The Division of Science and Mathematics
Emerging Caribbean Scientists Program

4th Annual
Fall Research
Symposium
September 25th, 2004

Book of Abstracts

Listing of Presenters

Augustin, Satesha	MEC1
Augustin, Shana	MAS1
Austrie, Marra	MEC2
Baig, Zeeshan	BCS1
Brandy, Yakini	BCS1
Brathwaite, Latoya	BCS2, PSY1
Broderick, Emily	MAS2
Browne, Idesha	BCS3
Chapman, Julene	PSY2
David, Alexander	MEC3
Eddy, Kersha	BCS4
Francis, Andre	MEC4
Francis, Deia	BCS4
Gentius, Gaetan	MAS3
Greaux, Jennifer	BCS1
Hazelwood, Ralph	BCS 5, BCS11
Henry, Thora	BCS6
Isles, Okesiha	BCS7
Izaak, Danielle	MEC5
Jacobs-El, Hannah	MEC6
Joshua, Diana	BCS8
Lasley, Rachel	MAS4
Marshall, Brittany	MAS5
Martyr, Cuthbert	BCS1
McSween, Verleen	MAS6
Ogno, Ursula	BCS9
Ortiz, Lia	MAS7
Purcell, Jeffrey	BCS9
Richards, Kia	BCS1
Smith, Kareema	BCS10, BCS11
Smith, Thalia	BCS11
Thomas, Chrisna	BCS12
Webster-Lake, Carissa	BCS2
Williams, Akima	MEC7
Wiltshire, Jay	MAS8

A Special Thank You to our UVI Faculty Mentors

Dr. Sandra Romano   Dr. Richard Hall   Dr. James Rackocy   Dr. Thomas Zimmerman   Dr. Jennifer Carrol

University of the Virgin Islands 4th Annual Fall Research Symposium

Dr. Stuart Ketcham   Dr. Stanley Lorbach   Dr. Robert Godfrey

Dr. Stanley Latesky   Dr. Alice Stanford

Very special thanks to Ms. Judy Roland and Ms. Vivian Nedd

Titles of Posters and Presenters

Biological and Chemical Science (BCS)

BCS1: Synthesis, spectroscopic characterization and binding studies of lanthanide and actinide complexes containing anionic tripodal Kläui-Type ligands
Yakini Brandy, Jennifer Greaux, Cuthbert Martyr, Kia Richards, Zeeshan Baig

BCS2: Developing a PCR Protocol for the rare plant *Erythrina eggersii*
Carissa Webster-Lake and Latoya Brathwaite

BCS3: DNA fingerprinting of the endangered plant species, *Zanthoxylum thomasianum*
Idesha S. Browne

BCS4: The effect of temperature on phasing of pyloric cell bursting in the stomatogastric ganglia of *Panulirus Argus* (Caribbean Spiny Lobster)
Deia Francis and Kersha Eddy

BCS5: Genetic diversity of *Solanum conocarpum*
Ralph Hazelwood

BCS6: *Salmonella enterica* mediated inhibition of degranulation in mast cells
Thora Henry

BCS7: Characterization of the microbiology of white pox and white band diseases of acroporid corals of the US Virgin Islands
Okesiha Isles

BCS8: A novel paradigm to investigate regulation of cocaine self-administration in humans using patient controlled analgesia techniques
Diana Joshua

BCS9: Cytotoxicity profiles of ten marine sponge species
Ursula Ogno and Jeffrey Purcell

BCS10: Silencing of three members of the p450 cytochrome family of genes to uncover their role in iron regulation in *A. thaliana*
Kareema Smith

BCS11: DNA fingerprinting of *Solanum conocarpum* through the development of an effective PCR protocol for *Solanum conocarpum*
Thalia Smith, Kareema Smith, Ralph Hazelwood

BCS12: The effect of periodontal disease on insulin resistance in United States adults
Chrisna Thomas

Psychology (PSY)

PSY1: Faith-based support systems aid African American/Black women in facilitating weight loss
Latoya Brathwaite

PSY2: One for one: Evaluation of needle exchange programs
Julene Chapman

Marine Science and Agricultural Science (MAS)
MAS1:   Use of digital infrared thermal imaging to evaluate the effect of scrotal color on scrotal surface temperatures of hair sheep rams in the tropics
Shana Augustin
MAS2:   Measuring productivity in the seagrass *Thalassia testudinum* for ecologically based marine management
Emily Broderick
MAS3:   Determining the effects of mineralized aquaponic effluent on plant growth and productivity
Gaetan Gentius
MAS4:   Chemical trail preference in the mating behavior of calanoid copepod, *Temora longicornis*
Rachel Lasley
MAS5:   Molecules and morphology may support different hypotheses about the evolutionary history of species of the common reef-building coral, *Acropora*
Brittany Marshall
MAS6:   Evaluating the relationship between temperament and production traits of hair sheep
Verleen McSween
MAS7:   Genetic differentiation observed among populations of the sea urchin *Diadema antillarum* in marine habitats surrounding St. Croix, US Virgin Islands
Lia Ortiz
MAS8:   Influence of carbohydrate concentration on cassava, *Manihot esculenta,* growth and rooting in vitro
Jay Wiltshire

Mathematics, Engineering and Computational Sciences (MEC)
MEC1:   Optimal Pace in Aerobic Exercise
Satesha Augustin
MEC2:   Pulse Analysis and Measuring Techniques Using Electrozone Sensing, Laser Diffraction and Image Analysis of Gold Particles
Marra Austrie
MEC3:   Analyzing distance functions for clustering protein subcellular location patterns
Alexander David
MEC4:   A stationary photovoltaic system versus a mobile photovoltaic system
Andre Francis
MEC5:   Integrating the most effective algorithm in extracting protein and cell names from online journals
Danielle A. L. Izaak
MEC6:   The effect of surface rigidity on drug flux
Hannah Amina Jacobs-El
MEC7:   Effects of moisture on the cohesive *nature* of hydrophobic materials
Akima Williams

Biological
and
Chemical Sciences

BCS1

Synthesis, Spectroscopic Characterization, and Binding Studies of Lanthanide and Actinide Complexes Containing Anionic Tripodal Kläui-Type Ligands.

Stanley Latesky (University of the Virgin Islands, St. Thomas, VI 00802) Gregg Lumetta (Pacific Northwest National Laboratory, Richland WA, 99352) Timothy Hubler (Pacific Northwest National Laboratory, Richland WA, 99352) Heather Brown (Pacific Northwest National Laboratory, Richland WA, 99352) Sergei Sinkov (Pacific Northwest National Laboratory, Richland WA, 99352) **Yakini Brandy** (University of the Virgin Islands, St. Thomas, VI 00802) **Jennifer Greaux** (University of the Virgin Islands, St. Thomas, VI 00802**) Cuthbert Martyr** (University of the Virgin Islands, St. Thomas, VI 00802) **Kia Richards** (University of the Virgin Islands, St. Thomas, VI 00802) (**Zeeshan Baig** (University of the Virgin Islands, St. Thomas, VI 00802)

Abstract

The use of anionic Kläui-type tripodal ligands in the selective binding and separation of lanthanides and actinides is an area of active research at the Pacific Northwest National Laboratory. In an attempt to better understand the structural and binding characteristics of these ligands, a series of lanthanide (M= La, Nd, Pr) and actinide (M = Th, U) complexes were prepared in 1:1 and 2:1 (L:M) stoichiometry by reacting MX_n (X = NO_3^- or Cl^-) with the required stoichiometric amount of $(C_5Me_5)Co(P(=O)(OR)_2)_3Na$ (R= Me or Et). The complexes were characterized by IR spectroscopy and NMR spectroscopy. Attempts were made to crystallize the materials and obtain crystals suitable for x-ray crystallographic studies. The neodymium and lanthanum chloride complexes were successfully crystallized. Binding studies, with Nd^{+3}, U^{+4}, Am^{+3}, and PuO_2^{+2} using the $(C_5Me_5)Co(P(=O)(OR)_2)_3Na$ (R= Me and R= Et) ligand were initiated. UV-Vis spectroscopy, liquid scintillation counting, and IR spectroscopy were the instrumental methods used for these measurements. The metal ions were chosen because they represent the wide range of oxidations states encountered for the actinide elements. Results will be presented showing the selective binding of these ligands to the lanthanide and actinide ions.

Developing a PCR Protocol for the rare plant *Erythrina eggersii*

Carissa Webster-Lake and Latoya Brathwaite

University of the Virgin Islands

Abstract:

Many rare plants are quickly becoming extinct before a potential use could ever be determined. According to local botanists, there are at least 5 rare plants in the United States Virgin Islands (USVI) that remain federally unlisted as threatened or endangered, and these plants may experience a similar fate. One such rare plant is *Erythrina eggersii* ("cockspur"), a member of the family Fabaceae, which also included Mimosas, beans and peas.

E. eggersii is endemic to the Virgin Islands and only exists in the wild in few numbers on St. John and Puerto Rico. It is currently threatened by an (apparently) exotic species of boring insect that has not yet been identified. Observations show that a PCR (polymerase chain reaction – used to amplify a region of DNA) protocol has yet to be developed for this plant. Without such a protocol the genomic DNA of the plant cannot be amplified. Thus, the long term goals of examining genetic diversity, delineating the population genetic structure and monitoring the species genetic diversity while trying to conserve the remainder of these plants are impossible to meet.

My task was to develop a PCR protocol for E. eggersii by making modifications to the protocol for *Solanum conocarpum*. I have found that the use of 4 of Operon Technology's BC line of primers (BC06, 08, 11 and 19) have successfully amplified the plants DNA in the presence of 1% BSA. Since the bands produced are not very defined, further research will be conducted with numerous other additives and techniques.

DNA Fingerprinting of the endangered plant species, *Zanthoxylum thomasianum*

Author: Idesha D. Browne
Mentor: Alice Stanford, PhD.

Abstract

DNA fingerprinting is used to identify genetic diversity within breeding populations. This procedure is very useful when dealing with plants about which very little information is known. *Zanthoxylum thomasianum* is an evergreen shrubby-tree that was placed on the endangered species list due to the location of its populations and its rareness. To fingerprint *Zanthoxylum thomasianum* RAPD-PCRs will be performed on its DNA. There is no developed RAPD-PCR protocol for the plant species. This research focused primarily on developing such protocol. A previously developed protocol for *Solanum conocarpum* proved ineffective for *Zanthoxylum thomasianum*. I tried several different additives, including TMAC (tetramethylammonium), DMSO (dimethyl sulfoxide), a 1% stock solution of BSA (bovine serum albumin) and TEAC tetraethyl ammonium) to enhance the PCR results. I also tried a variety of annealing temperatures and several different primers in the PCR mixtures. When 2 _l of TMAC was used in the PCR mix with a 35ºC annealing temperature, one bright band appeared on the agarose gel. Faint streaking occurred when 2 _l of DMSO was used at a 35ºC annealing temperature. These results however, have been irreproducible and inconsistent.

BCS4

The Effect of Temperature on Phasing of Pyloric Cell Bursting in the Stomatogastric Ganglia of *Panulirus Argus* (Caribbean Spiny Lobster)

Authors: <u>Deia Francis</u>[1], Dr. Richard Hall
and Kersha Eddy[2]

Panulirus argus, the Caribbean spiny lobster lives in waters ranging between 24-30°C, while most spiny lobster species are restricted to waters cooler than 15°C. As *P. argus* evolved from cold-water ancestors, they may have retained the ability to physiologically acclimate to colder temperatures. The aim of this study was to manipulate temperature and quantify the effects on the pyloric central pattern generator (CPG). The pyloric CPG is a component of the Stomatogastric Nervous System (STNS). It was hypothesized that *P. argus* animals accustomed to cold temperatures would exhibit different pyloric CPG bursting properties than *P. argus* animals accustomed to warm temperatures. To achieve this, animals were kept for a minimum period of three weeks in either cold water (16°-18°C) or warm water (27°-28°C). At the end of this period, the STNS was dissected out and extra-cellular recordings were obtained by placing pin electrodes against nerves conducting pyloric CPG activity. Temperature was then systematically changed so that recordings were made over a range of temperatures from 10°- 30°C. The pyloric CPG bursting properties (duty cycles, period, duration, frequency, and phasing) were quantified using CHART™ (AD Instruments) and custom written macro in IGOR PRO™ (Wavemetrics). The bursting properties of these cold and warm *P. argus* animals were then compared using nonparametric statistics and linear regression. Thermal acclimation influenced both the period and phasing of the pyloric CPG. The results from this research suggest that the pyloric CPG has an inherent plasticity that allows it to adapt to a range of environmental temperature.

Genetic Diversity of *Solanum conocarpum*
Ralph Hazlewood
Research Mentor: Dr. Alice M. Stanford Ph.D.

Very little is known about the ecology of the Virgin Islands' rare plant populations. Due to the deforestation of the Virgin Islands during colonization, the plant population suffered greatly. One rare plant *Solanum conocarpum*, a member of the shrub family, was once thought to be extinct. Only until recently, a few individuals have been found in the Virgin Islands National Park on St. John. Since then, more individuals have been found and have been cultivated in gardens across the Virgin Islands. The purpose of this research study is to test the genetic diversity of this rare plant using random amplified polymorphic DNA (RAPD) markers and running RAPD polymerase chain reactions (RAPD PCRs). Finding the heterozygosity, polymorphism level, and a genetic distance matrix allows for establishing the diversity of *S. conocarpum*. Preliminary data show that fragment size increases as distance (mm) increases. The low polymorphic level of 14.3% adds to these findings. Heterozygosity in the Nanny Point and Reef Bay populations was different than the rest of the samples. The Nanny Point and Reef Bay populations show significant difference from the rest of the samples, which suggest that these populations need to be conserved. The data analyzed here will aid in the conservation efforts of *S. conocarpum*.

BCS6

Salmonella enterica Mediated Inhibition of Degranulation in Mast Cells

Thora T. Henry[1], Rhea Brooking[2], Alejandro Aballay, Ph.D.[2], Soman N. Abraham, Ph.D.[2].
[1]University of the Virgin Islands, St. Thomas, United States Virgin Islands, [2]Duke University, Durham, NC, USA.

Mast cells are specialized secretory tissue cells which are located at mucosal surfaces in the body such as the skin, respiratory tract, and intestines. These cells contain granules which are storage areas for potent inflammatory mediators such as histamine, serotonin, and various cytokines. Upon activation by an external stimulus such as bacteria, mast cells play a key role in host defense by releasing their battery of inflammatory mediators from their granules. These mediators act as chemoattractants to recruit neutrophils from the blood to clear bacteria at sites of infection. Recent work from this laboratory has revealed that the highly virulent *Salmonella enterica* has the intrinsic capacity to avoid mast cell activation and as a consequence, limited neutrophil recruitment and bacterial clearance were observed at sites of *Salmonella* infection. We found that the inability of mast cells to release their mediators in response to *Salmonella* was associated with the heavy infestation of these cells by *Salmonella*. To further elucidate the mechanism by which *Salmonella* blocked the mast cell degranulation response, a transposon was used to generate a *Salmonella* mutant library in order to identify mutants that were incapable of blocking the mast cell degranulation response. The mutants were screened by using the ß-hexosaminidase assay to determine percent degranulation and the gentamicin invasion assay to determine the mutants' capacity to invade the mast cells. Six mutants were found to consistently evoke a significant mast cell degranulation response compared to the wild type *Salmonella*. Furthermore, three of these six mutants exhibited a lower capacity to invade mast cells than the wild type. These results suggest that *S. enterica* possesses one or more genes that are instrumental in the inactivation of mast cells and identifying these genes should help in elucidating the virulence attributes of these highly infectious bacteria.

BCS7

Characterization of the microbiology of white pox and white band diseases of acroporid corals of the US Virgin Islands

Okesiha Isles

Research Mentor: Dr. Stanley Lorbach, University of the Virgin Islands

Over the years the number of Acropora coral species has been in decline, especially in the late 1980's. The USVI experienced over ninety percent mortality of several key reef building corals. Two of the diseases that affect these coral exclusively are white pox and white band diseases. The causative agents of these diseases are unknown, however in the case of white pox disease it is thought to be caused by *Serratia marcescens*, a common fecal enterobacterium. Samples from healthy coral polyps and from marginal edges were collected at Hawksnest on St. John and inoculated into marine 2216 media. The presence or absence of *Serratia marcescens* from lesions of white pox in *A. palmata* and *Vibrio shiloi* from lesions of white band in *A. cervicornis* were assessed using gram staining techniques and a battery of fifteen different biochemical tests. We have confirmed the presence of a Gram negative bacillus in a sample of diseased *A. palmata* and *A. cervicornis* tissue.

A Novel Paradigm to Investigate Regulation of Cocaine Self-Administration in Humans using Patient Controlled Analgesia Techniques

Diana D. Joshua[1], Wendy J. Lynch, Ph.D.[2], Robert Malison, M.D.[2], Atapol Sughondhabirom, M.D.[2], Peter Morgan, M.D. , Ph.D.[2], Vladimir Coric M.D.[2] Peter Jatlow, M.D.[2]   University of the Virgin Islands, St. Thomas[1], Yale University School of Medicine, New Haven Ct[2]

This study examined the safety, feasibility and validity of human cocaine self-administration using patient controlled analgesia (PCA) techniques in order to enhance our ability to identify effective pharmacological treatments for cocaine addictions. Subjects were 14 non-treatment-seeking volunteers (10M, 4F) with current histories of cocaine abuse/dependence. Subjects participated in a randomized, double-blind, placebo-controlled study in which they had relatively unrestricted access to cocaine infusions (0, 8, 16, 32, and 16mg/70 kg retest) on five separate days. During each session, participants were allowed to self-administer intravenous cocaine using a PCA pump button in daily 2-hour sessions. Additionally, every five minutes, the heart rate, systolic and diastolic pressures were taken to ensure the safety of the participants. Overall, cocaine produced a dose-dependent relationship in the visual anolog scale ratings for "High" and "Paranoia". No significant differences in the cardiovascular measures were noted between active doses. These results indicate that patient controlled analgesia techniques provide a safe, feasible, and a valid technique for human cocaine self-administration research.

BCS9

Cytotoxicity Profiles of Ten Caribbean Marine Sponge Species

Ursula Ogno Jeffrey Purcell and Dr. Jennifer Carroll
University of the Virgin Islands, St. Thomas USVI

The majority of cancer chemotherapy leads are developed based upon compounds derived from natural sources. The marine environment is a largely untapped resource of bioactive compounds. The relatively recent advent of SCUBA technology has opened up opportunities for exploration and scientific inquiry. In fact, over 13,176 compounds have been derived from marine species. The objective of this work is to identify novel compounds from marine invertebrates, particularly marine sponges, which show high levels of cytotoxicity, and thus may lead toward a novel cancer therapeutic. Marine sponges are particularly valuable choices for this kind of study for a few reasons: 1) they are one of the more primitive types of marine species, 2) they are sessile, and 3) they possess unusually diverse chemistry. For this study, ten Caribbean marine sponge samples have been collected by SCUBA and returned to the UVI St. Thomas campus for extraction. The workup of samples included liquid-liquid extraction with solvents of differing polarity, followed by column chromatography. Throughout the purification process each extract was tested in a brine shrimp lethality test. Out of the ten extracts examined, four were deemed of highest priority for continuing separation. The LC_{50} values of the most active extracts (numbered 410, 412, 413 and 311) were 0.20 _g/mL, 0.205 _g/mL, 0.294 _g/mL and 0.21 _g/mL respectively. These four promising samples will be further purified in order to identify their active constituents.

BCS10

Silencing of three members of the p450 cytochrome family of genes to uncover their role in iron regulation in *A. thaliana*

Authors: Kareema B. Smith[1], Alberto Maurer[2], and Elizabeth E. Rogers[2]
[1]University of the Virgin Islands, St. Thomas, VI 00801
[2]Department of Nutritional Sciences and Genetics Area Program, University of Missouri- Columbia, Columbia, MO 65201

Iron absorption and distribution by an organism needs to be tightly regulated because iron is essential but in excess it can be dangerous and may even result in death. Through microarray analyses of iron-starved Arabidopsis plants (WT and a mutant) we discovered that three members of the p450 Cytochrome family of genes are up-regulated under iron deficiency. The genes are At4g31940, At4g31950 and At4g31970 and they are highly homologous to each other. Individual Arabidopsis knockouts do not show a phenotype suggesting that their function may be redundant. Since obtaining a triple mutant plant via crossings of individual KO lines is not achievable due to the three genes being tightly linked, we decided to employ a RNAi strategy to silence them. This approach will enable us to gain further insight into their role in iron homeostasis.

DNA Fingerprinting of *Solanum conocarpum* through the development of an effective PCR protocol for *Solanum conocarpum*

Authors: Thalia Smith*, Kareema Smith, Ralph Hazlewood and Alice Sanford (mentor)

Abstract

A standard PCR protocol can be developed for any species of plants. *Solanum conocarpum* is an evergreen shrub that was thought to be extinct prior to the discovery of two individuals on the island of St. John in the 1990s. Effective PCR protocols are needed to determine the genetic diversity among *Solanum conocarpum* individuals. A standard PCR protocol for *Solanum conocarpum* Dunal in Poir (Solanaceae) had been previously developed. After trying unsuccessfully to use this protocol on individuals of *S. conocarpum* found in four locations on the island of St. John, United States Virgin Islands, we determined that a new, more effective PCR protocol was needed. To develop the new protocol, we tried several different additives and variations on the existing PCR protocol for *S. conocarpum*. These modifications included testing several different primers, testing different annealing temperatures, increasing the amount of primer, MgCl2, and dNTP, and adding several different chemicals. The chemicals that we added included Triton X-100, TMAC (tetramethylammonium chloride), TEAC (tetraethylammonium chloride), DMSO (dimethyl sulfoxide), glycerol, BSA (bovine serum albium), and formamide. Of those variations and additives that we tried, we found that the addition of 1μl of 1% BSA (bovine serum albium) stock solution to each tube in the previous standard PCR recipe created an effective PCR protocol. Upon the development of an effective PCR protocol for *S. conocarpum*, DNA fingerprinting was now possible. This project is sponsored under the NSF Grant # HRD 9979896.

BCS12

The Effect of Periodontal Disease on Insulin Resistance in United States Adults

Chrisna Thomas [1] and George W. Taylor DMD, DrPH [2]

[1] Division of Science and Mathematics, University of the Virgin Islands, St. Thomas
[2] Dept. of Cariology, Restorative Sciences & ENDO University of Michigan School of
Dentistry University of Michigan, Ann Arbor

The aim of the study was to evaluate the relationship between periodontal disease
and insulin resistance in a probability-based sample of the United States adult population.
Subjects, ages 17 and older (n=14301) were derived from the National Health and
Nutrition Examination Study III (NHANES III). Subjects were classified based upon
their periodontal and glycemic status. Individuals included in this analysis were classified
as having pre-diabetes and diabetes but not taking oral hypoglycemic medications or
insulin. Additional variables evaluated in multivariable modeling included age, gender,
poverty-income ratio, race-ethnicity, education, blood pressure, cholesterol levels,
triglyceride levels, body mass index, smoking status were derived from the NHANES III
data set. Data were analyzed using weighted multivariable logistic regression. Insulin
resistance was calculated using the Homeostasis Model Assessment (HOMA) formula
(insulin resistance= (FI*FG/22.5)), where {FI} is Fasting insulin (uU/mL) and {FG} is
Fasting Glucose (mmol/l).

Individuals with established periodontal disease had a significantly higher prevalence
of IR (HOMA index above median) than those without periodontal disease (odds ratio
=1.48 95% CI: 1.17-1.86, $p<0.001$), after controlling for age, systolic blood pressure,
body mass index, smoking status, HDL-cholesterol, triglycerides, race-ethnicity, and C-
reactive protein. These results provide population-based evidence to support an
association between established adult periodontitis and insulin resistance.

Psychology

Faith-based Support Systems aid African American/ Black Women in facilitating Weight Loss
Latoya Brathwaite
Research Mentor: Judith Fifield RN, PhD

Within the African-American/Black population, 50% of females over 20 years of age are obese (BMI > $30kg/m^2$) vs. 30% of white women. Also, in a study by Rand and Kuldau, women of ages 18-96 and more than 20 pounds overweight (29% black women vs. 6% white) saw themselves as having no weight problem. This problem may become more detrimental in the African-American/Black population of women without proper intervention techniques like those being tested in the SisterTalk Hartford study. The aim of this summer study was to determine the association between spirituality and weight loss in overweight African-American/Black women.

Additionally, questionnaires were given to >318 participants. The questionnaires were designed to evaluate the significance that participants placed on the relationship between spirituality and weight loss. The responses were analyzed with qualitative textual coding methods and then analyzed quantitatively to produce tangible percent measures for each response. We hypothesized that this study would find an association between the spiritual lives of the participants and their perspectives on their obesity. The data suggested that the participants did not believe that their spirituality influenced their obesity. However, participants showed strong support for using faith to change their behavior, and the importance of group support in the church setting. This shows an indirect relationship between these women's spiritual lives and their beliefs about weight loss.

PSY2

One for One: Evaluation of Needle Exchange Programs

Julene S.T. Chapman, University of the Virgin Islands
Adeola Adeniyi, University of Illinois at Urbana-Champaign
Research Mentor: Dr. Lawrence Ouellet, University of Illinois at Chicago School of
Public Health

Injection drug users (IDUs) who exhibit high-risk behavior are more susceptible to blood-borne diseases. The needle exchange program (NEP) is a service that seeks to reduce and prevent drug injecting risk through needle sharing, with a focus on reducing risk of transmission of communicable diseases. This program allows injecting drug users (IDUs) to exchange their used syringes for new needles and at the same time provides access to counseling and referrals. It is essential that these programs are evaluated to determine their effectiveness and can therefore be utilized more efficiently in the future.
A literature review was conducted to determine the effectiveness of the needle exchange. Within the literature review several studies concerning NEPs were analyzed. Personal interviews were also conducted with clients that used the needle exchange at an NEP in Chicago. The primary goal of the needle exchange was to promote harm reduction by reducing the sharing of needles and other paraphernalia by making sterile needles available to IDUs. In analyzing studies regarding NEPs, it was established that there is a need for far more exchanges, more syringes, and better resourced services. Based on evaluation of the NEP in Chicago it was found that regular NEP users were less likely to share needles and other drug injection equipment, thereby decreasing the risk of HIV/AIDS and HCV. Studies have shown NEPs are effective in reducing the injection risk practices of IDUs.

Marine Science

And

Agricultural Science

Use of Digital Infrared Thermal Imaging to Evaluate the Effect of Scrotal Color on Scrotal Surface Temperatures of Hair Sheep Rams in the Tropics

Shana Augustin, Robert W. Godfrey, Raina E. Dodson and Adam J. Weis
Agricultural Experimental Station, University of the Virgin Islands, St. Croix, VI 00850

This study analyzed the thermal properties of hair sheep ram scrotums in the tropics using digital infrared thermal imaging (DITI), or thermography. Thermography is a technique used for detecting and measuring emitted heat and displaying it in an image format. The procedure has been used as a non-invasive method of assessing scrotal surface temperature (SST) in bulls and rams in temperate climates as a diagnostic tool to identify cases of abnormal testicular function related to poor fertility. This project was conducted using 38 sexually mature hair sheep rams (St. Croix White n = 17, Barbados Blackbelly n = 9, Dorper n = 2, St. Croix White X Dorper n = 10) having either a dark (n = 10) or light (n = 28) colored scrotum. Scrotal surface temperatures were measured using a Meditherm Vet 2000 Digital Infrared Thermal Imager connected to a laptop PC for image capture. The images were taken with the camera placed 0.76 m behind the ram standing in the chute. Thermal images were analyzed using WinTES software (v 1.05.1027). Within each image the scrotum was divided into three horizontal sections (top, middle and bottom) of equal height, but covering the width of the scrotum at each level. The WinTES software was used to calculate the average SST for each of the sections. The proximal to distal temperature gradient was as the difference in mean SST between the bottom section and the top section. Mean SST of each scrotum was calculated as the pooled average of the three horizontal sections. All data were analyzed using GLM procedures of SAS using scrotum color as the main effect. The temperature gradient from the proximal to the distal region of the scrotum was greater (P < 0.004) in light than in dark scrotums (2.26 ± 0.18 vs. 1.20 ± 0.29 ºC, respectively). Within the top, middle and bottom sections SST was higher (P < 0.02) for light colored scrotums than it was for the dark colored scrotums. Mean SST of dark scrotums was lower than that of the light scrotums (36.93 ± 0.87 vs. 39.71 ± 0.52 ºC, respectively). These results indicate that dark colored scrotums are cooler than light colored scrotums of hair sheep rams in the tropics and have less of a temperature gradient from the proximal to the distal region. The lower thermal gradient of the dark colored scrotums may make it more difficult to detect abnormalities that could be used to indicate potential fertility problems. This project was partially supported by grant MBRS-RISE 5R25GM061325-04.

Measuring Productivity in the Seagrass *Thalassia testudinum* for Ecologically Based Marine Management.

Emily Broderick

Seagrasses are primary producers and form the basis of highly productive marine habitats. Valued for several ecological functions seagrasses have many contributions including erosion control, increased water clarity, and providing food and refuge for animals such as waterfowl, polychetes (marine worms), crustaceans, fish, as well as endangered species of turtles and marine mammals. Therefore seagrasses are of great importance economically in that they sustain commercial fisheries and tourism. Seagrasses are aquatic angiosperms (flowering plants). Productivity measurement techniques and growth patterns of the seagrasses *Thalassia testudinum* (turtle grass) were evaluated to facilitate ecosystem comprehensions and management. The comparison of marking methods used to determine blade growth in *T. testudinum* provided support for a blade-clipping technique that seems to be an improvement on a hole-punching technique because it allows for the collection of more data per unit effort. However, further evaluation of the blade-clip method under different applications would be more conclusive. Nonetheless, assessments of *T. testudinum* productivity with in its structures below as well as above the substrate have proved to be useful in understanding the mechanisms that control and promote growth in the seagrass. Furthermore, productivity measurements of *T. testudinum* have been used successfully by the Virgin Islands National Park to mitigate seagrass destruction to sustain populations of endangered green turtles *Chelonia mydas* in the U.S. Virgin Islands. Optimistically information and assessments of productivity in *T. testudinum* can demonstrate the need for ecologically based marine management for seagrasses worldwide.

Determining the Effects of Mineralized Aquaponic Effluent on Plant Growth and Productivity

Author: Gaetan Gentius, James Rackocy Ph.d., Charlie Shultz, B.S., Eric Thoman, MA, Donald Bailey, MBA.
University of the Virgin Islands, St.Croix, United States Virgin Islands.

Hydroponic vegetable farmers commonly use inorganic nutrient solutions to grow and produce their crops. However, interest is growing in finding organic sources of nutrients for hydroponic production. One potential source of these nutrients is from aquaculture waste effluent. In previous and ongoing research at the University of the Virgin Islands (UVI), these sources have been shown to be acceptable alternatives for aquaponic vegetable production and for fertilization of field crops. An experiment was conducted at the UVI Agricultural Experiment Station (UVI/AES) in St. Croix, U.S.V.I., to determine the effects of mineralization of three different nutrient sources on plant growth and total production. The nutrient sources were greenwater aquaculture effluent (GAE), aquaponic aquaculture effluent (AAE), and a commercial inorganic hydroponic formula (CHF) with trace elements (N:P:K = 8-15-36; Hydro-gardens, Inc., CO, USA) which served as control. GAE and AAE were collected from active aquaculture systems and aerated for 14 days to facilitate mineralization and stabilize nutrient flux. Each of three treatments was arranged into three randomized tanks (n=3 tanks/treatment) measuring 1.49 m^2/tank and 15.2 cm deep. Three-week old Genovese Basil (*Ocimum basilicum*) plants were transplanted into the floating-raft hydroponic tanks (16 plants/m^2). Upon initiation of the experiment both effluent collection tanks were allowed to settle for two hours after which the supernatant was collected for inoculation of the hydroponic tanks. No replacement water or other nutrients were added during the 30-day growth trial.

Preliminary analyses showed that plants exposed to AAE resulted in significantly lower mean survival (18 %) compared to plants treated with GAE and CHF (54 and 88 %, respectively). Average plant height ranged from 11.3 cm to 40.6 cm for plants treated with AAE and CHF, respectively. Average total production demonstrated a similar trend with harvests yielding 23, 295, and 1911 g/m^2 for AAE, GAE, and CHF, respectively. Although plants treated with CHF resulted in superior growth, these results demonstrate the viability of GAE as a potential organic formula for hydroponic plant growth. Despite the poor performance of plants treated with AAE, it is believed that future research regarding the mineralization of aquaculture effluent and the reduction of solids will improve its efficacy for use in hydroponic plant production.

Chemical trail preference in the mating behavior of a calanoid copepod, *Temora longicornis*

Rachel Lasley, Jennifer Sehn, Dr. Jeannette Yen
Georgia Institute of Technology

Temora longicornis is a marine copepod that exhibits a unique trail-following behavior as a mate finding technique. When a male encounters the chemical trail of a female, he follows it until he catches her and begins copulation. There is little known about the specific nature of these trails or how much information is contained in them. In order to test the species-specific chemical nature of the trails, we subjected male *Temora* to the chemical trails produced by females of various species. Males followed conspecific chemical trails more often than all other choices. Further experiments should be conducted to test the level of this discrimination among various groups of males.

MAS5

**Molecules and morphology may support different hypotheses about the
evolutionary history of species of the common reef-building coral, *Acropora***

Brittany Marshall and Sandra Romano, PhD
University of the Virgin Islands, St. Thomas, Virgin Islands

Abstract:

Recent studies have shown that some morphological species of scleractinian corals are
not genetically distinct from each other. Coral species in the genus *Acropora* occur
sympatrically and display a great amount of morphological variability. I am examining
DNA sequences from the *Pax-C* nuclear intron to determine if morphologically defined
species of *Acropora* are supported by genetic data. DNA was extracted from sperm
collected from thirteen species of *Acropora* corals found in Guam. The *Pax-C* nuclear
intron was amplified from extracted DNA using PCR with published primers. PCR
products, ranging in length from 600 to 1000 base pairs, were isolated and purified using
Geneclean®, cycle sequenced, and then run on an ABI automatic sequencer. Sequences
were aligned to published sequences of 70 *Acropora* species from the Great Barrier Reef.
The aligned sequences were analyzed with Modeltest and PAUP*, using distance,
parsimony, and maximum likelihood criteria. Preliminary analyses suggest that some
morphological species are genetically distinct while species with morphotypes that grade
into each other are genetically similar. In addition, sequence alignments show that Guam
species are clearly related to other *Acropora* sequences from the Indo-Pacific. These
results are based on a relatively small number of samples. Continuing work will include
additional samples and analysis of mitochondrial markers to further elucidate the
relationship between morphology and molecules in these species.

Evaluating the Relationship between Temperament and Production Traits

of Hair Sheep

Verleen McSween and Robert W. Godfrey

In cattle it has been reported that temperament is a heritable trait that can affect the animal's response to handling. Poor temperament is related to lower growth rate and reduced meat quality in cattle. The objectives of this experiment were to analyze the relationship between temperament, chute exit velocity, and weight gain in young lambs and pregnancy in adult ewes. Temperament score was assigned as a numerical score based on response to restraint in the chute. The values ranged from 1 to 5 based on the following criteria: 1 - calm, stands still, no movement; 2 - slightly restless; 3 - restless, shaking the chute; 4 - vigorously shaking the chute, and 5 - a berserk frenzy. Exit velocity (m/sec) was measured using two sets of electric eyes 101.6 cm apart placed 45 cm past the exit door of the chute. Lambs of three breeds (St. Croix White, STX n = 20; Barbados Blackbelly, BB n = 35; Dorper X St. Croix White, DRPX n = 24) that were weaned at 63 days of age were evaluated 64.3 ± 0.6 days after weaning. Pregnant STX ewes (n = 25) were evaluated at 12.5 ± 1.2 days before and 13.5 ± 0.5 after lambing. Data were analyzed using GLM procedures of SAS. The STX lambs had a lower exit velocity ($P < 0.02$) than either BB or DRPX lambs (1.34 ± 0.21 vs. 1.99 ± 0.16 vs. $2.02 \pm .021$ m/sec, respectively). There was no difference ($P > 0.10$) in temperament score of lambs among breeds. Female lambs had higher ($P < 0.05$) exit velocities and temperament scores than male lambs. Lambs with a temperament score of 1 had a lower exit velocity ($P < 0.05$) than lambs with temperament scores of 2 or 3. Lambs with temperament scores of 1 or 2 had higher weaning weights ($P < 0.02$) than lambs with temperament scores of 3. Lambs with a temperament score of 1 had a higher average daily gain (ADG) through 30 days after weaning ($P < 0.04$) than lambs with temperament scores of 2 or 3 but there was no difference ($P > 0.10$) in ADG through 70 days after weaning. Temperament score of pregnant ewes was not different ($P > 0.10$) than that of non-pregnant ewes (1.16 ± 0.09 vs. 1.26 ± 0.09, respectively). Exit velocity of pregnant ewes was greater ($P < 0.002$) than that of non-pregnant ewes (2.96 ± 0.18 vs. 2.18 ± 0.17, respectively). There was no difference ($P > 0.10$) in exit velocity of pregnant or non-pregnant ewes based on temperament score. These results show that temperament scores of young lambs are related to ADG shortly after weaning but not at later times. There was a relationship between temperament score and exit velocity in the young lambs but not in adult sheep. This may be due to the number of times the adult sheep have gone through the chute during their life.

MAS7

Genetic Differentiation Observed Among Populations of the Sea Urchin *Diadema antillarum* in Marine Habitats Surrounding St.Croix, USVI

Lia Anaya Ortiz, Stuart R. Ketcham, & Ronald S. Burton
Summer Training Academy for Research in the Sciences Program,
University of California San Diego
University of the Virgin Islands
MBRS-RISE Program
Rise Program Director, Dr. Teresa Turner
tturner@uvi.edu
lia_anaya@hotmail.com
Stuart.Ketcham@uvi.edu
rburton@ucsd.edu

ABSTRACT:

Throughout the Caribbean, coral reefs serve as natural resources that contribute to the overall beauty and economy of the islands, and for this they are treasured. Coral reefs serve as a breeding area and habitat for many species of marine life. The United States Virgin Islands (USVI) recognizes how influential reefs are on their economy and in maintaining the beauty and exotic qualities of the islands. The USVI are in the process of developing strategies for maintaining their marine areas, which include the establishment of marine reserves and marine protected areas. One expected benefit of these established protected areas and reserves is that crucial species will likely disperse from these protected areas into adjacent areas, thus tending to support populations in the adjacent areas. The species of interest for this project is the long-spined, black sea urchin, *Diadema antillarum. D. antillarum* regulate algal overgrowth on the coral reefs through consumption, and are considered keystone species for the entire coral reef ecosystem.
 D. antillarum tissue samples were collected from three different beaches within miles of each other on St.Croix, USVI. These samples were brought to the Scripps Institution of Oceanography at the University of California, San Diego for PCR analysis using the random amplified polymorphic DNA (RAPDs) protocol to amplify arbitrary regions of the nuclear and/or mitochondrial genome. We separated the PCR products by agarose gel electrophoresis and scored the products from each individual urchin for the presence or absence of bands of four sizes. We assumed the presence of a band was a dominant trait and that absence of a band indicated the individual was homozygous recessive for that trait. For each of the four bands, we assumed the sampled population at each beach was in Hardy-Weinberg Equilibrium and calculated the distribution of genotypes among dominant homozygotes, heterozygotes and recessive homozygotes. We used a Chi-square analysis to test the null hypothesis that the distributions of genotypes from the three beaches were the same. Results of this genetic analysis indicated that there was significant differentiation among the *D. antillarum* populations. These observations suggest that the rate of migration of the larvae is low and that each population is supporting itself reproductively. Additional work is needed to obtain estimates of the rate of *Diadema antillarum* migration among geographic locales. The understanding of dispersal rates among populations of organisms will enhance the planning of marine reserves and protected areas in the USVI and all over the Caribbean.

Influence of Carbohydrate Concentration on Cassava (*Manihot esculenta*) Growth and Rooting in vitro

Jay Wiltshire

Mentor: Dr. Thomas W. Zimmerman

University of the Virgin Islands AES Biotechnology & Agroforestry Program,
RR2 Box 10,000, Kingshill, VI 00850 wiltshirejay@hotmail.com

Abstract

Cassava (*Manihot esculenta*) line TMS 60444 was used to study the affects of sucrose concentrations on micropropagation. Terminal and nodal explants of cassava were grown on Murashige and Skoog medium prepared with varying levels of sucrose. The cassava was grown for five weeks on 0%, 1%, 2%, 4%, 6%, or 8% sucrose followed by transfer to vermiculite. The higher concentration of sucrose in the media resulted in more leaf development and a longer root system than lower sucrose levels. Similar results followed through when the cassava shoots from the sucrose study were transferred and rooted in vermiculite in vitro. This study demonstrates that the carbohydrate concentration strongly influence cassava shoot growth and root development.

Mathematics,

Engineering

And

Computational

Science

Optimal Pace in Aerobic Exercise

Satesha Augustin   **University of the Virgin Islands**
Brian Pike   North Carolina State University

Research Mentor: Dr. Steve Blumsack (Florida State University)

Abstract

The problem is to find the distribution of exerted power, p, which minimizes the time to traverse a distance in a race. Energy is produced from glucose through two mechanisms: aerobic and anaerobic. Though the aerobic pathway is more efficient, it is a process limited by the respiratory system; the maximum such power is the aerobic limit. Beyond this threshold, energy must be produced anaerobically with the build-up of lactic acid, a by-product. Lactic acid reduces the efficiency of the use of energy. We assume that lactic aid is produced at a rate proportional to the difference between the power generated and the aerobic limit. Moreover, we assume that any lactic acid is gradually removed if the power demand is less than the aerobic limit. An obvious strategy is to perform at the aerobic limit. We investigated three scenarios in which exceeding the aerobic limit could be advantageous: a sprint to the finish near the end of a race, cooperative drafting in a bicycle race with the leader in an anaerobic phase and others partially recovering, and a performer going uphill in an anaerobic phase and partially recovering downhill.

MEC2

Pulse Analysis and
Measuring Techniques Using Electrozone Sensing, Laser Diffraction, and Image Analysis of Gold Particles

Marra Austrie

Research Mentors: Dr. Kevin Powers and Ryan Aycock

There are many ways for studying the size and shape of particles. Several forms of measurements should be conducted to attain accurate data. Seeing that disadvantages are found using various instrumentations, three measurement techniques were used in conducting this research: electrozone sensing, laser diffraction, and image analysis. The objective of this investigation is to study the pulses given by gold particles as a function of voltage versus time using electrozone sensing. The main focus of this study was to derive another process for analyzing high aspect ratios of gold particles. The expected results for specific pulse rates were to be established depending on the shape and size of the particles. For comparing size measurements of gold particles, the results where as follows: electrozone sensing - 4.256 microns (mm), laser diffraction - 119 mm, and image analysis 5.65 mm. However, developing another procedure (other than microscopy), to establish high aspect ratios on gold particles using electrozone sensing was not found.

Analyzing Distance functions for Clustering Protein Subcellular Location Patterns

Alexander David, University of the Virgin Islands
Mentors: Xiang Chen, Dr. Robert Murphy, Carnegie Mellon University

Proteomics is the term used to describe large scale documentation and characterization of all proteins expressed in a given cell type. Knowledge of protein subcellular location is critical to the understanding of its function. Previous research in the Murphy Lab at Carnegie Mellon University has shown that automated classifier and clustering methods could be trained to recognize and organize protein location patterns. The core of these approaches is the implementation and optimization of the Subcellular Location Features (SLF), which are numerical descriptors of subce
llular location patterns. The purpose of the current research is to compare different approaches to construct optimal cluster structures of a set of proteins based on their location patterns. One of the ways that this will be accomplished is by comparing different distance functions and the effect that they have on the structure of a cluster. For this research nine different distance functions were implemented and a ratio of the distances between clusters and within clusters was obtained using each distance function. The ones that yielded the highest ratio were implemented in a K-means/AIC algorithm to determine the number of clusters expected to be generated by using each function. Using a hierarchical clustering algorithm we then generated clusters and then compared them. Another goal of this research is to analyze the clusters that have been generated in an attempt to determine how well they fit the data set that was used to create them.

MEC4

A Stationary Photovoltaic System versus a Mobile Photovoltaic System

Student: Andre L. Francis, Mentors: Dr. Camille Mc Kayle and May Cornwall

University of the Virgin Islands –St. Thomas Campus, and the *Water and Power Authority, St. Thomas, United States Virgin Islands

PROJECT ABSTRACT

Rising energy costs in the Virgin Islands makes it imperative that alternate forms of energy be explored. St. Thomas, Virgin Islands is located at 18.20° N latitude and 64.58° W longitude. It is predominantly hot, and sunny most of the time. However, the terrain in St.Thomas is very hilly. Shading, and shadowing from trees is very common. The efficiency of any large-scale solar project applications in St.Thomas' residential regions has to take into account these features in the natural topography. Solar energy is an obvious alternative form of energy that can be harnessed to supplement, and replace the present energy source: that solely depends on the combustion of hydrocarbon-based fuels. The purpose of this project was to compare the efficiency of a stationary photovoltaic system to that of a mobile photovoltaic system for solar collection in the Virgin Islands. A mobile tracking photovoltaic system was compared to a stationary one under the natural topographic conditions in St. Thomas. The findings confirm that a mobile photovoltaic system produced higher peak voltages. However, a stationary photovoltaic system at an optimum angle is the most effective, and efficient method for solar collection on the hilly St. Thomas, United States Virgin Islands. The project was funded by the American Power Association, and the Water and Power Authority of the United States Virgin Islands.

MEC5

Integrating the Most Effective Algorithm in Extracting Protein and Cell Names from Online Journals

Danielle A. L. Izaak[1], Zhenzhen Kou[2], Robert Murphy[2]

University of the Virgin Islands[1] and Carnegie Melon University[2]

Data in the form of figures and accompanying captions in literature present special challenges for biological literature mining. Captions and figures are an important, but little studied part of scientific publications. The SLIF (Subcellular Location Image Finder), applies both image analysis and text interpretation to the figure and captions pairs produced from on-line journals. The information about the localization type comes from the image analysis, and the information about the protein name and cell type comes from caption interpretation. The purpose of creating such a system is to extract information about protein subcellular localization and generate assertions such as "Figure N depicts a localization of type L for protein P in cell type C." The present goal was to annotate at least 500 captions with protein names and cells names, compare the performance of several learning algorithms, come up with an effective algorithm and integrate it into SLIF so that it can be used to extract protein and cell names. Captions from online journals were extracted, labeled manually by hand in a Text labeler and tested for precision and recall of protein names with a Hidden Markov Model (HMM) with a dictionary. This HMM integrated with a dictionary was developed to do a 'soft' match between the names in the text with the items in the dictionary. This algorithm will be compared to other learning algorithms such as Maximum Entropy (MaxEnt) Model and Conditional Random Fields (CRFs). The algorithm with the best accuracy will be integrated into SLIF. The most effective algorithm so far is the CRF model. The on going work deals with combining other utilities with the model to enhance its performance in extracting assertions from captions and figures. This fully automated online information extractor will provide a truly useful tool for harnessing the vast amounts of information about protein subcellular locations available in online journal articles.

MEC6

The Effect of Surface Rigidity on Drug Flux
Ms. Hannah Amina Jacobs-El

ABSTRACT

It is important to understand how much rigidity at a surfactant-crowded interface or surface affects the rate and extent of drug transport. By giving us better knowledge of how to design an interface to vary flux across it, this research project provides information that will be applicable in the fabrication of optimal microemulsions for usage in detoxification of blood of an overdose victim. An 85:15 molar ratio of sodium dodecyl sulfate (SDS) was mixed with dodecyl alcohol ($C_{12}OH$), dodecyl pyridinium chloride ($C_{12}PC$), or dodecyl trimethylammonium bromide ($C_{12}TAB$) each at various total concentrations. The surface tension of theses solutions were measured and graphed using the Wilhemy plate device and Microsoft Excel and thus the critical micelle concentration (CMC) was determined. Amitriptyline Hydrochloride (AMT) was injected into the aforementioned solutions at their exact CMC values and the surface tension was monitored as a function of time to determine the extent and rate of drug penetration into the surfactant-crowded surface. It was hypothesized that drug penetration into the surface will be greatest for the least rigid system and the most rigid system will inhibit drug penetration. Evidence showed that at an 85:15 molar ratio, the surface appeared to be rigid enough to inhibit AMT penetration due to only slight changes in surface tension. This ratio is the optimal ratio for prevention of drug penetration. As a result, it is better to work with ratios that will allow *some* penetration to the surface so that the extent and rate can be explored more significantly.

Effects of Moisture on the Cohesive Nature of Hydrophobic Materials

Mentor: Dr. Mario Hubert
Advisor: Dr. Kerry Johanson
Presenter: Akima Williams

Abstract

Talc is a hydrophobic material that is presently being used in a treatment of a disease called Malignant Pleural Effusion. The talc acts like a cement to stick the pleural cavity to the membrane covering the lungs. In the past not many studies have been done for hydrophobic materials, therefore, not many assumptions can be made about the cohesive behavior of a hydrophobic material. The purpose of this experiment is to determine the relationship between the amounts of moisture added to the powder and its cohesive strength. A Schulz Shear Tester was used in determining the cohesive strength of the talc. Knowing the strength can enhance the understanding of the flowability of the powder. The strength can also aide in knowing the behavior of the hydrophobic material as more moisture is added to the material. The behavior of the cohesive strength of the talc was compared to the cohesive strength of another material known as Calcium Carbonate. One calcium carbonate was coated with a hydrophobic material and the other calcium carbonate was coated with a hydrophilic material. Both hydrophobic and hydrophilic calcium carbonate has the same particle size. The cohesive strength of the talc increases as more moisture is added. For a hydrophobic material after a maximum amount of moisture is added to the powder the strength will slowly decrease. The hydrophobic calcium carbonate also showed this same behavior. On the contrary the hydrophilic calcium carbonate strength decreases, increases, and decreases again. There was a greater increase between the dry talc and the 1% moisture strength than all the other strengths. It was concluded that the hydrophobic material plays a better role in a wetter environment therefore it is a better adhesive agent to use. The particle size was also used to aide in the understanding of the powder's behavior.

The Emerging Scientists Program of the University of the Virgin Islands thanks you for your support of the scholars