlled manner while increasing cell viability. Computational models are crucial in the design process, as they can identify a microfluidic and electrical design for optimal results. My role in this ongoing project is to stimulate a microfluidic platform that performs electroporation on blood cell types using COMSOL Multiphysics.

Acknowledgements:

This work was supported by the NSF REU in Cellular Bioengineering: From Biomaterials to Stem Cells (NSF EEC 1763005).

Structure-based virtual screening methods to determine the inhibitory potential of compounds isolated from caribbean marine natural resources against main protease of SARS-CoV-2

Juchara Margetson

Mentor(s): Dr. Neelam Buxani
University of the Virgin Islands

Session 5: COVID & Chemistry (1:10-1:20 pm)

The outbreak of the novel coronavirus disease COVID-19, caused by the SARS-CoV-2 virus, has spread rapidly worldwide and has become the current health concern to the entire world. The heart of the COVID-19 outbreak was in December 2019 in Wuhan, China. It has over 3,096,626 confirmed cases, and 217,896 confirmed deaths reported by the World Health Organization. Since SARS-CoV-2 is a newly discovered pathogen, no specific drugs have been identified or are currently available. An economical and efficient therapeutic strategy for developing antiviral drugs is drug designing using molecular docking. In this study, four native Caribbean plants (Aloe Vera, Moringa, Lemon grass, Lignum vitae) were selected to compile a list of compounds to be virtually screened and identified as potential antiviral agents for COVID-19. One hundred twenty-five compounds were observed *via* a docking study. Docking studies were performed using Gide software of Schrodinger (Schrodinger software suite, Maestro 2020-2). Out of 125 compounds, 13 were showed significant inhibitory potential against SARS-CoV-2 main protease's (PDB code: 6LZE) active site. Based on the docking score (in XP mode) and binding energy of aloin (-8.223) and rutin (-11.962). ADME studies were also performed to evaluate drug likeness of these compounds. Then just use the last sentence This research will help get new medicines from native Caribbean plants against COVID-19 and help fight the pandemic.

Acknowledgements:

NIH MARC grant award no. 5T34GM008422-26

Kale Leaf Growth and Water Content

Dazonte Mathurin-Phaire

Mentor(s): Dr. Thomas Zimmerman
University of the Virgin Islands

Session 2: Environmental Science (2:20-2:30 pm)

Kale is a health food grown during the cool season in temperate climates; however, the U.S. Virgin Islands (U.S.V.I) lacks a cool season, hence the need to evaluate how kale grows. The objective was to help farmers decide what kale to plant and when to harvest the leaves by studying the rate of leaf growth and water content in fifteen kale varieties. The null hypotheses was that all kale leaves grow at the same rate and have the same percentage water. Kale was planted in a completely randomized block design of three blocks and fifteen replications per variety and block. Kale leaf length was initiated on 2 cm kale leaves that were measured for three weeks. Mature leaves were weighed with and without the midrib and dried 48 hrs at 40°C. The 15 kale varieties were classified into four distinct leaf types: green and red curly, dinosaur, and 'Red Russian'. The results indicated kale leaf development is a linear curve with two distinct groups, and it has logarithmic followed by slow growth. Kale leaves can be harvested 21 days after planting. Dinosaur leaf kale varieties produced significantly more marketable leaves than other leaf types and are best to grow in the U.S.V.I. The kale's midribs significantly increase the fresh weight of leaves, with the larger the leaf, the greater the midrib weight; however, there was no significant difference between the percentage water content with or without the midrib. Kale production is possible even during the U.S.V.I.'s warmest dry season, with the deep green dinosaur types the most productive. Kale leaves can also be dried to extend the shelf life.

Acknowledgements:

NIH RISE - Building Students' Identities as Scientists (Grant award: 2R25GM061325-15)

Automatic Signal Detection and Analysis

Joel Mwambungu

Mentor(s): David Morris, Amalaye Oyake, and Dr. Nikolic Dragan
Jet Propulsion Lab (NASA) and College of Science and Mathematics, University of the
Virgin Islands

Session 6: Astrophysics & Technology (1:50-2:00 pm)

Gamma ray bursts are very energetic short-lived bursts of light. They are produced by one of two ways, the collapse of a supermassive star or the coalescence of 2 compact objects. These bursts are short lived and have a range of either a few milliseconds to a few minutes. CubeSats are a class of research spacecraft called nanosatellites. CubeSats are built to standard dimensions of 10 cm x 10 cm x 10 cm. The purpose of this project is to develop a framework for the rapid detection and classification methods of Gamma ray burst signals to be used by a cube-sat satellite which will be built by the UVI physics department and eventually launched into space. This framework was developed in a three-step process. The first is the analysis and manipulation of spectrometer signal data into a format that can be read via computer software. The second step is to read the signal data into a small program and create algorithms to identify the different peaks present on these signals. In addition, information such as the height and time of the peaks is also produced using algorithms. The third step is to generate custom signals using scientific equipment and modify preexisting algorithms to accurately detect and analyze output signals.

Acknowledgements:

This research was partially funded by the University of the Virgin Islands Physics department grant #80NSSC17M0048, UVI-GREAT and a grant from the Jet Propulsion Laboratory.

Detecting Transient Sources

Joshua Parris

Mentor(s): Dr. Dario Carbone
University of the Virgin Islands

Session 6: Astrophysics & Technology (1:40-1:50 pm)

Radio waves are apart of the Electromagnetic Spectrum. What determines the type of Electromagnetic radiation created is how fast a wave wiggles on the Electromagnetic Spectrum. Radio waves are the lowest waves in terms of frequency with Gamma Rays being the highest. Radio Astronomy was discovered by Karl Jansky. He discovered radio waves coming from the Milk Way. Astronomers map the position of objects in the sky using celestial coordinate systems along the Celestial Sphere. Radio transients are sources that are only visible during a certain period and are detectable by radio telescopes Transient Sources are sources that are short lived. In this project we analyzed a series of observations of the same field taken by the Low Frequency Array (LOFAR). Radio telescopes are interments that explore the Universe in radio waves. The Main goal of this project is to constrain the rate of transient sources if they are any found. For our methods we focused on four radio sources in that field. We used the computer program DS9 for the parameters of these images. We built a light curve using the computer programming language called Python to determine whether these sources were transient or not. Based on our results there were no transient sources found, but we were able to out constraints to the radio transient rate. Continued research will be required to find transient sources and constrain the rate if any sources are found in different frames.

Acknowledgements:

Emerging Caribbean Scientist Program

The Effects of Temperature and Humidity on COVID-19

Sheneka Patrick

Mentor(s): Dr. Christopher Plyley
University of the Virgin Islands

Session 5: COVID & Chemistry (1:40-1:50 pm)

The coronavirus disease 2019 (COVID-19) pandemic is the defining global health crisis of our time and is the single greatest challenge the world is facing right now. The way in which environmental factors affect the spread of the disease is of tremendous interest to the scientific community. Meteorological parameters are reportedly crucial factors affecting respiratory infectious disease epidemics. However, the effect of meteorological parameters on COVID-19 remains controversial. This study investigated the effects of temperature and relative humidity on daily new cases and daily new deaths of COVID-19, which has useful implications for policymakers and the public. Daily data on meteorological conditions, new cases and new deaths of COVID-19 were collected for 166 countries as of March-July 2020. Data was compiled, cleaned, and loaded into R programming software where a log-linear generalized additive model was used to analyze the effects of temperature and relative humidity on daily new cases and daily new deaths of COVID-19. Potential confounders controlled for included wind speed, median age of the national population, and population density. Initial findings support the theory that increases in temperature or humidity may suppress the ability of the virus to spread. Regardless, active measures must be taken to control the source of infection, block transmission and prevent further spread of COVID-19.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model grant award #1623126

Technical Infrastructure for Systematic Management of VIRT Scientific Productivity

Darren Paul

Mentor(s): Dr. Brice Orange and Priyadarshini Gokuldass
University of the Virgin Islands

Session 6: Astrophysics & Technology (2:50-3:00 pm)

A pipeline is a series or “tunnel” of data processing where the output of a specific process is the input of another. The Etelman Observatory on St. Thomas utilizes a reduction pipeline to process the images and data taken by the Virgin Islands Robotic Telescope (VIRT). These images include Bias, Dark, Flats, and Science Images. Each image is important in the fact that they contribute to creating the final reduced image. The goal of the project is to create a technical report containing the detailed status and use of the VIRT data reduction pipeline. The purpose of the reduction pipeline is to process the optical images obtained by VIRT. The bias, dark and flat images allow astronomers to aid in “reducing” the noises in the final science image, thus making it a clean reduced science image. The final image allows astronomers to further process the data with little error.

Fish client species showing a wide variety of posing behaviors towards anemone cleaner shrimps

Kahlifah Powell

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

Session 1: Marine Biology (1:40-1:50 pm)

Communication is very important in a symbiotic relationship, but it is also very difficult. Cleaner shrimps live on the anemone, *Bartholomea annulata* include *Ancylomenes pedersoni* and *Periclimenes yucatanicus* and communicate with the fish they want to clean by waving their antennae. Fish wishing to be cleaned need to communicate that they desire to be cleaned and that they are no threat to the shrimp; they might use some type of pose to communicate this to the shrimps. At least 16 species of fish are reported to visit anemones; not all will communicate with the shrimp the same way. The goal of this research was to quantify and compare behaviors that different species of fish exhibit to get cleaned by anemone shrimp. GoPro cameras recorded the mid-day visits of the different species of fish that came anemones to get cleaned from January to June 2020. After watching the videos, I picked the 5 species of fish that visited most often (grunts, lane snappers, butterflyfish, ocean surgeons, and tangs) and recorded behaviors they displayed when at the anemone, such as color change, fin and gill flapping, opening and closing of their mouth, and whether or not the fish are up in the water column. All of the five main fish species posed in the water column (rather than lying on the sea floor) making them at least somewhat active to remain stationary. The butterflyfish, tangs, and ocean surgeons were the most active fish out of the five since and they were the ones that flapped fins and gills rapidly while also opening and closing their mouths rapidly. The grunts and lane snappers were less active, but they were more likely to employ a color change such as darkening or striping. Visual signals such as color change have been reported, but we also hypothesize that the rapid movements of some species may communicate to the cleaner shrimp via a physical cue.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model grant award #1623126

Modeling Infection Rates in the USVI

Teh'Rhon Rabsatt

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

Session 5: COVID & Chemistry (1:30-1:40 pm)

Modeling and simulating infectious rates during a pandemic are critical to slow down and eradicate the spread of the COVID-19 disease. Decision makers are using those models and simulations to recommend life-saving interventions. In addition, slowing the rate of transmission also has an essential impact on the resources available to the health care system. Effective decisions allow relaxing interventions such as travel bans, social distance, business closures which are keys to relieve the pressure of the economic system. The U.S. Virgin Islands are heavily dependent on tourism industries. Models of infectious disease rates designed specifically to the U.S. Virgin Islands are urgently needed to assist in making appropriate public health interventions. Designing and testing such models also requires reliable data.

This research studies the susceptible–infected–resistant (SIR) compartment model. The SIR model is simple to understand with a few parameters and can be adapted to fit data in the US Virgin Islands. Using Biopython and pre-constructed infectious which were slightly modified I attempted to simulate the current infection rates of COVID-19 in the Territory. The data streams used were infection data from the WHO and VI Census data as they proved the most authoritative data available. The simulations showed that should the VI begin to loosen social distancing and public safety restrictions infection rates will grow astronomically. My simulations show that we would see high recovery rates which is common with the virus but a factor I could not properly simulate was the limitations of our healthcare system. My work with mathematical models to simulate infection rates in the USVI has highlighted the importance to the public and the scientific community to accessing reliable raw and aggregated data sets.

In conclusion, creating a model to test out expected error rates, model parameters, and source reliable data streams are the best way to resolve these issues, but this has proven difficult. Without quality tested infection disease models for the Virgin Islands the expected error rates remain a mystery and worst of all, the knowledge of which model parameters work best to tailor a model to the infectious scenarios of the Virgin Islands. From this research, I have derived that the SIR model for modeling COVID-19 spread is still incomplete due to a lack of accurate model parameters. Additional work is necessary to further research on modeling infectious diseases in the Territory.

Keywords: Model, Infectious, COVID-19

Acknowledgements:

National Institute of Health and University of Virgin Islands, MARC Grant Number:
5T34GM008422-26

Quantifying the Spread of the Stoney Coral Tissue Loss Disease: Random Walk Simulation

Xaver Richardson

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

Session 1: Marine Biology (2:10-2:20 pm)

Stony Coral Tissue Loss Disease, or SCTLD, is a disease that is affecting over 20 species of hard corals in the Caribbean and the Florida Keys. While diseases are not uncommon on coral reefs, SCTLD poses a particularly significant threat to reefs because of its large geographic range, extended duration, high rates of mortality, and the large number of coral species affected.

SCTLD is suspected to be caused by bacterial pathogens and can be transmitted to other corals through direct contact and water circulation. This disease is extremely dangerous to coral and, ultimately, to human activity. Coral ecosystems are a source of food for millions; protect coastlines from storms and erosion; provide habitat, spawning and nursery grounds for economically important fish species; provide jobs and income to local economies from fishing, recreation, and tourism; and are a source of new medicines. Tracking and understanding this disease's movements is an integral part of getting rid of this disease and protecting livelihood in the Virgin Islands.

With this research, we plan to gain a greater perspective on how this disease moves. It is believed that the disease moves through the water and is affected by currents in the water, diffusion and advection. The overall objective is to build and utilize mathematical models to discern the disease's movements. In particular, this project will simulate the movement with a random walk model. It is expected that this model will predict and show the movement of the disease. A random walk, in probability theory, is a process for determining the probable location of a point subject to random motions, given the probabilities (the same at each step) of moving some distance in some direction.

We are miles ahead in using random walks simulation to understand the movement of the virus. The preliminary code is working like a dream. Next steps are to add the diffusivity and the currents to the model in order to calculate the probabilities. When results do occur, they will indeed aid the professionals in combatting the disease. Hopefully for everyone's sake, we get this done.

Acknowledgements:

NSF HBCU-UP ACE Implementation Project: The UVI Growth Model grant award #1623126

Solar Energy Sustainability in the US Virgin Islands

Kiwanee Smith

Mentor(s): Dr. Gregory Guannel and Ariel Stolz
University of the Virgin Islands

Session 2: Environmental Science (2:10-2:20 pm)

On island, the cost of living is relatively expensive when compared to some cities in the America. The US Virgin Islands' economy is six times more energy-intensive and per capita; US Virgin Islanders use seven times more electricity. This, in result, causes Virgin Islanders to spend five times more money on electricity. To try and resolve this, in 2010, Former Governor DeJongh implemented a plan using renewable energy that would hopefully decrease petroleum use by 60% by 2025. Some forms of renewable energy that were planned for implementation include solar, biomass, and wind energy. Our goal at CGTC was to find out whether the territory could operate and function properly using only solar energy and if not, how capable are we of getting close to 100% sustainability.

Solar energy on island can go towards two different routes, utility-scale and residential-scale solar energy production. Residential-scale solar energy powers the area where the power is produced, and utility-scale solar farms send out the power produced. Looking at solar radiation data for the territory through ArcGIS, the eastern part of St. Thomas, the western part of St. John, and the south-southeastern part of St. Croix seems to be the best locations for any solar farm building; in these regions, there are actually two solar farms (one in Donoe on St. Thomas, and one in Spanish Town on St. Croix). We are currently working on a code that would allow us to combine the data into bigger sets of data (weekly, monthly, etc.) so that we could find when energy production would be most. Once we figure out how to fully approach this question, we plan on working with the different governmental agencies to see how this could affect electric transportation usage on island.

Acknowledgements:

NSF Grant

Requirement Traceability Matrix for UVI-GREAT

Kaheem Walters

Mentor(s): Dr. David Morris
University of the Virgin Islands

Session 6: Astrophysics & Technology (2:20-2:30 pm)

The topic of my project was to create a requirement traceability matrix for the University of the Virgin Islands' Gamma Ray Experiment for Astrophysical Transients (UVI-GREAT) mission. The UVI-GREAT mission will first be a gamma-ray detection instrument to monitor the gamma-ray sky for transient sources and will be launched into the upper atmosphere at 100,000 feet using the High Altitude Student Platform (HASP), a Louisiana State University high altitude balloon program that launches once per year carrying up to 12 student-designed and built experiments. With the success of this mission, the UVI-GREAT will later be constructed into a 3U Cube-Sat to complement BurstCube and Fermi Gamma-Ray Observatory, two NASA satellite missions designed to detect gamma-ray sources from low-Earth orbit, in the detection of gamma ray bursts (GRBs) enabling near complete sky coverage by providing 2 pi field of view. The requirements traceability matrix is a key engineering design document that demonstrates and organizes the relationships between high-level mission design objectives/goals and the more detailed systems-level and component-level requirements that will inform project management decisions regarding component purchases, assembly techniques, and testing and verification practices. The requirements in each subsystem are dependent on the primary science objective and the mission requirements and should be traceable back to a mission requirement, primary objective, or goal objective. These requirements must then be verified at a later date via inspection, modeling & simulation, analysis, and/or demonstration. The requirement traceability document is complete for the most part, with the chance of adding presently unknown requirements as the UVI team progresses through the mission and discover other necessities to accomplish the primary objective.

Acknowledgements:

NASA-EPSCoR program grant number VI-80NSSC19M0060

Relationship between Subjective Social Status, Perceived Discrimination, and Late-Life Depression on Executive Functioning in Older Afro-Caribbean Adults

Azriel A. Williams

Mentor(s): Aletha Baumann, Ph.D, Karin Schon, Ph.D, and Michael Rosario
University of the Virgin Islands

Session 3: Biomedicine & Community Health (2:40-2:50 pm)

When people get older, executive functioning declines, and that decline can be compounded by behavioral health and even a person's socioeconomic status. Executive functioning is the study's dependent variable. The first independent variable in the study is subjective social status (SSS). SSS is considered a part of an individual's socioeconomic status, and maybe an essential factor contributing to cognitive resilience in aging. Late-life depression is another independent variable, and it is a mood disorder and is associated with a lower level in the executive functioning of older adults. Higher perceived discrimination is the final independent variable and is associated with poorer cognition in older adults. According to the literature, we expect to see that SSS has a hand in moderating the relationship between perceived discrimination and late-life depression on executive functioning of older Afro-Caribbean adults. This study aims to investigate if SSS attenuates the relationship between perceived discrimination and late-life depression on executive functioning in older Afro-Caribbean adults. Participants will be 60 Afro-Caribbean men and women who have lived on St. Croix for at least 30 years. The instruments used for this study will be the MacArthur Subjective Social Status Ladder for SSS, Geriatric Depression Scale for late-life depression, Experiences of Discrimination for perceived discrimination, and Trail-Making Test B for executive functioning. Linear regression models will be performed to ascertain if SSS, late-life depression, and perceived discrimination predict executive functioning.

Acknowledgements:

Grant funded by the Alzheimer's Association and UVI MARC grant award
#5T34GM008422

Meta-analysis of Gene Expression Variability in Asthma

Ellaina A. Wyllis

Mentor(s): Lavidia R. K. Rogers, PhD
University of the Virgin Islands

Session 3: Biomedicine & Community Health (1:20-1:30 pm)

Asthma is a long-term inflammatory disease of the airway producing symptoms such as wheezing, coughing, chest tightness, and breathlessness. The Centers for Disease Control and Prevention (CDC) reported chronic lower respiratory diseases, such as asthma, as the 4th leading cause of death in the United States. The CDC also ranked asthma as one of the most common chronic diseases affecting children. The underlying cause of asthma is not yet fully understood. However, it is suspected that both genetic predisposition and environmental factors influence an individual's susceptibility to the disease. Our study aims to highlight differentially expressed genes in asthmatics compared to healthy cohorts. We conducted a meta-analysis of publicly available microarray data from asthmatic and healthy individuals. We curated datasets that used the Affymetrix microarray platform and those that reported the subject's sex and disease state (4 datasets, 807 samples). We pre-processed the raw microarray expression data in R and conducted an analysis of variance that incorporated sex and disease state as effects. We identified 1,641 differentially expressed genes for disease status ($p < 0.05$). However, we did not find any interactions between disease status and sex for these genes. Interesting Reactome pathways identified as enriched include neutrophil degranulation and mitochondrial calcium ion transport. We also identified gene ontology terms such as Hematopoietic cell lineage and prostate cancer. With our current findings and future analyses, we should be able to highlight potential gene and pathway associations that can hopefully be targeted to improve asthma diagnostics, treatment, and preventative care.

Acknowledgements:

Funding provided by UVI RISE grant #GM061325

Acknowledgements

Sponsors:

- ◇ National Institutes of Health (NIH) - Research Initiative for Scientific Enhancement (RISE) Program and Maximizing Access to Research Careers (MARC) Program



- ◇ National Science Foundation (NSF) - Historically Black Colleges and Universities Undergraduate Program (HBCU-UP)



- ◇ ECS Honors Fund (private donations)

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We thank the mentors for dedicating their time and energy to assist these student to prepare their presentations. You have made a huge contribution to their success and the symposia. Your dedication to the advancement of young Caribbean scientists in this community is greatly appreciated.

Thank you!



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