Book of Abstracts

The Emerging Scholars Research Program

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[photo of students]

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1. Curating DNA Methylation Signatures in Rheumatoid Arthritis
   Sajjad Abedian
   Prof. Evgenia Giannopoulou

   The aim of this project is to study the literature and extract the methylation gene signatures from two publications, compare the gene lists and finally summarize and present the results in a website. The two papers reviewed, "DNA Methylome Signature in Rheumatoid Arthritis" from Nakano K. et al., and An "Imprinted Rheumatoid Arthritis Methylome Signature Reflects Pathogenic Phenotype" from Whitaker JW et al.,. present DNA methylation signatures of patients with Rheumatoid Arthritis (RA) and Osteoarthritis (OA). The webpage collecting these signatures will be used for comparisons with gene sets from other labs also focusing their research in RA and OA. Future work, includes expanding the literature review and adding more functionality to the website (e.g., search function, Venn diagrams).

2. A Computer Keyboard with Finger Detection Sensors on Every Hey
   Joe Nathan Abellard
   Prof. Farrukh Zia

   There are numerous computer programs that aim to teach a user how to type using a standard computer keyboard. All these programs emphasize correct finger placement on the keyboard for accurate typing. The software works by placing strings of characters on a computer screen and expects the user to press corresponding keys on the keyboard. However, the software has no way of knowing whether or not a key is pressed using the right finger. Our goal is to build a keyboard with finger detection sensors on each key to solve this problem.

3. Using a Tensegrity Structure for External Actuated Shading Systems on Buildings
   Starky Acevedo
   Prof. Phillip Anzalone

   Energy consumption is a concern for every country in the world. In the United States 40% of the energy consumed comes in the form of buildings, with the majority of consumption from heating and cooling. This project focuses on improving the energy lost on existing as opposed to new buildings, as they make up the largest segment of the built environment. As solar radiation is a significant environmental load on buildings through irradiance through glazing, this project seeks to deflect incoming radiation before it reaches the interior of the building envelope through the retrofitting of a very flexible, lightweight and adaptive structure to the openings of these buildings.

4. Chronicling the Achievements and Activities of Honors Scholars at City Tech
   Evans Alexandre, Savannah Blodgett and Mariah Rajah
   Prof. Reneta LAnsiquot

   Scholars, the Honors Scholars Program newsletter contains articles, student achievements, and experiences as well as information on program activities. A student-driven publication, each issue showcases the skills of students serving as photographers, editors, graphic artists, technical writers, and reporters. Responsibilities crucial to this major interdisciplinary project include going to scholarly presentations, attending workshops, conducting interviews, creating layouts, editing texts, taking photos, selecting pull quotes, meeting deadlines, and integrating feedback. We also update our online presence, which can be accessed on OpenLab and College's Honors Scholars Program website.

5. GravGen, An Interdependent Alternate Energy Generator
   Eugene Babkin and Chirs Guzman
   Prof. Andy Zhang and Prof. Yu Wang

   This project involves researching and developing a prototype of an interdependent alternative energy generation system encompassing three technologies, Solar, Wind and Gravity. All three technologies will be integrated together into one system which will be monitored and controlled via low power microcontrollers. The system can greatly benefit the world by providing a clean, low cost, on demand power source capable of significantly limiting our dependency on fossil fuels. The gravity generator is the focus of this project, as well as the main source of energy production within the system.

6. Augmented Reality in Design and Construction
   Raveena Bahadur
   Prof. Phillip Anzalone

   Augmented Reality and Virtual Reality are means of incorporating real-time computational visualization in the field of human interaction. This project seeks to explore advances in the technology to aid in the design, visualization and construction of buildings through the use of immersive three-dimensional environments, developing research methods of integrating contemporary interactive technologies in the study of the relationship between architecture and human action. The first stage of development studies is the Virtual Reality proof- of-concept. The project proposes to develop a detailed three-dimensional model of a building space through the use of computational modeling software. The geometric data will be exported to a format that can be utilized through contemporary virtual reality software accessible through portable electronics devices such as an iPhone. The user shall be able to visualize the building simulation and the embedded overlay will allow users to engage the information in the combined physical and virtual environment. By engaging architectural space, this virtual reality system will explore a new type of interdisciplinary environment for teaching, practice and research.

7. Landscape determinants of neutral and adaptive genomic diversity in leaf-toed geckos within the Mexican dry forest
Saptarsi Basu
Prof. Christopher Blair

What makes migration occur? Why do mutual alleles appear in individuals who live thousands of miles away? This concept of gene flow is manipulated by both natural and anthropogenic disturbances. However, anthropogenic disturbances such as logging, agriculture, livestock and roads are widely considered to be the prime threat to the Tropical Deciduous Forest (TDF) of Mexico. We sequence genomic data of Leaf Toed Gecko's in the area and see how natural and anthropogenic disturbance are causing these individuals to migrate – resulting in gene flow.

8. The Health Effects of Long Term Exposure to Carbon Monoxide
Brittania Brown
Prof. Olufemi Sodeinde

Carbon monoxide (CO) is a deadly gas, which prevents oxygenation of the blood by attaching to hemoglobin in place of oxygen. The intoxicating air containing CO causes accidental morbidity. The main goal of this review is to bring awareness to the college community about the effects on health of prolonged and chronic level of carbon monoxide. This review focuses on the causes, effects, prevention, symptoms and treatment of exposure to chronic CO levels and acute levels to a lesser extent. Carbon monoxide poisoning is common in the United States, resulting in numerous emergency visits to hospitals. Evidence suggests that chronic exposure to low CO concentrations can lead to mild neurological effects. Symptoms of acute exposure are more serious and severe and include headache, loss of consciousness and visual changes. Studies conducted to determine levels of carbon monoxide in people's homes found that about 17% had CO levels above 10 ppm. These raised levels of CO were primarily caused by defective or improperly vented fuel burning appliances. Treatment includes administration of hyperbaric oxygen.

9. Tinnitus: Causes, Diagnosis and Treatment
Shenika Burke
Prof. Olufemi Sodeinde

Tinnitus is a common experience with up to one third of the adult population experiencing it at some time in their life. Tinnitus is defined as the conscious experience of a sound that originates in the head and neck, and without voluntary origin. Tinnitus is a common disorder that has many possible causes. It affects hearing and, therefore, the ear, a major sense organ. I reviewed information available in primary literature on the disorder. These disorders affect 37 million Americans and occur in adults roughly around the age of 40-70 years old, but occasionally in children. Tinnitus can cause hearing loss, external ear infection or Meniere's disease. Regarding

the types, tinnitus can be subjective or objective, vibratory or non-vibratory. Objective tinnitus is a very rare. The disorder can be the first sign of life threatening diseases like carotid stenosis. Treatment or management includes ear wax removal, counseling, cognitive behavioral therapy, sound therapy and hearing aids. In conclusion, tinnitus can be dangerous if not treated properly.

10. Differential Effects of Fat or Energy Intake in Males and Females
    Trevor Caraballo, Bora Durrsi, Devya Gurung and Nicole Madrazo
    Prof. Sanjoy Chakraborty

    The pathology of obesity produces many diseases. It has a far ranging negative effect on health including some type of cancers, non-alcoholic fatty liver disease(NAFLD), diabetes and many other diseases that are related with obesity. The aim of this study was two folds: i) to analyze the data that was collected (in a mice model study) in another university to observe the differences in the tissue morphology (liver, pancreas, adipose) in male and female mice when exposed to high fat diet for a period of 6 months; ii) to summarize the recently published results related to obesity in humans in respect to different sexes, ethnic and socio-economic groups. Within 3 months animals in VHFD showed signs of NAFLD and with longer treatment the liver showed deposition of lipid droplets in hepatocytes, which leads to non- alcoholic steatohepatitis (NASH) subsequently cirrhosis and hepatocellular carcinoma. Morphometric analyses of pancreas showed robust signs of inflammation, increase in pancreatic islets size and number in both obese male and female. Adipose tissue showed signs of hypertrophy than hyperplasia. The effect of high fat was more pronounced in male than female mice. We also found from many published articles that in the U.S. the prevalence of obesity is high among African Americans, Mexican Americans and Native Americans and different factors are involved such as socioeconomic status. Interestingly, the prevalence of obesity in women has been seen with the onset of menopause due to the metabolic changes and hormone fluctuations. Moreover, children and parents from low income and uneducated family have less access to many facilities and generally less aware about diseases and health outcomes.

11. The impact, sources, and resolutions of error in GPS
    Carl Chan
    Prof. Holly Carley

    Knowing where we are, i.e., our position on earth, is quite important in modern society. We use the Global Positioning System (GPS) in everyday life, from using it on our phones to in our cars. Knowing where we are is necessary for the GPS to give directions. Our question is how accurate is the GPS? In this research we will investigate some issues that affect the accuracy of the GPS. We will experience first hand how computers handle different types of mathematical inputs, learn about condition numbers, and ill-conditioned problems. We will incorporate certain numerical methods such as Multivariate Newton's Method, Nonlinear Least Squares and other methods to see how a so-called receiver finds its position using satellites and to estimate how far the answer may be from the correct answer. Initial results of our computer experiments

were quite surprising and will be presented. Further experiments and investigations aimed at determining and improving accuracy will be implemented in future work.

12. Light-matter interaction in semiconductor heterstructures
    Rakibul Chowdhury
    Prof. German Kolmakov

    By considering driven diffusive dynamics of exciton polaritons in an optical microcavity with an embedded molybdenum disulfide (MoS2) monolayer, we determine experimentally relevant range of parameters at which room-temperature superfuidity can be observed. It is shown that the superfluid transitions occurs in a trapped polariton gas at laser pumping power P > 600 mW and trapping potential strength k > 50 eV/cm2.

13. 3-D Printer Modeling and Construction
    David Amegavie, Justin Colon and Eraj Khan
    Prof. Gaffar Gailani

    A 3D printer is a manufacturing device that uses various processes to synthesize a three dimensional object. There are many fields that 3D printers can be used such as in aerospace, automotive, and electronics. In 3D printing, materials are built in layers under computer control to create an object. 3D printers are finding their way into many industries and homes. However, the majority of 3D printers are very expensive. They also come in a bulky size. The research that is currently being worked on is the construction of a 3-D printer. The 3-D printer was provided by the supervisor. The 3-D printer which is being modeled and constructed is not just a regular 3-D printer. It comes with many challenges. Models and some pieces are going to be created due to the fact that they were missing or broken. The main purpose of this research is to provide the Mechanical Engineering department with a 3-D printer that is more efficient. The printer will be constructed in a more eco-friendly way so that students and faculty can use it and cause the minimal amount of harm to the environment and the closed lab surroundings that they are working in. There were a few challenges encountered due to the missing pieces but were resolved through programs such as Inventors which helped create parts that were missing. Codes and programs like MatLab (and any other program required) will also be used to set up the printer to actually print the parts as needed with minimal flaws in the material/parts. The purpose of the programming is mainly to set up the printer so that it functions in the most effective way. The printer has yet to be completed due to the modifications being made to make it more efficient and more useful to its purpose.

14. Preliminary analysis of the structure of calpains in Tetrahymena thermophila using online tools
Coreen Cooper
Prof. Ralph Alcendor

Calpains are a family of cytoplasmic cellular enzymes protease involved in several cellular functions. They are widely distributed throughout mammalian cells, observed in biological processes such as cellular signaling and play have pathological implications in diseases such neurodegenerative diseases and arthritis. However, the environment in which their functions are triggered is not fully understood. Understanding calpain's response during oxidative stress and other cellular conditions can give further insight to the genes role in up or down regulatory expression. Both Cell Biology and Bioinformatics techniques were used in this experiment. Along with observing the genes expression during oxidative stress, the structure of Human Calpains are being compared to those found in Tetrahymena thermophila. T. thermophila is a commonly used single celled protozoan model organism found in freshwater. They have been used extensively to study a wide variety of genes and gene functions in eukaryotic cells, and the effect of compounds on cell death and survival.

15. Spectroscopic studies on the interaction of chlorin and isobacteriochlorin with human serum albumin
Alexandra DePasquale
Prof. Diana Samaroo

The interaction of potential photosensitizers (chlorins, CGlu4 and isobacteriochlorins, IGlu4) in the presence of plasma protein (human serum albumin, HSA) was studied in tris hydrochloride buffer at pH 7.4 using ultraviolet-visible (UV-VIS) absorption and fluorescence spectroscopies. Due to the excitation at 295 nm, the HSA fluorescence emission was monitored from 315 -470 nm. Using Stern Volmer and double logarithmic, there was a dynamic quenching found for increasing concentrations of IGlu4. The average binding constant for two independent trials was found to be 7.77×10^7 and the average number of binding sites to be 1.14.

16. The Buzz on the OpenLab, Analyzing Engagement with the Buzz: A Research Project by the OpenLab's Team of Student Bloggers
Jean-Luc Antoine, Amoni Brown, Jessica Deng, Pamela Drake, Konyca Francis, Mandy Mei, Samantha Pezzolanti and Brianna Vasquez
Prof. Jonas Reitz, Scott Henkle and Destry Maria Sibley

City Tech's OpenLab is a living lab that encourages the growth of diverse communities. The Buzz is the OpenLab's blog where eight student bloggers write about a variety of topics. With these topics we aim to create micro discourse communities to engage students. Given the lack of physical space for students to meet and engage on a commuter college, the formation of online communities is a growing alternative for campus engagement at City Tech and colleges like it.

17. Analyzing and Visualizing Social Networks
Fatime Zahara El Fatimi
Prof. Nadia Benakli

City Tech's OpenLab is a living lab that encourages the growth of diverse communities. The Buzz is the OpenLab's blog where eight student bloggers write about a variety of topics. With these topics we aim to create micro discourse communities to engage students. Given the lack of physical space for students to meet and engage on a commuter college, the formation of online communities is a growing alternative for campus engagement at City Tech and colleges like it.

18. Gender Differences in Vagal Tone Adaptation in an Expressive Writing Paradigm
Cherishe Cumma, Saber Ventura, Dana Glatzer, Ahmed Emrah
Prof. Jean Hillstrom and Prof. Pa Her

Writing about traumatic events can improve health and well-being. We measured the effects of expressive writing on the autonomic nervous system. There was a gender comparison measured for vagal tone and respiration. Improvements in heart rate and vagal tone have been compared as well.

19. The Learning Module of the iPractice challenge: A mobile app for practicing computer programming
Anthony Grullon
Prof. Benito Mendoza

iPractice Challenge: This project aims to create a self-assessment tool for practicing computer programming. Our students can use this tool on their mobile devices to practice during their commuting time, while there is no Internet connection.

20. Descriptive Stats, Classroom Observations and Teacher Competency
Jimmy Guity
Prof. Lieselle Trinidad, Prof. Hon Jie Teo, Prof. William Roberts

No one can be perfect. You'd expect those who are teaching us to know everything, but that isn't feasible because they're human. So what is it that makes these superhumans, simply human? What my mentors and I sought out to look for were the strengths and weakness of each person individually. Once we were done identifying the strengths and weakness of the individual, we sought out to look for any prevalent similarities or patterns that occurred from person to person or, more specifically, from case to case. While most people performed very well on the same form of competency, they also tended to do very poorly on the same form of competency. We went a step further by looking at the data statistically so that we'd have a better understanding of not only the similarities but also the differences between the rows and columns.

21. STEM Teacher Scholarship in NYC
Kendra Guo, Nanase Akagami, Janine Roccosalvo
Prof. Fangyang Shen
The objective of the NSF Noyce program is to train and develop qualified K-12 Science, Technology, Engineering and Math Educators in NYC. The collaborative Noyce program between City Tech and BMCC mainly provides teacher scholarships necessary for the development of STEM teachers. To achieve an optimal level of qualified STEM Education, the Noyce Internship program and Noyce Summer program are also organized. Six to seven hundred CUNY students are involved into the Noyce program during the grant period from 2014 to 2018.

22. Copper Binding Properties and Antioxidant Ability of Multi-Target Compounds. Implications in Alzheimer's Disease Therapy
Sarah Hambleton
Alberto Martinez

Alzheimer's disease (AD) is an irreversible and progressive brain disorder that eventually leads to the loss of ability to carry out even the simplest tasks. This form of dementia, that affects more than 5 million Americans and 28 million people worldwide, is characterized by the formation of Amyloid-b (Ab) plaques and reactive oxygen species (ROS). Current treatments are symptomatic and none of them interdicts the underlying cause of AD. Therefore, there is an urgent need for viable chemotherapies that target the root of the onset and progression of the disease. Metal ions, specifically Cu^{2+}, are thought to be involved in the advancement of AD in several ways. They promote the aggregation of Ab into toxic forms of the peptide, and their presence is needed to catalyze the production of ROS. In our work we have assessed the Cu^{2+} binding properties (stoichiometry and binding affinity) and the total antioxidant ability of two multi-target compounds, AM49 and EE229, by means of UV-visible spectrophotometric titrations and the DPPH assay, respectively. AM49 and EE229 belong to a family of compounds that are designed to chelate toxic concentrations of Cu^{2+} ions, to inhibit both ROS formation and Ab aggregation, and to interact with enzymes that are relevant to the progression of AD. In our experiments it was found that AM49 and EE229 form 2:1 (compound:Cu^{2+}) complexes with Cu^{2+} and display binding affinities around logKa~15, suitable to allow competition with Ab peptides but not with needed metalloenzymes. It was also found that AM49 and EE229 can scavenge the DPPH radical. Based on these results, compounds AM49 and EE229 show promising potential in the search for disease-modifying therapies against AD.

23. Combatting Horizontal Violence in Nursing using Peer-led Workshops
Monica Heredia, Peggy Saint-vil, Esther Saint-vil, Tatiana Toussaint, Christine Quasi
Prof. Aida Egues and Prof. Elaine Leinung

Imagine you are a new nurse who just got off of orientation and you are starting your first day on the floor. The more experienced nurse spends the day overwhelming you with work and belittling your skills. Why is this happening and how does this make you feel?

24. Microbiology of the Built Environment: The Changing Microbiome of New York City College of Technology
Manuela Hoyos
Prof. Jeremy Seto and Prof. Davida Smyth

There is much interest in understanding what constitutes the microbiome of buildings. The surfaces of buildings can often harbor pathogens, acting as fomites, capable of transmitting pathogens to hands. A better understanding of how bacteria transmit from surfaces to human hands would reveal insights into how bacteria prevail and persist in the environment potentially enabling better surveillance and prevention of the dissemination of community-associated and hospital associated bacteria. To address these questions, we have been sampling the biodiversity of a particular genus of bacteria, the Staphylococci, in our academic building over three semesters. We have focused our sampling on elevator buttons of the NAMM building, composed of 11 floors. Each button was sampled using a chromogenic contact plate, selective for antibiotic resistant Staphylococci on a single day at the same time to get a snapshot of circulating Staphylococci. Presumptive Staphylococci were sub-cultured, DNA was extracted and subjected to PCR and sequencing to identify the species.

25. Extraction of DNA from the scales of *Phataginus tricuspis* for PCR-based identification and barcoding using different extraction protocols
Angela Huang, Keisha Theobald
Prof. Olufemi Sodeinde

Pangolins are unique mammals covered with hard scales made of keratin. These scaly insectivores can be found across Asia and sub-Sahara Africa. There are eight species of pangolins. Our study is on one of the pangolin species found in Nigeria, *Phataginus tricuspis.* Pangolins are the most trafficked mammals; and the scales that we analyzed, is the body part with the heaviest use across continents where pangolins are found. For forensic analysis, it is imperative that we know the partial or complete DNA sequence of each extant pangolin species so it is possible to ascertain which species is being traded in when confiscated. We extracted DNA from the scales of the Nigerian pangolins using two different protocols. The aim is to identify which section of the scale and which protocol can provide the best quality DNA; as good DNA quality is important for downstream use in genomic analysis. For each pangolin, we used three samples, whole scale, exposed part of scale and embedded part; and two protocols using Promega and Qiagen kits for extraction. DNA yield and A260/280 ratio measured using the Nano spectrophotometer were best for the part of the scale attached to the skin and DNA extracted using the Qiagen kit and protocol.

26. Blending Wine Education and General Education: Preparing Tomorrow's Wine Professionals for Continual Growth
Malika Ikramova
Prof. Karen Goodlad

An in depth wine education is important for all hospitality students. This course of study helps students better understand the wine industry but also helps build critical thinking and communication skills. The study of the wine industry can be challenging, especially due to the lack of prior knowledge some college students may have with the subject. The study of the wine industry demands conscientious attention to detail, academic diligence and a passion for exploring ones senses. This research will help students to be more aware of the value of their wine education through the understanding that wine is as much about the overall experience as it is about the technological process of bringing the product to the consumer.

27. Liquefaction Analysis
Areeba Iqbal
Prof. Melanie Villatoro

Moderate magnitude earthquakes are possible in NYC region due to older, harder bedrock found in the northeast which generates high-frequency earthquake motions that can travel great distances before they subside. In recent years, Geotechnical Engineers have been taking seismic design parameters in consideration for New York City.
The main purpose of this research is to customize a Liquefaction Analysis spreadsheet created by Langan Engineering and Environmental Services. The Standard Penetration Test N-values obtained from the field investigation are normalized to account for different types of hammer energy. The blow counts are adjusted to N1(60) and plotted in Liquefaction Assessment Chart from the Building Code. If liquefaction evaluation is not required, the soil is safe for foundation. However, if liquefaction evaluation is required, correction for N60(cs) fines content, Cyclic Stress Ratio and Cyclic Resistance Ratio are carried out using methods by Idris and Youd (2001) and Idris and Boulanger (2010). Once all the corrections are taken in account liquefaction is described in terms of safety factor (Fsl = CRR/CSR). If the Factor of Safety is greater than or equal to 1, it proves that resistance exceeds the loading and liquefaction will not occur in the soil. If factor of safety is less than 1, a deep foundation system will be required at the site to transfer the loads to suitable bearing layers.

28. The Table if Content Module of iPractice: An AIG-Enabled Platform for Self-Assessment Systems
Munthasir Islam
Prof. Benito Mendoza

iPractice: This project aims to create a self-assessment tool for practicing computer programming. Instructors can create courses and question. Students can join to courses and groups.

29. The Effect of Oxidative Stress on Sirtuins In Tetrahymena thermophlia
    Suzanne Jacob
    Prof. Ralph Alccendor

    Tetrahymena are free-living ciliate Protozoa, found in freshwater ponds. These organisms are commonly used as model organisms in biological labs as they provide insight to human cell biology and diseases. One of the many causes of diseases in human beings and other organisms is oxidative stress (OS). Oxidative stress is a result of an excessive production of reactive oxygen species (ROS). This imbalance between ROS and antioxidants can lead to many disruptive processes such as DNA and protein damage. OS is an important regulatory factor for stem and cancer cells. It is known that an increase of ROS in cells is actually the reason why the cancer initiates and continues on. Also, ROS is a significant mutagen in stem cells. If ROS is high, then it blocks self-renewal of stem cells as well as signals stem cell differentiation. Sirtuins are proteins common among all living cells and are known to regulate many biological processes. Studies have shown that activating sirtuins with resveratrol (a compound that is present in red grapes and red wine) increases longevity. Tetrahymena thermophila are known to be very resistant to many environmental conditions such as high and low temperature and heavy metal toxicity. Therefore, this project aims to examine the effect of OS induced by ethanol on sirtuins in T. thermophila. The National Institute of Alcohol Abuse and Alcoholism reported that many diseases, including cardiomyopathy, arrhythmias, stroke, high blood pressure, alcoholic hepatitis, cancer, pancreatitis, and compromised immune system can be as a result of alcohol consumption. We hypothesized that sirtuins are involved in OS induced by ethanol. We exposed Tetrahymena to different concentrations of ethanol followed by analyses of metabolic activity and mRNA expression levels. High amount of ethanol, 0.5 mM – 0.75 mM, lead to lower cell number and lower metabolic activity. 1.0 mM of ethanol lead to 100% cell death within 24 hrs. Sirtuin mRNA increased with increasing amount of ethanol; however, by 0.75 mM mRNA expression levels decreased significantly. mRNA levels of antioxidant genes were also dose-dependently increased in the presence of ethanol. These results suggest that sirtuins may be involved in regulation of OS induced by ethanol.

30. Text and Network Discovery with Netlytic
    Felicia Jeter
    Prof. Nadia Benakli

    Netlytic is a free web-based system that can automatically analyze texts and discover social networks from online communications such as Twitter, Facebook, forums, blogs and chats.
    In our research, we learn how to analyze networks focusing on the relations between the actors in the network.
    We also learn how to use Netlytic to collect, analyze and visualize publicly available conversation from social media such as Twitter.

31. Molecular Characterization of Black Corals (Antipatharians) from the Flower Garden Banks National Marine Sanctuary (NW Gulf of Mexico)
Nicole Bellaflores-Mejia, Craig Dawes, Colin Joseph, Juanita Marin, Sheila Moaleman and Lysna Paul
Prof. Mercer R. Brugler, Prof. Tatiana Voza and Prof. Ralph Alcendor

Black corals (Cnidaria: Anthozoa: Hexacorallia: Antipatharia) are cosmopolitan in the world's oceans and live as deep as 8,900 meters. To date, 7 families, 42 genera and 247 species of black corals have been described. During Summer 2015, LSAMP Scholar Craig Dawes participated in a research cruise aboard the *R/V Manta* to the Flower Garden Banks National Marine Sanctuary (Gulf of Mexico) to collect mesophotic black corals using the remotely operated vehicle *Mohawk*. The primary purpose of the cruise was to conduct video and collection-based surveys immediately outside of the sanctuary in hopes of expanding the current boundaries and protecting any newly-discovered communities from further impacts due to oil and gas exploration and drilling. The cruise also surveyed the banks for new, as of yet undescribed species of black corals, and collected additional representatives of the black corals *Acanthopathes thyoides* and *Elatopathes abietina*. While both species are currently classified in the same family based on morphology, they do not group together in a molecular phylogeny; they are considered *wandering taxa* as they change positions depending on the gene (mtDNA vs. nuclear) or algorithm (parsimony, likelihood or Bayesian) used to build the phylogeny. To stabilize their position, additional representatives are needed; the cruise successfully collected two additional *Acanthopathes* and six *Elatopathes*. We are amplifying and sequencing three mitochondrial regions (*igrN*, *igrW*, *igrC*) and three nuclear genes (18S, 28S and ITS2) for these two taxa as well as all other black corals collected on the cruise. Based on morphological examination of the black corals collected at sea, we anticipate elucidating several new species based on DNA analysis.

32. Gene Expression Profiling of NGF Differentiating PC12 Cells
Daenna Joseph
Prof. Jeremy Seto

Gene expression involves the measurement of mRNA levels in tissues and at what level the genes are being expressed. The expression of these genes can be deduced by RNA-Seq in order to retrieve a sequence. RNA-Seq is generally used to compare gene expression between condition, to find out which genes are up or down regulated in each condition. PC12 cells are derived from the Pheochromocytoma of the rat adrenal medulla. The ectodermal lineage of PC12 cells reveals a neuronal phenotype when treated with Nerve Growth Factor (NGF). These signals result in gene expression changes that occur when differentiating and provides a unique opportunity to understand a genetic switch in a program that balances a mitogenic versus mitostatic outcome. RNA-Seq analysis focuses on the changes that appear in cellular transcriptomes and helps to facilitate the ability to look at alternative gene splice transcripts, transcriptional modification and changes in gene expression. TopHat and Cufflinks are software

toolkits tools used for gene discovery and expression analysis. These tools will help facilitate the assembly of the PC12 transcripts, estimate their abundance and test the different regulations and expressions within the gene.

33. Efficient Ocean-Powered generator Design
    Anita Keo, Ayesha Adeel, Luca Scarano, Ezra Stabler and Evan Snyder
    Prof. Masato Nakamura

    In recent years, there have been increasing demands for alternative energy, due mainly to the rising costs and negative effects of using conventional energy sources. The purpose of this research is to design a more effective and efficient solution for extracting energy from the forces of the ocean. The research will primarily be focusing on tides and wave, as these sources have low-operational cost, are predictable and constant, and are available in many locations around the world. Currently, this project has been divided into two phases, wherein the 1st phase was started in spring 2016, and upon its completion the 2nd phase will begin in summer 2016. The 1st phase starts with literature and online research, and then followed by the creation of conceptual design based on the collected information. For this phase, we have produced 3 different generator concepts.

34. Untitled
    Felix Kurniawan
    Prof. Eric Rodriguez and Prof. Chana Etengoff

    This exploratory study seeks to gather more detailed information on LGBTQ Muslims to determine how sexual and/or gender minority Muslim people of faith conform to both their religion, their sexuality and their gender identity and to observe whether successful identity integration occurs in the LGBTQ Muslim community. In this project I will combine materials learned from my spring 2016 MAT 1272 Statistics class with Dr. Rodriguez's training. This research has been approved by the Barnard College IRB to recruit human subjects and as a requirement the subjects must be a self-declared LGBT Muslim between the age 18 to 64, with as many as 500 subjects partaking in the interview process (current N to date = 113). This is a mixed methods online survey study (a quantitative questionnaire combined with qualitative structured interview questions) since there is no standardized measures of sexual/gender orientation and religious identity integration in LGBTQ Muslim community.

35. Digital Design Using VHDL
    Wai Ming Lam
    Prof. Ohbong Kwon

    VHDL is used as hardware description language capable of modeling integrated circuits and proving its functionality. With VHDL we can design our own logic device using a Programmable Logic Device rather than use fixed logic gates, allowing us to cut down on the number of chips

needed. We are going to create a logic circuit in VHDL to simulate its results (its logical output) before transferring it into a Field Programmable Gate Array (a type of Programmable Logic Device). We are then building the circuit onto an Altera DE2 Board to verify the results we simulated in VHDL.

36. Reflexive Geometries for Building Envelope Development
    Albina Mavlyutova
    Prof. Phillip Anzalone

    Building on investigations in the realm of reflexive geometries and caustic illumination, this project proposes using a computational algorithm to automatically generate rotated geometries to be used to direct light from predetermined origins (the sun) to desired target points through the manufacturing of custom building envelope components. A process was created to analyze simulation of incoming solar illumination in various reflecting and refracting situations, developing a computational script to be employed with CAD modeling software to generate a reflective surface. A series of physical experiments were conducted to compare how the actual reflection of light off the calibrated reflective surfaces generated through CNC manufacturing compared with the digitally simulated light reflections. The initial experiments proved the simulation responded in an accurate manner and determined the position and orientation of the machined surfaces required to perform the desired reflections. Various avenues of practical application were studied that seek to utilize the method to aid in the design of new energy responsive architectural features. Early studies included an enlarged sill on a building facade composed of a number of reflective panel arrays created through the system that will capture the light from the sun's path and reflect into high-performance photovoltaic cells.
    A second avenue of study considers the study of refracted geometry, currently being investigated digitally. While reflection is the main geometric transformation thus far simulated and prototyped, the first proposed experiment has the tendency to take on a dimensionally large physical footprint. The use of refraction allows for a bending of light in a manner that is geometric reduced and it is proposed to integrate refraction operation within the spandrel portion of modern curtain wall systems. Spandrel glass does not function as visually transparent glass in most facade conditions. Therefore, the glass that is typically used to mimic the other glass in the system can be replaced with a series of panels containing various synthetic films and materials with varying degrees of refraction. This system of refraction would transform light from multiple angles to hit photo-voltaic cells. The operation will take the parallel lines of the sun and bend them accordingly towards one photo-voltaic. Different mediums with different refractive indices will be used to bend the light at different angles. The bending of the light will happen in two different operations. The first medium would perform the z-axis transformation and the second medium would perform the x-y axis transformation.

37. Strong Cobra/Pixhawk Autopilot Board
    Israel Nava Hernandez
    Prof. Edward Morton and Prof. Farrukh Zia

This Project is about to build a drone. In the processes of building the drone, all hardware parts would be studied. The drone would be programmed on the Pixhawk Autopilot Board, where it would fly on balance. One of the main features of this project would be to implant GPS shield to locate where the drone is as well as identify the destination of every mission it will be given.

38. An Information-theoretic Investigation of Decoy Structures Used in Protein Folding & Fold Recognition
Chris Pang
Prof. Armando Solis

If a certain structure occurs very commonly in nature that means that it is energetically preferred. The idea is that the lower the energy, the more stable the structure is – the more commonly observed that particularly conformation is. As a result, pseudo-energy can be attached to different conformations. Knowledge-based potentials, deduced from patterns of solved X-ray and NMR structures, can potentially provide a simpler and more direct way in finding the native conformation of protein structures. The role of decoy conformations in fold recognition is to serve as a set of alternative conformations upon which potentials are tested on. The main objective is to critically analyze the quality of the decoy sets. There are decoy sets from which potentials consistency fail to score a high mark. The hypothesis is that in those specific sets, the distribution of decoys is very tight around the native structure; thereby, making discrimination more difficult. The immediate goal is to perform a literature survey for the purpose of analyzing decoy sets that are commonly used; and to be able to distinguish between their levels of quality. The long-term aim is to construct new decoy sets that may serve as a standard for which particular potentials, e.g., local potential, active potential, etc., of carrying discriminatory power can be measured against, given different structural parameters.

39. A Comparative Study of the Protein Sequences of BSA and HSA and their Interactions with Organic Molecules
Denia Saleh and Valentina Pineda
Prof. Diana Samaroo and Prof. Jeremy Seto

Proteins are the most diverse group of biologically important macromolecules. Serum albumin, one of the most abundant proteins in plasma, serves as a transporter for hydrophobic compounds like fatty acid chains. Albumins have three domains and each domain is composed of two subunits (A and B). Serum albumin is relevant to research because of its extraordinary ligand binding capacity that gives it the potential to be a carrier of many metabolites such as drugs, nutrients, metals, and other molecules. Our study focuses on human serum albumin (HSA) and bovine serum albumin (BSA), which share a 76% sequence identity. By using bioinformatics tools such as Pymol and Ugene, the structures of different mammalian serum albumins were compared. Using Pymol, bovine and human serum albumins were superimposed and docking sites were analyzed. In Ugene, the sequence similarities were studied by creating a

phylogenetic tree. In the future, we will analyze the acquired structures in depth to look for docking sites for small novel organic molecules.

40. Computational Design of a Drug to Reverse the Effect of Alzheimer's Disease
    Christopher Mason and Adam Sadowski
    Prof. Mai Zahran

    VEGF-D, a protein part of the vascular endothelial growth factor family, is commonly known as an angiogenic mitogen. It has recently been discovered to control the total length and complexity of dendrites both in cultured hippocampal neurons and in the adult mouse hippocampus through nuclear calcium-calmodulin-dependent protein kinase IV (CaMKIV) signaling. This finding gives hope for a potential cure of neurodegenerative diseases such as Alzheimer 's disease. VEGF-D is too large to be able to bypass the blood-brain barrier. The goal of our work is to computationally design and test a set of small molecules that would replicate the function of VEGF-D while being able to bypass the blood-brain barrier. We have computationally designed a set of peptides based on the three-dimensional structure of VEGF-D, and are planning to analyze their properties and the strength of binding to VEGFD's receptor in the future.

41. Comparing SDSS Spectral Quantities and Their Inclination Dependence
    Roberto Serrano
    Prof. Ariyeh Maller

    Galaxies are collections of many billions of stars bound by gravity. In cosmology it is widely believed that understanding the physics of stellar evolution is vital in order to understand the growth and acceleration of the universe. The Sloan Telescope, in New Mexico, has collected the spectrum of hundreds of thousands of galaxies. These electromagnetic spectrums can be reduced to determine various properties of an imaged galaxy, such as star formation rate, mass, redshift, metallicity, shape, color, etc. There are different mathematical models which reduce the spectrum of galaxies, thus different collaborations have produce different values for stellar properties for the same galaxies.
    The spectrums obtained by the Sloan Telescope, have been reduced by collaboration between John Hopkins University, and the Max Planck Institute for Astronomy. We will also investigate the spectrums reduced by the VESPA collaboration and match those objects to the MPA-JHU's SDSS DR7 model. The investigation will examine whether different models of stellar properties for the same object depend on inclination. Properties which do not vary are intrinsic, and are significant as it allows for a theoretical analysis of galaxies, as opposed to the traditional method of observation.

42. The effects of Gender and Participation in an Intermediate Algebra and Trigonometry Course with a Peer-Led Workshop Component
Farjana Shati
Prof. Janet Liou-Mark

New York City College of Technology has adopted the Peer-Led Team Learning (PLTL) instructional model in a foundational mathematics course. This study will examine the course MAT 1275: Intermediate Algebra and Trigonometry over the span of three semesters to determine what factors contribute to the success of the students enrolled in this special section that has an additional peer-led workshop. The effects of gender and workshop participation will be investigated thoroughly. Results from this study will be presented.

43. NYC Max
Houyu Wei
Prof. Ting Chin

This body of work is a small part of a larger project that will use New York City's zoning regulations to map the maximum allowable zoning envelope of Manhattan. The zoning envelope governs how much can be built and where. Mapping the maximum allowable envelope for the city will provide us with a metric for determining how many people can live and work on the island. This data will ultimately yield an answer to the question of how many people the current infrastructure of Manhattan can support. Since this project is still in its infancy the work this semester was focused on writing a computer script that will use the data in the zoning regulations to automate the development of a 3-dimensional digital massing model that will ultimately reflect the maximum zoning envelope of Manhattan.

44. Investigation of the flow in the microscopic level and its contribution to the poro-elastic properties in cortical bone
Meleha Yousaf
Gaffar Gailani

This work focuses on the Lacunar Canalicular Porosity (PLC) of cortical bone which includes the osteons. Osteons are semi cylindrical porous structures saturated with fluid within the bone and are approximately 250 micrometers in diameter; their outer boundary is called the cement line. The first objective of this work is to introduce an experimental protocolto determine the permeability of the cement line in cortical bone. Osteons will be extracted with and without the cement line. Designing a less expensive system to isolate micro structural components, osteons (diameter 200 – 250 micrometers), and designing a micro mechanical loading system are very challenging. The isolation system will be built into Inverted Microscope to allow mechanical isolation while looking at the specimens in the inverted microscope which will improve the accuracy and speed of the isolation process. Osteons will be extracted with and without the cement line. Osteons will be subjected to sinusoidal loading. Experimental results will be

compared to theoretical solutions of unconfined compression of poroelastic, fully saturated, annular cylindrical disk that is previously developed by the authors in number of publications. Results will determine the degree of permeability of the cement line. The analysis will show the sensitivity of the poroelastic properties of the cortical bone to the flow through the cement line.

45. A Modified Predator-Prey Model with Disease in the Prey
Xuebin Zou
Prof. Johann Thiel

Since the development of agriculture, pests are always been a big enemy to human survival. The battle between human and pests has never stopped and continues today. "With the development of the society and progress of science and technology, there are many ways to control agricultural pests, for instance biological pesticide, chemical pesticides, remote sensing and measuring, and so on"[3]. Pesticides, a modern weapon used by man, kill a decent amount of the pest population in a short period of time and in a economical way. Yet, pesticide pollution is a major health hazard to susceptible human beings and insects beside the target itself; also, as time passes, pests can develop a resistance to these chemicals. To reduce the undesired results of pesticides, researchers are more concentrated on Integrated Pest Management (IPM), "using microbial control with pathogens and releasing natural enemy together" [1] to control pests. One such method involves infecting a susceptible pest by a diseased pest, causing both to eventually die out by the disease; while, at the same time, releasing the natural enemy into the pest to catch and consume both pests. In this case, we call the natural enemy the predator and the pest the prey.

  An IPM system has recently been used in Brazil to fight the Zika Virus [2]. Researcher are releasing infected male mosquitoes with a self-destruct gene, which causes them to quickly die along with their offspring before reaching adult phase. In this project, we seek modify the IPM model in the research paper "A predator-prey model with disease in the prey and two impulses for integrated pest management" by Shi et al. [1] and to test our new model using numerical simulations.