2017 Symposium

Borough of Manhattan Community College
Tuesday July 25th
9:00am – 4:30pm
Good morning and welcome to the third annual CUNY Research Scholars symposium!

The CUNY Research Scholars Program funds research scholarships for associate degree students at all of CUNY’s community colleges as well as at the three comprehensive schools: College of Staten Island, Medgar Evers College, and the New York City College of Technology. More than 550 students have participated in the Research Scholars Program over the past 3 years. Many have graduated and transferred to other CUNY schools and beyond, including Columbia University, Cornell, and MIT.

The New York City Mayor’s office funds the program, and we are especially grateful to Mayor Bill de Blasio for his generous support.

Today’s symposium marks the culmination of a year-long program involving 234 students who are working in a variety of STEM disciplines ranging from astronomy to physics. None of this would have been possible without the support of the college directors and faculty mentors. Directors at each participating college arranged biweekly programming, including laboratory safety, abstract writing, and public speaking. Their tireless efforts enabled this program to thrive and grow. Faculty mentors shared their expertise with students, guided them along the path of scientific inquiry, and helped prepare them to present their work today. The work and dedication of the faculty mentors are the key ingredients that have made this program a success – and we salute all of you.

The opportunity to engage in authentic research contributes to CUNY’s foremost goal of student success. Research is the foundation of all scientific understanding, and through mentored laboratory experiences students participate firsthand in the creation of knowledge. Authentic research experiences are high-impact educational practices that not only supplement required coursework but also provide a level of insight into a subject that cannot be obtained in any other way.

Finally, we thank all of the administrators who have worked to make the CUNY Research Scholars Program a success on each campus.

In the following pages you will find a glossary of participating students (pages v-x) and their faculty mentors (pages xi - xiii) as well as the abstracts of all the scientific presentations (pages 1-71).

Avrom J. Caplan PhD
Ron J. Nerio PhD
Co-Directors, CUNY Research Scholars Program
Program

Morning Session

9:00 – 9:30 A.M.  Registration, Breakfast

9:30 – 9:45 A.M.  Vita Rabinowitz, Ph.D.  
Executive Vice Chancellor and University Provost

Karrin E. Wilks, Ph.D.  
Provost and Senior Vice President for Academic Affairs, BMCC

9:45 – 10:30 A.M.  Jayne Raper, Ph.D.  
Department of Biological Sciences
Hunter College

The good cholesterol of primates: Protecting Africa one cattle at a time

10:30 -11:30 A.M.  Student Oral Presentations  
BCC, Guttman, KBCC, NYCCT, QCC  
Session 1

11:30 - 12:30 P.M.  Poster Presentations  
BCC, Guttman, KBCC, NYCCT, QCC  
Session A

12:30 - 1:30 P.M.  Lunch (Fitterman Hall)

Afternoon Session

1:30 - 1:45 P.M.  Mark Hauber, Ph.D.  
Associate Vice Chancellor for Research

Karrin E. Wilks, Ph.D.  
Provost and Senior Vice President for Academic Affairs, BMCC

1:45 - 2:30 P.M.  Kevin Gardner, Ph.D.  
Structural Biology Initiative
Advanced Science Research Center

Inspired by nature: How studying cellular sensing leads to new therapies and biotech tools

2:30 - 3:30 P.M.  Student Oral Presentations  
BMCC, CSI, Hostos, LAGCC, Medgar Evers  
Session 2

3:30 – 4:30 P.M.  Poster Presentations  
BMCC, CSI, Hostos, LAGCC, Medgar Evers  
Session B
# Student Oral Presentations

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Protecting and Deprotecting Group of Alcohols in Organic Synthesis

Koffi Apegnadjro, Bammy Nabe

Mentor: Professor Therese Soosairaj
Bronx Community College

Protecting the functional group to inhibit the competitive reaction of the equally reactive groups are very critical in organic synthesis. For example, it is difficult to synthesis Grignard reagent with hydroxy group in the starting material due to the reactivity of the Grignard reagent with the hydroxy group. In such case, the hydroxyl group is protected first and after the reaction is completed it is deprotected. Also, when a group is extremely reactive and gives multiple products, then the functional group is protected so that the controlled product is obtained. In this research ribose, a carbohydrate is used which has four hydroxyl groups and in order to control the reaction as well to get products with particular stereochemistry protection of the rose is important. Ribose is protected using different protecting groups, and these protected ribose compounds will be used as a scaffold to build various biologically important compounds.

Synthetic Division of Polynomials with Non-Linear Divisor

Maria Alguacil

Mentor: Professor Alexander Kheyfits
Bronx Community College

We generalized the synthetic division algorithm for the case when the divisor is a polynomial of arbitrary degree.

Using Mitochondrial DNA Polymorphisms to Uncover Maternal Ancestry

Josue Bueno, Chu-Kan Chen, Felix Patawah

Mentor: Professor Rujin Tian
Bronx Community College

Unlike nuclear DNA, mtDNA (Mitochondrial DNA) is inherited solely from the mother and the sequences remain constant over many generations. Therefore, analyzing mitochondrial DNA can be a powerful tool to trace maternal ancestry including biological ethnicity, interracial relationship, and geographic location and migration routes back to hundreds and thousands of years ago. In this project our focus was to obtain mitochondrial DNA from our saliva by a simple saline mouth wash, then isolate and amplify a specific gene (a 440-nucleotide segment of a hypervariable region of the mitochondrial chromosome) through a molecular technique called PCR (Polymerase Chain Reaction). Variations in this mitochondrial DNA sequence at certain locations, called SNPs (Single Nucleotide Polymorphisms), were compared to and analyzed using bioinformatics tools. The mutation rate resulting in distinctive patterns of SNPs not only indicates the geographical and historical point of origin of our maternal ancestors, but also with whom you are related to in the maternal line.
In summary, this project offers a hands-on experience in modern molecular biology, as well as a greater appreciation of human evolution and diversity in the context of multiculturalism from a scientific perspective.

**Poster A4**

**Counting Topological Sortings of Directed Trees**

Rogelin Fernandez

Mentor: Professor Nikolaos Apostolakis
Bronx Community College

A *Directed Tree* (Di-Tree for short) is a directed graph whose underlying graph is a tree. A *topological sorting* is a specific ordering of the vertices of a directed graph that agrees with directions of the graph. There is currently no known general formula for the number of topological sortings on a given di-tree. In the particular case of ditrees that come from *rooted trees*, where every edge is directed away from the root, we were able to find that multinomial coefficients enumerate the number of topological sortings in the given di-tree. In the case of *zig-zag trees*, di-trees which follow an up-down pattern, we are also able to say that the topological sortings of a zig-zag tree with $n$ vertices are equinumerous with alternating permutations on $[n]$. Because of this we are able to apply what we know about the set of alternating permutations, for example its generating function and a particular a bijection from alternating permutations to a class of increasing rooted di-trees. We translated this bijection to be from topological sortings on a zig-zag tree to increasing rooted di-trees, and from there we are working on making a construction between any di-tree to increasing rooted di-trees. We have also found methods to count the topological sortings on any di-tree whose underlying graph is a path.

**Poster A5**

**Computer Applications in DNA Sequencing**

Philip Bredu, Kevin Gonzales, Luis Hermanson

Mentor: Professor Quanlei Fang
Bronx Community College

Nowadays applications of computer technology to the management and analysis of biological information are crucial in modern research. Analyzing biological data to produce meaningful information involves engaging computer programs that use algorithms from graph theory, image processing and computer simulation etc. To develop efficient and stable algorithms one needs to understand the mathematical foundations of algorithms.

In this interdisciplinary project, first we will learn the basics of DNA sequence analysis and implement existing computer programs that enable management of various types of data. Then we will focus on studying algorithms/data structures for DNA sequencing and developing online tools to store and analyze data with improved algorithms. In particular we aim to create tools to fit the needs of the analysis and visualization of data obtained from the experiments at our biology labs. Through this project students will get hands-on experience on bioinformatics software implementation and development. The proposed research will also help students gain a better understanding of the principles of algorithm design and learn how to apply them to solve practical problems arising from different fields.
Assessment of Effects of Calcium on Cadmium Toxicity in Rice (Oryza sativa): Implications on Phytoremediation Potential

Mohammed Mfosah
Mentor: Professor Charles Maliti
Bronx Community College

Cadmium ingestion is harmful to human health. There is an urgent need to find techniques that would lower the uptake of cadmium ions (Cd^{2+}) from contaminated fresh water systems to minimize exposure of humans to cadmium toxicity. The objective of this study is to evaluate the effects of calcium ions (Ca^{2+}) on Cd^{2+} uptake in A301 rice Oryza sativa cultivars by using tissue culture techniques in vitro. Growth parameters such as biomass accumulation will be evaluated for (1) A301 seedlings grown in Murashige and Skoog (MS) medium that have been supplemented with Ca^{2+} and Cd^{2+} relative to the control, and (2) A301 seedlings cultured in MS medium that have been supplemented with Cd^{2+} only, and are devoid of calcium. The findings of this study will form a baseline for evaluating the effects of calcium on cadmium toxicity in contaminated freshwater systems and soil sediments.

Tellurium Loading in Liquid Scintillator

Moussadatou Sabi
Mentor: Professor Sunej Hans
Bronx Community College

Tellurium (Te) can be used for the double beta decay, for neutrino experiments and beside its use in various organic synthesis. Loading an inorganic metal salt into organic solvent is not an easy process. Therefore, it requires several phases that will not only ensure the metal to be mixed into the solvent, but also the stability of the final complex. This research studies the progress of a Te-doped liquid scintillator in small amount. For such study, an organ-tellurium complex was synthesized and diluted to low concentrations in liquid scintillator. Then, samples were stored and monitored by ultraviolet-visible spectroscopy (UV-VIS), coincidence scintillation counter. The method of loading tellurium (Te) needs further optimization to confirm a long-term stability.

Application of NMR Spectroscopy to Investigate Fuel Cell

Ahmed T. Saeed
Mentor: Professor Eugene Mananga
Bronx Community College

Solid-State NMR spectroscopy is one of the widely used methods to investigate fuel cell electrolytes for energy applications. The use of fuel cell is becoming more important due to it been clean, quiet and highly efficient process and that is two to three times more efficient than fuel burning. Fuel cell also operates similarly to a battery, but it does not run down nor does it require charging and if fuel is supplied, a fuel cell will produce both energy and heat. Nuclear Magnetic Resonance (NMR) spectroscopy which is based on the measurement of
absorption of electromagnetic radiation in the radio-frequency region of roughly 4 to 900 MHz. To cause nuclei to develop the energy states required for absorption to occur, it is necessary to place the analyte in an intense magnetic field. To carry out this investigation, we used the Average Hamiltonian Theory which is a mathematical formalism that allow us to analyze how pulse sequences affect internal spin interactions [Haeberlen and Waugh, Phys. Rev. 175, 453 (1968)]. The result showed why Solid Oxide Fuel Cell (SOFC) is one the leading types of fuel cells that is not just clean, quiet and highly effective but also economical.

Guttman Community College

Poster A9

The Effects of Brewing Temperature on the Available Total Antioxidants in Green Tea

Gabrielle Blevins, Christopher Utate

Mentor: Professor Chulsung Kim
Guttman Community College

Green Tea is a well-known high antioxidant drink. The research investigated the effects of brewing temperature on the amount of available antioxidants in the green tea. One gram of commercially available green tea was introduced to 100 mL of water at different temperatures. After a reaction period of four minutes, the total antioxidant capacity was determined using the Trolox Equivalent Antioxidant Capacity (TEAC) method at 735 nm with the Aquamate 8000 UV-Vis Spectrophotometer. Experimental results showed that the available total antioxidant capacity in the green tea solution depends on the brewing temperature. The TEAC value of the green tea prepared at the boiling temperature (970 μmole of Trolox gram of green tea) is approximately four times more antioxidants than that prepared at a water temperature just above freezing (250 μmole of Trolox gram of green tea). According to the experimental data, when the brewing temp is increased, the TEAC value increases at the rate of about 7 μmole of Trolox gram of green tea × °C.

Poster A10

The effects of surface oxidation of untoasted green bean coffees on the hexavalent chromium reduction

Billy Corporan

Mentor: Professor Chulsung Kim
Guttman Community College

Three different green coffee beans including Ethiopian, Mexican, and Columbian Coffee were used to study the capacity of hexavalent chromium [Cr(VI)] reduction. Two grams of coffee were introduced into the 50mL of 40 mg/L Cr(VI) solution and the amount of Cr(VI) in the solution was determined as a function of reaction time. Diphenylcarbazide method was used to determine the Cr(VI) concentration at 540 nm using the Aquamate 8000 UV-Vis Spectrophotometer. Experimental data showed that it was not successful to observe any Cr(VI) reduction in the presence of unground green bean coffee with the mass ratio of bean to Cr(VI) as high as 5,000. When fresh ground bean was applied for the Cr(VI) reduction, some of the Cr(VI) disappeared within 30 minutes which was significantly lower than that for black coffee. The experimental data also confirmed that when the surface of the green bean coffee is oxidized for a four-week period to air, the effectiveness of Cr(VI) reduction is significantly diminished indicating that the rate of green bean coffee surface oxidation rate is strongly related to the available electron donors to reduce Cr(VI) in the solution.
**Drone Applications in Ecosystem Science**

Marcos Fermin  
Mentor: Professor Derek Tesser  
Guttman Community College

A comprehensive understanding of our dynamic planet requires the ability to ascertain information at the ecosystem level. However, traditional methods of data collection in earth science, such as earth observation satellites and in situ collection, are limited in their temporal and spatial resolution. Unnamed Aerial Vehicles (UAV or drones) provide a novel approach to study earth and environmental science at the ecosystem scale, though much of this technology in remote sensing remains experimental and not yet operational. The aim of this research is to evaluate the efficiency of drones in increasing the understanding of terrestrial ecosystem science by collecting areal information in the optical and radio regions of the electromagnetic spectrum. Initial designs for the UAV were provided by Jet Propulsion Laboratory (JPL). Parts were assembled and a flight navigation board was programmed to optimize drone flight and data collection capabilities. Optical scenes were collected at CCNY and at the Itapoa Reserve in Ecuador and video quality was assessed for image stability. It was found that optical video produced a “jello” effect that was minimized by installation of shock dampeners. Converting optical video to still images also improved the ability to make temporal comparisons between different scenes. Overall, UAVs present a novel method to collect high density temporal and spatial data in a variety of terrestrial ecosystems. Furthermore, the flexibility of UAV designs allows for optimization of data collection in several regions of the electromagnetic spectrum to monitor terrestrial vegetation and hydrological processes. Future work will focus on developing UAV infrared and microwave remote sensing capabilities using GPS reflectometry.

**Building Virtual Reality Models of Human Body Organs for Teaching Human Biology**

Anderson German  
Mentors: Professors Jinzhong Niu and Karla Fuller  
Guttman Community College

Physical organ models have been used in human biology classrooms to help students understand the structure and function of human body organs. However, physical organ models are expensive, which makes them not conveniently accessible to each individual student. This project aims to develop a mobile app allowing students to browse VR models of human body organs on their mobile devices. We use a structure sensor to acquire the VR models and build them into mobile apps on the Unreal Engine platform. With the ubiquity of smartphones, we believe that this work will benefit students in human biology classes at our college, across the CUNY campuses, and beyond.

**Stereotyping Among Young Adults In Health Facilities**

Mentor: Shenice Greene  
Mentor: Professor Kristina Baines  
Guttman Community College

Stereotyping that occurs daily has tremendous effect on individuals and communities. Research has shown that positive or negative stereotypes cause damage to self esteem, especially in young adults. This study was conducted to investigate the stereotyping of young adults, the highest uninsured population, in health facilities in order to examine if potential stereotyping affects health care choices. Preliminary findings from 20 surveys showed that
60% young people reported experiencing being stereotyped by an employee within a health facility, and that the experience changed their attitude towards their health. Additionally, these findings support ideas that young adults are the highest uninsured population in part because of stereotyping that takes place within health facilities. Further research on this topic can help bring awareness and change, to help more young adults become insured and more proactive in regards to their health.

**Poster A14**

**Using a microbial evolution and growth arena (MEGA)-plate to visualize evolving microbial resistance**

Anaisa Hernandez

Mentor: Professor Karla Fuller
Guttman Community College

According to the CDC, about 30% of prescribed antibiotics given to patients are unnecessary as they are prescribed mainly to treat illnesses caused by viruses, such as the common cold or minor ear infections. By over-prescribing antibiotics, microbes can become resistant to antibiotics, thus making them more likely to cause infections that cannot be treated by standard antibiotic regimens. In this project, we hope to demonstrate how these mutations happen. By creating a visual simulation of development of antibiotic resistance in common bacteria, we hope to draw attention to this common, and sometimes harmful medical practice. We hypothesize that using carefully calculated dosages of antibiotic, beginning with the maximum dosage needed to eradicate bacterial strains, we can successfully demonstrate how these mutations occur in real-time.

By providing a visual representation of microbial resistance to antibiotics using Escherichia, we intend to bring awareness to the effects of the misuse and overuse of commonly prescribed medications that treat these infections and hope to influence positive changes in community health practices.

**Poster A15**

**Data Mining Using Selfies from Flickr**

Tahir Mitchell and Yahdira Ixcoy

Mentor: Professor Jinzhong Niu
Guttman Community College

The purpose of this research is to collect selfie images from Flickr photo sharing website, quantitatively evaluate facial gestures exhibited in the images, and explore possible correlations between the evaluation and demographic information associated with people in the images. For instance, we aim to find out whether selfies taken from different geographical locations can be an indicator to tell if the people at one place are happier or sadder than those at other parts of the world. Indeed, our work aims to replicate part of the work done by Souza et al. [2015]. However, our work differs from theirs in the sense that we accomplish the whole procedure within a single webpage using JavaScript, making it accessible to virtually anyone online to use, while data collection and analysis in the work of Souza et al. [2015] were offline and their system is not available for others to use. More specifically, we create a website that first retrieves images through Flickr API that meets a user’s keyword criteria and are from the location they choose, then sends a request to face++ (a facial recognition web service) for evaluation in runtime, and finally calculates and displays the average on the webpage.
Application of ascorbic acid for the remediation of hexavalent chromium contaminated water

Erika Pacas

Mentor: Professor Chulsung Kim
Guttman Community College

Ascorbic acid was introduced to a hexavalent chromium [Cr(VI)] solution to investigate a potential reduction of Cr(VI). Varying amounts of 0.2M ascorbic acid solutions were added into a 100 mg/L Cr(VI) solution targeting an initial Cr(VI) solution of 50 mg/L. The initial concentration of ascorbic acid was in the range of 5mM–30mM, resulting in a mass ratio of ascorbic acid to Cr(VI) between 1.8 and 10.6. Experimental results showed that the addition of ascorbic acid instantly reduced the Cr(VI) significantly. More than 90% of the initial Cr(VI) disappeared within 1 minute in the presence of ascorbic acid. The hexavalent chromium reduction by ascorbic acid can be expressed as the overall second reaction order by 

\[
Rate = \frac{d[Cr(VI)]}{dt} = \frac{51.11 M^{-1}sec^{-1}[Cr(VI)]}{[Ascorbic Acid]},
\]

while it is first order reaction for each reactant, respectively. The experimental results confirmed that the application of ascorbic acid as a reducing agent is an effective, environmentally friendly method for remediating Cr(VI)-contaminated water with minimal secondary contamination.

Exercising the Effect of Oxidative Stress on Tetrahymena thermophila Sirtuins.

Emmanuel Adebola

Mentor: Professor Ralph Alcendor
Kingsborough Community College

Tetrahymena thermophila are free-living ciliate protozoa that can be found in fresh water around the world. Studying these cells has led to important findings such as mechanisms controlling cell cycle, and discovery of the structure of telomeres and telomerase. Oxidative stress is the imbalance between levels of free radicals and the ability of the body to neutralize these free radicals. High levels of OS can prevent proteins, DNA and other important molecules from functioning. Sirtuins are a family of proteins found in almost all living organisms. These proteins have been implicated in in a wide variety of cellular functions such as mitochondrial biogenesis, cell death and survival, and longevity. In other organisms these enzymes have been shown to function in regulation of OS. In Tetrahymena thermophila, the role of sirtuins in regulation of OS has not really been examined. This project aims to examine the effect of OS on Tetrahymena thermophila sirtuins. Cells were exposed to normal and starved conditions for 24-48 h. followed by cell death and mRNA analysis. Starvation led to reduction in cell number and metabolic activity. Compared to control, after 24 hrs, there was more than 75% reduction in metabolic activities. Furthermore, the expression levels of most sirtuins were significantly reduced after 24 to 48 h in starved conditions. Interestingly, compared to 24hrs in normal conditions, 48 h in normal conditions resulted in higher sirtuins expression levels. These results suggest that T. thermophila sirtuins may play a very different role in normal and starved conditions.
Wild Beer: Capture and Identification of Wort Fermenting Microbes

Sherie Alexis

Mentor: Professor Elizabeth Mulligan
Kingsborough Community College

The fermentation of beer has been documented dating back to the ancient Egyptians. In ancient times beer was fermented using open fermentation, and this process, while less popular, is still used today by both commercial brewers and home brewers. Yeast, a single celled fungus, found in air, soil, and water is the most common utilized microorganism for the production of fermented beverages, however, several bacteria can be used to augment this process. The purpose of this study was twofold. First to capture wild microbes capable of beer fermentation, on the Kingsborough campus, and second to determine the species of the yeasts captured using molecular biology techniques. Wort was prepared, placed along the sea wall at Kingsborough Community College, in sanitized jars with cheese cloth covers, for 16-24 hours. After collection, from the sea wall, the wort was allowed to ferment in the jars for one week with a one way gas release valve at room temperature. After fermentation, single colonies were isolated and evaluated using restriction fragment length polymorphism (RFLP). We successfully captured different microbes in our samples and were able to preliminarily identify both bacteria and yeast based on plate appearance and Gram staining. The initial attempts to definitively identify individual species using RFLP have been inconclusive due to an inability to get the basepair resolution needed to utilize published tables of RFLP fragments for microbes associated with beverage fermentation.

Tumor specific molecular mechanisms of RNA binding protein RNPC1a

Demetra Anastasiadis

Mentor: Professor Emral Devany
Kingsborough Community College

Based on several types of research it is well-known that different cancer types have various molecular mechanisms. The specific targets in different cancer subtypes should be identified in order to ensure a proper diagnosis and treatment. RNA binding proteins are involved in gene regulation; and cancer progression acting as tumor suppressors and/or oncogenes. This project focuses on mRNA binding proteins RNPC1a. Interestingly, RNPC1a acts as a tumor suppressor in high invasive breast cancer and as an oncogene in other cancer types. We hypothesized that RNPC1a interacts with different proteins in different cancer types, hence exhibits different roles. We prepared whole cell extracts from different types of cancer cells: Hela (cervical cancer), HCT116 (colon cancer), HTB26 (high invasive breast cancer) and MCF7 (low invasive breast cancer). We performed co-immunoprecipitation using RNPC1a antibody. We then performed Western Blot analysis to compare and determine cancer type specific interactors of RNPC1a. Our results suggest that RNPC1a interacts with HuR only in HCT116 cells but not in others. RNPC1a also interacts with PARN deadenylase in both of the breast cancer cell lines used in this study. Further analysis of interactions of RNPC1a will contribute to understanding of tumor specific molecular mechanisms, which is essential for both proper diagnosis and effective treatment.
Towards Helical Molecular Structures

Michelle Barrie

Mentors: Professors Homar Barcena and Aleksandr Gorbenko
Kingsborough Community College

The goal of this project is to synthesize 2,3-di(9H-fluoren-9-ylidene) succinic acid and its ester, dimethyl 2,3-di(9H-fluoren-9-ylidene) succinate. Subsequently, the ester will be tested for Krapcho decarboxylation. In addition, the optimum experimental conditions will be determined by running the reaction with a variety of solvents, halides, and temperature. The product will then be verified through thin layer chromatography (TLC), mass spectroscopy (MS), infrared (IR) spectroscopy, and proton and carbon nuclear magnetic resonance (NMR) spectroscopy.

Constraining the origin of arsenic contaminating the groundwater in the black shales of the Triassic Lockatong Formation, Newark basin

Yoana Boleaga

Mentor: Professor Larbi Rddad
Kingsborough Community College

This research project investigates the source of arsenic contaminating the groundwater of the Newark basin. Organic matter rich-Black shales of the Triassic Lockatong Formation is a fair to good source rock (Total Organic Carbon ~ 1.2%) and is over-mature (Tmax = 506 – 547 °C) [1]. Previous research indicates that black shales contain up to 34 ppm [2]. Given the fact that the Lockatong Formation has a low permeability, arsenic associated to black shales cannot be leached easily by the flowing groundwater. Because of the over-maturity of the black shale, we hypothesize that arsenic, initially linked to organic matter, was expelled from black shales due to thermal catagenesis and subsequently incorporated into hydrocarbons (bitumen). The latter occur in small crack within black shales and was formed as a result of organic matter catagenesis.

This study aims at analyzing arsenic in these bitumen veins to confirm that they are rich in arsenic. To that end, arsenic will be analyzed in these bitumen veins. If this hypothesis is confirmed, bitumen veins would be considered as a potential source of arsenic contaminating the groundwater of the Newark basin.

Colorimetric Determination of Ammonium in Solution and Measuring pH of Soils

Minhua Cao

Mentor: Professor Patrick Lloyd
Kingsborough Community College

Ammonium is one of the nitrogen sources for plants. Nitrogen contributes to the formation of amino acids and proteins. The amount of ammonium that each plant needs is determined by the ratio of ammonium/nitrate. When the plants absorb ammonium (NH₄⁺) a proton (H⁺) is released into the soil around the root, this decreases the pH of the soil around the plant. The pH can also affect in the solubility of nutrients and minerals in the soil. The nutrients and minerals must be dissolved to the plants absorb them. The method used for the ammonium determination is usually called “the indophenol blue method.” This method consists in the reaction between NH₄⁺, present in the soil solution, with phenate in an alkaline solution that produce an indophenol blue color in the presence of hypochlorite and sodium nitroferricyanide. The pH method we used consists in the dissolution of the soil in water, a ratio of 1:1. The samples are centrifuged for half an hour in the centrifuge and then have the pH measured by the pH meter, a glass pH electrode. This research aims to find an accessible and reliable way for urban
farmers and gardeners to determinate the pH level and the ammonium concentration in different soils to improve the growing quality of the plants.

Poster A23

**Are you really eating chicken? – Authentication of chicken products found in Supermarkets**

Ashley Civil

Mentor: Professor Azure Faucette
Kingsborough Community College

Obesity is associated with health risks, such as heart disease, stroke and type 2 diabetes. The prevalence of obesity in the United States has increased over the past 15 years.[1] This increase has made people more aware of what they eat (example: fat-free, lean meats/protein sources organic vs non-organic, genetically modified organism (GMO) vs. non-GMO). Soybean, along with wheat gluten, is often texturized and added to meat products as an extender.[2] This provides an economical, functional, high protein ingredient. The search for healthiest foods can sometime pose a risk for families with children with food born allergies.[3] Therefore, the objective of the project is to detect soybean in commercially sold chicken products by using PCR. Samples were selected based on ingredients found on the packaging. In addition, samples were selected to cover products consumed by a wide variety of socio-economic classes. Samples that listed soybean protein as an ingredient were excluded. Specific primers were selected to amplify small fragments of DNA for 12S rRNA (chicken, 183 bp) and lectin (soybean, 100bp). By testing a variety of chicken based meal, we are hoping identify mislabeled products.

Poster A24

**No-Mmonia Sewage Kings**

Alex Dean, Jessica Zhao, Julian Zhao, Wendy Zhao

Mentor: Professor Devin Camenares
Kingsborough Community College

Even though wastewater facilities use a combined biological-chemical treatment to remove excess nitrogenous compounds, an abundance of nitrogenous waste is still released into local waters, typically as urea and ammonia. The waste has the potential to harm marine and avian life due to direct deterioration of marshland roots and indirect hypoxia of the water they inhabit. The anaerobic ammonia oxidation, also known as the anammox pathway, combines ammonia and nitrate to produce nitrogen gas and water. The goal of this project is to import the enzymes needed for the anammox pathway into *Escherichia coli*, so that *E. coli* can carry out the reaction without oxygen. The idea is to incorporate our transformed bacteria into wastewater treatment plants to more effectively degrade excess nitrogen waste in water.

Poster A25

**Gold, Are We Suspended?: The Behavior of Gold Nanoparticles in the Environment**

Jessica Delph, Sara Sobolewska

Mentor: Professor Deborah Berhanu
Kingsborough Community College

Nanoparticles are particles measuring between 1 and 100 nanometers. They can be the result of natural phenomena, such as volcanoes, or they can be man-made. A single nanoparticle consists of atoms that are covalently bound together but have been prevented from growing further. The size constriction confers new properties to a given material. We can develop further concrete decisions about what particles can do on the grandest of scales
through the means of chemical applications. The physical and chemical properties of nanoparticles are distinctly different from larger particles with the same chemical composition. Nanoparticles may have various sizes and shapes, depending on the synthetic procedure and ligands that are used to stop their growth. The study of gold and silver nanoparticles in particular has provided imperative information, though mostly almost all stable metal elements on the table can be appropriated into nanoparticles. The gold and silver particles, when chemically observed, have shown us certain properties that can help develop a new field of science: nanotechnology. Its practical applications vary, from building materials to cosmetology, modern day drugs and antibodies, and modern therapies for cancers.

This study focuses on gold nanoparticles and their behavior in natural environments. Gold has a unique yellow color and is chemically stable, with a high redox potential. The confinement of the surface electrons in gold nanoparticles changes how it interacts with electromagnetic waves. Gold nanoparticles are red and have a high ratio of surface atoms, which makes them much more reactive.

The aim of this project is to study how nanoparticles behave in environments different from the one they were synthesized in. This project assesses the stability of gold nanoparticles in aqueous solutions with various ionic compositions. The experiments were carried out in sodium chloride, magnesium chloride, potassium chloride and calcium chloride solutions. The aim is to understand the behavior of nanoparticles once they are released into aquatic environments, such as lakes and seas.

**Poster A26**

**Solutions to the Schrödinger Equation**

Mousslim El Gada

Mentor: Professor Richard Garavuso
Kingsborough Community College

Solutions to the Schrödinger equation

\[ i\hbar \frac{\partial \Psi}{\partial t} = \hat{H}\Psi \quad (1) \]

are known for various quantum systems. Here, \( \hat{H} \) is the Hamiltonian operator and \( \Psi \) is the wave-function. When \( \hat{H} \) is time-independent, (1) reduces to the time-independent Schrödinger equation

\[ \hat{H}\Psi = E\Psi , \quad \Psi = \psi e^{-iEt/\hbar} , \]

where \( E \) is the energy eigenvalue of \( \Psi \) and the function \( \psi \) is time-independent. We will consider the one-dimensional harmonic oscillator, which has

\[ \hat{H} = -\frac{\hbar^2}{2m} \frac{d^2}{dx^2} + \frac{1}{2} m\omega^2 x^2 . \]

This system is known to have wave-functions

\[ \psi_n(x) = \left( \frac{m\omega}{\pi\hbar} \right)^\frac{1}{4} \frac{1}{\sqrt{2^n n!}} H_n(\xi) e^{-\xi^2/2} , \quad \xi \equiv \sqrt{\frac{m\omega}{\hbar}} x, \]

and corresponding energy eigenvalues

\[ E_n = (n + \frac{1}{2}) \hbar \omega , \]

where \( n = 0, 1, 2, \ldots \) and \( H_n(\xi) \) are the Hermite polynomials

\[ H_0 = 1, \quad H_1 = 2\xi, \quad H_2 = 4\xi^2 - 2, \quad H_3 = 8\xi^3 - 12\xi, \quad H_4 = 16\xi^4 - 48\xi^2 + 12, \quad H_5 = 32\xi^5 - 160\xi^3 + 120\xi, \ldots . \]

Next, the Hamiltonian operator will be perturbed by an extra potential term \( ax^3 \), where \( a \) is small. We
will then use time-independent perturbation theory to calculate the change in the ground state energy to second order.

**Poster A27**

**The effect of circularization on the stability and translation of prokaryotic mRNAs**

Tammy Flores

Mentor: Professor Devin Camenares
Kingsborough Community College

A common property of an RNA molecule would be its linear nature, but what does this mean? There are definite 5’ and 3’ ends, and these free ends allow degradation by exonuclease complexes. The reading frame is also linear, requiring initiation and termination for every translation event by a ribosome. Since the linear ends of an mRNA contributes to the regulation of its expression, a circularized mRNA(cmRNA) should exhibit an altered pattern of stability and expression. Circularization in vivo is more appropriate towards determining the stability and translation of such an mRNA. This can be accomplished by using a split version of a self-splicing group I intron. The cmRNAs produced by this method have been suggested to have increased stability, as would be expected due to the lack of access that is granted to exonucleases. This is aimed at determining how the linear property of an mRNA influences several aspects of the post-transcriptional control of gene expression. Towards this end, I will aim to obtain a more efficient method for production of cmRNA in vivo through directed evolution. The stability of cmRNAs, compared to the endogenous linear mRNAs, will be investigated to determine more precisely the differences in the degradation pathways. This analysis will also provide a means of testing the influence of the 5’ end of an RNA on RNase E in vivo that does not involve changes or mutation to the enzyme itself. The dynamics of translation for cmRNAs and mRNAs can be compared in a way not explored before. The ability of each form of mRNA to synthesize protein will be compared directly by removing the problems associated with infinite reading frames while preserving their advantage. The work proposed here will investigate these properties of cmRNAs in a more throughout and comprehensive manner than previous studies, and will hopefully lead to the development of more efficient means of RNA circularization. These two potential advances are not only of academic interest, but may be utilized by synthetic biologists interested in programming novel cellular behaviors or producing a large quantity of repetitive proteins.

**Poster A28**

**Statistical Analysis of Kingsborough Community College Avian Inventory**

Monique Fungkhee

Mentor: Professor Mary Theresa Ortiz
Kingsborough Community College

In the fall of 2013 an ongoing research project began at Kingsborough Community College (KCC) to identify and catalog the bird species at the campus and its environs to determine any ecological implications these populations may indicate. To date, 29 species of birds have been identified at KCC. Counts of these birds have been done, however, statistical analysis of the data has not been completed. In this project, statistical analysis of the data commenced. In previous studies, totals for these species at each of three locations on the KCC campus (Sheepshead Bay, Jamaica Bay, Rockaway Inlet) were calculated. However, repetition of birds had not been considered when these totals were ascertained. To determine a more realistic bird count, average numbers over time had to be considered. In addition, inferential analysis of the data must be performed. Despite the limitations of the previous studies, it has been determined that, of the 29-species identified, the five most populous are: Herring Gull, Brandt Goose, Great Black Back
Gull, Mute Swan and Great Cormorant. For this study, we did descriptive statistical analysis (mean and standard deviation for a sample) of the all the data and the Herring Gull data recorded by the BIO21 – Comparative Anatomy classes in 2013, 2014, 2015 and 2016. The Herring Gull data were analyzed because this is the most populous bird at KCC.

**Poster A29**

**Identifying Nematodes to Predict Floral Health**

Michael Hanna

Mentors: Professors Marie McGovern and David Michaelson
Kingsborough Community College

The Brooklyn Botanical Garden (BBG) uses organic practices to maintain the health of their gardens including the introduction of nematode worms to manage beetles, gnats, and other pests. Analysis of the soil ecosystem of the BBG is necessary to judge the effectiveness of these techniques. We hypothesize that identification of the nematode species present in the soil over time can be used to predict the health of the plants growing in that soil, particularly in relation to the persistence of nematodes introduced specifically to control pests.

Using Barcoding we identified three species of nematode, *Plectus minimus, Acrobeleoides apiculatus*, and tentatively a member of the *Protorhabditus* genus. However, these species are unlikely to be introduced to control pests based on the commercially available nematodes (*Heterorhabditus bacteriophora, Steinernema carpocapsae*, and *Steinernema feltiae*).

With more investigation, this could indicate the application of nematodes to control pests in organic agriculture is in need of more research. The role of the three species we found were potentially beneficial. Some were unclear. We will continue to work with the BBG to determine the role of these nematodes.

**Poster A30**

**Growing of human praedipocytes in vitro**

Sophia Maltsev

Mentor: Professor Sarwar Jahangir
Kingsborough Community College

Stem cell research is a newly developing field in science and medicine which promises highly advanced perspectives on various disease treatments, drug testing and tissue repair abilities. Previous stem cell studies have revealed that stem cell therapies could be the basis for personalized diabetes treatments, or a potential cure in a case of a damaged heart tissue. Moreover, the utilization of stem cells in the development and testing of new drugs is yet another large upheaval that is already serving scientists to extendly understand what might be the causes for hardly treated diseases such as cancer. Therefore, continuous study and understanding of the basic cell culture technique is essential for further research development and the fundamental learning of the many innovative approaches being used in stem cell growing. The cells that were chosen to be grown and examined in this project are preadipocyte cells which are the precursors of mature adipocyte (fat cells) in our body and are continuously present in the adipose tissue. This tissue is crucial for energy storage and metabolic homeostasis. An increase in fat tissue can be attributed to either an enlargement of mature adipocytes or the differentiation of preadipocytes into mature adipocyte cells. The differentiation process is controlled by a variety of growth factors and hormonal presence which makes undifferentiated preadipocytes a very suitable choice for investigation purposes of the physiological mechanism controlling proliferation, differentiation and function of adipose tissue.
Identifying Nematodes, Annelids and Fungi to Predict Floral Health

Serena McDaniel, Michael Hanna, Shayla Trotman

Mentors: Professors David Michaelson and Marie McGovern
Kingsborough Community College

The Brooklyn Botanical Garden (BBG) uses organic practices to maintain the health of their gardens, including the introduction of nematode worms to manage beetles, gnats, and other pests. Analysis of the soil ecosystem of the BBG is necessary to judge the effectiveness of these techniques. We hypothesize that identification of the nematode, annelid, and fungal species present in the soil over time can be used to predict the health of the plants growing in that soil, particularly in relation to the persistence of nematodes and other organisms introduced specifically to control pests.

Using Barcoding we identified three nematode species in soil samples from the temperate zone, one annelid species in soil samples from the tropical zone and 3 fungal species present in soil samples from the temperate zone, one of which was also in the tropic zone at the Brooklyn Botanical Garden. The role of some of these organisms we isolated was potentially beneficial where the soil of others is still unclear. We will continue to work with the Brooklyn Botanical Gardens to determine the role of these organisms.

Introducing Bioluminescence in Abies fraseri using pCAMBIA1304 via Electroporation and Agrobacterium tumeficiens LBA4404 by Incision

Jason Meyer

Mentor: Professor Sarwar Jahangir
Kingsborough Community college

We have obtained commercially available fraser fir seeds from treeseed.com in September 2016, The seeds were cold stratified at 40˚C for 14 days. The seeds get selected at random and are sterilized with a solution of 8.5% NaOCl and 0.1% Triton-X100. The seeds get transferred into sterile petri dish was sterile deionized distilled water. The seeds are incubated on a windowsill in direct sunlight for 3 weeks. We have noted that the fraser fir seeds germinate at about a 60% chance. During the germination process, we will grow our pCAMBIA1304 in an E. coli vector in LB overnight and use the wizard midiprep system from ThermoFisher to extract the plasmid. The plasmid sample will be tested for its protein/gene ratio using spectrophotometry. When the reading says it is at 1.8 up to 2.0, we proceed to electroporation. We have obtained cells of Agrobacterium tumeficiens LBA4404 from ThermoFisher. From a previous experiment, we were able to electroporate pBI121 into the cells at 2.0kV with 4 pulses at 150 µs with an interval of 250 ms. We will do this again with the pCAMBIA1304. In an aseptic environment, we will be testing to see if the A. tumeficiens will be able to infect the seedling without using plant cell culture. To do this, we will add acetosyringone to a sterile plate, 10 µl of transformed A. tumeficiens cells and the seedling of a 4 week germinated Abies fraseri seedling. To get the seedling to be accepting to the transformation, we will make a cross section incision of the tip of the plant’s shoot so interior cells will be exposed to the treatment. The plant will be put back into a sterile petri dish and allowed to heal for a week. My hypothesis is that the cells exposed to the treatment will be carrying the GFP
gene from pCAMBIA1304 and will continue to grow into a full plant that expresses the gene only above the incision.

Poster A33

Armomatic Nitratin for Quantifying Nitrat in Soils

Deira Morales

Mentor: Professor Patrick Lloyd
Kingsborough Community College

Nitrogen is a very important nutrient for plants. In soil there are various forms of nitrogen: nitrate(\(\text{NO}_3^-\)), ammonium(\(\text{NH}_4^+\)), nitrite(\(\text{NO}_2^-\)) and atmospheric(\(\text{N}_2\)). Nitrogen is an essential element because it builds blocks of proteins for the soil. Nitrogen also compromises most of the earth’s atmosphere (78%).

Nitrate is a specific form of nitrogen in soil which exist in solution that in some cases can precipitate as a salt. It serves as a nutrient helping the immune system and tissue development. Is also very important in the growth and survival of plants. It helps plants to produce seeds.

Methods for determining nitrate in soils are salicylic acid nitration, colorimetric test, uv-vis spectrophotometry and others. Nitratin of salicylic acid is a sensitive and specific method for determining nitrate levels in soils. This method is the one I am using in my research. It works by producing 5-nitrosalicylic acid, a strong absorber in the visible range of the electromagnetic spectrum.

Phosphate is a form of phosphorus in soil which is added to fertilizer. The purpose of phosphate in soil is to develop new tissue and is also important in the division of cells. Phosphorus helps in the maturity of plants and the formation of grain. Plants uses phosphorus a energy transfer, transformations of sugars into strarches and as a nutrient movement with in each other.

Poster A34

High-Temp superconductors using T-J models

Sunil Rajkumar

Mentor: Professor Jay Mancini
Kingsborough Community College

Superconductors conduct electricity without resistance. However to reach superconductivity we must lower the temperature of materials to at most 40 kelvin (-233 °C). Using AMX, CMX, Lanczos and Lanczos II we approximate the ground state energy of a chain of six electrons. Doing this is pertinent in finding the arrangement of electrons and holes, up spins and down spins to give the lowest possible energy. Minimizing the energy in this way optimizes the production of high-temperature superconductors.

Poster A35

Transferring and Growing Carrot With Luciferin Sulfotransferase Gene In Vitro

Ivan Rudichenko

Mentor: Professor Sarwar Jahangir
Kingsborough Community College

In order to develop a transgenic carrot with luciferin sulfotransferase gene (LSG), I have to develop a microbe that can transfer the LSG into carrot cells. We obtained SulfoLuciferin gene (pJKW 0693), containing LSG, from Addgene, and Agrobacterium tumefacients L4404 from Fisher Scientific and pCAMBIA from our previous collections in the lab. The plasmid, pJKW 0693, will be digested with EcoR1 and Bgl2 to separate the LSG fragment from the plasmid. The LSG fragment will be made blunt ended with DNase1 and ligated with EcoR1 adapters using T4 DNA ligase. I will grow Escherichia coli...
(E.coli) cells containing pCAMBIA and isolate pCAMBIA using Wizard Mini preps. The pCAMBIA will be digested with EcoR1 to be followed by adding LSG fragment containing EcoR1 adapter and ligating them together with T4 DNA ligase. The recombined plasmid will be called pCAMBIA-LSG. The Agrobacterium tumefacients will be grown along with carrot stem cells for the LSG fragment to transfer into cells. The carrot cells will from a callus followed by forming a carrot through differentiation.

Poster A36

Proteomics Investigations of Distyly using Primula vulgaris: A Protein Quantification Study

Randal Tam

Mentor: Professor Farshad Tamari
Kingsborough Community College

Primula vulgaris is an angiosperm species belonging to the Primulaceae family of plants. It is distylos, with a reciprocal positioning of the male and female reproductive organs. Short-styled plants (shorts) have short styles and long stamens and long-styled plants (longs) have long styles and short stamens. Distyly plants are typically self- and intra-morph incompatible. Previous studies have shown molecular differences between shorts and longs in distyly species belonging to another plant family (Turneraceae), where two proteins, Polygalacturonase and α-dioxygenase were identified as candidate proteins contributing to distyly and/or self-incompatibility. The genetics of distyly and self-incompatibility in Primula is well known, however, the molecular aspects of this interesting breeding system has not been investigated.

The goal of this project is to initiate a molecular investigation of distyly and self-incompatibility in Primula by quantifying and comparing protein concentrations in different tissues of short- vs long-styled plants. We hypothesize that there is tissue-specific variation in protein concentrations but not morph-specific ones. To test our hypothesis, we extracted proteins from short- and long-styled plants and quantified proteins in each tissue using the Bradford assay. One Way Analysis of Variance (ANOVA) with post-hoc pairwise comparisons were used for statistical analyses. Our results indicate that as expected there are tissues-specific protein differences, with short and long anthers having the greatest amounts of proteins (7.9 and 7.2 µg/µL, respectively). These are statistically different when compared to all other tissues, which were ovaries, styles and sepals, all of which had < 1.6 µg/µL of proteins. There were no statistical differences when comparing ovaries, styles and sepals. Also as expected, there were no instances of statistical morph-specific difference for any of the tissues investigated. This study will pave the way to a more detailed investigation of protein profile difference between the morphs as was accomplished in the Turneraceae.

Poster A37

Tumor Specific mRNA targets of RNPC1a

Emmanuela Tanis

Mentor: Professor Emral Devany
Kingsborough Community College

Gene expression, a multistep regulated process, responds to complex environmental changes by expressing the appropriate genes when needed. Abnormalities throughout this process can lead to several diseases. Errors in the mRNA processing step of gene expression have also been associated with human disease, one of which is cancer. The focus of this investigation is to determine the tumor specific molecular mechanisms of RNA binding protein RNPC1a. RNPC1a, plays a vital role in posttranscriptional control of gene expression by regulating important mRNA targets, such as p53, p21, MIC1 and HuR mRNAs, that have anti-tumor and/or cell cycle arrest functions. Interestingly, RNPC1a was reported to act as a tumor suppressor in high invasive breast cancer and as an oncogene in
several other cancer types, for example in low-invasive breast cancer. In this project, we investigated cancer specific effects of RNPC1a through its target mRNAs. To adequately portray these molecular interactions, mRNA was extracted and using the qRT-PCR technique, levels of RNPC1a mRNA and target mRNAs were detected. Our results suggest that RNPC1a mRNA is expressed differently in different cancer cell lines used in this study. Consequently levels of the two targets we investigated (p21 and HuR) were different in different cells. In order to determine effects of UV-induced DNA damage we also treated cell lines with UV. As expected UV induced levels of RNPC1a mRNA and the target mRNAs included in this study. Further studies will focus on other known targets of RNPC1a to identify tumor specific targets and their effects on disease. Identifying tumor specific targets of RNPC1a in turn will contribute to the diagnosis and treatment of different cancer types.

**Poster A38**

**Ground-State of the Dimerized 1D Heisenberg Model with Next Nearest Neighbor Interaction**

Mei Wai Tsui

Mentor: Professor Jay Mancini
Kingsborough Community College

The theoretical nature of the non-magnetic phases of a quantum antiferromagnet is a topic of great interest due to its possible connections with the mechanism of high-temperature superconductivity.

The Heisenberg model forms a realistic model of magnetic systems by treating the spins, specifically those of electrons in this study, quantum-mechanically, using the quantum operator $\sigma$ (Pauli spin-$\frac{1}{2}$ matrices at spin $\frac{1}{2}$), and the coupling constants $J$.

The one-dimensional antiferromagnetic spin $\frac{1}{2}$ Heisenberg model was first developed over eighty years ago and has been the focus of innumerable theoretical studies. A well-known variant of the model includes explicit dimerization. The quantum dimer model was introduced as an effective theory for excitations above paramagnetic ground states of quantum antiferromagnets.

In quantum mechanics, the Hamiltonian is the total energy operator corresponding to the sum of the kinetic and potential energies of the particles associated with the system, whose eigenvalues yield the total energy of the system. For this study, the Hamiltonian is given by:

$$H = \sum_{l=1}^{2N-1} \left( 1 - (-1)^l \delta \right) \vec{S}_l \cdot \vec{S}_{l+1} + J_2 \sum_{l=1}^{2N-2} \vec{S}_l \cdot \vec{S}_{l+2}$$

Where $J_1$ is the nearest neighbor interaction (here we take $J_1 = 1$), $\delta (0 \leq \delta \leq 1)$ is the dimerization and $J_2 (0 \leq J_2 \leq 2)$ is the next-nearest neighbor interaction.

Here we shall apply a Lanczos matrix truncation to study the ground-state energy, the binding energy between holes, as well as the energy gap.

**New York City College of Technology**

**Poster A39**

**Effect of infiltration through building entrance doors on indoor environment**

Lev Chesnov, Javonne Senior, and Sam Cui

Mentor: Professor Daeho Kang
New York College of Technology

Saving energy in buildings is of vital importance since buildings sector is a major contributor to the global carbon footprint. While many studies have focused on infiltration through the building envelope, influences of air flow through entrance doors have not been well studied. Our research is to compare the variation of indoor environment due to infiltration through building entrance doors in lobby areas at two City Tech buildings. It monitored outdoor weather and the indoor environment in the lobby areas in the Environmental building with swing doors and
Voorhees building with a vestibule consisting of sets of double swing doors on a winter day. It analyzed the data collected to see the variation of the indoor thermal environment in the two buildings along with the time series of entrance door openings. It presents the results of the measurements and compares the results between the two buildings. The results show that the indoor thermal environment in the lobby area significantly varies and the variation in the Environmental building, which has a set of swing door, is more significant. Monitor of seasonal variation and quantification of heat flows through entrance doors are needed to analyze energy implication of the air flows.

Poster A40

A Study of Cultural Competence and Implicit Bias Amongst Healthcare Students

Natalia Dembowska, Jerry Strklja

Mentors: Professors Zoya Vinokur and Elaine Leinung
New York City College of Technology

Cultural competence is defined as the ability of providers and organizations to effectively deliver equitable and unbiased health care that meet the social, cultural, and linguistic needs of a culturally diverse patient body. By 2050, minority populations will increase to 48 percent of the U.S. population and Hispanics will represent 24.4 percent of the total population (U.S. Census, 2010). This demographic shift brings challenges and opportunities to universities and organizations alike to create policies and curriculums that foster quality health care amongst students, while also contributing to the eradication of implicit biases that may unwittingly perpetuate healthcare disparities amongst racial and ethnic minority groups. Our research looks to answer the critical question of whether or not health care students are adequately prepared by their universities to deliver healthcare services that are culturally competent and sensitive? Are students aware of the importance of implicit biases and what measures can be taken on an institutional level to ensure that healthcare students are adequately prepared to deliver equitable healthcare to all minority groups. This study looks to gauge the understanding of cultural competence amongst a group of City Tech healthcare students by utilizing a cross-cultural survey of cultural competence questions dealing with poverty, age, stereotypes, illiteracy, homophobia, language, religion, and racism. Our data and research results suggest that many health care students are not able to properly define, nor fully implement cultural competence and sensitivity in their clinical settings. This data is significant because administrators and educators need to incorporate more learning strategies and relevant clinical training so that students may enter the work force better equipped to deliver the highest quality of care to all patients, regardless of race, ethnicity, cultural background, English proficiency or literacy.

Poster A41

Design of an Alternative 911 Mobile Communication System Concept

WeiJie Gao, Brian Taversas, Wen Yong Huang

Mentor: Professor Daniel Wong
New York City College of Technology

The 9-1-1 emergency system is an essential service to our society and plays a critical role in the process of resolving emergency situations. The system could improve its efficiency by upgrading the platform it works on using a system that takes advantage of the latest technologies. Improvements to the current 9-1-1 system could save more lives if efficiencies can be made. This project will define the existing 911 communication system inefficiencies and create a mobile app solution. It will offer new functions such as determining location passively using GPS, optimizing it for foreign language situations, make it convenient for people with disabilities, potentially increasing the response time.
The current 9-1-1 system does not fully incorporate the technologies many people use in their everyday life. Many people interact with their smartphones on a regular basis during the day. Communication can occur across the globe within seconds, which can allow for warning systems to activate in an event of a local and regional emergency.

Our preliminary research investigates the existing 9-1-1 system. We will interview and collect information from users, first responder, and dispatcher throughout the survey we created to see how the current system functions, and ask for recommendations from users—first responders, call centers, people in emergencies, government agencies—to determine where efficiencies can be improved immediately and making some changes to the current mobile app design screen we have.

Our research goal would result in the proposal of an alternative or additional system for aiding in emergency situations. Adoption of these concepts would potentially save lives, avoid personal and physical damage/destruction, and minimize risks to those whose job it is to aid those in need.

Poster A42

**Drug Delivery Tests for PDMS-based Scaffolds**

Maria Daniela Medina

Mentor: Professor Ozlem Yasar
The New York City College of Technology

Drug delivery plays an important role in cell growth within the engineered scaffolds to do tissue regeneration. In this project, PDMS based scaffolds were designed and fabricated by micro-printing at SET Research Laboratory at the department of Mechanical Engineering Technology. Then, the engineered scaffolds with different internal architecture designs were sandwiched between two glass slides to do drug delivery tests. Our results show that PDMS can easily be used for scaffold fabrication.

Poster A44

**Scaffold for Engineering Tissue**

Amalia Michel

Mentor: Professor Ozlem Yasar
New York City College of Technology

Drug delivery plays an important role in cell growth within the engineered scaffolds to do tissue regeneration. In this project, PEGDA based scaffolds are designed and fabricated by micro-printing at SET Research Laboratory at the Department of Mechanical Engineering Technology. Then, the engineered scaffolds with different internal architecture designs are sandwiched between two glass slides to do drug delivery tests. Our preliminary results show that internal architecture of PEGDA based scaffolds can be designed and fabricated for drug delivery tests.

Poster A43

**Infograms: Symbolic Graphics for Higher Order Cognitive Skills**

Rachel Ofer

Mentor: Professor Vasily Kolchenko
New York City College of Technology

Our research addresses the need for better understanding of cognitive processes in STEM learning. We optimize graphic abstraction in the innovative learning materials called Infograms and assess the effectiveness of the materials in the classroom. Infograms were developed at New York City College of Technology by Professor V. Kolchenko for BIO 2311 Anatomy and Physiology. They use graphic symbols, key words and abbreviations to generate meaningful narrative that has the potential to enhance learning. The Infogram is designed to promote and develop abstract, creative and critical thinking rather than rote memorization. It encourages students to use their imagination while recalling and visualizing the material. Our previous studies show that recalling is
a more efficient way of learning than rereading. Here, we explore various types of essential cognitive skills and strategies emphasizing the difference between deep and superficial cognition, and analyze students opinions and beliefs about them. We also improve current Infogram materials, formulate the methodology for the development of the instructional symbolic graphics and produce Infogram-based educational videos. We anticipate that this research may have a positive impact on educators who wish to improve their students’ cognitive skills and on students who are motivated to achieve better learning outcomes.

Poster A44

**Peer-Led Team Learning in Statics: The Impact of Collaborative Learning**

Karla Peña

Mentor: Professor Janet Liou-Mark  
College: New York City College of Technology

New York City College of Technology has adopted the Peer-Led Team Learning (PLTL) instructional model in a Statics course offered by the Department of Construction Management and Civil Engineering Technology. This study examined the differences between students who were enrolled in a PLTL workshop and those who were not. Factors that contributed to the success of the students enrolled in PLTL sections were identified. The data obtained from the Statics course was analyzed closely because the PLTL instructional model was implemented gradually. The study examined the final grade distribution analysis of the Statics course in three categories: no PLTL, non-mandatory PLTL, and mandatory PLTL. The classification depicted periods of the Statics course where PLTL was not offered at all, when it was an option, and when it officially became part of the curriculum. After examining the final grade distribution, results showed that the pass rates of the PLTL sections were statistically significantly higher when compared with the no PLTL and non-mandatory PLTL sections. Moreover, the withdrawal rates were statistically significantly lower for the PLTL sections than the other two sections.

Poster A45

**Gender Differences in Vagal Tone Adaptation in an Expressive Writing Paradigm**

Audrey Powell, Jelisa Watt, Jordan Jean-Pierre

Mentor: Professor Jean Hillstrom  
New York City College of Technology

Research shows that writing about traumatic or meaningful events is associated with improved health and well-being. We assessed the effects of a traumatic vs. meaning-making expressive writing format on autonomic nervous system function over time. Results indicate that heart rate and to a lesser degree, vagal tone, improved over time in both conditions but these results were moderated by gender. Men showed improvement in vagal tone for the traumatic condition, while women showed improvement in the meaning condition.

Poster A46

**XBee Wireless Sensor System**

Amelia Ramnauth, Rachel Alexander

Mentor: Professor Xin-Zhou Wei  
New York City College of Technology

Recently, privacy and information have been impacted widely. Hackers have been intercepting vital information which is a growing problem that needs extra attention. XBee applications can aid in protecting users’ privacy. XBee modules are very important to become acquainted with when learning the basic fundamentals of engineering. XBee and Arduino work hand in hand when it comes to creating wireless sensor systems. XBee is a wireless communication module that can be used to create wireless networks in any configuration. The objective of this research is to create a dedicated Wi-Fi network...
and transmit information over long distances rather than using internet service or 4G LTE service from another company. XBee modules are radio devices that use ZigBee or 802.15.4 protocol. It sends and receives data by the 2.4GHz at a relatively low power and can be used to set up simple point to point links. ZigBee is an IEEE 802.15.14 communication protocol used to create personal area networks with small low powered digital radios. ZigBee is simpler and less expensive than other wireless personal area networks such as Wi-Fi and Bluetooth. Its power transmits from 10-100 meters line of sight depending on power output and environment characteristics. It also provides a 128 bit encryption for data security. We have already configured the XBee modules on a PC and tested its capabilities. We also have conducted minor tests that ensure connection between two XBee modules. We are currently in the practice of ensuring the wireless connection for our network.

Poster A47

**High Performance Concrete**

Brandow Rojas

Mentor: Professor Navid Allahverdi
New York City College of Technology

High performance concrete (HPC) exceeds in durability and strength compared to regular concrete. The materials that make up HPC must be engineered to achieve certain specifications of durability for the requirements of the project. HPC is used in the construction of tunnels, bridges and tall buildings. One of the many examples is the One World Trade Center. The type of concrete used for the construction of the One WTC is called ICrete. The compressive strength of such concrete exceeds the 12,000 psi mark. In this research activity, application of HPC in structural design is investigated. Also, high performance concrete samples is designed and tested in the materials lab in the CMCE department.

Poster A48

**Water Filtration System**

Mohammed Ruhel Alif

Mentor: Professor Masato R. Nakamura
New York City College of Technology

By studying the fundamentals of a water filtration system, how can we design a zero-gallon water filter that would meet the key requirements of a functional water filter? What are the key requirements we are trying to meet (e.g.: particle size, flow rate)? How can the design meet the functional requirements? Also, by considering the manufacturing operation, what are the advance manufacturing processes and materials used to create the water filter? To observe the behavior of the water filtration system, CAD software will be used.

Poster A49

**Design of a Cell Phone Charging Exercise Bike**

Christo Sam and Utsab Dasrao

Mentor: Professor Angran Xiao
New York City College of Technology

In this project, the professor and students in Department of Mechanical Engineering Technology will design and build an excise bike that is able to power a set of cell phone chargers. The chargers will be powered by both a solar panel and the pedaling movements. The project will showcase the design and manufacturing capabilities of the college, as well as promote environmental consciousness among faculty and students.
Mechanical Tests of the Drug Dopped PDMS and PEGDA based Scaffolds

Navid Samani

Mentor: Professor Ozlem Yasar
New York City College of Technology

In this project, PDMS and PEGDA based scaffolds were designed and fabricated by micro-printing at SET Research Laboratory at the department of Mechanical Engineering Technology. Then, INSTRON machine will be used to do the mechanical test analyses. Our results indicate that both PDMS and PEGDA are mechanical strong to be used in the scaffold fabrications.

Scaffold Fabrication for Cell Viability Analysis

William Santiago

Mentor: Professor Ozlem Yasar
New York City College of Technology

One of the principle challenges in Tissue Engineering, especially with the production of large tissue constructs, is the cell survivability within the scaffolds. Cells can show healthy growth within the scaffolds if biocompatible materials are used to generate the scaffolds. In this project, collaborative work is done between the SET Research Laboratory at the department of Mechanical Engineering Technology at City Tech and Mechanical Engineering department at California State University, Chico to fabricate the scaffolds and to do the cell viability tests. Our preliminary results show that cells can survive within the PEGDA based scaffolds if 20% of PEGDA is used to fabricate scaffolds.

Interactive Robotic Mannequin - Roboquin II

Arooba Sohail

Mentor: Professor Farrukh Zia
New York City College of Technology

A robotic mannequin is designed and developed using inexpensive construction materials and low-cost open-source computer hardware and software, as a research platform for applications in several areas such as display model for e-textiles, wearable technology and fashion technology; interactive mannequin to be used in social robotics research projects; 3D physical modeling and simulation; computer controlled system design; and kinematics based movement control. In this ongoing research project an earlier obsolete motor controller circuit board has been replaced with the Arduino microcontroller. By programming the Arduino microcontroller, it has better control of the head and arm movements. In the earlier phase of this project, with the previous motor controller circuit we weren’t able to change the extreme positions of the head and arm movements. Now with the help of Arduino programming we are able to change and limit the extreme positions as well as have better control of the direction of the head movement. Two programs are used to test the Arduino based control. One program is used to move each motor from one extreme position to the other to test the range of motion. The other program controls each motor by using a potentiometer as a sensor. By moving the knob of the potentiometer we can move the head and arms to any desired position. In a related research project, other students have worked on the speech synthesis process so that mannequin can speak. There are three motors in each arm and two motors in the head. Next phase of this research project involves moving all eight motors together to move the arms and the head to match the speech so as to create a gesture.
Implementation of Cyber Physical System

Mellissa Valle

Mentor: Professor Farrukh Zia
New York City College of Technology

A Cyber Physical System combines sensors and actuators with embedded micro-controller to monitor and control the physical environment, remotely through the Internet. This particular implementation of a Cyber Physical System uses Intel Edison embedded micro-controller and Arduino micro-controller, a sensor shield, and a set of environment sensors to monitor the growth of a plant. Soil moisture as well as plant’s temperature, humidity, ultra-violet light intensity and visible light intensity levels are measured and transmitted over a Wi-Fi network to a web site. Sensor data is stored and analyzed on the web site, where it can be viewed in a web browser across the Internet. In the next phase of this project, plant growth will be monitored and controlled by carefully measured application of light, heat and moisture.

Degradation of Congo red Dye in the Presence of Single-Walled Carbon Nanotube-Ruthenium Nanoparticles Composites

Nicholas Carrero

Mentor: Professor Tirandai Hemraj-Benny
Queensborough Community College

Azo dyes are often used in textile industries, which are lost in wastewater during the dyeing procedure and causes great threats to aquatic life. Herein, a comparative study of the catalytic degradation of Congo red dye by single walled carbon nanotubes-ruthenium nanoparticle composites was performed. The composite’s catalytic properties were studied by UV-Visible Spectroscopy. It was observed that the rate of degradation of the Congo red dye significantly increased in the presence of the single walled carbon nanotubes-ruthenium nanoparticle composites.

Influence of Fortus 450 mc 3D printer on Manufacturing

Natasha Charles

Mentor: Professor Md. Shahadat Hossain
Queensborough Community College

Rapid Prototyping has been instituted as an alternative approach to compose simple as well as complicated parts which is relatively faster than traditional methods of creating parts. The purpose of this research is to instantly fabricate a scale model of a physical part or assembly using three-dimensional computerized geometric data to study
the efficiency of a high capacity 3D printer, the Fortus 450mc. This is achieved through a step-by-step evaluation where a detailed breakdown of the complete fabrication process of the Fortus 450 mc will be done. The process yields a prototype or basis model that can be modified by changing the production parameters to get maximum efficiency of the product.

Poster A56

A Comparison of PDFs for Fitting Dst Profiles

Jason Chou, Ying Dong

Mentor: Professor M. Chantale Damas
Queensborough Community College

In this study, we approximate the Disturbance Storm Time (Dst) profile of long-lasting geomagnetic storms using two probability distribution functions (PDFs): gamma and lognormal. Profiles of fifteen storms were fitted and categorized by storm intensity. Although both PDFs tend to approximate the main phase of storms reasonably well, the gamma distribution function tends to approximate the recovery phase much better. Further analysis also shows that the gamma distribution function is also a much better fit than the lognormal distribution for storms caused by ICMEs as opposed to CIR storms. This may be due to CIR storms' long duration recovery phases that can sometimes last days to weeks. More storms are being added to this study to further support our analysis and conclusion. Methods used and results will be discussed.

Poster A57

Isolation and Identification of Antibiotic-Resistant Bacteria Cultured from New York City Soil Samples

Adolfo Coyotl

Mentor: Professor Joan Petersen
Queensborough Community College

As an urban environment, New York City puts an enormous amount of pressure on its natural areas. As part of the Soil Joint Seed Project we are interested in the potential effects of antibiotic resistant bacteria on human health and the environment. My research project is focused on determining patterns of antibiotic resistance among bacteria found in New York City soils. Samples were collected from three sites with varying degrees of human influence: Thain Forest (TF-pristine), Central Park (CP-intermediate), and Newtown Creek (NC-heavily polluted). Over 131 pure cultures were isolated on Reasoner’s agar (R2A) from dilutions of soil samples. To test for antibiotic resistance, cultures were streaked onto R2A plates containing either penicillin or kanamycin. Gram staining and microscopy were used to determine morphology and Gram reaction of the resistant isolates. Overall there were 96 gram-positive and 35 gram-negative isolates. Endospore-formers were found among all three sites: Newtown Creek had the largest percentage of endospore-formers (65% of isolates). Antibiotic testing showed that there were resistant bacteria in all three sites, with more isolates being resistant to penicillin than to kanamycin. The Newtown Creek site had the most penicillin-resistant isolates (89%). Further studies will involve identification of species by 16S rDNA sequencing along with determination of resistance mechanism using PCR primers specific to resistance genes. The prevalence of the isolates in the natural soil community will be determined by comparing our sequences to metagenomic sequencing results. This research has possible implications for determining sources of antibiotic resistance genes in urban microbiomes.
Quantitative determination of Gallic Acid in Commercially Available Teas and Juices Using High Performance Liquid Chromatography (HPLC)

Margaret de los Santos, Julie Leong and Soraya Svoronos

Mentor: Professor Paris Svoronos

Queensborough Community College

Oxidative processes in our bodies produce free radicals, which may cause harm to our otherwise good health. Phenolics have potent antioxidant properties that can help the prevention of diseases that are related to oxidative stress. Gallic acid has the ability to quench radicals by providing species electron(s) to obey the octet rule thus, inhibiting the oxidation of biomolecules. Beverages with high levels of antioxidants can be used in maintaining good health. HPLC is used to separate, identify and quantitatively measure components present in a liquid sample using a particle packed column and solvent. In an HPLC experiment, the solvent is forced through a column and separation occurs under high pressure of up to 400 atmospheres. Several known concentrations of gallic acid are tested via HPLC to set up a calibration curve that is later used to measure the corresponding concentrations of gallic acid present in various beverages, such as commercial juices as well as different brands of coffee and tea.

Micro structure of iron in plants and its dependence on the soil composition.

Udya Dewanamuni

Mentors: Professors Sunil Dehipawala, Queensborough Community College and Harry Gafney, Queens College

Iron is an essential nutrient not only for humans, but also for all types of plants. Plants use iron for chlorophyll formation, RNA metabolism, and transpiration process regulation. Iron is one of the most abundant metals in the soil and occurs in a wide range of chemical forms. Humans receive iron through either meat products or plants. Non-meat eaters depend on plant product for their daily iron requirement. The iron absorption by plants depends on other minerals present in the soil and soil pH value. The amount of iron present in plants grown with different soil compositions were investigated using X-ray absorption spectroscopy (XAS) and Mossbauer spectroscopy. Tissue samples collected from different regions of a plant was dried at 200°C grinded to fine powder form. X-ray absorption spectra of samples were collected at the National Synchrotron Light Source of Brookhaven Laboratory for the energy range of 6900 to 8100eV. The main absorption peak of the absorption spectrum is proportional to the amount of iron present in the sample. The Mossbauer spectroscopy reveals that iron present in the samples has the form Fe³⁺ or electron density at the site of the iron nucleus similar to that of Fe³⁺.
Poster A60

Phenotypical characterization of a Streptomyces coelicolor SCO3855 knock out mutant

Shaina Durand, Lian Nicole Ramos, Hugh Small, Mateo Saenz, Yafit Muladjanov

Mentors: Professors Monica Trujillo and Naydu Carmona
Queensborough Community College

Proteases are enzymes that catalyze the splitting of proteins into smaller peptide fractions and amino acids by a process known as proteolysis. Intramembrane proteases (IMPs) cleave transmembrane domains of transmembrane proteins. IMPs are themselves membrane proteins and have their active sites buried within the lipid bilayer of cellular membranes. Rhomboid proteases are the best characterized IMPs so far. They are found in all kingdoms of life, and have a wide range of biological activities mostly related to cell signaling. Streptomyces are gram positive bacteria very abundant in the soil. They are prolific producers of secondary metabolites such as antibiotics, immune-suppressants and anticancer compounds. We aim to explain the role of rhomboid proteases in Streptomyces. These bacteria have a complex life cycle; they are unicellular organisms that exhibit a multicellular developmental cycle and possess a signaling system not yet fully understood. We hypothesize that rhomboid proteases play a role in cell to cell communication in Streptomyces. Our objective for this project is to characterize a rhomboid protease from the model organism Streptomyces coelicolor. The gene SCO3855 codes for a highly conserved rhomboid protease in Streptomyces. Our group constructed a knock out mutant SCO3855 KO, a strain that lacks the SCO3855 gene, using the CRISPR technology. The aim of the current project is to phenotypically characterize the SCO3855 KO strain. The comparison of the developmental cycle of the SCO3855 KO mutant with the wild-type strain has given us clues about the role that SCO3855 rhomboid protease plays in the S. coelicolor physiological and morphological differentiation cycle.

Poster A61

Analyzing Emirati Opinion on Immigration: Extending Migration Theory

Farbod Hadizadeh Moghadam

Mentor: Professor Adam Luedtke
Queensborough Community College

This research applied established migration theory to the case of the United Arab Emirates (UAE) by analyzing correlates of Emirati hypocritical opinion towards immigration, and comparing results to established findings in Western contexts. A single case study of Emirati citizens (N Amount) helped better gain an insight into the application of immigration theory in the UAE. While there is a common perception of “Demographic imbalance” in the UAE (90% of the resident population is foreign-born non-citizens), we lack knowledge of how this relates to public and elite opinions. This study analyzed opinions of Emirati’s to determine what degree of control the Emirati government is perceived to have over immigration. Do Emirati preferences correlate with policy? How does public opinion on immigration affect Emirati policymakers? How informed are Emiratis about immigration? What costs of benefits do Emiratis perceive from immigration, and what patterns stand out? How important is gender, age, education, or employment? The research takes migration theory into new areas by seeing if theories of immigration and public opinion from western contexts apply in the UAE, or whatever revision of these theories is necessary.
Generalizations of Magic Squares

Presenter: Jun Pyo Hong

Mentor: Professor Whan Ki Lee
Queensborough Community College

A magic square is an arrangement of integers $1, \ldots, n^2$ in a square grid so that the numbers in each row, in each column, and in each diagonal, all add up to the same number. In this project we generalize the concept to regular polygons. For this we consider regular polygons which have a place for a number at each vertex, at the middle of each side, and at the center, and define a magic $n$-gon as such an regular $n$-gon that has an arrangement of integers $1, \ldots, 2n+1$ so that the numbers in each side and in each diagonal all add up to the same sum. We investigate the questions: for each $n$, if there exists a magic $n$-gon, and, if so, how many there are. We approach these problems algebraically and prove that if there exists a magic $n$-gon, its center must be $n+1$, and the sum of the numbers on a side must be $3(n+1)$. Using these facts we show that there exist magic 4-, 6-, and 8-gons. We also show that there are no magic $n$-gons if $n$ is an odd integer. Further, we generalize the concept of magic polygons to regular polyhedrons similarly and show that there exist no magic $n$-hedrons.

Porous microspheres of polyaniline and its derivatives prepared from W/O/W double emulsions

Jean J. Hwang

Mentor: Professor David M. Sarno
Queensborough Community College

We have developed a method to prepare highly porous microspheres of the conducting polymer polyaniline (PANI) and a selection of its ring-substituted derivatives. Briefly, a water-in-oil-in-water (W/O/W) double emulsion is generated when excess 4M ammonium hydroxide is rapidly added to an acidic dispersion containing the preformed polymer and a monomer such as $o$-toluidine or $m$-toluidine. These monomers are soluble in acidic solutions, but spontaneously form immiscible droplets in sufficiently alkaline solution. The granular polymer dissolves in the monomer droplets to form the spheres, and pores are formed by water droplets trapped in the polymer matrix. The amphiphilic monomer serves as a single small molecular surfactant that stabilizes both the oil-water and water-oil interfaces of the double emulsion, which is rare among W/O/W systems. The dissolved polymer further stabilizes the water droplets and also suppresses Ostwald ripening of the spheres. The granular and spherical forms have nearly identical FTIR, UV-Vis, and NMR spectra, indicating no differences in the molecular or electronic structure. However, SEM images reveal that the morphology is highly sensitive to the monomer concentration; too little yields only granular particles and too much yields an oily product. The monomer can be unconsumed reactant from the polymer synthesis (e.g. $o$-toluidine in poly($o$-toluidine)), or specifically added to a polymer dispersion (e.g. $o$-toluidine in PANI). We have prepared porous microspheres of PANI, poly($o$-toluidine), and poly($m$-toluidine) using $o$-toluidine, $m$-toluidine, and $p$-toluidine as the surfactant. The simplicity and convenience of this method combined with the unique electronic properties of the polymers suggest applications including electroactive microreactors, scaffolds for catalysis, and encapsulants for payload delivery.

Microbial Interactions

Catherine Immordino

Mentor: Professor Mangala Tawde
Queensborough Community College

Today’s world of medicine and therapeutics needs more advanced treatment strategies to keep up with ever changing pathogens. Important anti-microbials
such as antibiotics, antifungal, and antiparasitic drugs come from members of Family Actinomycetes such as Streptomycyes. These antimicrobials make up two-thirds of our current clinically used antibiotics. These compounds are produced as secondary metabolites and their production is elicited due to competition with co-existing microbial species and a limited nutrient environment. To understand the mechanisms for antibiotic production we are interested in studying interspecies interactions amongst Streptomyces and non-Streptomyces bacteria where we grow the bacteria in each other’s vicinity and characterize the effects they have on each other. These interactions can be positive or negative. Antagonistic or negative interactions such as growth inhibition of other bacteria and positive interactions such as enhancing pigment production by neighboring bacteria are two of the characteristics that we have observed so far. Ultimately, my goal is to identify these Streptomyces using the 16 rRNA gene and identify chemical compounds causing antagonistic interactions that may lead to the discovery of novel antibiotics.

**Poster A65**

**Imidazole as a Novel and Robust Gold Binding Group at STM-BJ Method**

Yi Jiang, Tianren Fu, and Xiaofang Yu

Mentors: Professors Latha Venkataraman (Columbia) and Sujun Wei (QCC)

Recent technological advances allow for the fabrication of single molecule electronic circuits. In particular, the Scanning Tunneling Microscopy based Breaking Junction method (STM-BJ) developed in 2003 provides reliable, reproducible generation and measurement of electronic properties of molecular circuits. In order to complete the circuit with gold electrodes, special gold atom binding groups are installed at the both terminals of organic compound of interest. Typical gold binding groups include amino, thiol, methyl sulfide, thiochroman and pyridine. To expand this toolbox, we plan to investigate the imidazole as a potential candidate for the first time. We have quickly synthesized a series of bis(imidazole) alkane compounds (Im-n-Im) by a one-step reaction. Their initial conductance measurements by STM-BJ method are very promising.

**Poster A66**

**Identification of Microorganisms Associated with Sanitization Stations**

Marie Joseph and Cheryl Meddles-Torres

Mentor: Professor James Timbilla
Queensborough Community College

A study to isolate and identify microorganisms associated with sanitization dispensers began at the Biological Sciences and Geology Department of Queensborough Community College in fall 2015. The aim was to determine if some isolates are pathogenic. Samples collected from the Administration, Library and Art buildings were cultured on Tryptic Soy Agar (TSA) and isolated into pure cultures using the T-streak technique. Using standard procedures, physical and preliminary biochemical tests were conducted. Isolates from samples from the three locations were all Gram-positive with Bacillus and Coccal forms. The Coccal isolates grown on blood agar did not show any hemolysis. DNA of bacterial samples has been extracted and PCR conducted. Gel Electrophoresis and Bio Spec Nano analysis are being conducted for confirmation of PCR results. Subsequently the extracted DNA will be sequenced and compared with a GenBank for identification of the isolates.
**Polyaniline nanofibers as a scaffolding material for ruthenium nanoparticles**

Katherine Kim

Mentor: Professor David M. Sarno  
Queensborough Community College

We have prepared hybrid materials composed of ruthenium nanoparticles (Ru-NPs) and polyaniline nanofibers (PANI-NFs). The Ru-NPs can be rapidly synthesized by microwave irradiation in the presence of preformed PANI-NFs and an appropriate reducing agent. The nanofibers prevent the NPs from aggregating by dispersing them in a high surface area polymer scaffold. These composites are characterized by UV-Vis, FTIR, SEM and EDS to examine the effects of reagent concentrations and choice of reducing agent. Preliminary results indicate that NaBH₄ successfully reduces Ru³⁺ to Ru-NPs, but also induces changes in PANI. Other reducing agents of interest include glucose and ethanol. Our goal is to optimize the preparation conditions so that we may test the catalytic activity of these materials toward the degradation of the toxic azo dye congo red, a model compound that is representative of a variety of industrial pollutants.

**Refractive Index of Oxalic Acid Measured by Zoom-In Method and Extension Method**

Ha Eun Kim

Mentor: Professor Jun H. Shin  
Queensborough Community College

The refractive index of oxalic acid was measured by a refractometer using two different methods: zoom-in and extension methods. The zoom-in method requires two solvents which satisfy the following conditions: (i) a solid should have reasonable solubility in two solvents (10%), and (ii) the refractive index of the solid should be between those of two solvents. Two sets of solvents (i) DMSO and THF, and (ii) DMSO and n-PrOH were selected to determine the refractive index of oxalic acid, and the average value of 1.428(1) was obtained as its refractive index. The extension method, on the other hand, needs only one solvent to determine the refractive index of a solid, however, better solubility of a solid in the solvent was required compare to the zoom-in method. The refractive index of oxalic acid was measured indirectly from the linear relationship obtained between the % mass concentration of oxalic acid solution and its refractive index. The refractive index of oxalic acid was determined in six different organic solvents, and the values were in the range of 1.409 and 1.427. It is noteworthy to mention that oxalic acid showed very good solubility in DMSO and MeOH (up to 52% by mass), and a good linear plot between the % mass concentration and its refractive index were observed over 50% solution which may clearly support the assumption of the extension method that the straight line would be extended to 100% solution.

**A new synthesis of pyrrole by using Cadogan approach**

Mei Sze Lai

Mentor: Professor Sasan Karimi  
Queensborough Community College

The Cadogan-Sundberg synthesis of indoles and carbazoles involves deoxygenation/cyclization of o-nitrostyrenes or o-nitrostilbenes with trialkyl phosphite. For example, 2-nitrostyrenes (nitro group on the benzene ring) and b-nitrostyrenes (nitro group on the alkene) are converted to indoles and 2-nitrobiphenyls to carbazoles using a reducing agent which produces either a nitrene or a nitroso intermediate. This method of indole synthesis is similar to that of the Leimgruber-Batcho approach except there is no need to prepare a dinitrostyrene before reduction, thus avoiding an extra step. The
aim of this research project is to investigate if the available methods of preparing indoles and carbazoles from nitro compounds are in fact applicable to the synthesis of pyrrole and substituted pyrroles. Substituted pyrroles were able to prepare from nitrodienes using triphenylphosphine in one step. The yields are low, but can be enhanced using an Mo catalyst, bis(acetylaceto)dioxomolybdenum (VI).

**Poster A70**

**Project Title: Spectrophotometric determination of the total amount of antioxidants present in beverages using the Folin Ciocalteau method**

Julie Leong and Margaret de los Santos

Mentor: Professor Paris Svoronos
Queensborough Community College

The total phenolic content present in fruit, tea and coffee beverages was determined via the Folin-Ciocalteau method in a way similar to the one used by the wine industry. This procedure uses the Folin’s phenol reagent that oxidizes the polyphenols present in the beverages into the corresponding polyquinones. The reduced phosphomolybdate/phosphotungststate reagent produces a blue color that allows the microscale visible spectrophotometric determination of polyphenolic antioxidants originally present in the beverage. The results were expressed as Gallic Acid Equivalents and the measurements were made using the Beer-Lambert’s Law. This method was extended to several commercially available beverages as well as tea bags and instant coffee samples. A semiquantitative measurement of the antioxidants’ decomposition after seven days was also determined giving an estimate of the percentage of air oxidized decomposition of the polyphenols.

**Poster A71**

**How Do Community College Students Respond to Genocide Education and Prevention Curricula? A Content Analysis of Student Responses to Assignments and Events Aligned with the 2015-2016 NEH/KHC Colloquia Series**

Rolecia Nedd

Mentor: Professor Amy E. Traver
Queensborough Community College

This poster focuses on a two-phase study of students’ responses to curricula aligned with the 2015-2016 NEH colloquia series, “Gender, Mass Violence, and Genocide,” at Queensborough Community College’s Kupferberg Holocaust Center. Phase one was a faculty-driven rubric-based assessment of 144 students’ aligned papers. Phase two was led by a CUNY Research Scholar using content analysis to understand the same 144 papers. Both phases aimed to highlight the extreme importance of promoting global awareness in college and to empower students to be agents of change in our world. This poster will focus on phase two and its findings.

**Poster A72**

**Microbiomes Associated to Plant Roots in NYC Soil**

Edward Nouel, Katherine Palencia, Lian Nicole Ramos, Shaina Durand, Hugh Small, Mateo Saenz, Yafit Muladjanov

Mentors: Professors Monica Trujillo and Paul Sideris
Queensborough Community College

The microbial community in an urban setting can have important implications for human health. The soil can harbor up to 1010 bacterial cells per gram, and city dwellers use parks for entertainment and
outdoors activities. We are interested in characterizing the microbiomes associated to plant roots in NYC parks. On previous work done by our group we have characterized the structure of the microbial community associated with roots of plants from three contrasting sites in New York City: the Thain family forest at the New York Botanical Garden (NYBG) which is a pristine forest, the marshes in Newton Creek which are heavily contaminated soil and Central Park a green space exposed to pollutants. The diversity and composition of the soil community was analyzed using primers specific to the 16S rRNA gene. As a preliminary assessment of the possible implications for human health, we have characterized each microbiome by analyzing the distribution of antibiotic resistance genes using PCR. We are also interested in studying the distribution of metal resistance genes using PCR. We have used degenerated primers for the czcA gene to identify the bacterial communities that carry these gene. In order to identify the bacterial species coding for this gene we have cloned the PCR fragments and will sequence them. To correlate the presence/absence of metal resistance genes with the metals present in the soil samples we will chemically determine the concentration of certain metals in the soil. This project has already shed light into the influence of human activity in the distribution of both antibiotic and heavy metal resistance genes. Additionally, the determination of the metal concentration in soil and the identification of the bacteria species that carry the corresponding resistance gene will identify the bacterial species present in soil that can tolerate the metal concentration associated to urban sites.

Poster A73

**Wireless Mobile Ad-Hoc Networks’ Performance**

Jose Osorio-Hernandez

Mentor: Professor Merlinda Drini
Queensborough Community College

Recently information technology is being mainly based on wireless technology and these networks are characterized by no fixed base stations. The conventional mobile and cellular networks are still, in some sense, limited by their need for infrastructure: for instance base stations, routers and so on. A wireless mobile ad-hoc network is a self-configuring, infrastructure less network of mobile devices connected wirelessly. Their dynamic network topology is vulnerable to interference, to automatically form a network without infrastructure and adapt to topology changes.

The purpose of this study is to measure the ability of the routing protocol to react to the network topology change while continuing to successfully deliver data packets to their destinations. To measure this ability, we used different scenarios by varying the maximum speed in the network, with various application types over different terrain areas. From the simulations, we monitored critical conditions using the parameters like: Average Throughput, End-to-End Delay, and Packet Delivery Ratio.

Poster A74

**Influence of the Stratasys J750 3D printer on Medicine**

Oscar Pais

Mentor: Professor Md.Shahadat Hossain
Queensborough Community College

Additive Manufacturing (AM), an approach to create simple as well as complex 3D printed parts, is gaining a foothold in medicine. 3D printed models, guides and
tools based on medical imagery require a liaison between the medical community and the operator of a device such as the Stratasys J750 multi-material, multi-color 3D printer. The skill set to produce 3D models for medical use has not been academically formalized. Our research goal is to exploit the capabilities of the Stratasys J750 3D printer by fulfilling real requests from medical providers like Memorial Sloan Kettering Cancer Center. By supporting real requests by medical providers we will be able to identify the necessary skill sets to produce 3D printed models capable of meeting the requirements of the medical community.

Poster A75

**Bacterial Metal Resistance Genes in Sediments from Newton Creek and Central Park**

Kathereen Palencia-Serna

Mentor: Professor Monica Trujillo
Queensborough Community College, Bayside, NY

Human activity has introduced large amounts of metals in the environment that finally accumulate in aquatic sediments. Based on our previous work done in three contrasting sites in New York City we are interested in describing the bacterial communities and determining the presence of metal resistance genes in the aquatic sediments from Newton Creek and the pond at Central Park. We have collected the samples, and isolated the bacterial community DNA. To determine the diversity and composition of the soil community, we will amplify the bacterial community DNA using primers specific to the 16S rRNA gene. We have started the PCR experiments to detect the presence of the czcA gene a gene that confers resistance to cobalt, zinc and cadmium.

Poster A76

**Identifying potential substrates for the Streptomyces coelicolor rhomboid protease SCO3855**

Lian Nicole Ramos, Shaina Durand, Hugh Small, Mateo Saenz, Yafit Muladjanov

Mentors: Professors Naydu Carmona and Monica Trujillo
Queensborough Community College

Proteases are enzymes that catalyze the splitting of proteins into smaller peptide fractions and amino acids by a process known as proteolysis. Intramembrane proteases (IMPs) are proteases that cleave transmembrane domains of transmembrane proteins. IMPs are themselves membrane proteins and have their active sites buried within the lipid bilayer of cellular membranes. The ubiquitous family of intramembrane rhomboid proteases cleaves transmembrane domain (TMD) proteins, suggesting they are involved in cell signaling. A good to model to study bacterial rhomboids are *Streptomyces*, prolific secondary metabolites producers with a complex developmental cycle and multiple signaling pathways not completely elucidated. We have identified a functional rhomboid protease gene (SCO3855) in the model organism *Streptomyces coelicolor*, but we have yet to identify its substrates and therefore its biological activity remains unknown.

Previous work has shown that rhomboid substrates are characterized by instability in their helical TMDs and by a specific sequence motif surrounding the cleavage site required for proteolysis. This sequence can be used for genome-wide substrate prediction for different organisms. The aim of this project is to use bioinformatics tools to identify membrane proteins from *S. coelicolor* that have the predicted sequence motif that characterize rhomboid proteases substrates.
Recent results from our group have revealed that a rhomboid protease deletion mutant has a severe impairment in the Twin Arginine Translocation (Tat) system. The Tat system translocates folded proteins across the bacterial cytoplasmic membrane, and in *S. coelicolor*, it is composed by the TatA, TatB and TatC proteins. Therefore, our revised aim is to identify which of the proteins from the Tat system is the substrate of the SCO3855 rhomboid protease.

Poster A78

**Antibiotic Resistance in Streptomyces**

Brenda Torres, Catherine Immordino

Mentor: Professor Mangala Tawde
Queensborough Community College

More and more bacterial species are now becoming antibiotic resistant. Since most infectious diseases are treated with antibiotics, antibiotic resistance is becoming a serious threat to human health. *Streptomyces* is one of the major antibiotic provider as it produces about two-thirds of our current known clinically used antibiotics. Bacteria that produce antimicrobial compounds, are most likely to be resistant to their own products as well as other antibiotics. Ten *Streptomyces* strains were studied for resistance or susceptibility against various known clinically used antibiotics, such as erythromycin, kanamycin, vancomycin and Tetracycline. It was shown that some of the strains were growing in the presence of some of the antibiotics indicating that these *Streptomyces* strains are antibiotic resistant. Further molecular characterization can be used to determine whether these strains consist of genes/gene clusters that code for the antibiotic resistance. We will study antibiotic resistance in our strains by amplification of marker genes for specific antibiotics.

Poster A77

**Mislabeled Herbal Supplements**

Amandeep Rataul

Mentor: Professor Nidhi Gadura
Queensborough Community College

Recent studies on herbal supplements suggest that four agencies were accused of selling supplements that do not contain the herbs listed on the container. Authorities had tested herbal supplements from different retailers and found out that only one out of five actually consisted of the supplement listed on the container. The authorities, on testing the herbal supplements, found out that rice flour, asparagus and other house plants were used as fillers. These fillers can be very dangerous for people who have allergies from a specific type of food. DNA barcoding is a very efficient method for identifying plant species from their genomic DNA. We hypothesized that upon DNA barcoding we will find some samples that are used as fillers. We did genomic DNA extraction from the supplements. We then proceeded to do PCR using *rbcL* primers which are designed to identify the plant species. We did gel electrophoresis to verify the PCR results. Bioinformatics is used to analyze the sequences. Results will be discussed.

Poster A79

**Effect of Single Walled Carbon Nanotubes on Breast Cancer Cell Migration**

Isabela Velasquez, Jonathan Edouard, Mathiu Perez

Mentor: Professors Regina Sullivan and Sunil Dehipawala
Queensborough Community College

Biomedical applications of single walled carbon nanotubes (SWCNT) have the potential to expand treatment options for cancer patients. Carbon nanotubes have a high surface area to volume ratio which allows for surface functionalization. The size of these nanotubes facilitates use as a drug delivery
system as well. Recent studies have shown that unfunctionalized nanotubes enter cells via endocytosis. In addition, the nanotubes may enter cells through cellular gap junctions and ion channels. In previous studies we have shown that nanotubes are not cytotoxic in low concentrations. Currently we are testing the hypothesis that unfunctionalized single walled carbon nanotubes incorporate into the actin cytoskeleton and decrease migration of triple negative breast cancer cells. However, our studies have been limited by aggregation of the nanotubes in aqueous solutions which decreases cellular uptake and increases cytotoxicity in in vitro studies. Coating single walled carbon nanotubes with collagen has been shown to facilitate cellular uptake thus allowing for intracellular associations to be investigated. This method has limitations due to the acidic pH of the collagen solution. In this study, we compared the effect of collagen coated single walled carbon nanotubes with debundled single walled carbon nanotubes on breast cancer cell migration. Migration assays were performed and revealed that breast cancer cells treated with collagen coated SWCNT as well as the debundled SWCNT has a reduced rate of migration. These results suggest that the SWCNT may be incorporating into the actin cytoskeletal disrupting rearrangements that are required for the metastatic process. In future studies we plan to measure Young’s modulus which is an indicator of the degree of flexibility which in turn can be correlated with changes in the actin cytoskeleton. The study will be expanded to include other types of cancer cells as well noncancerous cells and may reveal potentially novel cancer treatments.

Poster A80

Examination of Structural Properties of Iron Particles in Volcanic Ash Through X-Ray Absorption Spectroscopy

Kaiming Wang

Mentor: Professor Sunil Dehipawala
Queensborough Community College

Kilauea is one of the world's most active volcanoes. The volcano has been in constant eruption since 1983. A large collapse occurred at Kilauea volcano in November 2005. Over the past years, the summit of Kilauea volcano has had an unusual eruption that has produced a significant amount of tephra (rock expelled from volcanoes). While the compositions of the gasses have been extensively studied, there is a variety of interesting coatings of white and pink minerals that form when the tephra reacts with the volcanic gasses in the vents. These materials were seen deposited on the vegetation around the volcano. It is important to identify chemical compositions of these materials. The structure of these particles was investigated by using techniques such as EXAFS and XANES at iron K-edge. Samples were collected from different distances from the volcanic vent, and X-ray absorption experiments were performed on these samples. From the initial results it appears that main absorption edge energy which is sensitive to the oxidation state changes with the distance. The amount of iron present per same mass of material also changes with the distance.
Syntheses of N-hydroxyphenyltrichloroacetamide Derivatives by Microwave Reactor: Possible Precursor to Polycarbamate

Hyeon Yun
Mentor: Professor Jun H. Shin
Queensborough Community College

Microwave reactor is a new technology and has become an invaluable tool adopted in many areas of science laboratories due to the convenience including temperature, pressure and power controls. In the previous report, N-4-hydroxyphenyltrichloroacetamide was prepared from the reaction between hexachloroacetone (HCA) and 4-aminophenol after refluxing overnight in CHCl₃. However, the same result was obtained after heating the reaction mixture for 1 hour at 120°C using a microwave reactor. 2- and 3-hydroxy derivatives were also similarly obtained using a microwave reactor in one hour instead of refluxing overnight. The prepared three derivatives were spectroscopically characterized, and the molecular structures were also determined by X-ray diffraction. Further reactions to convert them to the corresponding polycarbamate using a microwave reactor are under investigation.

Prime counting function

Bingming Zhang
Mentor: Professor Kwang Hyun Kim
Queensborough Community College

Optimizations of time and space complexity were major issues when computing the prime-counting function, π(x). To resolve these issues, we implemented a recent algorithm such as a modified Meissel-Lehmer method using multi-threads and CUDA which allows us to use the power of GPU. It is tested and benchmarked successfully with a new 16 threads Ryzen 1700x + 64GB.
AFTERNOON
SESSION
**Borough of Manhattan Community College**

**Poster B1**

**Solar Panel and Optical System**

Robiul Alam and Zhixin Deng

Mentor: Professor Shalva Tsiklauri
Borough of Manhattan Community College

The cost of current solar panel system is very high and it is less efficient that its cost. In order to reduce the high cost of solar panel systems that the new cost effective mirror reflecting linear focus type solar energy concentrating system. The concentrator system consists of flat glass mirrors, placed under the different angles, and focusing the sun light on to the solar cells mounted along the line. The developed the photovoltaic system (PV) concentrator system has several advantages in comparison with widely used other concentrating systems. Furthermore, the performance will be significantly increased. It is mostly protected from environmental influences (wind, dust, rain, hail). Due to the simplified structure of concentrating optics, the standard off-the-shelf technologies enable low-cost manufacturing.

Also, fresnel lense is another good idea to increase the performance. It could be used under the different angles and focusing the sun light on to the solar cells pad. The cost optimization method and the computer program for new concentrating systems design is developed as well. The program allows to design a PV system with the given output power, having the minimal price. The program can be used for cost effective PV solar energy concentrating systems design. Even, we have replaced at the rotation system. The solar pad could rotate 360 degrees to use the maximum of sun light.

**Poster B2**

**Preparation and Characterization of Chemically-modified Biomaterials and their Application as Adsorbents of Penicillin G.**

Jacqueline Baah Twum

Mentor: Professor Abel Navarro
Borough of Manhattan Community College

The presence of antibiotics in surface water creates microbial resistance and has a negative effect on the ecosystem. However, there are some biomaterials which rich in functional groups, like spent tea leaves and also suitable for chemical modification for diverse applications. This research suggests the use of spent tea leaves of green tea (GT), peppermint (PM) and chamomile (CM), as basic frameworks to incorporate carboxyl, sulfonyl and thiol functional groups into the biosorbents to improve their ability to adsorb the antibiotic Penicillin G (Pe). The distinctive nature of the adsorbents, especially in thiolated products, shows a higher number of acidic functional groups. SEM analysis showed changes on the surfaces of the adsorbents characterized by the reactions conditions, with a greater effect on thiolated and sulfonated adsorbents. The chemical modification of the adsorbents was confirmed with elementary analysis by EDS which showed the presence of sulfur atoms and an increase in oxygen/carbon ratios. At different pH, batch adsorption experiments show a strong pH-dependence, with a high adsorption percentage at pH 8 for all the adsorbents. The adsorption experiment recorded lower adsorption in the PMs, followed by GTs and then CMs. Therefore, the adsorption follows the trend CMs>GTs>PMs. Thiolation and sulfonation reported higher adsorptions among the chemical modification, most probably due to the sulfur bridge formation, reaching adsorption percentages of 25%. These results create a new reasoning in the use of spent tea leaves as scaffolds for chemical modification and their application in the bioremediation of antibiotics.
Two Different Approaches for the Stirling Numbers of the Second Kind

Xueying Chen

Mentor: Professor Jaewoo Lee
Borough of Manhattan Community College

The Stirling number of the second kind, denoted \( S(n, r) \) where \( n \) and \( r \) are positive integers, counts numbers of ways to arrange \( n \) objects into \( r \) nonempty identical blocks. It is important to count the number of arrangements or patterns, but it is impossible to list all of arrangements in practice. Therefore, in this project, we seek the general methods that enable us to count this more effectively. Namely, we will use combinatorics and generating functions. We get our first formula by counting, with inclusion-exclusion principle:

\[
S(n, r) = \frac{1}{r!} \sum_{i=0}^{r} (-1)^{i} \binom{r}{i} (r - i)^n.
\]

After going over this method briefly, I will give an introductory overview of generating functions and how these can be used to prove formula for the Stirling number of the second kind.

Isolation and Characterization of Heavy Metal Tolerant Bacteria from the Newtown Creek

Lionel Colon, Nicole Yoo and Walker Farnham

Mentor: Professor Sarah Salm
Borough of Manhattan Community College

Heavy metal contaminants are often found deposited in areas surrounding urban and industrial sites after improper waste disposal. These pollutants, which include nickel, lead, and copper, pose major health risks to life populating such areas. Removing them from the environment is a costly and challenging endeavor. Some bacteria, however, have plasmids that allow for tolerance to these toxic elements. These bacteria can be used as tools for bioremediation, an increasingly used approach for the removal of environmental toxins. To this end, we have attempted to create cost efficient and environmentally friendly means of bioremediation to resolve contamination of populated areas, avoiding heavy metal toxicity. Our team has isolated 15 bacterial strains from the Newtown Creek, a highly contaminated superfund site in Brooklyn, New York. Initial characterization of the bacteria was performed using standard biochemical and culturing methods, including staining, and growth on selective and differential media. Final strain identification was made by performing 16s rDNA PCR and using the BLAST platform to analyze sequences. We have successfully isolated bacteria with interesting traits, such as *Comamonas aquatica* which can degrade phenol, as well as several opportunistic pathogens. All isolates were tested on media containing a variety of antibiotics to test for resistance. Isolates that were resistant to antibiotics showed promise for heavy metal tolerance because both genes tend to be paired together on plasmids. These bacteria were grown on media containing 4mM-20mM of \( \text{Pb(NO}_3\text{)}_2 \), \( \text{Ni(NO}_3\text{)}_2 \) or \( \text{CuSO}_4 \) to test their tolerance to these compounds. Analysis of strains that thrived on these media showed that they contain plasmids, which we have isolated and partially characterized. As plasmids frequently contain genes for heavy metal tolerance, we plan to transform our plasmids of interest into *B. subtilis*, a non-pathogenic soil organism. We will use these transformed bacteria to amend soil contaminated with heavy metals.
Joining of Low-Module Thermoplastics for Dental Implants

Mayumy Cordova

Mentor: Professor Rafael Niyazov
Borough of Manhattan Community College

Polymeric materials, such as thermoplastics have been used in various biomechanical devices and, in particular, for a creation of low cost and high quality dental implants. The purpose of the conducted research is to find a new composite thermoplastic with a higher strength by joining different specimens through the welding process. Welding of thermoplastics is usually involving a local heat at the interface of the polymer to enable the melting and intermolecular diffusion in order to provide a high strength bond. The focus of this investigation is to weld thermoplastics, such as polycarbonate (PC), high density polyethylene (HD-PE) and acetal (POM) by using ultrasonic. Then, the maximum strength of the welded specimens will be tested by using Z-3 tensile test machine.

Utilization of Used Green Tea Leaves for the Removal of Yellow Hair Dye through Bioremediation

Tesfamichael Demeke

Mentor: Professor Abel Navarro
Borough of Manhattan Community College

Researches have indicated that the presence of dyes in water bodies reduces transparency and inhibits photosynthesis of plants, as dyes are efficient at absorbing sunlight. In addition to this, some dyes also contain heavy metals and sulfur. This poses serious environmental problems due to the toxic nature of these elements to harm organisms and cause acid rains. From the toxicological point of view, the manner and time of exposure are related to the hazardous risk of dyes on human health. Dyes have a low acute toxicity because of the harm they cause in a short time of exposure. This is because dyes have low solubility in corporal fluids and high water solubility that favors metabolism. Chronic toxicity due to continuous dye exposure is, in general, low. However, it has been demonstrated the carcinogenic potential of some azoic dyes and at least 3,000 azo dyes have been catalogued as carcinogenic. Dye toxicity resides in the release of aromatic amines by oxidation, hydrolysis, or reduction of the azo bond. Some aromatic amines that are used in the fabrication of dyes have also been recognized as carcinogenic. This project focuses on the use of American (GT), Peruvian (PGT) and decaffeinated (DGT) used tea leaves for the elimination of basic yellow 57 (BY57) hair dyes using bioremediation techniques. Green tea leaves are discarded in industrial amounts as by-products of tea-based industries such as Nestle and Snapple. Taking into account that a proper waste disposal management is needed to prevent contamination of water by hair dyes, this project explores the adsorption capacity of these biomaterials against basic yellow 57 (BY57). Decaffeinated, American and Peruvian used green tea leaves were experimented with in this study to compare their dye affinity and explore their possible large scale use to decontaminate fresh water bodies.

The Effects of Forskolin on Cultured SH-SY5Y Neuroblastoma Cells

Jay Gadsden

Mentor: Professor Jane M. Tezapsidis
Borough of Manhattan Community College

Neuroblastoma is a pediatric cancer that starts in nerve cells and is responsible for almost 700 new cases of cancer per year. Our research investigates the effects of Forskolin, a root extract derived from Plectranthus barbatus, on viability and growth of
neuroblastoma cells. Forskolin is known to boost cyclic adenosine monophosphate (cAMP), crucial for signal transduction, to influence cell growth and differentiation. Because understanding these pathways in neuroblastoma cells may be beneficial to developing new therapies, we have performed dose response studies using forskolin and SH-SY5Y cells (derived from a human neuroblastoma) as well as E18 embryonic neurons from Sprague-Dawley rats. We observed a significant time dependent trend of declining cell viability when SH-SY5Y cells were exposed to Forskolin. However, Forskolin treatment significantly increased survival of E18 neurons compared to untreated controls. These results suggest that forskolin has differential effects on normal and tumor cells and further investigation is warranted.

**Poster B8**

**Black Tea Extract has anti-proliferative effects on the oral bacteria, Porphyromonas gingivalis and Human Gingival Fibroblasts in a dose dependent manner**

Shanna-Kay Griffiths
Mentor: Professor Brian Rafferty
Borough of Manhattan Community College

Periodontal disease is an inflammatory disease of the gums, in part, due to the presence and growth of the gram-negative bacterium *Porphyromonas gingivalis*. This results in damage to tissue structures that anchor the teeth. Studies have shown that black tea extract (BTE) and green tea extract are advantageous for cardiovascular disease and some forms of cancer. We examined the role of BTE on the growth of Human Gingival Fibroblasts (HGF) and *P. gingivalis*. An MTT assay was used to assess HGF proliferation while *P. gingivalis* growth was monitored using optical density (OD). The cells were exposed to various concentrations of BTE over different time periods. The data shows that there is a decrease in *P. gingivalis* and cell growth at concentrations of BTE from 50µg/mL-100µg/mL. The DMSO did not have a major effect on *P. gingivalis* and HGF cell growth compared to the media controls. Future experiments to observe the effect of BTE on *P. gingivalis* invasion of HGF cells and BTE’s role on cell death are planned.

**Poster B9**

**Fighting Drug Addiction with Water: Analyzing the Solvation Thermodynamics of the D3 Dopamine Receptor Binding Cavity**

Jayeda Hossain
Mentor: Professor Lauren Wickstrom
Borough of Manhattan Community College

Emilio Gallicchio (Brooklyn College) and Tom Kurtzman (Lehman College)

Dopamine receptors play a critical role in the cell signaling process responsible for information transfer in neurons functioning in the nervous system. These processes are ultimately responsible for modulating movement, cognition, and emotion through activation of the dopamine G protein coupled receptors in the brain. Traditionally, drugs targeting these receptors have been used to treat schizophrenia and Parkinson’s disease. Recent strategies to treat drug addiction have targeted the dopamine D3 receptor. However, designing drugs for the D3 receptor is a challenging task because they must be selective for only the D3 receptor. Due to this challenge, novel computational techniques must be employed to design new drugs. The aim of this project seeks to develop an improved computational protocol for the study of protein-drug interactions combining the accuracy of detailed explicit solvation models with the versatility of implicit solvation approaches, and to validate it experimentally on the important D3 dopamine receptor drug target. In the first part of the study, we have used solvation thermodynamics to characterize the displaceable water molecules in the D3 binding pocket. Future work will focus on using this
information to develop more accurate computational models for binding in implicit solvent in order to develop better drugs to fight drug addiction.

Poster B10

**Adsorption of Phenol from Aqueous Solutions with Native Caribbean Seaweed: Purify Toxicity of Phenol from Water**

Md Samirul Islam

Mentor: Professor Abel E Navarro
Borough of Manhattan Community College

The research aimed to determine the highest phenol absorptivity from aqueous solution. We had chosen different algae that come from Puerto Rican. In the experiment, Sargassum sp (SG) and Chaetomorpha (CM) absorbed the highest amount of phenol from aqueous solution and we used both the algae to optimize batch experiments at room temperature. The effect of pH, adsorbent dose, phenol concentration, salinity and presence of interfering substances were evaluated. Initial solution pH exhibited a strong effect, mainly on the phenol aqueous chemistry; showing the maximum adsorption at pH 10. Sorption isotherm results were modeled according to the Langmuir, Temkin and Freundlich equations. Isotherms modeling indicates a maximum adsorption capacity (qmax) of 82.10 and 17.7 mg of phenol per gram of SG and CM, respectively. Salinity and presence of detergent in the matrix solution showed a positive effect on the adsorption, suggesting that adsorption of phenol was mostly driven by polar forces and not by ionic exchange. However, the presence of heavy metals like copper, lead and cobalt displayed a negative effect on the adsorption. The result shows that a potential formation of hydrogen bonds between the algae and phenol is proposed as the main adsorption mechanism. Besides, these results provide further insight into the adsorption mechanism of phenol and their use as inexpensive adsorbents for the treatment of phenol-containing wastewaters.

Response priming reveals capacity limitations

Urjana Kica

Mentor: Professor Marjan Persuh
Borough of Manhattan Community College,

Visual working memory, a system for temporary storage and manipulation of visual information, is strictly limited in capacity. Similarly, humans’ ability to track is limited to only a few individual items at a time. We hypothesized that there is a common source of these limitations. Our working hypothesis was that capacity limitations originate at the encoding stage and are a general property of the visual system. We tested our prediction using response priming, a paradigm that differs substantially from both working memory and object tracking paradigms. It requires fast motor responses and rapid processing of visual information. Evidence also suggests that response priming requires intact retinogeniculostriate pathway. We hypothesized that priming is limited by the representation of visual information at the encoding stage. We tested participants in two experiments; the first experiment presented bars of different orientations and second experiment used different shapes. Participants made speeded responses to targets displayed at the center of the display. Prior to target presentation, a prime was presented at one of the eight positions around the imaginary circle. We varied the number of items on the screen by presenting a single prime together with distractors. Priming effects were the strongest for a single prime, presented in isolation. As the number of distractors increased, priming effects become progressively weaker and with the set size of six, were eliminated altogether. These results suggest that the capacity of visual system to represent individual objects for priming is similar to restrictions previously demonstrated for working memory. Furthermore, because response priming is independent of visual awareness, our results indicate...
that capacity limitations of our visual systems are not restricted to conscious vision.

Poster B12

**Title: Simulation of Adsorption Models—Instantaneous and Non-Instantaneous Mixing**

Jieying Li and Jie Lan

Mentor: Professor Chris McCarthy
Borough of Manhattan Community College

Our research involved developing and simulating models of adsorption-like processes. Adsorption is the chemical phenomena where molecules adhere to a surface. We developed a “particles in a box with one sticky side” toy-model of this, with the particles' motion being represented as random walks on an N by M integer lattice. We investigated how instantaneous and non-instantaneous mixing affect the adhesion rate. We showed that this process can be modeled by Ordinary Differential Equations and Probability Generating Functions. However, in the non-instantaneous mixing case, a more accurate model makes use of the diffusion partial differential equation. We show how to calculate these models' constants from theory (e.g., the diffusion coefficient) and how to verify these models by applying non-linear regression to data from their computer simulations.

Poster B13

**An Autonomous Ground Explorer using Computer Vision**

Jiahua Liao

Mentor: Professor Hao Tang
Borough of Manhattan Community College

Nowadays, the development and application of the robot and Artificial Intelligence (AI) gives a huge impact to human life. For example, robots often represent human to do some meticulous or dangerous human working, which include cleaning, surgery, and rescue and so on. Therefore, robots can provide a lot of assistance for human being. On the other side, the further development of AI makes robots working more flexible, accurate, and applicability.

In this project, we will design and implement an intelligent mobile robot, which can navigate in an indoor environment and map the building layout. The robot includes mobile platform, microcontroller and a number of sensors, including color camera, stereo cameras and Lidar sensors. My research focuses on designing and building a complete mobile robot, then using it to establish a map using Computer Vision algorithm for an indoor environment so that blind people can be navigated through the indoor map that the robot made.

Poster B14

**Quantum dots in 2-D TMDs Materials**

Sofía Mvokany

Mentor: Professor Shalva Tsklauri
Borough of Manhattan Community College

In latest years, there have been a promptly increasing number of experimental and theoretical publications focusing on transition metal
dichalcogenides (TMD) materials. Strong electron–hole binding in TMDs suggests that it would be possible to obtain a discrete spectrum due to trapping of excitons, holes and electrons in strong electric or magnetic fields. We assume the excitons, electrons and holes are confined in an infinity square two dimensional and harmonic potential wells in order to have a first estimation of the confinement criteria. We solved Schrodinger equation and calculated the first confined levels. We obtained an energy separation between the first two confined levels, which larger than the thermal fluctuations at lower temperature. We constructed the hypothesis of exciton confinement that helped us to determine the conditions in which a quantum dot could generated via strain field.

Poster B15

**Biological Activity of *Taraxacum officinale***

Eric Pereira

Mentor: Professor Adolfinia Koroch
Borough of Manhattan Community College

The leaves and roots of dandelions (*Taraxacum officinale*) are used in traditional Brazilian herbal remedies to treat diseases of the liver, urinary and digestive disorders as well as regulating cholesterol and lowering blood pressure. Plants synthesize and accumulate various chemical compounds that provide an ecological advantage. A class of these chemicals are called polyphenols. Many of these polyphenols have beneficial health effects for humans through their antioxidant, antibacterial, anti-inflammatory, and anticarcinogenic properties. Cultures that practice traditional medicine often use specific plants that contain many types of polyphenols, such as flavonoids, phenolics, and antioxidants. Dandelions are also rich in iron, magnesium, potassium, zinc minerals as well as vitamins A and C.

The objective of this research is to determine the total biological activity of these polyphenols in commercial samples of dandelion leaves and roots. Dry samples of dandelion leaves and roots are grinded and dissolved in DMSO and made into extracts. These extracts are measured for total phenolics, flavonoids, and antioxidant activity using a spectrophotometer. Determining the total biological activity for this class of polyphenols will help understand the use and effectiveness of dandelion in traditional plant remedies.

Poster B16

**Molecular Recognition of Cell Adhesion Proteins: Does Water Help the Candida Fungal Pathogen Colonize a Host?**

Sheila Sarkar

Mentor: Professors Lauren Wickstrom
Borough of Manhattan Community College and Emilio Gallicchio (Brooklyn College)

The Candida fungal pathogen is a newsworthy source of life threatening nosocomial infections and its cell-adhesion proteins on its surface enable it to stick to and colonize a host. Understanding the mechanism behind this widespread adherence to host tissue in our bodies is key to developing methods to prevent tissue invasion and infectious disease. X-ray structural data from a Candida protein-peptide complex suggests that a network of water forms a bridge between the cell-adhesion protein of the pathogen and a host peptide. The goal of this work is to determine whether these water molecules influence the molecular recognition of cell adhesion proteins to their host cells. We investigated this hypothesis by performing all-atom molecular dynamics simulations of the ALS-9 protein-peptide complex in explicit solvent, allowing for water molecules to occupy the binding cavity. As expected, we observed that the protein complex is stable in solution based on the structural fluctuations of the protein and ligand. Future work...
will compare the conformational dynamics of the ALS-9 protein-peptide complex in explicit solvent and implicit model where we expect the peptide to bind weakly without the specific solute-water interactions. We hope these results and previous studies generate alternative strategies for designing anti-fungal drugs.

**Poster B17**

**Body Segmentation and Recognition in AR/MR**

**Pedro Torres**

Mentor: Professor Hao Tang
Borough of Manhattan Community College

As the world of Augmented Reality and Mixed Reality (AR/MR) continue to evolve, one of the areas where engineers are still battling is the recognition of entities. Current techniques to recognize objects involve the use of predefined models, as image targets or 3D scans. With the guidance of these targets, a AR/MR program can identify the real objects on which the targets are based. We’ll take a step into this area with the segmentation of the human body in a mixed reality environment. With this project, we seek to create a system that can recognize body parts without the need of visual targets. To accomplish this task, we make use of Microsoft’s Kinect, a sensor that tracks human movements and gestures, and senses depth, and the HoloLens, a MR headset that places holograms into our real world. The completion of this system could benefit future projects involving human body segmentation on a AR/MR application.

**COLLEGE OF STATEN ISLAND**

**Poster B18**

**Towards real time crime forecasting using machine learning methods**

**Tatiana Anderson**

Mentor: Professor Feng Gu
College of Staten Island

Crime forecasting can be used to identify and analyze crime patterns and trends so that police officers can prevent and stop crimes before their occurrences. It is a challenging task to predict crimes because many factors decide the occurrence of a crime, such as individual characteristics, interactions with peers and families, time, available police resources, and situational factors including weather, events, lightning, audiences, etc. Traditionally, regression models, statistical approaches, and other simulation models are developed to qualitatively and quantitatively study the relationship between the occurrences of crimes and different factors for detection and prevention. But in many scenarios, it is hard to accurately predict real time crimes using those methods due to many reasons including complexity of the system, interactions among different factors, and limited data availability. In this work, we plan to apply machine learning methods to forecast real time crimes by automatically detecting situational factors including liquor stores, bus or subway stations, demographics, etc. of the occurred criminals. The criminal data from the Portland Police Bureau from 2012-2017 will be used to verify the effectiveness of the used methods.
**Design and Feedback Control of a Robotic Arm**

Mobin Uddin Chowdhury and Melvin Summerville

Mentor: Professor Aleksander Haber
College of Staten Island

This project aims at developing a robotic arm with three degrees of freedom capable of performing precise positioning and trajectory tracking. The prototype will be developed from scratch using affordable components such as Nema 23 stepper motors, Makerbeam aluminum extrusions, rotary encoders, Arduino microcontrollers, etc. Most of the moving parts including bevel gears, spur gears, and the rotary base will be 3D printed.

As a result of the first phase of the project, we present a robotic joint composed of a stepper motor, spur gear reducer, relative rotary encoder, electromechanical end stops, as well as an Arduino microcontroller. We have implemented a PID control algorithm whose purpose is to rotate the joint to a desired angle. The rotary encoder measures and sends the angle information to the microcontroller which then calculates the control actions for the stepper motor. The challenge is that the rotary controller is of a relative type, meaning that its zero position is determined by the system’s initial position. Consequently, the desired angle cannot be achieved. This is solved by including an electromechanical end stop. When the system is started, the joint rotates until it reaches the end stop. The end-stop determines the zero position of the system, and starting from this position any desired angle of rotation can be achieved. The second problem we addressed is related to the fact that initially the stepper motor could not produce enough torque to lift the load attached to the joint. This challenge is resolved by designing a spur-gear reducer that amplifies the torque and reduces the rotation speed. We have 3D printed the reducer, and surprisingly, it is able to amplify the torque such that the load can be lifted. The next stage is to use the 3D printing technology to design and manufacture a moving base.

**Insulin receptor expression in the brain and its role in hyper-excitability**

Md Zahirul Islam

Mentor: Professor Abdeslem Elidrissi
College of Staten Island

Brain homeostasis relies on a number of factors that regulate neuronal excitability. Surprisingly one of these factors coincide with the insulin neuroendocrine system. There is ample evidence that insulin play an important role in neuronal excitability. Previous studies have shown that taurine-fed mice have increased insulin sensitivity in the pancreas, when compared to controls during glucose tolerance test. These results also showed an increase in insulin and insulin receptors expression in the pancreas. Our hypothesis is, since insulin is secreted into the bloodstream and does indeed pass through the blood brain barrier, taurine supplementation may increase the expression of insulin and insulin receptors in the brain which determines the levels of excitability in each brain region. Thus we also believe that the increase in taurine supplementation can modulate neuronal excitability. It is important to note that neurons highly express insulin receptors. Furthermore, insulin crosses the blood-brain barrier through a high affinity uptake system. Once insulin passes to the brain, it binds to the insulin receptors and affect neuronal excitability via signal transduction pathway, with differential effects on brain structures. In the cortex and hippocampus, insulin receptor activation has been shown to increase excitability, whereas in the hypothalamus the effects of insulin are inhibitory.

We determined the expression of insulin/insulin receptors in the brain/pancreas through
immunohistochemistry and confocal microscopy in 4 different group of mice; the wild type controls, fnrl KO, taurine-fed (for two months prior to examination) wild type, and taurine fed KO. Our results show that insulin and insulin receptors expression and activation are highly regulated in these treatment groups and indicate that insulin, through activation of its cognate receptor, may regulate neuronal excitability.

Poster B21

**Identifying synergistic partners of TGFβ inhibition in glioblastoma cells.**

Absiola Shittu and Brianna Sampson

Mentor: Professor Nancy Liu-Sullivan
College of Staten Island

Glioblastoma multiforme (GBM) is the most aggressive form of primary CNS malignancy with an average survival rate of slightly over one year. There is no available efficacious chemotherapy for GBM. The only available drug called Tomozolomide (TMZ) is used to treat cancers metastasized to the brain from other organs. GBM does not response well to TMZ. This dire situation calls for the high need to discover novel treatment strategies for GBM. Transforming growth factor beta (TGFβ) is a master cytokine that regulates key cellular processes including cell proliferation, differentiation, apoptosis, and migration. TGFβ is found to be significantly elevated in GBM tissue, making it an attractive molecule as a therapeutic target. A TGFβ inhibitor called LY2157299 is currently undergoing phase II clinical trial but only effective at GBM elimination for less than 50%, not an acceptable statistics for GBM patients. Under the mentorship of Dr. Nancy Liu-Sullivan of the College of Staten Island, we have explored combination possibilities of LY with other compounds that also influence cytokines signaling in GBM tumor sphere formation and migration. In my oral presentation, I shall describe our exciting findings and discuss the significance in addition to future perspectives.

Poster B22

**Neuronal basis for the late onset ataxia in fragile X**

Mathura Sothylingam and Luis Alvarez

Mentor: Professor Abdeslem Elidrissi
College of Staten Island

Fragile X syndrome is a genetic condition that is due to a trinucleotide CGG expansion in the premutation alleles along the promotor region of the FMR1 gene. Fragile X associated Tremor/ataxia syndrome which is caused by these triplet expansion, is considered a neurodegenerative disorder affecting males with late onset (ages > 50 yrs). FMRP is an mRNA binding protein and has been shown to play a role as a transporter of mRNA. Therefore, the absence of FMRP causes improper shuttling of mRNA which leads to abnormal brain development. Since ataxia is a neurodegenerative disorder characterized by abnormal locomotor activity, we hypothesize that the lack of cerebral structure integrity in FMRP (-) brains may lead to underdeveloped Purkinje cells. The importance of Purkinje cells in the cerebellum is due to their ability to act as a resistance modulators during a high volume of incoming signals from proprioceptors, basal ganglia and other areas of the brain. Thus, we can speculate that histopathologies of cerebellar structures may cause ataxia-like tremors later in life. Through IHC and confocal microscopy, we will be able to explore and compare the structures of the cerebellum in FVB/NJ wild type and KO mice. In order to confirm that ataxia does occur, the DigiGait ataxia machine will be used to measure the footsteps of both groups and evaluate forefront and hind leg coordination. We found a significant alteration in the dendritic tree of Purkinje cells using calbindin and tubulin as markers and a
very pronounced aberration in locomotor activity that we think typifies ataxia in these mice.

HOSTOS COMMUNITY COLLEGE

Poster B23

Comparing Content Understanding Across High School, Junior, and Senior Colleges

Bishoy Abdou

Mentor: Professor Damaris-Lois Lang
Hostos Community College

Academia is established to train, equip and supposedly reward intelligence. However, the means to reward the wide variations of intelligence is not fully explored in most of our academic settings worldwide. Education for the most part, focuses on content understanding and retention of subject material; book-smart. Exams are given to test students’ acquisition of the “book-smart” skill, which then translate to success in their respective field of study. In this research, we are testing the ways in which one’s educational environment could influence learning through content understanding and retention. This finding will further give us an insight into ways to enhance the ‘book-smart’ skill which is of utmost necessity in academia. We hypothesize that, content understanding and retention will differ among the Colleges and High School students in the reading versus listening categories. To test our hypothesis, students from high school, junior college and senior colleges were given the same material to read and/or listen. This was then followed with questions pertaining to the passage they read. We then compared the scores across the educational categories. The results although showed that generally the hypothesis was supported, it also showed that, listening scores progressed across the educational categories, starting from the high school, to the junior and then senior colleges. This progression was not seen for the reading category.

Poster B24

United States Capitalism: Slavery and Prison Industry

Victoria Araujo and Abraham Ferrera

Mentor: Professor Lauren Wolf
Hostos Community College

It seems from historical documentation that from 1619 until present African Americans have been more subjected to criminalization than Whites. The criminalization process has impacted the progress of minorities in society. Making the process of criminalization recurring and reaffirming for many who agree with the belief that Blacks are inherently more prone to criminality than Whites. In this ever-changing landscape of American politics, we would like to show how slavery has remained the same only refurbished and repackaged. We demonstrate on our timeline how the exploitation in American prison is rooted in slavery. We also created a chart to show how minorities, particularly black males, make up a disproportionate share of the U.S. prison population. Being black and brown in America is no easy task due to the systematic racism that is from the unequal education, opportunities in the workforce and negative stereotypes that America has grown to believe. The impact of criminalization on the community resources and job opportunities has left many colored males and females incarcerated, executed, or both and their family members poor and without positive role models. We have resorted to the prison industrial complex and the new American economy of insourcing. We promote made in America when should we say made in American prisons, for free or pennies an hour.
Impact of Educational Background on Content Understanding

Assita Belenkoabga

Mentor: Professor Damaris Lang
Hostos Community College

In academia the two most common methods utilized in delivering course content to students are via education level to lectures and reading the course content from a textbook. The understanding of the course content is then assessed by test taking. The scores received measure how well the student has adequately mastered the subject, which is used in turn to determine degree acquisition. The purpose of this research was to determine whether education background has an impact on test score. To carry out the study, random selection of college students and high school students were asked to read or listen to one minute long passage which will be followed by taking a test pertaining to the read passage. Two groups of participants were recommended to read and listen to the passage as long they want, then record the time they took to understand the passage. The last one had to think about the subject matter of the same passage. Participants were also informed they were going to be tested on the passage just after they finish reading or listening to the passage. Although there was no statistical significance that education background did not affect the test scores, the sample mean for the reading, listening, and control tests were 46.4%, 43.1%, and 39.3%, respectively.

Experiments With Finding Potential Function By Simultaneous Integration Of Partial Differentials

Willy Baez and Madieng Diao

Mentor: Professor Alexander Vaninsky
Hostos Community College

Conventional procedure of finding a potential function for gradient vector fields in space comprises a series of interleaving integrations and differentiations. This research suggests a simpler procedure that uses only integration of partial differentials. For gradient vector fields in plane the validity of this approach was proved by Johnson and Vaninsky (unpublished paper). We provide a sketch of the proof and conduct computational experiments aimed to extend this approach to the gradient vector fields in space.

Impact of Zika Virus in Human Population

Berkis Berroa Reyes and Adali D. Ocasio

Mentor: Professor Edme Soho
Hostos Community College

Zika Virus (ZIKV) is a mosquito-borne flavivirus, found in Aedes aegypti mosquitoes which live in tropical and subtropical areas. It is believed that A. aegypti mosquitoes were introduced to Americas from the old world in barrels of water transported on ships used for European exploration and colonization. Zika Virus can be transmitted through the bite of an infected mosquito to a human, from human to human through sexual intercourse, and the contact of some body fluids. Zika Virus has spread in many countries including Nigeria, India, French
Polynesia, Cuba, Puerto Rico, Brazil, the United States, and many other countries. The consequences of the Virus are catastrophic especially in developing fetuses. Zika Virus has been associated with microcephaly in newborns, and Guillain-Barre syndrome, both terrible diseases for humans. The aim of this research was to track Zika Virus infection in humans worldwide from 1948 to the present. Also, investigate the investment of some countries to fight the virus in human population.

Poster B28

**Application of Principal Component Analysis in Statistical Analysis**

Eric Campos and Hector Colon

Mentor: Professor Reginald Dorcely
Hostos Community College

Principal Component Analysis (PCA) is a projection method that helps in the visualization of information contained in a data matrix. Large data matrix is usually composed of large amounts of information, which are partly hidden because the data is too complex to be easily interpreted. PCA allows us to find out in what way samples differ from one another, which variables contribute the most to these differences, and whether or not those variables contribute in the same way or independently from each other. The purpose of this project was to study relationship between the Singular Value Decomposition theorem and the Principal Component Analysis in the context of environmental data analysis. To carry out this study, data collected from the internet were analyzed using Excel, Matlab, and SPSS revealed that 5 Principal Components (PCs) capture 85.01 % of the variation.

Poster B29

**An Understanding Of The Principal Component Analysis**

Hector Colon, Erick Campos, and Bassiriman Dembele

Mentor: Professor Reginald Dorcely
Hostos Community College

Principal Component Analysis (PCA) is a projection method that helps in the visualization of information contained in a data matrix. Large data matrix is usually composed of large amounts of information, which are partly hidden because the data is too complex to be easily interpreted. PCA allows us to find out in what way samples differ from one another, which variables contribute the most to these differences, and whether or not those variables contribute in the same way or independently from each other. The purpose of this project was to study relationship between the Singular Value Decomposition theorem and the Principal Component Analysis in the context of environmental data analysis. To carry out this study, data collected from the internet were analyzed using Excel, Matlab, and SPSS revealed that 5 Principal Components (PCs) capture 85.01 % of the variation.

Poster B30

**From School to Prison: Loss of Potential Black and Brown STEM Majors and PhD Candidates**

Abraham Ferrera and Victoria Araujo

Mentor: Professor Lauren Wolf
Hostos Community College

College campuses lack diversity across the mathematics department. Evidence demonstrates that there is a shortage of opportunities in STEM
majors for people of color, that starts from elementary through high school and beyond. Evidence also shows that there’s a difference on average spending per US child, white v. non-white, student that affects the outcome. Now when it comes to the college experience and inequality in the work-force they both play a major role in the loss of potential PhD candidates in mathematics. According to Lee Smith and William Harvey in 1988 math classrooms were one of the most segregated places in the United States. We have collected data and put together graphs depicting the lack of black and brown math professors in the world and the United States. Even though studies show that black and Latino students show more enthusiasm in post-secondary school they are less likely than white and asian students to take advanced math courses. (National Center for Education Statistics, 2004; Teitelbaum, 2003) This poster is part of a larger conversation of how we can equip and prepare our students for the most important STEM jobs of the 21st century.

Poster B31

**Derivation of Curvature Formula For Curves in Polar Coordinates**

Pamela Kolontchang

Mentor: Professor Alexander Vaninsky
Hostos Community College

The mathematical notion of curvature describes how fast a curve changes direction at a point [For a long time now, this concept has been significantly applied in areas such as physics, engineering, equations of bending, vibrations of tense strings, oceans waves and much more; thus the interest in expanding the knowledge and making it much more effective in different coordinates systems. We considered curves in plane defined in polar coordinates and used a simplified formula for the curvature obtained in a publication of Dr. Vaninsky, in order to derive an expression for the curvature in terms of the polar coordinates r and θ [3]. In this way, we were able to expand the traditional topics of calculus with parametric curves.

**Poster B32**

**Two-Dimensional Cfd Simulation Of The Flow Induced By A Rotationally Oscillating Flat Plate**

Andrey Lavrentyev and Michael Pineda

Mentor: Professor Moise Koffi
Hostos Community College

Recent studies have shown an increasing interest in applications involving rotational oscillating flat plates. Examples include the flapping wings of flying birds, the cooling of portable electronic devices with piezzo-electric fans or the flapping of elephants ‘pinnae for heat dissipation purposes. However, literature review indicates that this problem has not been fully investigated. To fill the gap, the present study is conducted to analyze the flow field and determine its impact on the thermal characteristics in the immediate proximity of a rectangular flat plate, subjected to rotational oscillations. The plate is rotated at 2 rad/s about one of its edges from 0 to 90 degree-angle using a UDF written in C programming language while a constant heat flux is applied to both of its faces. The induced flow field characteristics are simulated using the dynamic mesh method. Velocity vectors and flow pathlines indicate the presence of a vortical structure at the tip of the flapping plate. It is the shedding of these vortices that affects the local thermal characteristics of the rotating plate.
### Improving Persistence in Undergraduate Engineering in Two-Year Institutions

Ramah Sharaf and Oluwafemi Ligan  
Mentor: Professor Edme Soho Ph.D.  
Hostos Community College

Defining factors have been linked to engineering dropouts based on institutional and individual hardships and loss of interest. In this study, we revisit the timeline upon which engineering students drop out or switch their major to non-engineering majors. We aim to find pivotal points in these timelines complied with descriptive statistics from students to understand the correlation. Data have shown consistency under which level students leave engineering. The levels are classified into two categories and each category into sublevels based on the requirements of the courses at which the students leave engineering either by dropping out or by switching to non-engineering, particularly non-STEM majors. We define courses per each sub level as parameters. These parameters are then identified with their pre- and co- requirements to study the knowledge and skills that expected engineers are required to have for each of the defined parameter. Each of these parameters is then to be provided with adequate material for better preparation of future generations of engineers.

### Cloud-Based Smart Device For Environment Monitoring

Khalid Naitbourhim, Christian Huacon, and Nyomor-Da Tackie-Yarboi  
Mentor: Professor Biao Jiang  
Hostos Community College

Due to the advancement in technology and increase in economic growth, the environmental pollution has become rampant throughout metropolitan cities. Thus, the purpose of this research project is based on designing a low-cost, cloud-based smart device named Cloud-based Environment Monitoring Smart Device (CEMSD) that monitors the different environmental parameters such as air quality, noise, temperature and humidity. To build the CEMSD, we use the Raspberry Pi 3 (RPi 3) Model B, thus a microprocessor along with DHT11 temperature-humidity sensor, Grove-Loudness sensor, Shinyei PPD42NS particle matter (PM) Grove dust sensor, COZIR Wide Range 5-100% Carbon Dioxide (CO2) sensor and the MQ131 Ozone (O3) Gas sensor. The utilities of RPi 3 have been proven in many electronic projects of its abilities to be used as a computer and can be remote controlled through the Linux operating system based. The CEMSD collects and sends data from targeted measurement locations through wireless network or cellular network to a cloud server which can be accessed using a computer or any smart device. Social media can be used as Control action once the CEMSD environmental index exceeds the threshold. The CEMSD can be integrated into the making of Smart Cities which would help reduce level of pollution, save energy and provide an overall living environment enhancement.
**Investigation Of The Metabolic Heat Regulation Of African Elephants (Loxodonta Africana) Using Infrared Thermography**

Aimee Nandziga

Mentor: Professor Moise Koffi
Hostos Community College

The African elephant (Loxodonta Africana) is the largest walking animal on Earth. Due to socio-economic reasons, many elephants are kept in captivity, away from their natural habitats in zoos, reserves and temples. However, a major concern remains the conservation procedures insuring the well-being of these animals for their long term survivals. Due to their large size, studies indicate that elephants produce a huge amount of metabolic heat. However, how the animal dissipates its excess heat has been disputed for several decades. It is hypothesized that the flapping of the elephant’s pinnae plays an important role in heat dissipation. This study is conducted to investigate experimentally how the flapping of the elephant’s pinnae participates in the regulation of its body temperature. A mechanism was designed in the Aero-thermal lab of the City College of New York for the simulation of the elephant’s flapping pinnae. An infrared camera was used to scan the body of the elephant model during the rotational oscillations of its pinnae at different rates. It is observed that the presence of vortices in the flow field affects the heat transfer rate from the flapping pinnae to the surroundings, leading to a decrease in the animal’s body temperature.

**Environmental Noise Pollution: Analysis of Hospital, Educational Buildings, Senior Housing and Residential Building in The New York City Area**

Juanny Nunez

Mentor: Professor Biao Jiang
Hostos Community College

Environmental noise pollution is a disrupt in the natural environment caused by sounds and is a problem the world has been dealing since a few decades ago. In recent years, the population in New York City (NYC) has increased dramatically according to the statistics of NYC Department of City Planning. As a result of the increase in population, the noise pollution has become a major issue in NYC areas. In 2014, it was reported that Manhattan, Brooklyn and the Bronx had a noise disruption between the range of 39-44%. Thus, scientific research of noise pollution within urban areas was essential to understand this pollution. The purpose of this research was to study and measure the noise pollution in decibels (dB), to analyzed the disturbing patterns and how it affects these communities. The noise level was measured in five (5) different selected urban areas within NYC. The locations chosen were; the residential area near the Yankee Stadium; Walton Avenue Senior Housing; John Peter Zenger Elementary School; Lincoln Medical Center; and the quiet zones inside Hostos Community College (HCC). In this research, around 19,000 individual noise readings were recorded using a digital sound level meter with an accuracy of 1.5 decibels (dB). It was observed that the sound level was above the recommended dB. Reducing noise pollution is critical to keep a less disturbed environment with fewer cases of hearing loss throughout the years. Reinforcing the noise control act in urban areas can be a solution to reduce noise pollution.
Analysis of Various Mathematical Models in Harvesting Fish Population

Mohamadou A. Ouaba, and Josepha Kisbedo Teewende

Mentor: Professor Tanvir Prince
Hostos Community College

In a recent United Nation survey, it is pointed out that more than 200 million people depend on fishing as their source of food and income. However, uncontrolled fishing practice can threaten the security of marine life and can have a drastic effect on the ecosystem. For example, the collapse of the cod fish in Newfoundland in the early 1900 is an example of such dramatic effect of the overfishing. It is important to balance between the economic needs and ecological consideration. There are various mathematical models that was established for this purposes. In this research, we will study various mathematical models of fish population. We will also introduce new parameters into the model and see how it changes (for the better or worse) the dynamical system.

Spectrophotometric Determination of Cadmium in Water Samples of the Harlem River

Boukari Regtoumda

Mentor: Professor Francisco Fernandez
Hostos Community College

Cadmium is well known to be a pollutant for many decades all over the world. Long-term exposure to Cadmium can cause serious health problems that can lead to death. Heavy metals, such as Cadmium could produce severe damages to any living species including humans. The objective of this research is to determine the degree of contamination by heavy metals in water streams and principally in the water of the Harlem River. The analytical procedure is based on the extraction of Cadmium in the form of a complex with PAR (4-2-pyridylasoreorcinol) and its concentration determination using spectrophotometry. Calibrating graphs were obtained in the laboratory. The solutions were adjusted to an appropriate pH to measure the absorbance. Samples of water from the Harlem River were analyzed based on those measurements. The work is in progress. It is expected to determine if the Harlem Rivers’ water contains any substantial amount of Cadmium ions or not. The results should be compared with others methods of determination.

Analysis of Various Mathematical Models for the Spread of Contamination in the Groundwater

Jenifer Vivar and Mohosima Islam

Mentor: Professor Tanvir Prince
Hostos Community College

Chlorinated solvents such as trichloroethylene (TCE) are a common cause of environmental contamination. This is true for thousands of government and private industry facilities in the world. TCE and other chlorinated organics, collectively referred to as dense nonaqueous phase liquids (DNAPLs), are denser than water and only slightly soluble in water. DNAPLs tend to accumulate as a separate phase below the water table and provide a long-term source of groundwater contamination. In this research, we study various mathematical model of the spread of such groundwater contamination over time and study the long-term effect of such dynamical system. We will introduce our own parameters into the system of
differential equations governing the spread of contamination and study its various effects.

**Poster B40**

**Analysis of Cropland Per Capita in the United States**

Randy Ramsammy

Mentor: Professor Edme Soho
Hostos Community College

All of life is dependent on the production and sustainability of agriculture procedures on Earth. Agricultural production of cropland in the United States (US) are threatened by many conditions such as severe climate change, erosion and other variables. The top layer of crop land consists of top soil. Top soil is one of the 4 layers of Earth’s surface. It contains the highest concentration of organic matter and microorganisms where plants gain the ability to grow. In the US, the acreage of cropland declined from 420 million in 1982 to 357 million in 2007. The population in the US increased by 69.57 million from 1982-2007. Population is at an increasing rate whereas crop land is limited to Earth surface. As human populations increase and demand for food and energy expands, the need for cropland will increase. The purpose of this research is to analyze and compare the ratio of crop land per capita in the US.

**Poster B41**

**College Timeline Significance In The Development Of Engineering And The Process Of Dropping Out**

Ramah Sharaf and Ligan Lucrece

Mentor: Professor Edme Soho
Hostos Community College

Defining factors have been linked to engineering dropouts based on institutional and individual hardships and loss of interest. In this study, we revisit the timeline upon which engineering students drop out or switch their major to non-engineering majors. We aim to find pivotal points in these timelines complied with descriptive statistics from students to understand the correlation. Data have shown consistency under which level students leave engineering. The levels are classified into two categories and each category into sublevels based on the requirements of the courses at which the students leave engineering either by dropping out or by switching to non-engineering, particularly non-STEM majors. We define courses per each sub level as parameters. These parameters are then identified with their pre- and co- requirements to study the knowledge and skills that expected engineers are required to have for each of the parameters. Each of these parameters will then be provided with adequate material for better preparation of future generations of engineers.
Smart System for Noise Measurement in Metropolitan Areas

Arly Wispe

Mentor: Professor Biao Jiang
Hostos Community College

Noise Pollution is a major concern in cities with high concentrations of residents. The use of transportation, commercial areas, and construction are one of the major causes of noise pollution. Raising awareness of the impact of noise pollution on the residents of metropolitan cities has become a significant task for environmental agencies. Sound level meters (SLM) enable measuring the noise in a targeted area. However, the values obtained are not easily accessible to the community and does not operate unattended. Thus, a device that can record noise exposure data, perform unattended and update data in a cloud service is highly important for crowded cities. The purpose of this project is to present the accuracy of The Cloud-based Environmental Monitoring Smart Device (CEMSD) compared to the SLM Extech 407750. The research will display the accuracy, abilities and benefits of the CEMSD such as update of noise exposure for individuals who reside or frequent a targeted location, graphical representations of sound level as a function of time and alerts when noise exposure becomes a threat to humans. The CEMSD stores data and then send them to a cloud where the data are accessible at any time to individuals via the internet. The device was designed by using Raspberry Pi 3 (RPi 3) Model B. Grove loudness sound sensor was incorporated within the CEMSD to detect sound levels. The accuracy is tested by measuring the noise pollution of indoor and outdoor locations with the SLM and the CEMSD. The measurements were taken simultaneously with the sound level meter and the CEMSD, then the decibels recorded were compared and the difference between decibels is used to determine the accuracy of the CEMSD. The CEMSD will be efficient to use in the locations where public agencies want information regarding noise pollution.

LaGuardia Community College

Poster B43

The Role of Dectin-1 Receptor in LPS-Induced Phagocytosis Stimulation In Microglial Cells

Clara Altidor and Maria Muñoz

Mentors: Professors A. Lucía Fuentes and Maria Entezari
LaGuardia Community College

Neuro-inflammation and accumulation of Amyloid βeta (Aβ) protein are critical components of the pathogenesis of Alzheimer’s disease (AD). AD is characterized by impairment of Aβ clearance as well as secretion of neuroinflammatory cytokines. Phagocytosis is a highly regulated process in microglia that involves a variety of receptors, including several known Pattern Recognition Receptors (PRRs). Lipopolysaccharide (LPS) is recognized by common (PRRs), including TLR-4, and C-type lectins, such as Dectin-1. However, little is known about the role of these receptors in the regulation of microglial phagocytic capabilities. In this study, we conducted in vitro experiments using BV2 mouse-derived microglia, to investigate the involvement of Dectin-1 receptors in the cells phagocytic response to pro-inflammatory molecules. BV2 cells were treated with LPS for 24 hours, then cells were incubated with zymosan and phagocytosis was quantified microscopically. We found that LPS upregulated, phagocytosis of zymosan, compared to untreated cells. This effect of LPS was significantly reduced by pre-treating cells.
with laminarin, a soluble beta-glucan known to bind Dectin-1. The data point to the importance of Dectin-1 receptors in the modulation of phagocytosis observed when cells are exposed to immune-modulators such as LPS. These findings open the possibility of elucidating the pathways involved in phagocytic stimulation in microglia.

### Poster B44

**Effects of Nutrient Starvation on the Production of Extracellular Polymeric Substances in Medical Tubing by Pseudomonas species**

Fatima Benitez

Mentor: Professor Olga Calderon
LaGuardia Community College

Pseudomonas bacteria are the common cause of nosocomial or hospital-acquired infections. These opportunistic pathogens are also known to have antibiotic resistance. Currently, only a few Carbapenem compounds are still effective and used against Pseudomonads genera. The ability of these microbes to survive and populate medical materials, equipment and surfaces is largely due to their capability to produce extracellular polymeric substances (EPS) or biofilms. EPS is suggested to be a defense, survival & evolutionary strategy. The purpose of this study is to determine how nutrient depletion can play a role in the development of biofilms in various types of medical devices such as IV tubing, urethral caterers, Penrose tubing and feeding tubing. In our study we use a nutrient starvation approach to measure production of biofilms in common medical equipment by *Pseudomonas aeruginosa* and *Pseudomonas fluorescens* in relation to nutrient availability.

### Poster B45

**Combined Sewage Overflow and Enterococci: Examining Patterns of Bacterial Contamination in New York City’s Waterways**

Thomas Calella

Mentor: Professor Holly Porter-Morgan
LaGuardia Community College

New York City’s waterways face increasing pressure due to aging infrastructure and growing population. The city’s waterways are also affected by its combined sewage system, which can release overflow of residential sewage, industrial wastewater, and rainwater street runoff directly into receiving waters during rain events. The objective of this research was to investigate the relationship between urban land use, Combined Sewage Overflow (CSO) effluent, and the abundance of *Enterococcus* in New York City waterways. In collaboration with the Citizen’s Water Quality Testing Program, weekly water samples were collected and tested for the presence and abundance of *Enterococci* bacteria, an indicator of sewage contamination. Geographic Information Systems were used to characterize a number of variables associated with urban wastewater infrastructure. Variables included: CSO drainage area, lot-level land use for each drainage area, identity of the CSO pipe(s) in closest proximity to each of the 25 sample sites, direct drainage area, annual CSO drainage volume, and total street area. A multivariate linear regression analysis was performed and an association was found between total annual CSO discharge volume and *Enterococcus* colony forming units, when controlling for other variables (p<0.01).
**Thermodynamic Description of Nuclear Level Density**

Jiafeng Chen and Alsion Valbuena

Mentor: Professor Roman Senkov
LaGuardia Community College

Knowledge of the level density is an important element in understanding the behavior of a quantum many-body system of interacting particles in various physical processes. In nuclear physics, this knowledge is necessary for the description of numerous reactions, including those of astrophysical or technological interest. One of the purposes of the current research is to compare the exact shell-model nuclear level density with phenomenological ideas based on the Fermi-gas picture at a certain temperature. We look at these ideas and the corresponding equations from the viewpoint of our numerical results. Our attention is mostly concentrated on the usually cited empirical parameters of the level density such as the temperature parameter.

**Calculating Wind Turbine Performance Using a Weibull Distribution and Blade Element Momentum Theory**

Michael Wiley & Paul DeVries

Mentors: Professors Malgorzata Marciniak, Marina Nechayeva and Vladimir Przhebelskiy
LaGuardia Community College

The purpose of the research is to identify and maximize the energy output of a wind turbine if it were placed on the roof of a LaGuardia Community College building. To accomplish this, a Weibull Distribution is used to model local wind speed data. A year’s worth of local wind speed data was recorded and the Weibull shape and scale parameters were obtained from the data using the Maximum-Likelihood Method of parameter estimation. The Blade Element Momentum Theory was used to determine a wind turbine’s efficiency at various windspeeds. The annual energy production was then estimated by using the probability and calculated power of each wind speed.

**Chemical Tagging of Milky Way Galaxy Halo Red Giant Stars**

Lucia Dikaczova and Christobal Serra

Mentor: Professor Allyson Sheffield
LaGuardia Community College

The purpose of this research is to collect data about chemical abundances of M-type red giant stars in Milky Way’s galactic halo with intermediate masses between 1-10 M☉ masses. Particularly, we are interested in the metallicity and abundances of alpha-elements and neutron-capture elements (r-process and s-process). By comparing stellar chemical abundances (especially Fe 1, Fe 2, Mg, Si, Ne, Ar, Ca) with their immediate stellar surroundings it is possible to determine whether a particular star formed in the Milky Way or within accreted dwarf spheroidal galaxy. This analysis allows us to understand more about the history of stellar formation in the Milky Way. We obtain our data from VALD3, Vienna Atomic Line Database and we used Python based iSpec tool for detailed, automated analysis of their chemical abundances (Blanco-Cuaresma, S.) The goal of this project was to demonstrate how understanding of the chemical and dynamical properties of different stellar populations in the Galaxy can be determined by analysis of stellar spectra. The inspiration for this project comes from an emerging field of astrophysics called ‘Galactic Archaeology’, which aims to map and understand history of development of Milky Way Galaxy.
Revision of Australasian Ground Spiders (ARANEAE, GNAPHOSIDAE) of Genus Zelanda, (Foster, 1979)

Anjana Dudhraj
Mentor: Professor Boris Zakharov
LaGuardia Community College

Originally, the genus Zelanda was recorded only in New Zealand. Scientists from American Museum of Natural History (New York) accumulated collection material on Australasian ground spiders from major museums of the World, including all museums of Australia, New Zealand, and the United States of America. The study of these collections discovered that spiders of this genus are very diverse and common not only in New Zealand but also all over Australia. The 18 new species were discovered so far. The study is still in the progress and discovery of more new species of these spiders from Australia is very possible.

Study of Thermal Deterioration in Vegetable Oils using Fluorescence Spectroscopy

Yousra Elhamdouchi
Mentor: Professor Xin Gao
LaGuardia Community College

This part of the research project investigates the difference between the fluorescence spectral features of two vegetable oils: Sunflower oil and Extra Virgin Olive Oil. The whole project proposes to study the thermal deterioration in different types of vegetable oils with an aim to identify changes in fluorescence components, thus revealing changes in the chemical components in these oils, especially those which are potentially harmful to human health. Previous research in this area has shown that in virgin olive oil, both high monounsaturated fatty acids (MUFAs, 55-88%) and low polyunsaturated fatty acids (PUFAs, 2-21%), when combined with the presence of highly anti-oxidative phenolic compounds that inhibit production of hydroperoxides, give higher resistance to oxidation processes imparting properties advantageous to frying as compared to other vegetable oils [1]. We will study the fluorescence spectral features of different vegetable oils before and after heating or exposing them to light in air. The heating process will change from minutes to hours. We will also compare the changes in the fluorescence spectra of these oils after cooking different food (vegetable or meat) and storing the oil for an amount of time.

The role of Drosophila SOCS36E in linker histone H1-mediated heterochromatin formation and tumor suppression

Kimsun Fan, Andrea Mejia, Meghan Pfau, Nathan Doran, Amber Crockett1, Arthur I. Skoultchi2, and Na Xu1.
Mentor: Professor Na Xu

1LaGuardia Community College,
2 Albert Einstein School of Medicine

The linker histone H1 is a key component of chromosomes and plays a major role in heterochromatin formation. However, how H1 executes these biological roles is largely unknown. Our recent studies showed that H1 interacts with three key factors involved in heterochromatin formation, Su(var)3-9, HP1 and STAT (Lu et al., 2009, Lu et al., 2013, Xu et al. 2014). We further discovered that the interaction of H1 and STAT plays an important regulatory role in JAK-STAT-induced blood tumor formation in flies (Xu et al.,...
To further identify genes that cooperate with H1 in regulation of heterochromatin formation, we completed a mis-expression genetic screen. We ubiquitously mis-expressed 453 distinct genes in control and H1 knockdown flies, by using the EP collection of P-element insertions on the second chromosome. We then examined effects of their mis-expression on H1 knockdown-induced lethality. We identified a number of genes whose mis-expression either decreased or increased lethality induced by H1 knockdown. These genes spanned a wide spectrum of biological activities ranging from cell cycle regulators to chromatin remodelers. One of the suppressors identified in the screen is SOCS36E, a negative regulator of the JAK/STAT signaling. Our studies also showed that SOCS36E not only functions together with histone H1 in mediating fly lethality, but also is required for H1-mediated heterochromatin structure and function. Taken together, our results suggest a role for JAK/STAT signaling and SOCS36E in H1-dependent regulation of essential processes in *Drosophila*.

**Poster B52**

**Modulation of Immune Function by Antioxidants**

Kathy Flores

Mentor: Professor Tonya Hendrix
LaGuardia Community College

The immune system is comprised of tissues, cells, and organs that protect the body from pathogens. Macrophages, the body’s first line of defense when a pathogen enters the body, is a type of white blood cell. By using phagocytosis, macrophages are able to engulf and destroy pathogens. Macrophages develop in bone marrow and then disperse through the blood stream. Macrophages have receptors located on their cell membrane that bind to chemicals produced as a result of infection. They leave through the blood stream by squeezing in between cells of the vessel (see Figure 1) near the site of infection (see Figure 2). Once the macrophages are activated, they produce oxidants which aid in their function. Although helpful in macrophage function, oxidants can also be detrimental to general cellular metabolism and can contribute to heart disease and cancer. Antioxidants, on the other hand, are molecules that inhibit or counteract the action of oxidants. The body needs a balance of both oxidants and antioxidants in order for optimal functioning of the immune system as well as the other systems.

In this study, we will determine the effects that antioxidants have on macrophage function. The hypothesis is that macrophage function will be decreased in high concentrations of antioxidant. In this study, macrophage function is measured by a phagocytosis assay. It is expected that the antioxidant, N-acetyl cysteine, will decrease phagocytosis of RAW macrophages in a dose dependent manner (see Figure 6).

**Poster B53**

**Synthesis of Porphyrin-Based MRI Contrast Agents**

Ali Inaba

Mentor: Professor Sunaina Singh
LaGuardia Community College

Magnetic Resonance Imaging (MRI) has become a prominent imaging technique in medicine. MRI contrast agents are used to increase the sensitivity of this technique. $^{19}$F MRI is emerging as a new imaging technique because of its potential for direct and precise cell quantification. High $^{19}$F content, relatively short longitudinal ($T_1$) nuclear spin relaxation time and high magnetic fields are essential for successful in vivo $^{19}$F MRI. Recently, a new method for cancer treatment with a less side effect called photodynamic therapy (PDT) has been introduced. Hence, diagnosis-treat union of MRI and PDT will be significantly promoted if a new
family of bi-functional agents is found, which would combine the effects of a contrast agent in MRI and of a photosensitizer in PDT. It will bring great improvement to the cancer diagnosis and treatment. This work briefly describes the synthesis of porphyrin substituted with three thioglucose units and one $1H,1H,2H,2H$-Perfluorodecanethiol which can act as bi-functional agent for MRI-PDT. This compound contains 33 F atoms which can play a significant role in modulating signal intensity and enhancing tissue contrast.

Poster B54

Isolating Hydrocarbonoclastic Microorganisms from Newtown Creek

Yukari Izumiyama

Mentor: Professor Joby Jacob
LaGuardia Community College

Newtown Creek which separates Brooklyn and Queens is one of the most polluted waterways in the country. It has been subject to long-term industrial, particulate, and sewage pollution. It is also the site of one of the largest oil spills in the country. Petroleum-hydrocarbon degrading bacterial species have been identified at the sites of other oil spills. The object of this research is to isolate bacterial species capable of breaking down the petroleum hydrocarbon, Octacosane, and to characterize and identify them. The ultimate goal is to better understand the role and mechanism of naturally occurring bioremediators in urban waterways. Water samples were collected from Newtown Creek, and bacteria were isolated in an enrichment culture of Bushnell-Haas Broth with the hydrocarbon, Octacosane, as the sole hydrocarbon source. Our results seem to indicate that there are Gram negative bacilli in Newtown Creek capable of breaking down Octacosane.

Poster B55

De Novo Design of Selective Drug Lead Candidates Towards The Dopamine Receptor

Jon-Eric Ortiz, Yasmeen Munasser and Ahmed Zeidieh

Mentor: Professor Ian Alberts
LaGuardia Community College

Dopamine and its receptors are critical for many functions of the brain and body including emotion, learning, reward-motivated behavior and motor control. Dysfunctions of the dopamine system have been linked to neuropsychiatric disorders such as addiction and schizophrenia and treatments for some of these disorders involve the use of dopamine receptor inhibitors. Our goal is to design high affinity selective drug lead candidates towards the dopamine receptor. Ligands based on the dopamine agonist-antagonist stepholidine were docked to models of dopamine receptors using the automated docking software AutoDock, and predicted ligand conformations and binding energies were obtained. The docking conformations were viewed in the molecule modeling software Maestro to identify important ligand to receptor interactions for binding. Initial results show that better binding energies towards the D3 dopamine receptor are obtained with ligands with longer alkyl chain substituents from specific points of the stepholidine scaffold. The stepholidine analogues designed so far have shown selectivity towards D1 and D3 dopamine receptors over D2 which is a key requirement for reducing unwanted side effects. Future studies will include docking a larger variety of modified ligands with various docking parameters and observing the molecular basis for ligand specificity to design and optimize ligands with better binding to D1 and D3 but not D2.
**Poster B56**

**Enhancing Geometric Phase Sensitivity in Atomic Coupled Ring Interferometers by Modulating Inter-Ring Distance.**

Eleni Romano

Mentor: Professor John R. E. Toland
LaGuardia Community College

Previous theoretical work in the study of transmission properties of cold atoms in coupled ring waveguide structures has indicated that the sensitivity to geometrical phase shifts is greatly enhanced by increasing the number of rings in an array or by changing the relative size of the rings in an array of the coupled waveguides. The coupled ring structures in these simulations assumed zero distance between rings. Our research addresses how increasing the inter-ring distance of the chain of \( N \) rings affects the rotational sensitivity of a ring array interferometer. We determine the sensitivity of a ring array gyroscope by calculating the slopes of the transmission function with respect to phase at the sharpest transmission resonance in the transmission function. The distance between rings is parameterized as the product of the wave number \( k \) and the distance between the rings \( d \), while the size of the rings is parameterized by the product of \( k \) and the ring circumference \( L \). The transmission is periodic with oscillatory regions and zero transmission gap regions. Our results show that modulating the inter-ring distance near \( kd = 0.5\pi \) leads to sharp transmission resonances with slopes that are orders of magnitude greater than those in ring arrays with directly connected rings.

**Poster B57**

**A multi-pronged strategy to identify HIV protein phosphorylation sites.**

Kathleen Rowe¹, Pratikkumar Rathod²,³, Hsin-Pin Ho²,³, Kevin Mark¹,², Emmanuel Chang²,³

Mentor: Professor Kevin Mark
LaGuardia Community College; York College and the ³ CUNY Graduate Center

Phosphorylation is a dominant form of post-translational modification of proteins, involved in numerous biochemical processes such as signal transduction, activation and deactivation of proteins. Determination of the phosphorylation sites of Human Immunodeficiency Virus (HIV-1) proteins could provide insights into how the virus functions in the human host cell, and furthermore develop strategies to reduce its efficacy. Phosphorylation predominantly occurs at the amino acids serine, threonine and tyrosine. Using the sequenced genomes for HIV-1 clades, bioinformatics software (eg.NetPhosK, KinasePhos and GPS) have computed candidate sites for phosphorylation within each protein. Synthetic peptides of these proteins have been placed in environments to induce phosphorylation and later analyzed by mass spectrometry (MS) to validate the bioinformatics data.

In this work, Matrix Assisted Laser Desorption Ionization Linear Trap Quadrupole (MALDI LTQ) is used to analyze phosphorylation. A peptide sequence of a p24 HIV-1 protein has been found to be phosphorylated by a specific enzyme. This study was expanded to the whole p24 protein, where phosphorylation was measured to be in a phosphorylated to unphosphorylated ratio of 1:1000. The goal of this study is to identify potential phosphorylation sites of p24 on the peptide level and to compare the results with both the bioinformatics and p24 whole protein phosphorylation data.
Mobile Robot for Data Collection Project

Supta Sen

Mentor: Professor Praveen Khethavath
LaGuardia Community College

The idea of using the mobile robot for data collection has been applied in various fields including medical, personal assistance, security, warehouse, military and space exploration. A mobile robot is capable of navigation autonomously. This project was to build and explore applications of a mobile robot for data collection using BOE shield-Bot. The robot built uses Arduino (Brain of the robot) to store and run programs which controls the movement of robot. The software Arduino Uno was used for programming the robot to follow a particular path. The robot was also programmed to follow another robot, use whisker sensor to avoid obstacles during navigation, make use of speaker to provide audio signals. The motion of the robot was analyzed. The concept of electrical engineering was applied to build the circuits and make connections to receive power from the batteries. Some of the major challenges of the project were to assemble the robot in a precise manner and to create appropriate interface with the Arduino machine.

Maria Ignacia Serey-Roman


Maria Ignacia Serey-Roman and Delfino Enriquez

Mentor: Professor Malgorzata Marciniak
LaGuardia Community College

The purpose of this research is to mathematically compare the efficiency of flat solar panels with non-flat solar panels to prove that adopting a nontraditional shape will result in greater energy absorption and light exposure. Motivated by the sun’s geometry and the direction of perpendicular sunrays, we found that the current shape of a solar panel limits how much energy absorption and light exposure it can take in on a regular day. Using vector calculus and computer software, we have generated a model that under certain circumstances prove that a curved surface is 30–50% more efficient than a flat surface. These results prove that there is a gap between geometry and design, thus allowing for an innovative solar panel that could theoretically maximize annual accumulation of the sun.

Newtown Creek: An Environmental Disaster in Our Backyard

Kevin Sarmiento, Prasala Tuladhar

Mentor: Professor Jennifer Vance
LaGuardia Community College

Newtown Creek is a 3.5-mile harbor estuary that partially divides the boroughs of Brooklyn and Queens. Since the mid-1800’s Newtown Creek and
the surrounding Greenpoint neighborhood has served as an industrial hub for the expanding City of New York, characterized by its ports and manufacturing capabilities. Unfortunately, the continuous growth of the city has strained the fragile Newtown Creek ecosystem and repurposing the creek as an industrial dumping ground. Pollutants like refining chemicals, fertilizers, raw materials, oils, metals, and human waste have all found their way into this waterway. After over a hundred years of contamination, Newtown Creek was listed on the Superfund National Priorities List by the Environmental Protection Agency (EPA) in 2010, a designation reserved only for the most polluted waterways in the United States. The primary objective of this research was to understand the greatest anthropogenic threats to this aquatic environment. The secondary objective was to determine if the water quality in Newtown Creek has improved since becoming a Superfund site. Water samples were collected from Newtown Creek and analyzed for phosphate, phenols, chromate, chloride, copper, iron, lead, and nitrate using the CHEMetrics Instrumental kits and HACH TNTplus metals and lead kits and measured with UV-Spectrophotometer DR5000 and CHEMetrics V-2000 Multi-Analyte Photometer. Lead and phosphate were some of the most concerning and threatening toxins based on their constant presence and concentration over the EPA’s Maximum Contaminant Level (MCL). Additional data will be gathered and compiled with existing data to understand the potential trends of these toxins through time.

Poster B61

Synthesis of Thioalkyl Substituted Metalloporphyrins to Investigate Catalytic Activities of their Self-Organized systems for Environmental Remediation

Michelle Tuz Cordova

Mentor: Professor Amit Aggarwal
LaGuardia Community College

Porphyridoids and metalloporphyrinoids are promising components for advanced material chemistry because of their rich photochemistry and optoelectronic properties. Supramolecular systems of metalloporphyrins shows enhanced catalytic activity for allylic oxidation of olefins using molecular oxygen as oxidizer under ambient conditions, in contrast to their completely solvated metalloporphyrins in organic solvents. However, their self-decomposition limits their use for these applications. Here we are presenting synthesis of a series of iron (III) porphyrinoids appended with various thioalkyl groups at the meso position using commercially available 5,10,15,20-tetrakis(pentafluorophenyl) iron (III) porphyrin, Fe(III)TPPF₂₀. Our hypothesis is that the presence of long thioalkyl chains at para positions of the meso phenyl groups attached to the metalloporphyrinoids may folds around the porphyrin face and block the access to the central metal atom from self-decomposition, where the oxygen is activated during their catalytic activity.
**Antibiotic resistant genes in soil bacteria in new town creek**

Manolis Tzanidakis

Mentor: Professor Olga Calderon
LaGuardia Community College

Antibiotic resistance is a problem that surfaced right after the first antibiotic clinical trials were done in the mid twentieth century and continue to be a concern in the medical community. Some of the factors that contribute to the development of resistant genes in microorganisms include misuse of antimicrobial compounds, using antibiotics in animal fed, and prescribing antibiotics when they are not needed. Perhaps the most important factor is one that we have no control of: Evolution. Organisms, evolve constantly by adapting to new and changing environments. In this study we focus on bacteria present in soil samples collected at Newtown Creek, NY, one of the most polluted waterways in America. We use intricate microbiological techniques that include traditional methods of isolation and culturing as well as DNA methods of isolation and identification to find out: 1) the microbes inhabiting this environment, 2) If the microbes have evolved resistant genes to various antibiotics commonly used to treat bacterial infections in humans and 3) Make a correlation between antibiotic resistant genes in bacteria and heavy metals.

**Thermalization in a Many-Body Quantum System**

Jiafeng Chen and Alison Valbuena

Mentor: Professor Roman Senkov
LaGuardia Community College

In this research, we calculate and analyze the energy level densities of interacting many-body systems such as atomic nuclei. Level density is defined as the number of energy levels per energy interval and describes the distribution of the energy levels as a function of excitation energy of the system. The knowledge of nuclear level density is important to understand the microscopic structure of nucleus and its properties, and it is a significant ingredient for calculations of thermonuclear rates for nuclear synthesis in astrophysics. To study nuclear level density and the processes of thermalization we use the Shell Model in sd- and pf-shell model spaces. We also study the dependence of the level density on the nucleon-nucleon interaction and on the strength of the nuclear pairing correlations. For the pairing correlations, we introduced a simple schematic model with an effective interaction.
**MEDGAR EVERS COLLEGE**

**Poster B64**

**Effect of Tyrosine kinase Inhibitors on proliferation of v-Ras Transformed NIH 3T3 cells**

Oluwaseun Olowookere and Enaude Bernard

Mentor: Professors Ijaz Ahmed and Alam Nur-E-Kamal
Medgar Evers College

**Background:** The Ras GTPase family has been found to regulate various functions of mammalian cells. Oncogenic mutants of Ras GTPases have been demonstrated to be associated with the development of various types of cancer in human. We have demonstrated that ACK is required for the survival of v-Ras transformed NIH 3T3 cells, but not the parental NIH 3T3 cells. In this report, we studied the effect of some tyrosine kinase inhibitors (inhibits ACK kinase) on growth of v-Ras-induced NIH 3T3 cells.

**Method:** We seeded v-Ras transformed NIH 3T3 cells into culture dishes and incubated overnight at 37°C in standard culture conditions. Then tyrosine kinase inhibitors of STK series or PD168393 were added. Cell growth was monitored by MTT assay after 24 hours. We determined IC50 for each inhibitor. We also assayed markers of apoptosis in ACK inhibitor treated cells.

**Results:** It was found that some activated Cdc42-associated Kinase (ACK) inhibitors induced Ras-transformed cell death, while some others did not show any inhibitory activity. We also demonstrated that cell death was associated with induction of apoptosis. The results obtained from this study will be presented in this report.

**Conclusion:** Our results indicate that ACK inhibitors induce preferential death of v-Ras transformed cells. Development of ACK kinase inhibitors might lead us to design new experiments to study the potential of such inhibitors for the treatment of Ras-induced cancer.

**Poster B65**

**Assessing IFN-g (Interferon-Gamma) and A2A AR Expression in Clinical Samples**

Chenel Gayle

Mentor: Professor William Carr
Medgar Evers College

In the human body, there are receptors, and proteins that trigger cellular responses to infections. Certain genes trigger an inflammatory response which is what we are observing in this experiment. In this study, we are observing how specific genes related to immune responses are expressed in clinical blood samples from patients with Human Immunodeficiency Virus-1 (HIV-1) infection and fungal infection by *Cryptococcus neoformans*. *C. neoformans* is a fungal infection of the central nervous system that commonly occurs in AIDS patients who have compromised immune systems. The genes being analyzed for relative expression are Adenosine Receptor A2A (A2A AR), Beta Actin, GAPDH, and IFN-g (Interferon Gamma). A2A AR is the target gene in this experiment that is known to have an anti-inflammatory effect; therefore, it is expected that the gene is going to be greatly expressed in the clinical samples. IFN-g is the second target gene that triggers a pro-inflammatory cellular response to viral and microbial infections while also having the ability to inhibit viral replication directly. GAPDH and Beta Actin are being used in the analysis to normalize the expression of A2A AR and IFN-g. If the target genes show an expression in the clinical samples, it may be possible to determine how the immune response can be modified to better treat HIV patients with *C. neoformans* co-infection. Furthermore, it is expected that the expression of
both the A2A AR and IFN-g genes will surpass the amount of expressions of the housekeeping genes GAPDH and Beta Actin. However, since A2A AR has anti-inflammatory effects and IFN-g has a pro-inflammatory cellular response, it is expected that the expressions of both target genes are going to be inversely correlated.

Poster B66

A Genetic Screen to Identify Regulators of Collective Cell Migration

Nicholette Hall and Janika Gentle

Mentor: Professor Monn Myat
Medgar Evers College

Cell migration is essential for proper location, as well as the function of all organs. The study of single cell migration gives us information about all forms of cell migration. However, cell migration as a group gives rise to organs during embryogenesis and the spread of cancerous cells. We performed an RNA interference screen in the fruit fly Drosophila melanogaster to identify genes responsible for the migration of salivary glands, an epithelial-based secretary organ. We screened 38 RNAi lines and identified 6 genes with defects in salivary gland migration. These genes encode Rac2, Enabled, NADH-PDSW subunit, Rab35, DGK and MAPK-AK2. We will analyze the embryos for each of these mutations to better understand how they affect salivary gland migration during organ development.

Poster B67

Can dietary supplements decrease melanotic tumors in fruit flies?

Shellane Gill and Jermaine Wilson

Mentor: Professor Chiyedza Small
Medgar Evers College

Several signal transduction pathways have been implicated in the development of human diseases such as cancer. One of these disease-related pathways is Janus kinase (JAK)/signal transducer and activator of transcription (STAT). Having only one JAK (Hopscotch), Drosophila is used to study the functional requirements of the JAK-STAT pathway across species. Drosophila Hopscotch tumorous-lethal (hopTUM-L) mutation acts as an activated oncogene causing hematopoietic neoplasms called melanotic tumors to form due to over proliferation of cells. Dietary supplements such as Selenium and garlic play important roles in keeping the body healthy and reducing inflammation. Selenium is an essential mineral antioxidant with anti-carcinogenic properties. Garlic is thought to have anti-cancer properties along with a myriad of health benefits. Studies suggest that people who consume lower amounts of selenium could have an increased risk of developing cancers of the colon and rectum, prostate, lung, and stomach. Whether selenium supplements reduce cancer risk is not clear. The role that garlic plays in cancer prevention is also unclear. More research is needed to understand the effects of garlic and other dietary supplements on cancer risk. Our studies investigate the effect of Selenium and garlic on the development of melanotic tumors in Drosophila JAK-STAT mutants. Understanding the role of these supplements in this mutant pathway-specific context may shed light on their functions in cell proliferation, differentiation and growth. Results from these ongoing studies will be presented.
Blocking Lysine Acetylation-Directed Epigenetic Mechanisms Abrogate the Growth of Prostate Cancer Cells

Vimal Arora, Loveth Igbineweka, Olamide Fadamiro and Abdul Kamara

Mentor: Professor Shiraz Mujtaba
Medgar Evers College

Acetylation of amino acid lysine by histone acetyltransferases (HAT) creates acetylated-lysine (AcK) moiety on chromatin and chromatin-associated proteins to regulate nuclear signaling and gene transcription. These Kac sites serve as a docking site for bromodomain-containing proteins. Dysregulation of this acetylation-mediated molecular processes leads to development of many cancers including Prostate Cancer (PCa). Therefore, blocking acetylation-mediated events could prevent the growth of PCa.

CREB-binding protein (CBP) is the master coactivator that activates gene transcription through site-specific acetylation of lysine residues on chromatin by its HAT domain. One of the members of BET family, the Bromodomain 4 protein (BRD4) is recruited to the Kac site upon CBP-mediated acetylation. Literature suggests that inhibition of CBP HAT activity and BRD4 functions abrogate the growth of melanoma cells.

CBP is a coactivator of Androgen Receptor that directs the progression of PCa. We previously demonstrated that acetylation plays a pivotal role in development of PCa. Thus, here, we hypothesize that inhibiting CBP HAT and BRD4 will block the growth of PCa cells. Towards this goal, we tested the effects of CM354 and JQ1 which are inhibitors of CBP HAT and BRD4 in blocking the growth of cancer cells the study demonstrates that CM354 and JQ1 can indeed induce abrogation of PC3 cells proliferation.

Determination of Arsenic, Lead and Cadmium concentration of some coarse grains by Microwave Digestion with Inductively Coupled Plasma Optical Emission Spectrometry

Soutong Kabore

Mentor: Professor Jin Y. Shin
Medgar Evers College

High levels of toxic elements in grains are potential concern for human health. The objective of this study was to examine the amount of total arsenic, lead and cadmium in different types of grains from two different countries using inductively coupled plasma optical emission spectrometry and estimate the potential health risk. Microwave digestion procedure optimized was applied for digesting rice, red bean, black bean, millet, maize red millet, brown rice. Total concentration of arsenic in this study is varied from 0.87-6.33 mg/kg. White rice from California contained the highest arsenic concentration from this study. The success of combining the microwave digestion technology with the ICP-OES was a simple and precise method to determine many mineral elements in coarse grains simultaneously.
**Genotype of Bacterium V6-VP, an Antibiotic Producer Isolated From Brooklyn Soils.**

Torrelle Lewis

Mentor: Professor Carolle Bolnet
Medgar Evers College

*Streptomyces*, a genus of the Actinobacteria grows in different environments. All the members are gram positive filamentous bacteria. *Streptomyces* play a major role in the decomposition of organic matter and are mainly found in soil, consequently contributing to its earthly odor. These bacteria are also highly recognized for their ability to produce antibiotics used to treat bacterial infections. In a previous study in our lab we have isolated from Brooklyn NY soils 26 (V1-V26) colonies of *Streptomyces* and assayed their supernatants for antibiotic production. The antibiosis activity was assayed against the test bacteria *E. coli*, *M. luteus*, *S. marcescens*, *S. aureus*, *P. aeruginosa*, and *B. subtilis* using the well diffusion method. Our results showed that colony V6 secretes an antimicrobial agent against *P. aeruginosa* a gram-negative bacterium that is well known for its increasing natural resistance to antibiotics as well as to disinfectants.

This work aims at characterizing genotypically our *Streptomyces* clone V6 that is secreting an antibiotic-like substance against *Pseudomonas aeruginosa*.

To that end, V6 was grown on TSB for 76 h at 37C. Total genomic DNA was recovered using MoBio bacterial DNA isolation kit. After quantifying and evaluating the purity of our DNA using the NanoDrop instrument, PCR was performed using the primers (fD1/ rP2) that specifically amplify the 16S ribosomal gene, followed by electrophoresis.

Genomic DNA as well as the amplicons were sent to an external lab for sequencing. Our results show that V6, the *Streptomyces* producing antibiosis against *Pseudomonas aeruginosa* shared 94% similarity with *Streptomyces niger*, a well-known producer of antibiotic, antitumor and immunosuppressant metabolites. Our future work aims at producing larger amount of V6 supernatant for purposes of characterizing the antibiotic-like product.

**Carcinogens in New York City Soil Environments**

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Mentor: Professor Blaszczak-Boxe
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We quantify several hundred carcinogenic compounds (e.g., aromatics, long-chained, pahs, pcbs, etc.) in NYC soil environments via wet chemical techniques and gas chromatography-mass spectrometry (GC-MS), where they are organized as a function of boroughs. These compounds all have a toxicity story, which pertains to both long- and short-term exposure. Backward trajectory analysis of air parcels as a function of altitude has been done to gain insight into the origin of air samples. Principal component and regression analysis of data will also be used to quantify unknown correlations among the data. Data will also be compared to other locations in the US to attain overall perspective on the implications for human health and the detrimental effects they cause.
Optimization of in vitro assay conditions to assess A2A adenosine receptor function among human lymphocytes

Tesean Millington
Mentor: Professor William Carr
Medgar Evers College

**Background:** Dimethyl sulfoxide (DMSO) is a chemical that is used in freezing cells and in reconstituting drugs that are not soluble in water. At high concentrations DMSO is toxic to cells and will cause cell death. Since the drugs used to modify Adenosine receptor (A2A AR) responses are not soluble in water and must be reconstituted in DMSO, it is necessary to determine how much DMSO is tolerable for conducting assays using whole blood.

**Methodology:** For this experiment it was necessary to test and compare the cell viability of whole blood from two healthy blood donors using different concentrations of dimethyl sulfoxide. A media was prepared that possessed 0%, 0.1%, 1%, 10% and 20% of DMSO in order to test this. Flow cytometry on a Gallios 10-color flow cytometer, 7-AAD dye and CD45 FITC monoclonal antibody were used to monitor cell death and identify lymphocytes, respectively. The data was then analyzed using Kaluza software and Prism software.

**Findings:** After complete analysis, it showed that more cell death occurred in DMSO treatments at higher concentrations than lower concentrations. 20% of the DMSO treatment was proven to be toxic to the cells and incurred more cell death than the other treatment concentrations. The optimal concentration for treatments using DMSO is 10%. This is because it is at a high enough concentration to reconstitute drugs used for treatment while keeping the rate at a minimum.

Real time Measurement of black carbon by Micro Aethalometer for outdoor and indoor urban atmosphere in the NY city.

Jessenia Soriano
Mentor: Professor Jin Y Shin
Medgar Evers College

This study measured Black Carbon (BC) in 5 different environments in the New York city and New Jersey by using Micro Aethalometer AE51, is one of most useful instrument to collect the black carbon in various environment due to its portability and battery powered device. The highest concentration of BC (4,000-8,000 µg/m³) were found in the subway transition platform (Franklyn Subway, Brooklyn) by comparing the data from 4 other locations in the NY city and a controlled site in the suburban of New Jersey. The time series plots of the Micro Aethalometer data showed the relationship between the specific BC source and its concentration. In addition, the result showed the indoor locations were distinctly lower than outdoor as it had to the range of the 0 to 2000 BC µg/m³.

Eutrophication at Newtown Creek: Linking CSOs and Algal Blooms

Diana Calderon
Mentor: Professor Holly Porter-Morgan
LaGuardia Community College

Newtown Creek, a 6.0 km tidal waterway between Queens and Brooklyn, was designated a Superfund site in 2010. Although decline in heavy industry and establishment of the Clean Water Act has reduced the inflow of pollutants, during periods of
high precipitation, Combined Sewer Overflow pipes deliver sewage, wastewater, and street runoff to the waterway. The objective of this research was to examine the relationship between the process of eutrophication, which is characterized by nutrient over enrichment and subsequent algal growth, and CSO discharge events. To do so, weekly water samples were collected at key locations across the Creek and the following parameters were measured: dissolved oxygen and nutrients. Data on visible algal blooms, precipitation, and fecal indicator bacteria also were collected. Algal blooms were found to be correlated with high levels of dissolved oxygen and fecal indicator bacteria. Results from this research have been presented to the community and will be important, as the Long-Term Control Plan for the Newtown Creek waterway is currently being determined.