The University of the Virgin Islands VIII Undergraduate Fall Research Symposium

ABSTRACTS of Posters Presented

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St. Thomas, Virgin Islands

Sponsored by:

The Division of Science and Mathematics (UVI)

Emerging Caribbean Scientists Program (UVI)

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Mission Statement and Goals of the

Emerging Caribbean Scientist Programs

Mission Statement:

The mission of the Emerging Caribbean Scientist program is to increase research training and promote excellence for students at the University of the Virgin Islands.

Goals:

- Increase the number of students majoring in Science, Technology, Engineering and/or Mathematics (STEM) disciplines
- Better prepare students in STEM disciplines for medical school, post baccalaureate study, teaching and science and technology industry
- Support faculty research, which will in turn support undergraduate student research, through providing funding opportunities for research at UVI and off island
- Provide funding for undergraduate student research
- Provide for role models for UVI students through the visiting scientists program
- Provide for enhanced curriculum through development and adoption of innovative instruction

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Title: Synthesis and Characterization of a Kläui Complex Containing a Functionalized Cyclopentadienyl Group, Na[Cp'Co Co{PO(OC2H5)2}3]

Presented by Surria James and Michelle Malone

Faculty/Staff Mentors: Stanley L. Latesky, PhD, University of the Virgin Islands,

Gregg Lumetta, PhD, Pacific Northwest National Laboratories,

Timothy Hubler, PhD, Pacific Northwest National Laboratories

Abstract - The separation of actinide ions from complex chemical matrices is of importance in terms of radioanalytical chemistry and the management of radioactive waste materials. The work that was performed this summer is part of an ongoing study involving the synthesis and characterization of materials that can selectively extract and concentrate radioactive nuclides from complex mixtures. The Kläui salt, Na[Cp'Co{PO(OC2H5)2}3] (Cp'= C5H4C(O)OCH3), was synthesized. The route chosen to synthesize the ligand is similar to that used in the original reported synthesis. The functionalized NaCp' used in the synthesis was prepared by reacting NaC5H5 with dimethylcarbonate (CH3OC(O)OCH3). This product was then reacted in situ with anhydrous CoBr2, forming Cp'2Co. The Cp'2Co was then refluxed with excess diethylphosphite forming [Cp'Co{PO(OC2H5)2}3]2Co. Reaction of the latter compound with NaCN in air in methanol resulted in the formation of the sodium salt Na[Cp'Co{P(O)(OC2H5)2}3]. The new Kläui ligand and its precursors were characterized using IR spectroscopy and mass spectrometry. Attempts were made to grow crystals of all of the products and to characterize them using single crystal x-ray diffraction. The crystal structure of [(Cp')Co{PO(OC2H5)2}3]2Co indicates that the ester functional group was reduced by excess diethylphosphite to a methyl group. Further studies will investigate oxidation of the cyclopentadienyl methyl groups to a carboxylic acid functionality, with the ultimate goal to covalently attach the functionalized Kläui ligand to a polymer support and to evaluate its potential to selectively bind actinide ions. The ability of these Kläui ligands to selectively bind actinide metal ions has been previously reported for both liquid-liquid and solid-liquid extractions. In those studies the ligand was weakly adsorbed onto the surface of an Amberlite XAD-7 extraction resin. With the functionalized ligand prepared in the course of this study it is hoped that we can covalently attach the ligand to a functionalized polystyrene support, resulting in a more robust material.

Partially supported by UVI NSF HBCU-UP Award No. 0506096.

University of the Virgin Islands, Division of Science and Mathematics
VIII Fall Research Symposium, September 24, 2006

Imaging of Mechanically Induced Calcium Mobilization in Fibroblast Cells

Presented by Nailah Brandy

Co-Authors and Mentors: Warren C. Ruder,[b] Philip LeDuc,[b] Robert Murphy,[b]

Center for Bioimage Informatics, Carnegie Mellon University

Abstract - Calcium performs a distinctive role in cell function. It is responsible for the cell's processes such as gene transcription, cell death (apoptosis), cell growth (proliferation) and metabolism. The purpose of this project was to measure the relative amount of calcium in cells subsequent to chemical and mechanical stimulations. The addition of these stimuli caused calcium to be released into the cell's cytosol. Following release, cells returned to their basal calcium level. For the purpose of detecting calcium in NIH 3T3 cells, conventional epi-*fluorescent microscopy was introduced. The fibroblast cells were loaded for 15 minutes with 2μM fluorescent calcium dye, Fluo 4-AM. The dye entered the cell freely due to the lipophilic AM group and was trapped intracellularly when endogenous esterases cleaved the group from the dye molecule. Live cell images were taken every 5 seconds to detect any response to stimuli. As a chemical agonist, 100 μM ATP, which stimulates the cell's purinergic receptors, was added to the cell's environment. Many cells responded to this chemical stimulation; this response was visualized as a brighter glow in cell images and in analytical data, a spike. Although there was possible interference from sources such as noise and photobleaching, robust calcium responses were observed. For the mechanical stimulation, elementary magnetic tweezers were constructed consisting of a magnetized needle and ferromagnetic particles coated in fibronectin and bonded to the cell's integrin receptors.The cells responded to this mechanical stimulation with an increase in dye brightness, although the purpose of gently tugging on the cells to detect a calcium response was defeated. Future work for this project will include the perfection of the mechanical force; the introduction of gadolinium, a stretch-activated calcium channel inhibitor; and application of ionomycin which chaperons calcium outside the cell into the cell.*

This research was funded by NSF Grant at Carnegie Mellon University and by NSF- HBCU-UP program from the University of the Virgin Islands Award No. 0506096. Ms. Bandy is currently supported by the NIH MARC Program.

Identification of Metabolic Markers for Bleaching in the Coral Porites Astreoides

Presented by: Semoya Phillips

Faculty Mentor: Tyler Smith PhD, University of the Virgin Islands

Abstract - Coral reefs are an important marine habitat. Bleaching is one of the largest threats to coral reefs worldwide and is often thermally induced. It occurs when ocean water temperatures exceed a specific threshold temperature. Coral bleaching is the loss of the photosynthetic symbiotic zooxanthellae from a coral polyp. Bleached corals may survive by consuming plankton; however they are often weaker and more susceptible to disease. This study is attempting to identify metabolic markers for bleaching in the coral Porites astreoides *(mustard hill coral) by comparing healthy versus thermally stressed samples maintained in aquaria. Initially each of twenty colonies was placed in aquaria each with their own water flow. An ambient water treatment of 29.5 C and a heated water treatment of 30.9 C. Ten samples were taken at the beginning of the one week treatment period for exudate and whole tissue sampling. The remaining ten samples were placed under their respective treatments and they were also used for exudate and whole tissue sampling. Visual comparisons after the initiation of stress validated that the corals in the heated treatment were thermally stressed. Though one week was too short of a time period for bleaching to occur, the coral in the heated treatment formed mucus build ups or completely cocooned them with mucus. Using liquid chromatography mass spectrometry, small molecules collected from the surrounding environment and whole tissues are being compared from the different treatments. While some samples are continuing to be analyzed, to date five markers have been detected. These markers still need to be identified.*
Future work for this project includes testing the markers for time relevance, i.e. do these markers correspond to five days before bleaching occurs?

The student completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096.

No Differences in DNA Sequences from Two Color Morphs of the

Mustard Hill Coral Porites Astreoides, Presented by Tryphena Cuffy

Faculty Mentor: Sandra L. Romano sromano@uvi.edu, University of the Virgin Islands

Evolutionary biology is based on the process of speciation and the characterization of a species. This process helps with the clarifying species boundaries to aid in the development and understanding of our surroundings. Systematics of scleractinian reef corals (defined by morphological differences) have proven to be controversial. The genus Porites *is found abundantly in the Caribbean and many Pacific islands. The genus is speciose, but for many of these species there is doubt as to whether they are in fact separate species. This is problematic due to inter- and intraspecific variation within the genus* Porites*. Much research has been done, but it has been difficult to establish a basis of distinction of species among the genus.* Porites astreoides*, a massive coral, is found as two morphs in the Caribbean – green and brown. The genetic similarity between the two morphs has proven to be elusive to scientists because of morphological evidence that supports the hypothesis that they are genetically similar as well as evidence that opposes it. By comparing DNA sequences, I determined the genetic similarity of the two* P. astreoides *morphs to test the hypothesis that the two morphs are a variation of one species and the alternative hypothesis that the two morphs are genetically different from each other. Samples were collected from colonies in St. Thomas, United States Virgin Islands. Genomic DNA, including nuclear and mitochondrial DNA, was extracted from samples of both green and brown morphs of* P. astreoides *for polymerase chain reaction (PCR) amplification of two mitochondrial gene regions. PCR products were cycle sequenced and electrophoresed on an automatic sequencer. Sequences were analyzed, aligned and edited using Sequencher®. There were no differences in nucleotide sequences between any of the samples. These results thus far do not support the hypothesis that the two different morphs are genetically distinct from each other. Continuing work on this project includes more samples of* P. astreoides *and analyses of nuclear DNA sequences to more comprehensively test the hypotheses that the two morphs of* Porites astreoides *are genetically distinct and that the species* Porites branneri *(distinct in morphology and bluish in color) is synonymous to* Porites astreoides*.*

The student completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096. S.L. Romano is supported by University of Puerto Rico Sea Grant Program as well as by VI-EPSCoR under National Science Foundation Grant #0346483.

Preparation and Fractionation of Cytotoxic Natural Products

Extracts for High-Throughput Screening Application

Presented by Digna Washington

Faculty Mentors and affiliations: Kirk Gustafson and James McMahon, Molecular Targeting Development Program, Center for Cancer Research, National Cancer Institute

Authors: Digna Washington,[1] Ben Winer,[2] Charles Zhu,[3] Kirk Gustafson[3] and James McMahon[3] Digna Washington,[1] Ben Winer,[2] Charles Zhu,[3] Kirk Gustafson[3] and James McMahon[3,] [1]University of the Virgin Islands, [2]College of William and Mary, [3]Molecular Targeting Development Program, Center for Cancer Research, National Cancer Institute

Abstract - In the quest for new anticancer therapeutics, natural products represent a rich source of bioactive metabolites. A significant number of the new anticancer drugs in clinical trial were either derived from or natural product inspired compounds. The NCI screens extracts collected from a diverse range of organisms (eg. plants, fungi and marine organisms) for anticancer activity. Crude extracts were initially screened via a 60-cell line assay, which assessed the extracts ability to inhibit the growth of cancer cells. High-Throughput screens were used to guide the fractionation of the identified active extract, which will eventually result in the isolation of a pure anticancer active metabolite. Additionally, this process is used to eliminate promiscuous cytotoxins.

Database Support for Retinal Ontologies

Presented by: Verleen K. McSween

Authors: Verleen K. McSween[1], Jiyun Byun[2], Kristian G. Kvilekval, Ph. D.[2], David Hollingsworth[3]. [1]University of the Virgin Islands, [2]University of California - Santa Barbara, [3]California State University San Bernadino

Abstract - The researcher's ability to introduce, share, compare, and query information has led to critical issues in various fields of science. Often times, biologists will employ their own set of terms to describe their conceptualizations or ideas. This leads to a higher degree of difficulty, confusion, and misinterpretation when attempting to determine similarities in results from various labs. Our semantic library attempts to bridge that gap. With researchers generating large amounts of homogenous results that are semantically unique, tools must be designed to consolidate all the information into a useful resource. Our use case for this application is the retinal research conducted at UC Santa Barbara. We attempt to generate and employ tools that maintain the semantic structures contained within ontologies. keep order, and in turn establish new relationships. Here we use a Direct Acyclic Graph (DAG) to represent the information contained in our retinal ontology. An effective management system for an ontology allows a user to create, read, update, and possibly deprecate or destroy concepts. As terms, metadata, or relationships are modified, versions are associated with each action. Definitions are also scored (prioritized) and dated. The database's user management system assigns a different role class to each user, either an administrator, editor, or viewer. A multiple user environment is key for the management of the records in the database. Semantic differences that are discovered are flattened into relations between similar concepts, thus yielding better results. Moving the ontology to a database increases the efficiency of the ontology maintenance and information extraction. With this tool, research efforts and results will become more streamlined as its usage expands.

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Red Form of Echinometra Lucunter Shelter from Sunlight More Than Other Color Forms

Presented by Fitzherbert Harry

Faculty Mentor: Dr. Stephen Ratchford, University of the Virgin Islands

Abastract - Ultraviolet light is a growing concern in the world today due to the depletion of the ozone layer. Little research has been conducted on the effects of ultraviolet light on marine life. Echinometra lucunter (the rock-boring urchin) are found in the shallows, where they are exposed to sunlight. They come in three color forms: black, red and a mixed red/black form. We asked "Is there a difference in the sensitivity to uv light among the three color forms?" We conducted 50 m2 transects and 30-min timed swims at several sites around St. Thomas during which we counted urchins of the 3 color forms exposed to sunlight versus the ones found under rocks. A greater percentage of the red urchins than black or mixed were found under rocks. Is this distribution caused by red urchins using rocks to shade them from the sun more than the black urchins do? We constructed four shallow wet-tables with flowing water and small shelters – two tables in sunlight and two in a shaded lab. We placed ten urchins haphazardly in each of four tables. One table in the sun and one in the shade got red urchins; the other two got black urchins. After three days, we recorded the number of urchins found under shelters. Both color forms were more likely to use the shelters in direct sun than in the shaded treatments. Although we have seen no difference between red and black urchins seeking shelter in the sunlight treatment to date, in the shaded treatment red urchins were more likely to be found under shelters than black urchins. The black pigment may provide more protection from damaging UV rays than the red pigment.

The student completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096.

How Gradient of Human Impacted Watersheds Affects Coral Reef Algal Population and Dynamics

Presented by: Gaetan Gentius

Faculty Mentor: Tyler B. Smith PhD, University of the Virgin Islands

Abstract - Near-shore coral reefs are in decline and field studies note a general correspondence between amount of decline and the degree of human development in linked watersheds. Direct impacts from sedimentation, harvesting of resources and eutrophication are known, and include mortality by smothering and increases in macroalgae that compete directly with adult and juvenile corals for space. Other effects may include the stimulation of bacterial growth and the triggering of disease states either through direct inputs of materials, such as dissolved organic carbons (DOCs), or stimulation of macroalgal abundance and growth, that leads to increases in DOCs from leaky algal thalli. The potential for algae to impact reefs through the mechanisms listed above depends on their actual abundance, species composition and production. We will study Macroalgae in three catchments linked to watersheds of varying degrees of human impact; Namely, Lameshur Bay, Brewer's Bay, and Magen's Bay. The periodic surveys that will be done will make the use of techniques to determine biomass composition of algae such as, video transect, drying, and weighing. The palatable, fast growing and abundant macroalga Acanthophora spicifera will be used in assays for the growth potential in different watersheds. Bunches will be deployed in each of the watersheds within small, galvanized wire cages. Three coral reefs in each of the watersheds will be selected and cages will be randomly deployed along the same depths. Deployments will last 3-6 days, depending on algal growth rates. Relative herbivory rates will be assessed as in the algal growth potential experiment, at the same time and in the same areas. Also, herbivore populations (abundance, size distribution, and biomass) will be assessed along belt transects. This proposal ultimately investigates whether macroalgal populations and dynamics vary predictably across a gradient of watershed development and, if so, what watershed processes are most important in controlling these differences.

The student completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096.

Low Genetic Variability in Zanthoxylum Thomasianum

Presented by: Charnise Goodings

Faculty Mentors: Dr. Alice Stanford, University of the Virgin Islands

Zanthoxylum thomasianum "St. Thomas prickly-ash" is an endangered plant that is native to Puerto Rico, St. Thomas and St. John. It became endangered because of destruction of its natural habitat due to development. Knowing the genetic variability of this plant will aid in conservation management. I hypothesized there will be a low level of genetic diversity among Zanthoxylum thomasianum, and the larger populations will have more genetic variability. To be able to find out about the genetic variability of Zanthoxylum thomasianum many PCRs were performed. The products were ran through a gel electrophoresis which yielded band that were compared to each other. After research I found that genetic variability is low in Z. thomasianum. Populations GHPR and JBR have a higher level of diversity than other populations and should be given priority in conservation planning.

The student completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096.

Efficient Acquisition of Fluorescence Microscopy Images

Presented by Jennifa Mohammed

Faculty Mentors: Charles Jackson, Dr. Jelena Kovacevic, Dr. Robert Murphy,

Center for Bioimage Informatics, Carnegie Mellon University

Abstract - Sub cellular location patterns are revealed through the use of fluoresce microscopy. Fluorophores are added to a cell and this causes the fluorophores to bind to proteins. When an excitation light is shined on the cell, the fluorophores fluoresce and the sub cellular location pattern is revealed. However, often times, the excitation light damages the cell, which is known as phototoxicity and the fluorophores, which is referred to as photobleaching. We present three proposed algorithms for the efficient acquisition of fluorescence microscopy datasets. We evaluate these with a protein classification system based on subcellular location patterns. The goal of this project is to acquire the datasets more efficiently in terms of the speed at which we acquire images, as well as the amount of light that the specimen is exposed to, in order to speed up acquisition and reduce photobleaching. We compared downsampling, reduced resolution, and reduced exposure time. Our results found that downsampling is the most efficient of these methods, but that a combination of all three can yield even better results.

Partially supported by UVI NSF HBCU-UP Award No. 0506096.

Controlling a Virtual Environment During an Acrophobia Therapy

Presented by: Kailah Davis

Faculty Mentors: BORIS BRACIO, P.H.D., PAYAL JALAN ,University of Alaska Fairbanks

Abstract - There are millions of people who suffer greatly from phobias which include fear of flying, fear of heights and many more. The ultimate goal of our project is to create a virtual environment that can be used for virtual reality therapy, in our case acrophobia, better known as the fear of heights. Three sensors were incorporated during the therapy sessions. These sensors measured heart rate, skin temperature and blood pressure. With the use of sensor information that is sent to a computer workstation, we were able to create a formula based on the three sensors values to compute the patient's fear factor level. As the patient's sensor information increases the patient's fear factor increases, which results in a change in the virtual environment during a therapy session. Due to the fact that the virtual environment sceneries are contingent upon the patient's fear factor, as the patient's fear level intensifies, the virtual environment becomes more terrifying. The patient's therapy session will end when the patient's fear factor level reaches the maximum, which is one hundred. Computing a fear factor that controls the environment allows the virtual reality therapy to be more effective and successful. Two computer workstations were used to send sensor information in order for the fear factor to be computed. The sensor information was first sent to one workstation using Matlab, a high level computer language which is use for analysis and numerical computation. Once these information were stored in this workstation, the values were sent to another workstation. To effectively communicate between both computers, the computers were connected to each other through the parallel port. This allowed information to be sent from one workstation to another. Due to the fact that most computers have a female twenty-five pin D-SUB at the back of the computer, a male parallel port cable was used to connect both computers allowing the sensor information to be transferred from one computer to another. To send the sensor information to the parallel port a program in Matlab was created. Once this was done, the second computer would read the three values that were sent to the parallel port. To read these values on the second computer a program was created on a Linux machine using C++, a high level programming language. Successfully sending and receiving information through the parallel port allowed the sensor information to be transferred, allowing us to use the information to compute the patient's fear factor which was previously described. Currently, the prototype that has been designed is being improved upon and as a result little testing with actual patients has been done. The on going work deals with incorporating more sensors and creating different virtual environment sceneries that can treat different phobias.

This research was funded by the Arctic Region Super Computing Center at the University of Alaska Fairbanks and by NIH MARC program MARC 2 T34 GM008422 at the University of the Virgin Islands.

When does Sigma Preserve Addition?

Presented by Everard Bellot

Faculty Mentor Douglass Iannucci, PhD

Abstract - Sigma (which is represented by the Greek letterσ) is an arithmetic function which sums up the divisors of any natural number. Let m *and* n *be natural numbers for which* σ(m) *and* σ (n) *denote the sum of the positive divisors of the natural numbers* m *and* n *respectively. It is well known that* σ (mn) = σ (m) σ (n) *as long as* m *and* n *are relatively prime, i.e. that have no common divisor. In this project we will try to find properties which* m *and* n *must have for which* σ (m+n) = σ (m) + σ (n).

The student completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096.

Species Diversity of Fish and Shrimp in Gut Streams is Related to Land Development and Human Activities in St. Thomas, USVI

Presented by Rifca Mathurin and Duvané Hodge

Faculty Mentors: Donna Nemeth, PhD, University of the Virgin Islands and Renata Platenberg, Virgin Islands Division of Fish & Wildlife

Abstract - St. Thomas, Virgin Islands, is characterized by steeply-sloped hillsides that channel waterflow after heavy rains in defined watersheds or guts. This creates freshwater stream habitats that typically consist of a series of pools that are connected by flowing water. Rainfall, slope, and drainage of the soil affect whether the flow is continuous year-round. Encroaching human development, with its potential negative inputs of sewage, sedimentation, and chemicals could further limit the ability of this variable habitat to support aquatic life. To determine whether human activity has an impact on the ecological community of the guts, we selected 3 St. Thomas guts that varied in degree of development, collected water quality data, and identified the shrimp and fish species inhabiting them. Overall, 5 species of shrimp and 4 species of fish were identified in the freshwater guts of St. Thomas. The individual guts varied in terms of which species were present. The least developed gut, Neltjeberg, had the highest number of species present (4 shrimp and 2 fish), including one shrimp and one goby species found only in that location. Two of the fish identified in the three guts were introduced (non-native) species and were present only in the relatively more developed guts (Dorothea and Turpentine Run). To relate levels of development to water quality that could impact the habitability of the gut for different species, we measured temperature, pH, total dissolved solids, salinity and conductivity in several pools within each gut. The only water quality parameter that was distinctly different among the guts was the presence of coliform bacteria, which was found in the 2 more developed guts. E. coli *was confirmed to be present only in Turpentine Run. While human activity was associated with the presence of coliform bacteria, it is not certain that this would directly affect the survival of the aquatic species. The presence of unique species in the Neltjeberg gut could be related to the lack of introduced species, but may also be highly dependent on other physical characteristics of the stream such as flow, oxygen levels, and connectivity to the sea which is necessary for completion of their larval life stage. While human development has great potential to influence water chemistry and hydrology of these gut habitats, and impact communities through the introduction of exotic species, natural season variation in water flow is also likely to have a significant effect on the species assemblages present.*

The student started this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096.

Combining Wavelet Features with PCA for Classification of Protein Images

Presented by Alexia Mintos

Authors: Alexia Mintos, Gowri Srinivasa, Amina Chebira, & Jelena Kovačević

Department of Biomedical Engineering, Carnegie Mellon University[1] and

Department of Mathematics, University of the Virgin Islands[2]

Abstract - A study of protein localization lends insight to understanding the functioning of normal cells, aiding biologically relevant inferences. Classification of protein location patterns based on fluorescent microscopy images is a crucial step in this endeavor. Automating classification contributes to increasing the efficacy and consistency in dealing with the large amount of data now available. The Murphy Lab at the Carnegie Mellon University has done pioneering work in the field of automated classification for location proteomics. Their system of protein image acquisition, feature extraction and classification provided a foundation for our work. We augment their system by a full wavelet tree decomposition on the protein images and Principal Component Analysis (PCA) on the features computed on the subbands resulting from the decomposition. PCA reduced to a standard eigen analysis on the set of images was implemented using MATLAB functions. PCA enabled a visual observation of feature interaction in the subbands, across classes. Our experimental results, though preliminary, lend credence to the hypothesis that choosing subbands adaptively does help in classification. The classification accuracy can be improved with PCA, even with dimensionality reduction, thereby reducing the computational complexity without sacrificing accuracy.

Effects of Algae on Movement of the Long Spined Black Sea Urchin Diadema Antillarum,
Presented by: Eddie Parish

Faculty Mentors: Dr. Teresa Turner, University of the Virgin Islands and

Dr. Linda Walters, Biology Department, University of Central Florida

Abstract - Since the mass die-off of the herbivore Diadema antillarum, *the long spined sea black urchin, in the 1980's coral reefs in the Caribbean have undergone a major phase shift and in many cases reefs are now dominated by macroalgae. In recent years the sea urchins have grown largely in numbers and may be significant enough to lead another phase change on reefs back to which corals would again be dominant.* D. antillarum *are known herbivores but only recently has a preference in diet been examined. To test the role of algae on urchin movement, experiments are being conducted placing tagged urchins on palatable and unpalatable algae. Preliminary results suggest that urchin grazing patterns depend largely on the type of macroalgae present. In Brewer's Bay, U.S.V.I., urchins were collected and tagged using a small fish hook with a piece of numbered flagging tape used to identify each urchin. They were then separated into either the control or experimental group, with each of those groups containing a high density group (5 urchins per .25* m^2*) or a low density group (1 per 4* m^2*). The control group was then placed on a rocky substrate with little algae present, while the experimental group was placed on high densities of either the unpalatable brown algae* Dictyota spp*, the palatable green alga* Caulerpa sertularioides*, or the unpalatable green alga* Halimeda opuntia*. The movement of the urchins was monitored every two to three hours and the distance traveled was recorded. The urchins were monitored at night and during the day and moved more during the night, which corresponds to literature categorizing urchins as nocturnal.* D. antillarum *appear to move less on* Caulerpa sertularioides *than on the any other substrate. Preliminary results suggest that urchins travel greater distances when placed on* Dictyota *or* Halimeda opuntia *perhaps because it is not as palatable as other algae. Further replication of these experiments is on going. Determining grazing patterns of* Diadema *based on the presence of algae may allow for a better assessment for the ability and likelihood of coral reefs to regain dominance in the Caribbean.*

Funded by NSF - EPSCoR

Using ADCP Data to Determine Red Hind (Epinephelus guttatus) Fish Spawning at Hind Bank

Presented by Afiya Fredericks and Jodi Hodge

Authors: Afiya Fredericks, Jodi Hodge, and Marra Austrie, University of the Virgin Islands

Faculty Advisor: Nasseer Idrisi, Ph, D University of the Virgin Islands

Abstract - The purpose of this project is to determine if the spawning period of fish at Hind Bank is at neap or spring tide. We will test the hypothesis that around the full moon Red Hind (Epinephelus guttatus) Fish spawn when currents bring eggs northeast on Hind Bank, followed by westerly currents that spread the eggs/larvae onto the bank. The Acoustic Doppler Current Profiler (ADCP) was used to measure the currents speed, direction, backscatter data (signal strength) and temperature at varying depths at the bank. The retrieved data was taken near full moon from December 2005 – February 2006 and was preprocessed in Nortek Storm Software, reformatted, and interpreted in MATLAB.

The student started this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096.

Influence of Cassava Starch on Bacteria Growth

Presented by Victoria Henry

Faculty Mentor: Thomas W. Zimmerman, University of the Virgin Islands, Agricultural Experiment Station,

Abstract - Cassava is a native annual crop grown in many tropical and subtropical regions that forms starch storing tuberous roots. Cassava starch is used for both human food and industrial purposes including the starch found in paper. Cassava starch can also be used as a thickening agent. The purpose of this research was to evaluate the use of cassava starch as a thickening agent in supporting gelled bacteria media. Cassava starch was added at the levels of 0, 20, 40 g/L to Luria Bertani (LB) medium solidified with 4 g/L Gelrite. Both Escherichia coli *strain DH5 and* Agrobacterium tumefaciens *strain EHA 105 were the sources of bacteria streaked on the treatment media plates.* E. coli *produced large colonies within 48 hours while* A. tumefaciens *required 72 hrs to differentiate. Bacteria media containing cassava starch resulted in* E. coli *and* A. tumefaciens *growing as well as or better then LB medium with agar.*

The completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096 and NSF- SEAGEP.

University of the Virgin Islands, Division of Science and Mathematics
VIII Fall Research Symposium, September 24, 2006

Title: Slow Recovery of the Long-Spined Black Sea Urchin, Diadema Antillarum in St. Thomas, US Virgin Islands from the 1980's Die-Off.

Presented by Steve McCauley

Mentors: Dr. Teresa Turner, University of the Virgin Islands and
Dr. Linda Walters, University of Central Florida

Abstract - The long-spine black sea urchin, Diadema antillarum is an herbivore found throughout the world's oceans on shallow, rocky, reef areas and is thought to be a keystone grazer for new coral recruitment on reefs. Between 1983-84 a disease occurred in the Caribbean, killing approximately 99% of all Diadema. This study quantified recovery of these urchins in theCaribbean waters surrounding St. Thomas more than twenty years later. We set quadrats down on 30 m transects in order to quantify the Diadema densities, measuring the 1 m quadrats with a chain link to assess surface variability. Field sites varied in densities, ranging from 0-3.1/m², at an average of ~1.3/m². We have thus concluded that average densities in the waters surrounding St. Thomas are not as high as the densities preceding the 1983 die-off (which were ~10/m2), but these urchins have recovered more than other places in the Caribbean. Our data somewhat support our hypothesis that more surface complexity (e.g., crevices) correlates with an increase in urchin numbers (the relationship is barely positive). This increase in Diadema numbers is hopeful, as recovery will benefit coral recruitment on reefs in the Caribbean.

The student started this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096.

Identification of Neurons in a Small Neural Circuit

Presented by: Matthew Cring

Faculty Mentor: Richard Hall, PhD, University of the Virgin Islands

The stomatogastric nervous system of the Caribbean Spiny Lobster, Panulirus argus is comprised of hundreds of neurons distributed between four interconnected ganglia. The stomatogastric ganglia, STG, contains cells for two small neural circuits, including the pyloric central pattern generator, pyloric CPG. In this report we describe a technique for identifying individual cells in the pyloric CPG amongst the 32 neurons found in the STG.

This research is supported by MBRS SCORE award number GM 069923-21

Identification of Weather Patterns and their Potential Impacts for U.S. Virgin Islands Communities, Presented by: Javier Navarro

Faculty Mentor: Marc Boumedine, PhD., University of the Virgin Islands

Abstract - The main research objective is to identify weather patterns on St. Thomas, U.S. Virgin Islands that could impact Virgin Islands Communities through applications such as weather prediction, relationships between atmospheric and oceanographic conditions, or solar radiation prediction. The first step of this research is to analyze data sets collected by the Water Resources Research Institute Weather Center (WRRI) during the last three years such as average temperature, relative humidity, average solar radiation, barometric pressure, or average wind speed. At this early stage of the project (1 month) data sets have being visualized using statistical and data mining tools, and relationships between variables have been derived. Initial findings have shown that a high correlation has been observed between average solar radiation and average temperature (.8504), and the second highest correlation is between average solar radiation and average wind speed (.4327). The next step is to derive models in order to predict daily solar radiation from air temperature and how this prediction may help to inform or warn our community of potential risks.

Title: Reconstruction of Positron Emission Tomography Images

Presented by Shanda Chalwell, Jodi Hodge and Keridon Williams

Faculty Mentor: Bernard Mair, PhD., University of Florida

ABSTRACT - The clarity of Positron Emission Tomography (PET) images is important in obtaining information from the PET image. In this research we explore an algorithm that can serve to enhance PET images. A Butterworth filter is used in combination with the Expectation Maximization Maximum Likelihood (EMML) Algorithm to improve the reconstruction of Positron Emission Tomography (PET) images from low count data. We reconstructed our image by inserting a smoothing step after each EMML iterate. During this process we attempted to attain the optimal order and cut off frequency for our filter, and then tested our hypothesis with the signal to noise (SNR) ratio. We found that our image did improve with the use of the Butterworth filter and although the SNR was not consistent with the results obtained, the variation was in the ten thousandths of a point.

The completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096 and NSF- SEAGEP.

Imaging Compression with Singular Value Decomposition and the Huffman Code

Presented by Marra R. Austrie, Clarissa J. Chapman, Afiya C. Fredericks

Faculty Mentor: Bernard Mair, PhD., University of Florida

Abstract— *The primary goal of this project was to reduce the address space of two dimensional grayscale images using the concepts of singular value decomposition (SVD) and Huffman coding. The SVD was first used to determine an approximation and the residual image was then encoded by the Huffman method. The compressed images were lossless with small compression ratios and relative errors. Thus, the compressed images maintained the quality of the original image while utilizing much less storage space.*

The completed this work in the UVI Summer Undergraduate Research Experience (UVI-SURE) supported by UVI NSF HBCU-UP Award No. 0506096 and NSF- SEAGEP.

Summer Science Enrichment Academy Projects

Canine and Cancer
Students: Taliah Bryan, Cherise Burton, Shellese Cannonier, Sigorney Creighton, Shatelle George, Javon Knighton and Amor Royer
Mentor: Linda Wymer

The Importance of Bird Diversity in Relation to Human Health
Students: Robert Bailey Jr., Mark Bernier, Lindeon Davis, Tinisha Frazier, Lennox Mark, Mario Stout
Mentor: Jim Corven, PhD

Metals in Freshwater Stream of St. Thomas
Students: Jamilya Christopher, Nneka Byron, Shamar Greaves, JaNee Rohlsen, Chantel Christopher, Dale Carty,
Mentor: C. William Anderson, PhD

Modeling the Spread of a Sexually Transmitted Disease
Students: Dean Chinnery Jr, Karimah Elliott, Julia Julien, Sara Molyneaux, Arshala Laurent, Shamelle Farrington
Mentor: Clive Wyatt

The completed this work in the UVI Summer Science Enrichment Academy UVI- SSEA supported by UVI HCOP Award Number D18HP02946