Book of Abstracts

Emerging Scholars Program

Fall 2018

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Optical Absorption Due to Excitons in Phosphorene Double Layer

Victor O. Adedara

Prof. Oleg Berman

Phosphorene, an atom-thick layer of black phosphorus that does have a natural band gap, has aroused considerable interest currently. It has been shown that monolayer phosphorene is a relatively unexplored two-dimensional semiconductor with a high hole mobility and exhibits unique many-electron effects. In particular, first-principles calculations have predicted unusual strong anisotropy for the in-plane thermal conductivity in these materials. Among the intriguing band structure features found are large excitonic binding energy, prominent anisotropic electron and hole effective masses, and carrier mobility. We studied the excitons in a double layer phosphorene, which are the bound states formed by electrons in the conduction band and holes in the valence band. We calculated the binding energy of excitons a phosphorene double layer.

Assessing Participants' Feedback to Dental Screening Provided by New York City College of Technology's Dental Hygiene Students

Nazrin Akbarova, Dirien Santos, Roseanna Torres

Prof. Susan Davide

The purpose of this research is to determine if CUNY students, faculty and staff are aware of the Dental Hygiene Program and services located at New York City College of Technology (NYCCT). Dental Hygiene students at NYCCT provide educational, clinical and therapeutic services to the public in accordance with individual state Dental Hygiene practice acts. Prevention and treatment of oral disease are recognized as important factors in a patient's overall health and well-being. Dental hygienists are important members of the dental health care team providing these services. The first phase of the project consisted of a free dental screening event that was held during a Wellness Fair at the CUNY Graduate Center on May 2nd, 2018. The individuals that participated in this event were contacted to schedule an appointment in order to receive a prophylaxis (comprehensive Dental Hygiene examination and treatment/care) with a Dental Hygiene student. The second phase of the project involves an electronic survey completed by the dental screening participants as well as a hard copy (paper) survey that will be given to individuals who complete dental treatment at NYCCT's Dental Hygiene clinic. The findings of this research will demonstrate that those individuals who received the dental screening are likely to schedule an appointment to receive a prophylaxis. Additional benefits associated with this study are that the findings will support raising the level of awareness of the services available in our dental clinic in terms of future dental screenings.

Track Search: an AI System that Helps New Students Choose a Track Within it

Ouri Alkada

Prof. Marcos Pinto

Mimicking the way we think and react to real-world situations are the objectives of the field of Artificial Intelligence (AI). The implementation is done using machine-learning by repetition or induction. Our application uses data from a survey on areas of interest in computer science conducted with freshman and sophomore students.

Synthesis and Three-Dimensional in Silico Study of Newly Synthesized σ1 Receptor Ligands Based on a 2,6-dioxopiperazine Scaffolds

Abdullah Allaoa

 Prof. Mai Zahran

A library-friendly approach to generate new scaffolds is decisive for the development of molecular probes, drug like molecules and preclinical entities. Here, we present the design and synthesis of novel heterocycles with spiro-2,6-dioxopiperazine and spiro-2,6- pyrazine scaffolds through a three-component reaction using various amino acids, ketones, and isocyanides. Screening of select compounds over fifty CNS receptors including G- protein coupled receptors (GPCRs), ion channels, transporters, and enzymes through the NIMH psychoactive drug screening program indicated that a novel spiro-2,6-dioxopyrazine scaffold, **UVM147**, displays high binding affinity at sigma-1 (σ1) receptor in the nanomolar range. In addition, molecular docking of **UVM147** at the human σ1 receptor have shown that it resides in the same binding site that was occupied by the ligand 4-IBP used to obtain a crystal structure of the human sigma -1 (σ1) receptor.

Obesity a Pandemic: Study of High Fat Diet in Male Mice

Bushra Miah, Ilhom Bakiyev, Ralph Alteus, Travis Caraballo, Viktoriia Olshana

Prof. Sanjoy Chakraborty

Obesity has become an epidemic in America, with about 27% of Americans now being considered obese. Obesity is a disorder caused by the accumulation of excess adipose tissue. The role of a High Fat Diet (HDF) and its direct correlation with regards to health has become one of the most important subjects of our time. The aim of this study is to analyze the effect of high fat induced obesity in male mice model by feeding them a Very High Fat Diet (VHFD) for 2, 12, and 24 weeks. Body weight, food intake, calorie intake, hormone levels, and islet of Langerhans/adipocyte size

are quantitatively recorded. In VHFD-fed animals, body weight significantly increased (as well as in leptin and insulin levels, along with growth in islet and adipocyte size) within the first 12 weeks and then plateaued with time. The results show the impact of obesity and possible causes in the human population worldwide.

Design and Application of Internal Hardware Circuits of a Micro-Controller

Rabia Arif
Prof. Farrukh Zia

A Micro-Controller consists of a microprocessor and many different internal hardware peripheral circuits to interface with and control external devices such as keyboard, mouse, LCD displays, sensors and motors. These topics are covered in relevant courses in the CET program. This research project will demonstrate how this knowledge is applied in practical applications where micro-controllers are used to control various devices.

Measurement of Airflow through Entrance Doors

Fuxin Bao, Adam Brzozowski, Raymond Sandoval,
Jelani Barro, Demba Diop
Prof. Daeho Kang

Saving energy in buildings is of vital importance since the 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 in two City Tech buildings that have different entrance door configurations.

We monitored outdoor weather and the indoor environment in the lobby areas in the Environmental building without vestibule and Voorhees building with a vestibule on a day. We 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. This poster presents the results of the measurements and compares the results between the two buildings. The results show that the indoor thermal environment in the Environmental building significantly varies while stable in the Voorhees building.

Past vs Present Intellectual Functioning as a Predictor of Remote Memory Loss in Dementia

Ilhom Bakiyev, Eliza Gonzalez, Christina Bhawanidin
Prof. Daniel Capruso

Aim: To compare intellectual functioning in cerebrovascular (CVA) vs. Alzheimer's disease (AD).

Method: Subjects had Psychiatric disorders (n=26), CVA (n=37), or AD (n=27). Expected premorbid intellectual functioning was computed using educational attainment. Intellectual ability was separated into deviation quotients for Verbal-Conceptual, Attention-Concentration, or Perceptual-Constructional ability, and Psychomotor Speed. The difference between obtained and expected intellectual functioning in each cognitive domain was analyzed using a repeated measures ANOVA with age as a covariate.

Results: There was a significant Time x Etiology interaction for Full Scale IQ ($F_{2,80}=20.54$, $p<.001$). The Psychiatric patients had no intellectual loss. Deficits in Verbal-Conceptual intellect were equivalent in patients with CVA and AD. In the cognitive domains of Attention-Concentration, Perceptual-Constructional ability, and Psychomotor Speed, CVA produced worse cognitive deficits than did AD.

Conclusions: The findings are in good clinical correlation with the neuropathology of these diseases. In CVA, patients sustain cerebral lesions in one or more of the arterial territories of the brain, which leads to substantial loss of intellectual function. In the early to middle stages of AD, the neuropathology is typically concentrated in the area of the hippocampus with resulting loss of memory, not a generalized loss of intellectual function.

Wonder Woman Warbringer
Julie Bradford
Prof. Sara Woolley Gómez

Wonder Woman Warbringer is a new graphic novel slated for publication by DC comics for Summer 2019. I will be applying professional illustration skills learned in the classroom as an assistant to Professor Woolley, the colorist on this new book. In this year-long project, I will research various visual and color references, learn color flatting and professional organization skills on a real world publication project for one of the two largest comics publishers, and practice skills learned in the classroom. Such skills include digital coloring and the use of programs in Adobe Suite, and how to apply them as one would working professionally in the comics industry. In addition, I will have the opportunity to fully immerse myself in a studio environment and be taught how to manage a work flow on a multi-person 170 page illustration project. While the project is in its starting stages, Professor Woolley and I have been going over the required steps I will be taking when the work starts unloading. Photoshop will be the main go-to software and where the majority of the work will take place. I do expect to push hard against my personal boundaries, and learn to be more pro-active and engaging working with others.

The Role of PPD Skin Test in Diagnostics of Tuberculosis
Stephanie Cabrera
Prof. Liana Tsenova

Tuberculosis (TB) is one of the 10 most common causes of death worldwide. As of 2017 a total of 9,105 cases were reported in the United States (CDC TB report, 2018). Although, TB is not

completely preventable it can be treated and controlled. The goal of this study is to determine the role of Purified Protein Derivative (PPD) skin test in the diagnosis of tuberculosis. This was accomplished by performing an extensive literature search. An overview on tuberculosis is provided describing the agent, pathogenesis as well as the signs, symptoms and treatment of this disease. One of the most popular ways to diagnose TB is by performing a skin test. The PPD skin test is an essential tool for TB-diagnosis however, it can be misleading. This study provides an understanding on the role of PPD skin test and any contradictory factors such as the Bacillus Calmette–Guérin (BCG) vaccine and latent TB infection (LTBI). The study analyses the pathogenesis of PPD in response to BCG vaccination and/or exposure to tuberculous bacilli in LTBI.

Housing Affordability

Abraham Gonzalez, Krystel Campuzano, Wenderlin Gomez
Prof. Barbara Smith Mishara

Throughout the centuries major cities had offered new opportunities to people seeking better life, New York City is not exception and continues to attract people from all over the world. Based on NYC population census, New York City has grown by almost half million its population in the last seven years. Because of this, residential real estate has been in great demand. Statistics show that less than 1% of residential units are vacant. However, the disparity in real estate prices continues to be a major social and economic issue for the citizens. Considering that the average median household income is less than $45.000 gross yearly and the considerable fair rent should be one third of the income that means $1250 monthly. The average monthly rent in the five boroughs for one-bedroom apartment is $2.000. One must ask, how affordable is housing in New York City? To aid low and middles income households, city government created affordable housing programs. Although it has helped many families, do these programs continue to be effective? Is affordable housing affordable in our city? We will further discuss the history of affordable housing in New York City, the current and most effective programs in our city and how affordable is housing for a recent college graduate.

Studying Global Lakes Water and the Surrounding Land Surface Temperature Trends Using Satellite Observations

Ronaldo Carhuaricra, Sergio Carrillo
Prof. Hamidreza Norouzi

There are over 100 million lakes on Earth (excluding those that are covered with glaciers), covering roughly 4% of the land surface and representing approximatively 0.013% of world total water (Shiklomanov, 1993). Even though a small percentage, lakes are the most crucial freshwater ecosystem in giving water supply, power production and agricultural use. Dying Lakes are one of the climate change phenomena that are some due to the human mismanagement, pollution, and

loss. They can affect our water supplies and the habitat for birds and fish. The variations in Land Surface Temperature (LST) of lakes could be one indicator of these changes, especially in the world's dying Lakes. This project focuses on the application of remote sensing and geographic information system to investigate the change in lakes surface water temperature and their relationship with their surrounding land cover type. In this study, the world first major 305 lakes have been investigated. An analysis of LST variation over the global lakes have been conducted using observations from the Moderate Resolution Imaging Spectroradiometer (MODIS), an infrared-based satellite platform. MODIS Land Surface Temperature Version 6 provides LST data twice a day since 2002. The data products were first processed to obtain the average daily temperature over the lakes and their surrounding land areas from July 2002 to May 2018. A statistical approach was applied to calculate the temperature trends of the lake water, the surrounding land. The trend of the difference in temperature over land and water was computed as well. Moreover, the relationship between the LST trends and potential driving factors such as the land cover changes in the lakes' basins, lakes areas, depth, and latitude were investigated. The primary results show that lakes water temperature is warming faster than the surrounding land temperature. Furthermore, 67.54% of lakes are shrinking while 24.92% are growing. Lakes located in tropical areas are getting warmer than their counterparts in the poles.

Controller Development for Miniature Unmanned Aerial Vehicles

Leonardo Chiang
Prof. Xiaohai Li

In this project we plan to build series of individual quadcopters with the main goal of group flying. By far, we have design and created the hardware parts to assemble the quadcopter. Also, we have designed a testing experiment, which in conjunction with a testing stand, will facilitate the adjustment of the PID controller in the Flight Controller. Later, we will develop replicas of this version to create a group of drones. The next step of this project is to conduct a research and development of a group coordinating navigation.

Mathematical Modeling in the Air Quality Control

Michael De Filippo
Prof. Ariane Masuda

Air pollution is a major issue affecting numerous facets of society. Biologically, the environment, ecosystems, and many species within them are negatively affected by air pollution. The most pressing issue facing humanity – anthropogenic climate change is due to air pollution via greenhouse gases. Additionally, human health is negatively impacted on an individual level via cancer, heart disease, and strokes. On a broader level, urban areas often experience an increased impact of air pollution. Minority communities often experience greater air pollution burdens, which ignited an interdisciplinary field called environmental justice. This project will

mathematically demonstrate how air pollution can be modeled. We will focus on the analysis of one-dimensional diffusion. Our particular model will provide a description of the concentration of a given substance at any given time or place along a tube.

A Quantum Leap: The Mathematics of Quantum Mechanics

Ana Maria Delgado
Prof. Satyanand Singh

While many scientific fields use real functions to investigate components in their research, quantum mechanics must travel into the complex realm, as the wave functions which describe a variety of phenomena "exist" in the complex plane. In this way, we can evaluate special integrals that have widespread applications in quantum mechanics.

Utilizing the complex plane allows us to create a useful representation of the information present. These special integrals contain values for which the integral is undefined. We consider these values and create a path that excludes them, while also approaching them at an infinitesimally close proximity. Leaping across various contours, twisting and turning along various paths, we can redefine the integral into more accessible parts. These contours lead us to a solution that is otherwise unachievable as the legs of the integral succumb.

Through the evaluation of these special integrals as contours, and the researching and referencing of established mathematical solutions to well-known portions of the integrals, we were able to obtain finite, real values. By modifying these contours, one could certainly apply the methodology to other functions. Furthermore, we hope to have produced something that not only allows people to appreciate problems in quantum mechanics, but is also accessible to students.

Canine Phenotypic Identification Derived from Cleavage Amplification Product

Romario Denoon
Prof. Jeremy Seto

Derive Cleve Amplified Polymorphic Sequence of Canine Genetic Prediction of Phenotypes
Genomic research has found an association between variants in three dog genes with morphological distinctions in their coat, such as length, texture and facial hair. Experimentation was conducted to confirm this association with local dogs found around New York City College of Technology. Buccal mucosa tissue was collected from four different dog breeds and suspended in chelex. The samples were stored in -20°C. PCR of a DNA barcode gene COI was used to confirm DNA extraction. Derived Cleavage Amplified Polymorphic Sequence (dCAPS) will test these allelic associations by creation of unique restriction sites in amplicons using primers designed with intentional single nucleotide polymorphisms (SNPs).

Chemistry Student Attitudes toward and Utilization of Faculty Office Hours

Babacar Dieng, Edgar Gomez, Andre Rodriguez
Prof. Pamela Brown, Prof. Diana Samaroo, Prof. Katherine Gregory

While research has demonstrated that faculty-student interactions increase retention and graduation rates[1], faculty often report that their office hours are underutilized[2]. To better understand students' attitudes, usages and plans toward faculty hours, a survey was administered in the second to third week of the fall 2018 semester to students in 5 sections of general chemistry courses. The goal was to better understand how students perceive the benefits and hindrances of office hours, along with current or planned attendance. Prior to survey administration, it was speculated that students not attending office hours could be because they were not scheduled at a convenient time, the students were overall not motivated to ask for help, or instructors were not encouraging their students to participate. The results were then collected and inserted into an excel spreadsheet, where built-in data functions allowed for data implications to be verified. Presumptions were partially correct. While overall 66% of the students indicated that office hours were scheduled at a convenient time, in one section only 40% indicated that they were. One-third of the students indicated that they had not been encouraged to attend office hours. A majority of students (66%) indicated that a reason for not attending office hours was that they "do not like asking for help," despite the fact that 94% agreed that their instructor provided useful feedback. These results offer faculty strategies to improve student interaction and attendance at office hours.

[1]Strategies for Improving Student Retention. (2014) Hanover Research. https://www.hanoverresearch.com/media/Strategies-for-Improving-Student-Retention.pdf

[2]https://cft.vanderbilt.edu/2013/03/ask-professor-pedagogy-lonely-office-hours/

The Ambivalence of Princessa

Princessa Dominique
Prof. Eric M. Rodriguez

Personality psychologists often obtain information through a narrative analysis of life story accounts. Significant moments are referred to as "episodes," with each episode considered a self-determining event. Describing an individual's episode involves examining how that particular event affects areas of their personality or changed the course of their life. There are three key personality psychology techniques that can be applied during the course of a narrative analysis: 1) Thematic lines, or recurring wants and desires throughout episodes, can be extracted via ideologies of agency and communion; 2) Theme agency, reflecting an individual's attempt to expand, assert and protect their sense of self while attempting to master the environment where their sense of self resides as conceptualized through an investigation of personality traits such as dominance and extraversion; and 3) Communion as another key thematic line, comprised of a person's efforts to merge with others, bonds of love, intimacy and friendship, alongside personality traits such as

agreeableness and nurturance. Relying upon Dan McAdam's (2009) theory on the narrative analysis of life scripts and life stories, I conducted a narrative analysis of one of my own episodes to explore my personality and to better understand my own unique sense of self and identity.

Examining the Effect of Oxidative Stress on Tetrahymena Thermophila Sirtuin Member, THERM_00194149

Emmanuel Dubuisson
Prof. Ralph Alcendor

Sirtuins are a family of enzymes that fulfill various important biological functions. Investigators have looked for the implication of Sirtuin genes in cell signaling mechanisms, in the formation and silencing of heterochromatin, in the regulation of ion channels, and in the modulation of the cellular redox reactions. Different model organisms have been previously used to conduct these studies; among them, there are yeasts, nematodes, and fruit flies. Each one has made some valuable contribution into the vast body of knowledge related to this field.

However, gaps in the understanding of Sirtuins functions still remain to be filled. In this optic, the purpose of this experiment is to uncover the impact of oxidative stress on *Tetrahymena thermophila Sirtuin, THD18*. This protist offers several advantages. In addition, of being widespread, it is easy to culture and to reproduce in the laboratory environment, inexpensive to maintain, and have a short generation time. From a phylogenetic perspective, mammalian Sirtuins share some homology with those found in *Tetrahymena*. Therefore, results of scientific investigations conducted on *Tetrahymena* Sirtuins can have direct applications to other fields such as human medicine.

At a molecular level, oxidation reactions in living organisms are catalyzed by enzymes. In human beings for example, enzymes called SIRT3, and SIRT4, which are Sirtuins, participate in oxidative reactions. While SIRT3 protects against oxidative stress by acetylating and activating the Super Oxide Dismutase 2 (SOD2), which is an enzyme found in the mitochondria, SIRT4 on the other hand has the opposite effect, and tends to facilitate the oxidation of fatty acid in the liver and muscle cells. Based on this fact, we hypothesized that the level of mRNA of THD18 will increase in response to high levels of oxidative stress. Cells were exposed to different concentration of hydrogen peroxide, an oxidative stress inducer, for various time points. Preliminary results show cells were unable to survive in high concentrations of hydrogen peroxide. RNA analysis will be performed to investigate the effect of oxidative stress on THD18 and genes involved in oxidative stress.

Making Connections, Developing Learning Resources for Students in Dining Room Operation

Bannesa Espinal
Prof. Karen Goodlad

Have you ever opened a bottle of wine and perhaps interpreted serving it as if you were a fine dining restaurant server? In the department of Hospitality Management at New York City College of Technology, we emphasize providing the best quality of service through a series of hands on experience laboratories. Particularly in Dining Room Operations, faculty focus on providing students every resource possible to execute and become comfortable while providing high quality service. Students with minimal knowledge of wine or those who are yet to work in the industry face difficulty understanding the wine profile and most importantly service standards and skills.

This research will gage the level of beverage service knowledge students acquire during their Dining Room Operation course. Topics will include extensive service standards and skills and student's perception of how learning about beverages and beverage service will help in their future career. Students enrolled in Dining Room Operations will be given a survey at the beginning of the semester including questions about mise en place, how to read a wine label, tableside suggestive selling, and how to open and pour a bottle.

We believe the research will show that learning about beverage and beverage service will help students become more aware of the value of their beverage education through understanding the professional and technical process of bringing the product to the consumer and its impact on the overall hospitality experience.

Computational Techniques for Scattering Amplitudes

Juliano Everett
Prof. Giovanni Ossola, Prof. Ray D. Sameshima

Scattering amplitudes in quantum field theory can be described as the probability of a scattering process to happen within a high energy particle interaction, as well as a bridge between experimental measurements and the prediction of the theory. In this research project, we explore the Standard Model of Particle Theory, it's representation in terms of Feynman diagrams and the algebraic formulas associated with each combination. Using the FeynArts program as a tool for generating Feynman diagrams, we evaluate the expressions of a set of physical processes, and explain why these techniques become necessary to achieve this goal.

Brooklyn Tourism Guide

Erick Faican

Attracting Tourism into neighboring boroughs of New York City from Manhattan. New York City's main attraction is Manhattan is it's difficult to compete with. The main target group would be families, because they are more willing to explore different options to suffice everyone's

curiosities. Family tourist also tend to spend more, and often find participative attractions the most interesting. This view would potentially allow neighboring ethnic enclaves to draw from its diversity perspective, integrating more hands on activities. The development of neighboring boroughs to tourism also has potential negative impacts. If enough promotion to neighboring ethnic enclaves happen gentrification could also follow. A unified advertisement of all ethnics is impossible. This however are over powered by the positive it can produce. Social exclusion has been long lasting in NY, and this could compensatively address such criticism. Effectively Williamsburg could serve as a test site to create a hot pot of tourist ingenuity.

Cultural and Social Responses in Egypt and Israel to the 67 War

Daniel Fanning
Prof. Stephanie Boyle

On April 30'th, 1968, an apparition of the Virgin Mary appeared in the sky above the church of the Holy Virgin in Zeitoun, Egypt. She appeared bathed in light to over 40,000 spectators, Muslims and Christians. She held a cross in one hand and an olive branch in the other. The historic event was accompanied by miraculous cures of the sick.[1] Between 1968 and 1971 over one million people claimed to have witnessed the recurring apparition of "Our Lady of Zeitoun"[2] The Virgin Mary appear in Egypt amid great political turmoil, social dissatisfaction with the government, widespread student protests and a national sadness. Egypt's devastating loss to Israel in June of 1967 signaled an end to Egypt's rising status as the dominant regional power and the end of Gamal Abd-al-Nasser's position as the leading Arab Socialist fighting American imperialism in the "Third World." The apparition of the Virgin Mary, a notable event in Egyptian national history, provides a unique opportunity to understand how Egyptians understood themselves and as part of a larger global movement, in 1968.

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[1] Pearl Zaki, *Before Our Eyes: The Virgin Mary, Zeitoun Egypt 1968 and 1969, (Santa Barbara Queenship Publishing, 2002)*

[2]

The Catholic Church has also recognized this as a miraculous event. The Vatican claimed that this was the first time that Mary appeared in front of a non-Catholic church, but also recognized the legitimacy of this apparition by claiming that the Coptic Church or patriarch of Alexandria was founded by Saint Mark, the writer of the gospel and that many saints had been buried under the church. This explained why the Virgin Mary appeared to a group of non-Catholics. For more on this topic please see, Pearl Zaki, Our Lord Mother's Visit to Egypt, 1977. Interestingly, it has stirred some controversies among Catholics who claimed that Mary appeared to this group to tell them to stop following their false pope. This debate is still being raised in some circles. Also of interest, is the re-appearance of the Virgin in 2009 at the church in Warraq, a neighborhood in Cairo, on the fortieth anniversary of the 1968 appearance, many spectators have claimed that this event is a hoax created by means of a laser.

Developing GUI for FIND: A Tool to Filter Noisy Data Using Ensemble Model Averaging

Kayla Ford
Prof. Ashwin Satyanarayana

Originally developed as a sole algorithm to filter 'noisy' data, FIND has become a universal tool with many applications ranging from predicting cancer to predicting grades of students. The ensemble algorithm targeted random variation by silencing noisy data which previously caused lower classification accuracy. While this algorithm has many implications, the interface limited the use of it amongst a broader audience. To address this issue and further insinuate these beneficial implications, a Graphical User Interface (GUI) has been implemented. This interface allows increase usability and user experience for the algorithm, making it more accessible to others wanting to utilize this tool on their datasets. The tool also displays the improved classification accuracy, percentage of noisy instances filtered in addition to generating the filtered dataset.

Advanced Composites for Structural and Biomedical Application

Saminur Miah, Astrid Frank
Prof. Akm S. Rahman

The goal of this project is to improve the mechanical and thermal performance of geopolymer for fiber reinforced geopolymer composites. Due to low temperature processing and high thermal stability, geopolymer is a potential alternative to ordinary Portland cement in construction engineering. It is also a viable alternative to ceramic matrix composites. In this project we will focus on fire retardant geopolymer matrix composites with high flexural strength.

This geopolymer will be prepared using Class F Fly ash, Metakaolin, Potassium Silicate and potassium Hydroxide. Several filler materials including Rice Husk ash, Fumed Silica, Zirconium oxide and Titanium oxide will be used in order to increase compression strength and reduce porosities.

This project will allow us the utilization of several equipment including Vacuum Bagging System, Thinky Mixer, Shake Table, Micro Balance, Optical Microscope, Carver Hot Press, Instron Mechanical Testing Machine, and Rockwell Hardness Tester. The results from previous groups showed improved compression strength with Rice Husk ash and Fumed Silica. We will do further studies in order to evaluate mechanical and thermal properties in with more attention. The results will be presented in terms of Compressive strength, Flexural Strength, Fire test, Optical and Scanning Electron Microscope.

Design and Manufacturing of an Automatic Trash Can

Kerolos Hanna
Prof. Angran Xiao

In this project, the professor and students in Department of Mechanical Engineering Technology will create an under sink trash can that is able to sense the hand gesture and move in/out the cabinet automatically. Students will learn Design of Manufacturing, CNC programming and coding with Arduino controller. We present an Internet of Things sensor system to create our smart life. A product's design is not easy! The benchmarking is needing to be done of the first stage of the production process, which will improve our product's competitiveness in the market.

We focus on the three companies and compare them to gain the best concept and improve the weak part. Base on the benchmarked and customer requirement to finalize the structure of our product. The most complex challenge that we will be facing is how to make the customer's to show canny's reliability to our customers, so the customer requirements are met as this is an industrial design. We can use marketing research techniques to determine the customer need. Rate each requirement narrows them down to 5 requirements, which is most important. Then we move to the second stage of the production process stage, start to sketch the ideas. Before that, we divide the workload to each group member to have the better teamwork, we make the decision for the final concept design by vote. In addition, we must consider safe, convenient, and hygienic smart garbage can. The safety of the product which needs to follow the social, political, and legal requirements. For the material, we may use stainless steel, plastic, or dirt proof material. Then move to the next stage to create the prototype and functional analyze. Test the function's performance as many as we can to achieve the higher quality function performance. Finally, finish up with a smart product. The main goal of the product to makes life easier, simple and clean.

A Novel Approach to Exploring Host-Microbe Interactions in Atherosclerosis

Jabreal Hasan
Prof. Nasreen Haque, Prof. Niloufar Haque

Atherosclerosis, a chronic condition in which the arteries narrow and harder due to the development of plaque in the arterial wall, is the leading cause of death and disability in the developed world. Although there may be no symptoms initially, the plaque may rupture promoting platelet aggregation and thrombus (clot) formation. This may lead to lethal cardiovascular conditions including acute myocardial infarction and stroke. The underlying cause of atherosclerosis is not known although it is generally considered an inflammatory disorder. Recently, microorganisms have been implicated in the pathogenesis of atherosclerosis. We postulate that bacteria from the atherosclerotic plaque may demonstrate phenotypic differences that may contribute differently to plaque pathogenesis. Therefore our aim to isolate, culture and characterize bacteria obtained from the atherosclerotic plaque. We will culture plaque samples obtained from carotid endarterectomy in both aerobic and anaerobic conditions and characterize

their phenotype. If successful, our study will exemplify a valuable method of exploring bacterial behaviors that potentially influence the pathophysiology of atherosclerosis.

Implementation of Sensor Hardware and Software in an Assistive Technology Robot

Jannat Hoque
Prof. Farrukh Zia

Heath Kit Educational Robot (HERO-1) went into hibernation after helping colleges and universities for 15 years since 1980 across the country to teach students about Computer and Robotics Technology. Currently, three students from CRSP including myself is reviving HERO to give new features with modern computer hardware and software technology, such as mobile robot obstacle detection and navigation and speech synthesis and recognition. This will enhance the implementation of Assistive Technology to enable her to help people with disabilities. The two most common modern devices that is used for mobile robot obstacle detection and navigation are ultrasonic sensor using sound waves and infrared sensor using light waves. By learning and comparing the advantages and disadvantages with testing and technical specifications of the two devices, we implement them on a mobile robot to test their effectiveness in real world situations. The main difference between the Ultrasound sensors and IR sensors is that IR sensor detects electromagnetic radiation and the Ultrasound detecting mechanical energy. In the future, a script of servo motor and ultrasonic sensor will be tested and replace the old hardware device in the HERO robot. Also, we are plan to work on connecting the robot to a Bluetooth device to replace remote control panel of the old HERO robot. This part of experiment was tested for people who need help with vision by producing speech output.

Solar and Rain Catching Canopy (Urban Oasis)

Afolabi Ibitoye, Grzegorz Kosieradzki, Kaiyrgul Sultanova, Jude Vallon
Prof. Alexander Aptekar

The accumulation of water runoff during rain storms is a major problem in New York City's combination water systems, forcing water treatment plants to release untreated excess water. To avoid overfilling of the sewer system by this grey water, pocket parks and gardens will be used to absorb the excess rainfall. We will be harnessing nature's resources using current technology, such as solar panels combined with rain catching canopies, to beautify the environment, educate the public about sustainability, and stimulate growth to local businesses through increased foot traffic and bringing social awareness on environmental issues.

The canopies are designed to collect the maximum amount of rainwater based on its surface area, maximize solar collection and retention. Our flawless design has analyzed expected rainfall and optimal solar angles for the solar panel placement on the canopy to provide shade for benches near existing flower beds, collect rainwater for irrigation, and harness solar energy. Rainwater is collected

on the canopy, flows into pipes and distributed to clay pots to efficiently spread the collected water, while solar panels provide energy for public electrical outlets.

Upon completion of the minimal viable product using mostly recycled wood and plywood materials, the density of the canopy shade proved to be top heavy thereby making the overall structure unstable, posing safety concern. This new design uses environmentally friendly material made of canvas and worn on a prefabricated aluminum to maintain conformity and aesthetics of the previous wooden designs. This new design is lighter in weight, stand-alone and remains adaptive to any structure.

Microbial Profiling of Atherosclerotic

Sumaiya Jannat
Prof. Nasreen Haque

Atherosclerotic plaque affect millions of people and cost billions of dollars in the United States. Atherosclerosis is a disease that affects the blood vessels called arteries, which carry blood to the organs of the body. Normal arteries allow blood to flow freely however these arteries can become hardened and narrowed by deposits called plaques. These plaques are made up of cholesterol and inflammatory materials. This disease process is called atherosclerosis and it can occur in any artery in our body. Atherosclerosis disease is the leading cause of the death worldwide. These atherosclerosis plaque harbor poly-microbial biofilm communities, which can be difficult to elucidate using culturing methods. Clinical molecular microbiological methods are increasingly being employed to investigate the microbiota of chronic infections, including wounds, as part of standard patient care. However , the molecular testing is more sensitive than culturing, which results in markedly different outcome being reported to clinicians (Rhoads,2012).This study compares the results of direct metagenomics analysis and culturing of bacteria isolated from carotid endarterectomy (CE) and it examines the relative abundance score that is generated by the molecular test and the usefulness of the relative abundance score in predicting the likelihood that the same organism would be detected by culture.(Rhoads,2012).and Results culturing allow direct examination bacteria found in CE which allow functional characterization of host- microbe interaction. We are looking at the carotid endarterectomy (CE) from the patients sample and evaluate the microbiome to determine the resistance of isolated bacteria to common antibiotics our hypothesis is that bacteria found in CE may have unique properties that is sinusoidal with the initiate and development of plaque.

IOT Home Security Model

Ayesha Javed
Prof. Farrukh Zia

IoT refers to the infrastructure of connected physical devices which is growing at a rapid rate as huge number of devices and objects are getting associated to the Internet. Home security is a very useful application of IoT and we are using it to create an inexpensive security system for homes as well as industrial use. The system will inform the owner about any unauthorized entry or

whenever the door is opened by sending a notification to the user. After the user gets the notification, he can take the necessary actions. The security system will use a microcontroller known as Arduino Uno to interface between the components, a magnetic Reed sensor to monitor the status, a buzzer for sounding the alarm, and a Wi-Fi module, ESP8266 to connect and communicate using the Internet. The main advantages of such a system includes the ease of setting up, lower costs and low maintenance.

Sorting Algorithms Visualized

Hashim Kayani
Prof. Brad Isaacson

A lower bound for an algorithm is the worst-case running time of the best possible algorithm for a given problem. To sort a list of size n, this lower bound is $O(n \log n)$. While many algorithms have attained this lower bound (such as Mergesort), there are still differences in their efficiencies depending on the shape of the input. For example, many algorithms run very quickly if the inputted list is already sorted or have some very particular and unlikely property. The aim of this project is to visually analyze these differences.

Talk and Roll Bot: Software Design

Jane Lynnel Ladaban
Prof. Farrukh Zia

Talk and Roll Bot is an ongoing research and development project in the CET department. Its goal is to design and build an interactive mobile robot that can be used for demonstration and teaching purposes in CET courses as well as make announcements and greet visitors and students during open-house and other departmental events. In this research project, software programs will be designed, implemented and tested to add new features and improve the functionality of the robot.

Protein Interaction with Porphyrins and Chlorines using UV-vis Spectra and CD Spectra

Dianna Landi
Prof. Diana Samaroo

Fluorescence emission and circular dichroism (CD) spectroscopy were used to investigate the interactions of proteins with porphyrins. The protein used was human serum albumin. We investigated two types of porphyrins (a combination of either negatively charged, positively charged, or neutral). Based on the fluorescence data, we observe a strong interaction with the positively charged porphyrin [5, 10, 15, 20-Tetrakis (1-methyl-4-pyridino) porphyrin tetra (p-toluene sulfonate)] to human serum albumin. Our circular dichroism data also shows a change in protein structure. We present our preliminary findings.

Convolution Reverb

Tian Leng
Prof. Crystal Kim

In digital signal processing, convolution reverb can simulate the reverberation of a real acoustic space. The acoustics of different seating areas in an auditorium can vary from each other. To determine the reverberant characteristics of City Tech new building's auditorium, impulse response (IR) signals are be recorded in the orchestra, mezzanine, and balcony of the auditorium. Balloon pop is chosen as the impulse source. An omnidirectional and a cardioid microphone with flat frequency response are used to record IR signals to 24-bit monophonic .wav files. Each IR signal, along a dry vocal signal, is convoluted in MATLAB through both direct and fast convolution methods.

Hardware Implementation of an Assistive Technology Mobile Robot

Joycephine Li
Prof. Farrukh Zia

This is a continuing two-part research project in which Heathkit Education Robot (HERO) hardware circuits and features will be upgraded by using modern hardware devices and sensors. The second part of the project will be to use the modern hardware to implement assistive technologies to help people with disabilities. Previous studies from this project includes comparing the old hardware devices of the HERO and new hardware devices. In addition, the devices and sensors were put together and tested successfully. Currently, we are putting the robot together with the old and new hardware devices onto the model of HERO. We are recycling and reusing the components of the old robot instead of discarding them. In the future, we are planning to work on connecting the robot to a Bluetooth device to replace the remote-control panel of the old HERO robot to have the robot moving. Another next step is to test other features onto the robot, such as mobile robot obstacle detection and navigation.

Eco Composter: Waste to Energy

Xiao Lin
Prof. Masato Nakamura

Landfilling food waste results to increase the amount of the Greenhouse Gases emitted into the atmosphere. Eco-composter will process food wastes in a kitchen average amount of food waste that currently goes to landfill. It will change in land surface characteristics directly influence of the climate.

Cell Survival and Longevity Factors

Christopher Magloire
Prof. Ralph Alcendor

Tetrahymena thermophila is a unicellular eukaryote. *T. thermophila* has two different nuclei, a big non-germline micronucleus and a small germline micronucleus. These nuclei carry out different functions with distinct biological properties. This characteristic of *T. thermophila* is one of the reasons scientists choose to use this eukaryote in research regarding gene expression and gene integrity. Sirtuins are a class of proteins that regulate important biological pathways in bacteria, archaea and eukaryotes. There are about 14 Sirtuins, each of which have different functions. Sirtuins have been known to regulate longevity in organisms such as flies and worms. Presently, little research has been done on the effects of oxidative stress on *T. thermophila* and Sirtuin THD17. The goal of this study is to examine the effects of oxidative stress on one of *T. thermophila* calpains. The effects of oxidative stress were examined by exposing *T. thermophila* to hydrogen peroxide and looking at the response on Sirtuin mRNA levels. *T. thermophila* cells were grown and the cells were exposed to hydrogen peroxide. Then, the RNA was extracted so they can be examined. MTT assay was also performed to determine the amount of cell survival post oxidative stress. PCR was performed to examine the level of mRNA. Preliminary results suggest mRNA of selected oxidative stress genes increased in the presence of $0.2 - 0.5$ µM of hydrogen peroxide but decrease in the presence of $1 - 4$ mM of hydrogen peroxide. Cell death also significantly increased in the presence of $1 - 4$ mM. These results suggest oxidative stress does affect the activity of selected genes in *T. thermophila*. The effect on calpains will be examined in subsequent experiments.

Software Implementation of an Assistive Technology Robot

Jannatul Mahdi
Prof. Farrukh Zia

This is a continuing two-part research project in which Heath kit Education Robot (HERO) hardware circuits and features are being upgraded by using modern hardware devices and sensors. The second part of the project will focus on using the modern hardware to implement assistive technologies to help people with disabilities. Currently, we are putting a combination of some of the old circuits with new hardware devices and coding it from scratches for the model of HERO. In the future, we are planning to work on programming the robot using coding languages like C++ and Python. We will be coding for different features on the robot, such as mobile robot obstacle detection, navigation, Bluetooth communication, speech etc.

Geospatial Population Analysis with R

Afsana Mimi
Prof. Mariya Bessonov

Abstract: R is used to analyze geospatial flyover data of New York City. A shapefile of footprint outlines of buildings from NYC Open Data is used for analysis. We ultimately aim to determine whether there is a relationship between certain features of building footprints and economic well-being on a neighborhood scale. We also plan to examine whether the conclusions made from this project apply to other cities within and outside of the US.

A Mobile Game Application with Motion Event

Waseem Akram Al Mohammed
Prof. Marcos Pinto

A mobile application that explores the basic motion events triggered by touching the screen with a finger. Touch gestures like tapping, swiping vertically/horizontally, panning, etc. happens when a user places one or more fingers on the screen and by the time the last finger loses contact, the entire pattern of finger movements is interpreted as a particular gesture by your android application. These actions are interpreted and the corresponding actions are reflected in the code. The application will implement some of these gestures in Android mobile devices.

Exploring Student Persistence in Mathematical Problem Solving

Joel Morales
Prof. Nadia Kennedy

How do students persist in solving problems? Do they persevere or do they easily give up? What reasons do students give to justify their persisting in problem solving or their lack of persisting in the problems they work on? My research would examine to what extent the students persist and what reasons they offer for justify their persistence or lack of. I will Data will be collected through administering surveys that include questions about the degrees to which students complete their worksheets during their peer-leading sessions and homework. I will also conduct interview with selected individual students to explore what drives or curtails their persistence.

Chronicling the Achievements and Activities of Honors Scholars at City Tech

Christopher Navarette
Prof. Reneta Lansiquot

Scholars, the Honors Scholars Program newsletter, contains articles, student achievements and experiences as well as information on program activities. A student-driven publication, volume 6, issue 1 showcases my skills as a photographer, graphic designer, technical writer, and editor. Responsibilities crucial to this major interdisciplinary project include attending scholarly

presentations and workshops, conducting interviews, creating layouts, editing texts, taking photos, meeting deadlines, and integrating feedback.

The Role of Sirtuins in T. Thermophila
Jordan Newland
Prof. Ralph Alcendor

Tetrahymena thermophila is a free-living ciliate. This organism is a major ecologically successful monophyletic group of unicellular eukaryotes, larger than many mammalian cells. Though *T. thermophila* is a unicellular organism, it is similar to human cells as they are eukaryotes and share many biological functions and properties with human and other eukaryotes. *T. Tetrahymena* is ideal for research, not only because of its similarity to other eukaryotes, but also they are easy to work with and they do not require too many sophisticated and expensive equipment. *T. thermophila* has been used in other studies such as cell cycle control and histone modification. This project is interested in examining the role of Sirtuins in oxidative stress mechanisms in *T. thermophila.* Sirtuins are a family of proteins involved in many biological processes such as cell cycle regulation, cell survival and cell mobility. The role of Sirtuins in oxidative stress is not fully understood. Therefore, this project hopes to shed some light on any role one of *T. thermophila's* Sirtuins, THD10, may have in oxidative stress mechanisms. Cells were exposed to different concentrations of hydrogen peroxide for various time points and cell death and mRNA expression were analyzed. Preliminary results show high amount of hydrogen peroxide induced significant cell death. The mRNA levels of selected genes involved in oxidative stress increased in the presence of hydrogen peroxide. The mRNA levels of THD10 will be analyzed in the near future.

Racial Identity Health
Trianna Nunes
Prof. Amanda Almond

It is of critical importance for health psychologists to explore health behavior change in order to reduce racial health disparities in the United States. The relationships between social, cognitive, emotional and health factors are key. Focusing on decisional balance, which informs us of a person's preparedness to change, we set out to learn about exercising, smoking and weight management for Black men and women.

These well-established measures have yet to be used and validated on populations as heterogeneous as Black Americans. Participant responses to these decisional balance measures, from two different samples of Black Americans, will be investigated. Our goal is to explore and then confirm the factor structure of these concepts, to help further understand disparities as a problem based on social perceptions, and not biology. Previous recruitment strategies and sample composition have influenced decisional balance measures, and their usefulness, but not for this particular population. Outcomes of this work include more accurate assessments of the

intentions to promote health for a group that carries a disproportionate burden of disease in this country.

Peroskite Solar Cells

Bryan Ortiz
Prof. Masato Nakamura

New technologies for solar cells have been increasing over the last few years. Of all of the materials being researched and used on, the one that's been emerging the most are perovskite solar cells. Perovskite is a combination of materials that form the crystal structure of calcium titanium oxide ($CaTiO_3$). Studies have shown that this material does well in converting photons into electricity. With perovskite's ever-increasing efficiency, and lower costs to make them, they may be replacing the traditional silicon solar cells. This research will show the comparison of their efficiency outputs and the economic costs of their manufacturing.

Interaction of multi-target compounds with Human Serum Albumin (HSA)

Gabriel Ortiz
Prof. Alberto Martinez

The distribution, excretion, activity and toxicity of a drug are determined, at least in part, by its interactions with serum proteins. Human serum albumin (HSA), the most abundant blood plasma protein, reversibly binds pharmaceuticals, mainly at the hydrophobic cavities of subdomains IIA and IIIA. In previous work, multi-target compounds (AM29, AM49, AM56, and AM59) have been synthesized and studied for their potential in fighting against important aspects of Alzheimer's disease. As part of our ongoing investigations on the biological activity of these compounds, we are now exploring possible transport mechanisms, in comparison with resveratrol, a polyphenol that has completed phase II clinical trials in Alzheimer's disease. We have studied the interaction of these multi-target compounds with HSA through fluorimetric titrations and circular dichroism (CD). Analysis of results for compounds AM29, AM49, and AM59 suggest static quenching and adduct formation with HSA displaying binding affinities in the range 10^4 to 10^6 M^{-1}. CD experiments show slight or no modifications on the secondary structure of the protein upon interaction with the compounds. Overall, our results seem to indicate that there is a compound-protein interaction which could have a potential impact on transporting properties of the multi-target compounds.

Talk and Roll Bot: Hardware Design

Syeda Nazia Rahman
Prof. Farrukh Zia

Talk and Roll Bot is an ongoing research and development project in the CET department. Its goal is to design and build an interactive mobile robot that can be used for demonstration and teaching purposes in CET courses as well as make announcements and greet visitors and students during open-house and other departmental events. In this research project hardware circuits will be designed, implemented and tested to add new features and improve the functionality of the robot.

Sequence of Visual Attention to Child Injury in Psychiatric Patients

Sade Romeo, Desiree Raymond
Prof. Daniel Capruso

Aim: To determine if normal control and psychiatric inpatients have differences in foveal fixations to a complex visual stimulus.

Method: Subjects were normal controls (n=21) and inpatients (n=34) committed to a forensic psychiatric center. The visual stimulus was a 10s exposure to a classical painting of semi-nude males, females, and a satyr engaged in frenzied activity. Foveal fixations were measured using a Tobii T60 Eye Tracker and then subjected to a Group x Gender MANOVA with age as a covariate.

Results: There was a significant Group x Gender interaction for fixations on a satyr ($F_{1,54}$=5.08, p<.05), and a significant Group main effect for fixations on children ($F_{1,54}$=6.71, p<.05). For psychiatric inpatients females had a longer duration of fixation on the satyr than did males. For controls, males had a longer duration of fixation on the satyr than did females. Normal females had a longer duration of fixation on children than did normal males.

Conclusions: Females with psychiatric disorders and normal males focused on a grotesque male satyr assaulting a woman. In contrast, normal females showed a preference to focus on children. The results are consistent with the sociobiological concepts of male propensity to aggression and female attention to offspring.

Talk and Roll Bot: Speech Synthesis and Recognition

Samiha R. Riham
Prof. Farrukh Zia

Talk and Roll Bot is an ongoing research and development project in the CET department. Its goal is to design and build an interactive mobile robot that can be used for demonstration and teaching purposes in CET courses as well as make announcements and greet visitors and students during open-house and other departmental events. In this research project, speech synthesis and speech recognition sub-system will be designed, implemented and tested to add new features and improve the functionality of the robot.

A "Puzzling" Solution to a Stacking of Cubes Problem

Mian A. Shabbir
Prof. Satyanand Singh

In this project, we will study an important problem in cube stacking known as instant insanity and will use one method to solve it. Instant Insanity is a puzzle from 1960's and it has four cubes with each face colored with one of four colors. The goal is to stack cubes in a way such that all four sides have four colors present. It sounds easy but the cubes can be stacked in 41,472 configurations, which seems impossible to do by trying each configuration one by one. Our approach will be to use graph-theoretic techniques to find a quick solution to the puzzle. We will discuss important applications of this model.

Creating a Mobile Digital Stop Watch

Naome Singh
Prof. Marcos Pinto

The mobile application, initially only for Android-based devices but easily adapted to iOS devices, makes use of threads and loopers, which are Java classes applied to GUIs (graphical user interfaces). The screen shows hours, minutes, and seconds, and it can be used for alarm timing, down timing, stopwatch, time-out and memory functions. Stopwatches are designed for routine quality control and experimental needs of labs, and for the exacting demands of timing industrial tests, enzyme analysis, or research results.

Design and Build a Custom 3D Printer Using Open Source Components

Jennifer Solomon
Prof. Farrukh Zia

This is a research project that has high educational and research value. It will help students to see how computer technology and embedded systems theory and skills taught in Computer Engineering Technology courses are applied in the design and operation of a 3D printer.

Examining Peer-leader's Growth during a Semester of Peer Leading Sessions

Yasmine Soofi
Prof. Nadia Kennedy

The study examines the perceptions of a group of new peer-leaders of their learning during a semester of peer-leading training and experience working with a group of students. Data will be collected through individual interviews in the beginning of the semester and through administering

a survey at the end of the semester. The data will be organized, analyzed and presented at the poster session.

Mechanical Characterization of Nano-material Doped Polydimethylsiloxane (PDMS)

Joyce Tam
Ozlem Yasar

In recent years, Tissue Engineering is utilized as an alternative approach for the organ transplantation. Success rate of tissue regeneration is influenced by the biomaterials, cell sources, growth factors and scaffold fabrication. In this project, dog-bone shaped PDMS testers are fabricated at the Research Laboratory SET in the Department of Mechanical Engineering Technology. Then, the tensile tests are performed to investigate the mechanical properties of the PDMS samples. Similar procedure are repeated for the nanomaterial doped PDMS to investigate the effects of nanomaterials on the mechanical properties of PDMS.

Bacteria Findings and Functions

Patrick Traore
Prof. Nasreen Haque

The Gowanus Canal in New York City is extremely polluted but still serves the local inhabitants. Microbial diversity is a major contributor to the biogeochemical processes in the estuarine environment. In time, waste accumulates at the bottom (sediment) of any water body and is subjected to relatively less flow then at the surface. Therefore, microbial biofilms formed at the sediment remain intact longer and have the ability of forming complex associations and increased resistance. Microbial activity is bound to be a major contributor to biogeochemical processes at this site. However, despite the significant and profound effect of microbes on diverse ecosystems, the anthropogenic impact on microbial population in this environment remains unexplored. We have previously shown that bacterial colonies were observed in various selective media and were site and zone specific, demonstrating microbial preference for particular niches. We hypothesize that the sediment from the bottom of the canal in different zone will be distinct due to the niche preference by microbial population. Therefore, our aim is to characterize the zones of biodiversity by depth. In the present study, total DNA will be isolated from bacteria from different sites/zones and metagenomics analysis will be performed to characterize microbial diversity in the canal.

ArEnged Project

Suleyman Turac
Prof. Benito Mendoza

The AREngEd project aims at using Augmented Reality (AR) in Engineering Education, in particular in computer engineering education. This is an undergraduate research and technology

project where students will explore the educational applications of AR for subjects such as Computer Programming, Electrical and Digital Circuits, Computer Architecture, and Computer Networks. The AREngEd's goal is to support inquiry-based and collaborative learning combining physical and virtual objects by letting users in close vicinity manipulate virtual objects. AR is well suited for demonstrating spatial and temporal concepts. With AR we could provide to the students some visuals for understanding intangible physical phenomena that are difficult to grasp. We will explore the use of simple AR based apps on mobile devices such as iPads and Android tablets to provide with overlying animations. In particular, this part of the project will focus on enhancing learning about electrical circuit's components and their uses and functionality.

Design and Fabrication of Miniature Swarm Robots

Mellissa Valle
Prof. Farrukh Zia

This research project will explore the design and fabrication of tiny low cost robots for implementing and testing swarm robotics algorithms. The computer technology has advanced to the point where it is now possible to make tiny inexpensive robots using fairly sophisticated and powerful micro-controllers that cost very little. A large number of these simple robots can be made to work together as a group (swarm) to accomplish sophisticated tasks.

Synthesis of the Tetracyclic Framework of the Oxygenated Angucyclines

Xiaolan Wu
Prof. Tony E. Nicolas

The Angucyclines are a class of natural products containing a characteristic carbon tetracyclic ring structure (ABCD ring) and featuring a wide range of biological functions, including antibiotic, antitumor, antiviral and antifungal properties. This extraordinarily therapeutic character has interested many chemists to develop efficient methodologies to synthesize the tetracyclic framework of the Angucyclines. However, the installation of the cis-hydroxyl groups on the AB ring junction is still a major synthetic challenge towards the synthesis of Angucyclines. Our research focuses on an enantioselective approach to the ABC ring system. The synthesis of the Phthalide and the Enyne components has been attained. Presently, we are working on a large-scale Michael coupling and Dieckmann cyclization of the Phalide and Enyne. Future experiment will focus on assembling a fully functionalized ABC ring model by installing the hydroxyl groups of the A ring through a Sharpless Asymmetric Dihydroxylation.