



Research Scholars Program

List of CRSP students and their abstracts presented at the 2023 CRSP Symposium

The Effect of Erlotinib on Epidermal Growth Factor Receptor in Cancer

Nourhan Elzayat

Mentor: Professor Nancy Liu-Sullivan

Effective treatment of cancer is primarily due to complex signaling networks that enable cancer cell growth, differentiation (how much or how little tumor tissue looks like the normal tissue it came from), migration, apoptosis (cell death), and drug resistance. The epidermal growth factor receptor (EGFR) gene is a more frequently mutated gene in many cancer types. While the EGFR mutation is correlated with increased overall patient survival in some cancers with a major pharmacological inhibitor like Erlotinib, it is still unclear how effective these current drugs are in reducing cancers associated with the mutation. Certain isoforms of the EGFR gene expressed at specific levels have been found to increase overall patient survival. To understand the effect of Erlotinib on cancers in general, we will conduct a study on EGFR on cancers including lung, breast, ovarian, and stomach cancer. In addition to assessing drug efficacy, we will also determine how different EGFR gene expression levels affect overall patient survival in the four types of cancers described above using the Kaplan-Meier database. This database shows the probability that a subject will survive for a given length of time. Through this, it was determined that when specific isoforms of EGFR are expressed at high levels, overall patient survival increases. This is especially true for breast cancer.

Image Encryption via Bit-Plane Decomposition and Scrambling

Maxim Voyevoda

Mentor: Professor Sos Aгаian

Oral Presentation Award Winner

Efficient and reliable image encryption has become essential in light of the growing number of privacy-sensitive images being produced daily, including those stored in popular cloud photo services or medical records, as it ensures the security of these images. Images often contain personal information that users may not wish to reveal. Image encryption is a method that can transform an image into an unrecognizable form or noise-like image to minimize any trace of its source. Decryption can reverse this procedure and restore the image to its original, unaltered form. To address this issue, this project proposes a solution that utilizes bit-plane decomposition and a scrambling algorithm. A simple tool has been developed to encrypt and decrypt images while ensuring zero loss of information. The effectiveness of this method can be accurately measured using histogram analysis

and visual observation. Generally, this project provides a practical and reliable solution for image encryption, which is becoming increasingly important in today's world of privacy concerns.

Project Espial: Analyzing Low-Grade Metamorphic Samples using Geochemistry to Uncover Suspected Volcanic Ash

Jay B Tobon

Mentor: Professor Jane Alexander

An outcrop beneath the Palisades Sill was discovered during a construction project in North Bergen, New Jersey. Samples taken from the North Bergen expedition gave a better understanding of certain landmarks like channel deposits, clastic dykes, and metapelites. The geochemistry of these samples showed that as well, except for two samples. Both of these samples had a high concentration of thorium, which is a trace element used to trace volcanic ash. Further examination of these samples showed that these samples contained smoky quartz, a type of quartz that is dark, and gray in color due to radiation coming from the rock which is due to the high concentration of thorium. This project aims to expand upon our findings and take a closer look at these samples. Specifically we are examining the light and dark part of each sample. Major and trace element concentrations are being analyzed from both parts of each sample. We are also identifying the minerals in each sample by thin section microscopy. In this project we will be able to see if the dark part of these samples are volcanic ash which can help us better understand the types of volcanoes in the Newark Basin nearly 200 million years ago.

Saltwater Marshes Against NYC Water Disasters

Peter Wang

Mentor: Professor Alfred Levine

Marshes have a direct impact on how vulnerable city infrastructure is. Marshes should be implemented into city development since they act as a barrier between vulnerable coasts and properties. It absorbs water and prevents overflow from reaching inland, preventing coastal property damage. Marshes are also natural sponges. One single acre of saltwater marshes can hold 1.5 million gallons of floodwater. New York City is most vulnerable to hurricanes and water disasters; therefore, I analyzed the impact of marshes on water quality and flood prevention. As an intern for a startup focused on incorporating IoT technologies into environmental science, I obtained water quality data from prominent NYC landmarks like Coney Island, Marine Park Salt Marsh, and the East River. For example, I collected water quality data from Marine Park Salt Marsh at both low and high tides. During low tide, I gathered water data on the trail. I analyzed how the tides carved into the banks of the river. During high tide, I utilized a kayak circling the island inside the marsh to monitor changes in conditions by placing the machine on the kayak and sticking the probe into the water. Upon analyzing the data, I discovered that water quality in marshes is superior to water conditions in areas like the East River. The water quality in marshes steadied between healthy limits while other locations experienced dips or spikes in water quality. Additionally, I observed that the tall grass in marshes had roots that stabilized the banks of the inlet. In contrast, social media often showed water from the East River overflowing and seeping into sidewalks and pavements.

These observations provide important insights into the critical role marshes play in maintaining water quality and preventing flooding. Data can inform us to establish marshes to protect NYC's infrastructure and waterfront.

African Burial Grounds: Using QR Codes and Oral Histories to Acknowledge Those Who are Forgotten

Yamilet Vasquez

Mentor: Professor Katie Cumiskey

Poster Presentation Award Winner

In the 1950s, on Staten Island, a sacred African burial ground was taken over by the city since they owed \$11,000 in taxes.

On the land, located on Forest Avenue and Livermore Avenue, profitable stores and businesses have now covered the African Burial Grounds with cement and foot traffic that disregards the souls buried there.

My involvement in this project started through my participation in an intentional learning community at CSI St. George focused on building a new interdisciplinary field called Public Interest Technology. Working with community activists, I started collecting stories and identifying key locations of burial grounds around Staten Island and a similar location in Flatbush, Brooklyn. This project features the use of QR codes to generate a virtual memorial at the site in order to create a site of public history. A history to be shared with Staten Island, some of whom are descendants of slaves. The goals of this project are achieved through a focus on Benjamin Perine, the last person born into slavery in Staten Island and who is buried at the site.

I collected stories from his Great Grandchildren who spoke about how they felt finding out their grandfather was buried underneath a parking lot. Their support of my project validates our goal to recognize the people who were once buried there and share their stories with the community.

Mitigate, Enhance, Preserve and Educate - The Impact of Development on the Graniteville Wetlands

GraceAnna Akparanta, Elmar Abu

Mentor: Professor Katie Cumiskey

Communities are unknowingly shielded from coastal flooding by wetlands. These unique areas provide a vital role in managing water, acting as a natural sponge that helps to prevent flooding and property damage during storms. The anticipated global loss of wetlands is close to 50%, and the rising demand for space for community development will prioritize the building of convenience stores instead of providing protection from extreme weather. This project started as part of an intentional learning community at CSI St. George focused on building a new interdisciplinary field called Public Interest Technology. Through engagement with tech tools, we are raising public awareness of the threats to Staten Island's North Shore Graniteville Wetlands from continual shrinkage based on the approved project development of a major wholesale warehouse store. Using Google Earth Pro, we examined a historical map of Staten Island to compare with recent satellite images to understand the current threat that recent development has posed to the natural wetlands resulting in an almost 94.5% decrease over the past hundred years of civilian settlement on the North Shore of Staten Island. The historical Staten Island map had 1,140.67 acres of wetlands total compared to Graniteville's size of 62.68 acres. Further construction of the proposed development project on the Graniteville wetland would further reduce it to 57.58 acres. It is crucial that the community members

have an understanding of the consequences of the loss of wetlands by providing them with a visual mapping tool using Google Earth Pro that shows an updated re-evaluation of their flooding zones with the newly constructed stores. Arming the community with the ability to track flooding caused by the reduction of wetlands and creating an awareness campaign related to preservation will provide Staten Islanders with the tools to not only protect their homes and neighborhood but to combat environmental racism and hold the developers collectively responsible for mitigating damage to the Graniteville wetlands.

Dopamine Receptor Transcript Expression by Oligodendroglial Cells in the Corpus Callosum

Josue D Criollo Mendoza, Shelby D Louis

Mentor: Professor Leora Yetnikoff

Myelination is a process in which oligodendrocytes produce a lipid-rich material which enwraps neuronal axons, improving the transmission of action potentials between neurons. It is now known that axon myelination is plastic, wherein daily life experiences can alter patterns of myelination through changes in neural activity, a phenomenon termed experience-dependent myelination. However, much remains to be understood about which neurons are capable of communicating with oligodendroglial cells to regulate experience-dependent myelination. Research from our lab has demonstrated that midbrain dopamine axons are present in the corpus callosum, the largest white matter tract of the brain, implicating dopamine neurons in experience-dependent myelination. However, whether dopamine neurons communicate with oligodendroglial cells is still unknown. In this study, our goal was to address this question by determining whether oligodendrocyte lineage cells in the corpus callosum express dopamine receptor transcripts. To investigate this, we obtained coronal brain sections containing the corpus callosum from adult male and female mice and used RNAscope and advanced microscope analysis software (IMARIS) to investigate the expression of dopamine d1 and d2 dopamine receptor transcripts by oligodendrocyte precursor cells (OPCs) and oligodendrocytes in this white matter tract. Our findings demonstrate that ~40% of OPCs express d1 and d2 dopamine receptor transcripts, whereas ~20% of oligodendrocytes express d1 and d2 receptor transcripts. These results lend support to our hypothesis that midbrain dopamine neurons participate in experience-dependent myelination of the corpus callosum and suggest that at least one mechanism may involve communication with OPCs and oligodendrocytes. Future research will investigate the role(s) of dopamine D1 and D2 receptors in the proliferation and differentiation of OPCs and in the survival of oligodendrocytes in the corpus callosum. Understanding the role of midbrain dopamine neurons in experience-dependent myelination may lead to the refinement of treatments for dopamine-related neuropsychiatric diseases, which are also frequently associated with altered myelination.

The Sister Mura Foundation: Serving International Migrants Living with HIV and AIDS in Johannesburg, South Africa

Jericee A Mitchell

Mentor: Professors Jean Halley and Ron Nerio

This project is a study of the Sister Mura Foundation (SMF), which has been providing health information, psychological counseling, and social services to over 140 adults and over 60 teenagers

who are migrants living with HIV and AIDS in Johannesburg, South Africa. The foundation also provides limited economic assistance, including help with school fees for children; emergency housing; and legal aid. It is the only nongovernment organization in Johannesburg that assists migrants of any status, including those without approved government documentation.

My mentors, Dr. Ron Nerio and Dr. Jean Halley, have conducted interviews with 28 clients of the Sister Mura Foundation, along with the organization's full-time nurse, part-time social worker, volunteer chairperson, and members of the board of directors. I am coding these interviews to understand the needs and experiences of the SMF clients as well as the perceptions of the leadership and staff regarding the organization's best practices. My analysis will discern patterns related to the following: how clients learn about their HIV status, how they adapt to life after this discovery, what leads them to become clients of the SMF, how they obtain anti-retroviral medications and other necessary medical treatments, and how they cope with the stigmas sometimes attached to HIV+ status. Coding the interviews with the professional and volunteer staff will reveal the near-term and long-term needs of the organization and how well the staff believes the SMF is meeting the needs of clients and future potential clients. My contribution will enable the SMF to better evaluate its provision of vital services and will help the general reader understand more about the importance of support for migrants with HIV and AIDS in South Africa's largest city.