



The City College
of New York



City College Research, Experiential Learning, and Service Learning Fair

Do you want to learn about opportunities to get engaged on campus?
Do you have research and creative work you would like to present?
Join us to learn about opportunities on campus and for a showcase of
CCNY undergraduate students' work

Student Abstracts

Location:
Shepard Building, Great Hall

Organized by the Committee on Undergraduate
Research and Experiential Learning, the Office for
Experiential Learning, and the Office of Research.

The City College
of New York

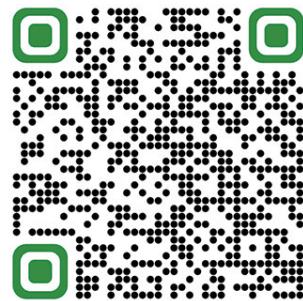


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City College Research, Experiential Learning, and Service Learning Fair

Tuesday,
October 10th, 2023



The City College
of New York

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CCNY STEM Community Summer Research Program (SCRIP)

Aya Sara Elwassif, Jefferson Estrada

Mentor: David Jeruzalmi

ABSTRACT

Our project aims to study the initiation mechanism of how DNA replication occurs in Bacteriophage λ , a virus that infects *Escherichia coli*. Specifically, we seek to understand the opening and closing mechanism of helicase, a hexameric protein that unwinds the DNA double helix during the replication process. To do this, we explore the interaction(s) of DnaB Helicase and Lambda P (henceforth: BP) with DnaJ, DnaK, and both together.

The process of DNA replication ensures that the genetic information of the cell is inherited by future offspring and survives. The elimination of this process would mean the end for the cell. Hence, it is important to study the mechanism of how DNA replication is initiated.

CCNY STEM Community Summer Research Program (SCRIP)

Krishna Krishna, Erica Paltrinieri, Ealonah Volvovitz

Mentor: Prabodhika Mallikaratchy

ABSTRACT

The protection with cleavable protection groups on the amine group at the N6 position in deoxy adenosine is essential in the generating modified purines for the solid-state synthesis of DNA. Typically, a benzoyl group is used in the protection N6 amine of the deoxyadenosine, we therefore, first protected the N6-amine with benzoyl group using benzoyl chloride. Based on the NMR characterization, we observed that the, benzylation is a promiscuous reaction, which led to benzylation of undesirable 3' and 5' hydroxy-groups. The product, N6-Benzoyl deoxyadenosine was therefore used to investigate the cleavage patterns of benzoyl groups using various cleavage conditions. We investigated three reagents. First, aqueous ammonia, which cleaved all the benzoyl groups generating undesirable fully deprotected deoxyadenosine. Second, methanolic K₂CO₃ at both 0 °C and room temperature did not lead to cleavage. Third, use of lithium diisopropylamide at 0 °C led to a mixture containing molecules with the cleavage of only the benzoyl groups on the 5'-O- and 3'-O- generating desirable N6 protected deoxyadenosine. The results of this study allowed us to perform mild and selective deprotection of N6-modified deoxyadenosine, which will facilitate the use of N6-benzoyl protected deoxyadenosine in synthesizing modified deoxyadenosine phosphoramidites for solid-state DNA synthesis.

City College Fellowships Program

Noel Mathew

Mentor: Shawn Rickenbacker

ABSTRACT

This research was performed by analysis of a dataset provided by JP Morgan Chase. This dataset includes information regarding consumer spending patterns from the years 2019, 2020, and 2021. This data set contains the month and zip code information for transactions that took place in areas, throughout New York and New Jersey. The aim and analysis for this dataset is to be able to identify trends and patterns in the data, with this we will then be able to compare purchasing habits with Harlem with other areas. The pandemic deeply affected Harlem and small business in the area, forcing many to close down or file for bankruptcy. By looking quantitatively at this data we can determine how the pandemic affected Harlem, and measure the rate of how other areas recuperated from the pandemic.

CUNY Career Launch

Korina Singh

Mentor: Kendra Krueger

ABSTRACT

Clason Point, nestled in the southeastern expanse of the Bronx, has earned the moniker "Little Puerto Rico" due to its predominantly Latino population. Despite its vibrant culture and close proximity to major transportation arteries, this neighborhood grapples with a pressing issue: the detrimental impact of air pollution. Primarily stemming from vehicular emissions along bustling roadways and emissions from local industrial sources, the environmental challenges faced by Clason Point residents have provoked profound questions about the stark disparities in the burdens of pollution-related health consequences faced by minority communities.

In response to these challenges, this study endeavors to empower the Clason Point community by developing a low-cost air pollution sensor that community members can utilize for real-time monitoring. To gain a comprehensive understanding of the local air quality, we initiated this project by comparing the data collected from our sensors with commercially available data from established monitoring systems like Purple Air. The creation of our affordable sensor holds the potential to revolutionize the way residents interact with their environment, providing them with the tools necessary to identify and address the sources of pollution that have plagued their community for years.

This research aims to shed light on the specific pollutants prevalent in Clason Point and elucidate the causes behind their presence, thereby enabling informed, community-driven initiatives to mitigate the adverse effects of pollution. By fostering a sense of agency within the neighborhood and emphasizing environmental justice, we aspire to contribute to a more equitable and sustainable future for Clason Point and similar marginalized communities nationwide.

Department of Psychology

Dania Alhindawi

Mentor: Waleed Sami

ABSTRACT

Despite the large amount of research on trauma and its influence on academic performance and academic motivation, research on its impact on Muslim American college students is limited. Trauma is a focus of many different disciplines, including psychology and mental health. Research indicates that trauma influences mental health issues (Swan et al., 2021) and negative behaviors in school (Caldwell, 2011). However, Muslim American college students' trauma and academic outcomes have received very little attention in the literature. Muslim American college students are at higher risk of having trauma influence their academic outcomes. Muslim-majority populations have experienced intense military conflicts, climate disasters, and authoritarian attacks on their human rights, leading to a massive refugee crisis around the world. Post-traumatic growth (PTG) is a transformation after a traumatic event. This literature review also focuses on PTG and how PTG affects Muslim American college students and their academic performance and motivation. We found that the higher the education, the higher the PTG rates; the lower the education, the lower the PTG rates (Wen et al., 2020). This literature review will inform us how their past trauma affects their academic outcomes. It will also seek to answer if academic motivation is an important factor in PTG in Muslim-American populations. The City College of New York has a vast population of Muslim American college students; the benefits of this research will inform colleges, such as CCNY, about Muslim American college students' academic outcomes and if interventions need to be implemented for Muslim students who may come from highly traumatic backgrounds. The academic motivation interventions may enhance student's ability to advance in college and future careers. This literature review contributes to investigating trauma's relationship to academic outcomes and Muslim American college students.

Department of Psychology

Daniel Ricci, Hannah Rosenberg

Mentor: Waleed Sami

ABSTRACT

Social inequality exerts an impact on mental health, creating various different social classes. This literature review is the justification for a study examining the relationship between social class and mental health. Research in the social determinants of mental health (Fink-Samnack, 2021) highlights this relationship, noting it as due to a significant lack of adequate resources being provided to those in lower social classes. While specific studies show an association between factors such as religiosity, social class, and mental health, many elements from other research, such as meritocracy, tend to be unaccounted for. Our study seeks to account for multiple factors that may influence an individual's mental health, such as meritocracy, and view of god, from this literature review, future questions could be raised such as, how does a lower-class individual's perception of meritocracy influence their mental health? Does an individual's subjective classism influence their mental health? Does the perception of divine control help one cope with inequality? The City College of New York is a part of the broader City University of New York system, which provides affordable higher education and serves students of all social class standings. This research will help colleges and universities such as the City College of New York better understand and provide more tailored resources for their student body, enabling students to perform better academically and lead to more opportunities in the future. In-depth research on the subject matter will allow for more accurate measurements of social inequality's impact on mental health and a better understanding coping measures.

Hudson River Park's River Project & The City College Initiative to Advance Academic Success in STEM (CiPASS)

**Luisahiris Espinal, Emanuel Santiago Hernandez
Garcia, Gregory Sanchez**

Mentor: Karin Block

ABSTRACT

The Science Leadership Program (SLP) is an intensive, paid 6-week summer program for female-identifying high school students directed by Hudson River Park's River Project in collaboration with the City College of New York, The Young Women's Leadership Schools of NYC and The Intrepid Sea Air and Space Museum. This program aims to remedy the lack of quality mentorship available for underrepresented groups in STEM by using a tiered mentorship approach, in which a coordinator provides feedback to three undergraduate mentors as they supervise twelve interns. A pre- and post-survey is given to verify the success of the program by qualitatively measuring the confidence of the mentors and interns in their scientific identity.

Opportunities in Research and Creative Arts (ORCA)

Anna Plotnick

Mentor: Alexandra Stern

ABSTRACT

This project was completed in order to better understand the impact of Indigenous violence in a newer historical field specifically related to Greater Reconstruction. The Sand Creek Massacre is one of the most violent indigenous massacre, and changed the outcome of the U.S. federal policy, and relationship between Native people in the country but specifically the Western region to the present day.

Opportunities in Research and Creative Arts (ORCA)

Samantha Cajamarca

Mentor: Adriana Espinosa

ABSTRACT

Background: Triple-negative breast cancer (TNBC) is an aggressive breast cancer subtype distinguished by high recurrence rate, poor prognosis, and lack of targeted treatments. TNBC incidence is three times higher for Black and 22% higher for Hispanic women. FDA-approved immunotherapy improves progression-free survival in TNBC. Using the Health Belief Model, this study explored how education may play a role in TNBC immunotherapy decision-making among Black and Hispanic women.

Methods: From April 2022 to July 2023, a subsample of 35 TNBC patients participated in 30-minute semi-structured interviews as part of a larger qualitative study. Questions spanned 3 domains: (1) Attitudes and knowledge about treatment and diagnosis; (2) Attitudes and knowledge about immunotherapy and side effects; and (3) Attitudes toward the medical system. Eligible patients self-identified as Black or Hispanic, spoke English or Spanish, were between 18 to 85 years old, had stage II-IV TNBC, were treated in the NYC metropolitan area, and were eligible for immunotherapy. A multidisciplinary team of three coders conducted a rapid qualitative analysis. Themes were compared between low versus high education, and between Hispanic ethnicity versus non-Hispanic Black race.

Results: Patients in this subsample were NH Black (n=21) and Hispanic (n=14); they had low (n=20) or high (n=15) education. Preliminary analysis indicated 9 themes spanning race, ethnicity, and education. One theme specific to patients with high education was taking source credibility into account. Three themes specific to patients with low education were: 1) Placing trust in their oncologist due to religious faith; 2) Decisions were influenced by television advertisements; and 3) Feeling lack of choice about treatment. Themes did not differ based on race or ethnicity.

Conclusions: Results highlight the role of education in TNBC immunotherapy decision-making among Black and Hispanic women. Future empirical studies can develop and test interventions to address specific educational needs.

Opportunities in Research and Creative Arts (ORCA)

Chloe Basarab, Kyle Bradley

Mentor: Edward Keller

ABSTRACT

We (Kyle Bradley and Chloe Basarab) worked under the guidance of Professor Edward Keller and William Gibbons in the George Lois Big Idea Archive. There were 2 main focuses of our work: to organize the archived materials to make them more accessible for future researchers, and to learn from a true visionary about what makes great advertising. Our work was two-fold in the sense that while we were learning to curate and maintain an archive, we were simultaneously being exposed to hundreds if not thousands of advertising materials that we could analyze and learn from. These documents included full pitch decks and notes on campaigns for various products and industries over the span of decades. Some of the most insightful documents we found were what we've dubbed George's "creative manifestos" in which he detailed the role of advertising and his beliefs that creativity and integrity has been lost in the art of advertising. From there, the questions we sought to answer in our research became, "what are the elements of great advertising", and "how do we spread George's ideas to the new generation of communications professionals?"

Opportunities in Research and Creative Arts (ORCA)

Tatiana Smith

Mentors: Yana Kucheva and Norma Fuentes

ABSTRACT

There is an inverse relationship between accessibility services given to Latino Immigrants in comparison to their mental health during the SARS-CoV-2 (COVID-19) pandemic. Many Latino Immigrants faced issues with food insecurity, lack of access to healthcare, and poor health both mental and physical. Many had to rely on relief measures such as SNAP, food pantries, unemployment, and help from local churches. Or income from family and friends. Families with undocumented or mixed-status suffered to receive this aid and often were less likely to reach out for help if they had contracted the virus. Latino immigrant mental health showed an increased risk of depression, anxiety, and loneliness due to the social isolation.

Opportunities in Research and Creative Arts (ORCA)

Chyenne Osondu, Sajeda Suleman

Mentors: Katherine Chen, Yana Kucheva

ABSTRACT

This project explores seniors' experiences with climate change in a Lower East Side Mitchell-Lama co-op complex called Masaryk Towers. The context of our study centralizes on two main questions: "What is the impact of climate change and environmental inequality on the health and wellbeing of seniors?" and "What kinds of social policies can lead to healthy aging?" Part of the data was collected using weekly non-participant and participatory observations at the complex's Naturally Occurring Retirement Community (NORC). The types of activities observed included fitness classes, painting, outdoor events, and the annual Masaryk Towers' NORC flea market. The second part of our data was collected in the form of 1-on-1 interviews, where residents had the opportunity to share their more in-depth experiences, concerns, and prior knowledge about climate change. Many residents provided histories of the complex where they shared their experiences with the changing racial composition in the neighborhood. In addition, senior residents at the NORC are aware of the dangers of heat exposure, however, many residents prefer to limit their exposure to air conditioning units in favor of natural air through windows, fans, etc. Considering that the NORC has the potential to promote community involvement and climate resiliency, we encourage strong investment from the NYC government and Department of Aging to maintain Masaryk Towers' NORC program. We also hope for other buildings and complexes to develop safe and efficient infrastructure for helping residents achieve climate resiliency in the NYC area.

Opportunities in Research and Creative Arts (ORCA)

Aya Abdallah

Mentor: Janee Moses

ABSTRACT

A series of lessons focused on "The Hunger Games" trilogy which fulfill the standards set by NYS for 11th and 12th grade ELA curriculum, while also incorporating modern and politically relevant works of literature into classrooms.

Opportunities in Research and Creative Arts (ORCA)

Jason Cabral, Nahila Nzina, Nicole Serino

Mentor: Robert Melara

ABSTRACT

Body dissatisfaction is a prevalent issue among women in the United States, with the increase of social media usage. Body dissatisfaction is concerning as it could lead to the potential risk of eating disorders, anxiety and depression. Recent literature has shown that social media usage is a causal factor for body dissatisfaction due to the promotion of an ideal body type (Aparicio-Martinez, 2019). In addition, further literature on body image and cognition suggests that individuals with body dissatisfaction have an attentional bias towards a thin ideal body type (Joseph, 2016). Researchers have used various experimental methods to measure attentional bias such as the dot probe task, visual search and eye tracking but they have produced mixed results (Rodgers, 2016). This study aims to discover the relationship between body image, social media usage and selective attention. For this study, 10 female participants were recruited and required to complete a consent form, Demographics form, TikTok usage survey, Body Shape Questionnaire and Eating Attitudes Survey. They were later required to complete a visual selective attention task measuring their attentional bias towards small, neutral or large body images. This study hypothesizes that participants with increased body image satisfaction will perform better on the selective attention task versus those with increased social media usage and body image concerns. Findings suggest that higher body image concerns and TikTok usage are associated with lower Stroop accuracy and reaction time, indicating less distractions. It also suggests that small and large body images caused an attention effect on the participants.

Opportunities in Research and Creative Arts (ORCA)

Dedipta Bhattacharjee

Mentor: Robert Higney

ABSTRACT

Memory never fades, but is immortalized by writing. Through Eileen Chang's novels, readers are transported back in time to the Shanghai and Hong Kong of the 1940s. With her eloquent use of words and fluency in both Chinese and English, Eileen Chang stands out as one of the greatest Chinese women writers of the 20th century and an important figure in global modernism. But her life was marked by political upheaval in Communist China, as well as personal tragedies. The start of Mao's People's Republic of China in 1949 marked the end of Chang's career in China, as she refused to conform to the country's patriotic sentiments. In 1955, she emigrated to the United States hoping to save her writing career, but her works were not well-received. It is noteworthy that there has been a recent resurgence in interest in Chang's literary works not only in China, but also in the United States. As literature becomes more global, it is crucial to comprehend how foreign writers are received in Anglophone literary markets and to be aware of the current and past trends. To understand why Chang's writing didn't have the impact it deserved, scholars like Hui Meng and David Jiang have analyzed her literary career. They have found that a combination of factors, such as American stereotypes of Chinese people, Chang's somber and realistic stories, and her sense of inferiority in the new sphere of American writers, hindered the flourishing of her literary career. Unable to connect with her new audience, Chang resorted to revisiting and revising her previous translations, trying to recapture the past in her imagination. Chang's retranslations immortalized the past and cemented her as a storyteller, novelist, and historian of a world that can never be returned to, leading to the fame that she ironically enjoys today.

Opportunities in Research and Creative Arts (ORCA)

Aleksander Zima, Katherine Anderson

Mentor: Osceola Whitney

ABSTRACT

The vocal control network is a group of brain regions that play a critical role in song development in birds. It is composed of two main pathways: the posterior motor pathway and the anterior forebrain pathway. The posterior motor pathway is responsible for the production of song and consists of a series of brain regions that control the muscles involved in singing. The anterior forebrain pathway is involved in the learning and plasticity of song. Together, these pathways play a crucial role in the complex process of song development in birds. Neural activity in the vocal control network is sensitive to song production as well as social contexts. The complete mechanism through which external social stimuli are conveyed to the vocal control network is unknown.

Studies in mice implicate a role for oxytocin-mediated release of dopamine in social-context-appropriate behaviors. Oxytocin is primarily synthesized in the paraventricular nucleus of the hypothalamus (PVN), and plays a crucial role in the study of learned social behaviors in birds. Neural mechanisms that facilitate social-context-dependent oxytocin signaling is unknown. We hypothesize that the social behavior network, a collection of six interconnected brain nuclei, signals to the PVN - ultimately facilitating social-context-appropriate song behaviors in adult male zebra finches.

To test this hypothesis, I will inject retrograde axonal tract tracer dextran FITC into PVN in the left and right hemispheres in six adult male zebra finches. One week after stereotaxic delivery of this tract tracer, birds will be sacrificed and their brains will be excised and immediately cryopreserved. All six brains will be coronally sectioned to 8 μm and thaw-mounted on charged glass slides in series for immunohistochemical analysis of FITC distribution. I will immunostain tissue with primary antibodies against tyrosine hydroxylase, to clearly label each region of the social behavior network. Labeled cell bodies in each social behavior network region will be quantified using FIJI ImageJ2.

This study of axonal projections from the social behavior network to the PVN is crucial to understanding the neural mechanisms that underly context-appropriate behavior. The use of zebra finches as a model organism in this study provides an opportunity to investigate the contribution of the social behavior network to context-appropriate song production, a previously unexplored area of research

Opportunities in Research and Creative Arts (ORCA)

Jane Ekhtman

Mentor: Elliot Jurist

ABSTRACT

Borderline Personality Disorder has been criticized for pathologizing behaviors that are culturally normative under patriarchy. Gender and sexual minorities (GSM) experience higher diagnosis rates than straight men. This study sought to determine how endorsement of BPD symptoms might vary based on queer identity and gender. 38 participants (16 queer, 22 straight) were screened for BPD upon obtaining demographic information. Queer people endorsed a greater total of BPD symptoms than straight people. 18.8% of queer people and 4.5% of straight people met criteria for BPD. Notably, 44% of queer people endorsed self-harm compared to 5% of straight people, and 50% of queer people were often distrustful of others compared to 18% of straight people. Likely due to discrimination of social identity, GSM may exhibit behaviors/feelings that overlap with BPD criteria at higher rates. To increase competency, clinicians must understand symptoms socially and further research should examine whether these symptoms cause enough distress for a diagnosis.

Opportunities in Research and Creative Arts (ORCA) & College-wide Research Vision

Nusrat Ali-Maisha, Kaitlynn Guzman

Mentor: Yana Kucheva

ABSTRACT

This study addresses the problem of social isolation among senior citizens living at Masaryk Towers. It looks at the serious impact of social isolation on the elderly citizens' mental, emotional, and physical health. In order to lessen social isolation and improve residents' overall quality of life, the study suggests customized treatments and community-based activities. It also intends to discover the unique causes of social isolation in this community. By conducting this study, we hope to better understand the special dynamics and difficulties that Masaryk Towers' residents experience and to encourage a more active and vibrant senior community there.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Matthew Babayev

Mentor: Adam Braunschweig

ABSTRACT

Enveloped viruses including SARS-CoV-2, ZIKA, & HIV have been responsible for global pandemics in the last decade and continue to threaten global health. These enveloped viruses are surrounded by glycoproteins which play an essential role in the viral life cycle. The Braunschweig lab has synthesized various Synthetic Carbohydrate Receptors (SCRs) that target the glycans on the glycoproteins of the viral envelope. These SCRs have inhibited viral disease progression in animals. To produce these SCRs, 3, 3', 5, 5' - tetrakis (azidomethyl) - 1, 1' - biphenyl (TAB) is synthesized in multiple steps. This product is a precursor to the synthesis of the SCR library. SCRs with demonstrated high potency and low in-vivo cytotoxicity are optimized for medicinal purposes, focusing on formulation and pharmacokinetics, with the ultimate goal of seeking authorization for an Investigative New Drug (IND) Application.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Nathanael Singh

Mentor: Daniel Keedy

ABSTRACT

Protein tyrosine phosphatase 1B (PTP1B) is a central regulator of cellular signaling pathways, making its structural and functional investigation crucial for potential therapeutic interventions. In this project, we propose to characterize a de novo designed PTP1B variant, created using the AI-based ProteinMPNN algorithm, along with a mutant variant generated through crowdsourcing. We aim to comprehensively assess their enzymatic kinetics, conduct high-resolution X-ray crystallography to unveil structural insights, and employ high-resolution local hydrogen-deuterium exchange mass spectrometry (HDX-MS) to map dynamic changes. Additionally, we will explore the stabilization of alternative structural states, including the open state and a simultaneous stabilization of both closed and open states, to study their effects on catalytic activity. This research advances our understanding of PTP1B, showcasing the potential of AI and crowd-driven approaches in protein design for structural and functional studies.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Zi Yu Chen

Mentor: Reza Khayat

ABSTRACT

Porcine Circovirus 2 (PCV2) is a virus that infects pigs and causes immunosuppression. It is of financial interest to the pig industry as well as of health interest to the public because of the possibility of it becoming zoonotic. It replicates via rolling circle replication (RCR). Porcine Circovirus 2 replicase (Rep) binds to the origin of replication (ori) in the PCV2 genome and initiates replication. Rep has 3 domains, the endonuclease domain (ED), the oligomerization domain (OD), and the ATPase domain (AD). The project seeks to identify the domain(s) of PCV2 Rep that bind to ori and initiate replication. Constructs of Rep will be generated without either the AD or ED, namely ED-OD and OD-AD. Firstly, the constructs will be expressed and purified. Then, they will be analyzed using electrophoresis mobility shift assays (EMSA). The constructs that show a shift in the EMSA are those that are requiring for binding to the ori. If neither construct shows a shift, then the entire protein is necessary for binding to ori.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Edda Monique O. P. Hobuss

Mentor: Alexander Khanikaev

ABSTRACT

Topological photonic systems attracted a significant deal of attention due to the possibility to control electromagnetic waves in a unique way, e.g., via artificial degrees of freedom (pseudo-spins), and thanks to robust trapping and guiding they offer. Their unique optical responses made topological photonic crystals promising for studying light-matter interactions. In this context several demonstrations of topological polaritons were realized, including semiconductor quantum dots and quantum wells, and 2D van der Waals materials integrated photonic structures. However, the lack of low-loss and high refractive index materials at shorter visible wavelengths makes this approach less fruitful, and one needs to sacrifice between loss and the degree of the mode confinement by choosing to work with lower index membranes (e.g., SiN), which are also difficult to fabricate, pattern, handle.

Recently, bulk TMDCs themselves have been successfully used as high index substrates for direct patterning and several optical nanostructures with moderate loss and desired functionality were reported. For polaritonics, direct patterning of bulk TMDCs may also offer the opportunity to couple excitons and photonic modes bypassing the need of patterning any substrates. In this work we will undertake this approach to realize a polaritonic topological nanostructure by directly nano-patterning 40 nm thick TMDC film of WS₂. To this aim, several of WS₂ flakes will be exfoliated and transferred on top of a SOI substrate. Then, the electron beam lithography and reactive ion etching processes will be used to produce a set of spin-Hall type of topological lattices. Topological properties of the structures viz., bulk topological bands and two counterpropagating topological boundary modes in the bandgap region will be confirmed using back focal plane imaging followed by real space imaging.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Will Butler

Mentor: Christine Li

ABSTRACT

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that affects >6 million people in the US. At the cellular level, AD is characterized by two pathologies: neurofibrillary tangles and amyloid plaques, whose main component is the β -amyloid peptide, a cleavage product of the amyloid precursor protein (APP). APP, along with APLP1 and APLP2, belong to the APP protein family. In mammals, APP is processed through two pathways. In the non-amyloidogenic pathway, APP is cut within the β -amyloid sequence by α -secretase, releasing an extracellular fragment (sAPP α); a subsequent cut by γ -secretase releases an intracellular fragment (AICD). In the amyloidogenic pathway, APP is cut within the β -amyloid sequence by β -secretase to release sAPP β ; subsequent cleavage by γ -secretase releases the β -amyloid peptide and AICD. Mutations in the APP gene and/or mutations in the enzymes involved in its processing, have been linked to early-onset AD.

Although the precise function of the APP family proteins is unclear, they are essential for viability. APP knockout mice are viable but show several defects. The APP and APLP2 double knockout mice, however, show postnatal lethality. The nematode *Caenorhabditis elegans* possesses only one APP ortholog, *apl-1*, and serves as a good model system for studying APP function. *C. elegans* only has the α -/ γ -secretase pathway. When *apl-1* is knocked out in *C. elegans*, the animals show larval lethality. However, this lethality can be rescued by reinserting *APL-1* or the extracellular fragment sAPL-1 into the animals. ADM-14 and SUP-17 are two candidate α -secretases in *C. elegans*, but it is unclear which enzyme (or both) cleaves *APL-1* to release the sAPL-1 fragment. We performed western blot analysis to identify the α -secretase, but our analysis yielded conflicting results. Future research will investigate whether different α -secretases are predominant during different larval stages of the animals.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Christopher Manohar

Mentor: George John

ABSTRACT

The traditional lithium-ion battery (LIB) has acquired acceptance owing to its high energy

density. However, their positive electrode materials have toxicity, environmental unfriendliness, and humanitarian issues surrounding them. It is imperative to design green electrodes as future energy-storage materials to replace the eco-detrimental inorganic alternatives in circulation. Green electrodes obtained from naturally occurring sources (e.g. biomass) are inherently safe, renewable, and low-cost and can potentially alleviate man-made geological problems (e.g. water pollution, land degradation) caused by mining and the purification processes of inorganic elements. We synthesized tetrakislawsonone (TKL) by tetramerization lawsonone, an extract of the naturally occurring tattoo dye henna, around benzene under green conditions of water and ethanol. TKL coordinated four Li ions and three Na ions in Li and Na batteries respectively, but the electrode suffered from dissolution in the organic electrolyte. Also, the synthesis of TKL has a poor yield of 35 % of pure product. Here, we have attempted to improve the yield of the reaction by varying the water to-ethanol ratio and observed that H₂O: EtOH 3:2 by vol improves the yield to 50%. We aim to optimize solvent ratios and thermal conditions of the reaction to attain a yield > 80%. Further, the stability of TKL will be improved by synthetically dehydrating the molecule using acetic anhydride to yield oxygen-bridged tetrakislawsonone (OBTKL).

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Janice Rateshwar

Mentor: Linda Spatz

ABSTRACT

SLE is an autoimmune disease characterized by anti-dsDNA antibodies. While the origin of anti-dsDNA antibodies is unknown, it may be due to molecular mimicry of EBNA-1, the major nuclear protein in Epstein-Barr Virus, and dsDNA. A monoclonal antibody to EBNA-1 (designated 3D4), generated in the laboratory of Dr. Linda Spatz, exhibits cross-reactivity with dsDNA. Epitope mapping revealed that 3D4 recognizes a 160 amino acid fragment, LS9C, in the carboxyl region of EBNA-1. Understanding interactions of 3D4 with LS9C and dsDNA may indicate origins of anti-dsDNA antibodies. The 3D4-LS9C complex was recently crystallized to reveal antibody-antigen binding sites. However, further modeling via docking is beneficial for testing reproducibility of 3D4-LS9C binding interaction and assessing the predictive power of computation modeling. PyDock and HDOCK are Fast-Fourier-Transform docking web-servers that were used for free docking of 3D4 and LS9C. 3D4-LS9C PyDock models (3D4-LS9C-PMs) and 3D4-LS9C HDOCK models (3D4-LS9C-HMs) were ranked according to lowest energy. The top 10 3D4-LS9C-PMs and 3D4-LS9C-HMs were overlaid onto the 3D4-LS9C crystallized structure (3D4-LS9C-CS) and assessed for overlap with the 3D4-LS9C-CS via PyMol. 2D interactions of 3D4-LS9C-PM and 3D4-LS9C-HM with greatest overlap were analyzed using LigPlot+ and overlap calculations were graphed using Excel. Average percent overlap between 3D4-LS9C-HMs and 3D4-LS9C-CS was greater than average percent overlap between 3D4-LS9C-PMs and 3D4-LS9C-CS ($p=0.0225$). Paired comparison of 3D4-LS9C 3D4-LS9C-PMs and 3D4-LS9C-HMs revealed that seven out of ten times the 3D4-LS9C-HM model had greater overlap with the 3D4-LS9C-CS than the corresponding 3D4-LS9C-PM. 3D4-LS9C-HM rank three had the greatest overlap with the 3D4-LS9C-CS overall. These results suggest HDOCK exhibits greater accuracy in predicting crystallized interactions than PyDock. Since HDOCK can also perform free protein-DNA docking, future studies will test 3D4-dsDNA interactions with HDOCK to improve understanding of anti-dsDNA antibodies that are characteristic of SLE.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

**Anis Choudhury, Andreas H Kottman,
Santiago Uribe-Cano**

Mentor: Andreas Kottman

ABSTRACT

The striatum is a key brain region for the coordination of efficient yet adaptable motor actions. Within this region, a sparse population of neurons referred to as Cholinergic Interneurons (CINs) act as the main local source of Acetylcholine, a neurotransmitter that regulates learning and synaptic plasticity within the striatum. Through this influence, CINs are central in both natural habit formation, behavior flexibility and motor skill learning, as well as striatum associated disorders such as addiction and Parkinson's Disease. Unlike other striatal cells, CINs have been shown to express chronically high levels of cell stress as measured through the degree of integrated cell stress response (ISR) activation. The ISR is a collection of intercellular signaling pathways activated in response to a range of cellular stressors and all converging on the phosphorylation of Eukaryotic Translation Initiation Factor 2A (p-eIF2a). Levels of p-eIF2a can therefore be used as a proxy for ISR activation and, in CINs, elevated baseline levels of p-eIF2a have been suggested to regulate behavior in mice, such that reducing p-eIF2a levels in CIN alters skill learning in mice. Understanding the factors that regulate ISR levels in CINs therefore offers greater insight to the cellular processes that regulate CIN function and CIN-associated behaviors.

One signal previously shown to modulate CINs is Sonic Hedgehog (Shh), a peptide normally released by Dopamine Neurons which heavily innervate the striatum. Specifically, reductions of Shh in the striatum have shown to produce CIN degeneration as well as increased expression of the endoplasmic reticulum (ER) cell stress marker Grp78. While ER stress markers act upstream of p-eIF2a, it is unclear whether Shh impinges on p-eIF2a levels and as a result regulates CIN-associated behaviors. The focus of this research is two-fold: 1) to determine the degree to which Shh modulates p-eIF2a levels in CIN and 2) determine what behavioral deficits observed after changes in Shh signaling onto CIN are associated with changes in CIN ISR levels. To accomplish this, we utilized transgenic mice with either CIN-specific genetic ablation of Smoothed (Smo), a downstream effector of Shh, or CIN-specific expression of SmoM2, a constitutively active form of Smo to manipulate Shh pathway activity. Behavioral differences among these mice and controls were then measured and levels of ISR activity were quantified using post-mortem Immunohistochemical detection of p-eIF2a.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Alexandria Durant

Mentor: Urs Jans

ABSTRACT

In 1979 the EPA passed regulations on the concentration of 11 disinfection by-products (DBPs) in drinking water due to studies showing that chlorine, the main disinfectant used, led to the formation of toxic DBPs. An emerging alternative disinfectant that can be used in the process of removing micropollutants from wastewater is Fe-TAML/H₂O₂ which utilizes iron with a tetra amido-macrocyclic ligand (Fe-TAML) as a catalyst with H₂O₂ as the oxidant. This project analyzed the type of trihalomethanes (THMs), a class of DBPs, and their concentrations formed when Fe-TAML/H₂O₂ is used as a disinfectant compared to chlorination. Each solution contained borate buffer, iodine or bromide, and Pahokee Peat humic acid to obtain a concentration of 6 mg/L of carbon, and 15 μM bromide or 1.5 μM iodide. For the chlorination experiments, NaOCl and NH₄Cl were added to obtain a chlorine concentration to be 84 μM. The Fe-TAML/H₂O₂ experiments had concentrations of 200 nM Fe-TAML and 330 μM H₂O₂. In the chlorination experiments, the average iodoform concentration was 4.89 μg/L, while for Fe-TAML/H₂O₂ it was 4.28 μg/L. However, the difference between the two is not statistically significant enough to conclude that iodoform concentrations are lower when Fe-TAML/H₂O₂ is used as a disinfectant compared to chlorine. The average CHBr₃ concentration in the chlorination experiments was 42.59 μg/L, 7.263 μg/L for CHBrCl₂, and 35.768 μg/L for CHBr₂Cl. While in the Fe-TAML/H₂O₂ experiments, no brominated THMs were detected. This makes Fe-TAML a promising disinfection alternative as 3 out of the 4 THMs regulated by the EPA are brominated.

Opportunities in Research and Creative Arts (ORCA) & The City College Initiative to Advance Academic Success in STEM (CiPASS)

Jubyaidd Uddin

Mentor: Bo Shang, Jizhong Xiao

ABSTRACT

Automated construction inspection is vital for ensuring code compliance and structural integrity. This study focuses on crack segmentation in concrete inspection, a critical task for identifying potential issues. Traditional manual methods are labor-intensive and may compromise safety.

To address this, a pneumatic wall-climbing robot with an RGB-D camera is employed. Leveraging deep learning, the proposed "InspectionNet" model utilizes convolutional neural networks for precise crack segmentation. This model enhances detection accuracy and enables measurements even in incomplete depth data scenarios.

The introduced CSSC dataset offers pixel-level annotated images of cracks, fostering research collaboration. Experimental validation demonstrates the robot's efficiency on uneven surfaces and the model's robust performance under varying lighting conditions.

This research contributes to automated construction inspection by providing an effective solution for accurate crack segmentation, improving overall inspection efficiency and safety.

Science Education and Public Engagement

Rafael Cruz

Mentor: Yael Wyner

ABSTRACT

Nature Adventure Guides work with the Urban Park Rangers but are not Rangers! Rangers deal with animal related issues, park enforcement, as well as education, while Nature Adventure Guides solely deal with education. Guides:

- Plan and offer educational materials relating to NYC wildlife, history and conservation. These will be presented through pop-up programs
- Hone customer service skills in order to improve patron experience in parks
- Outreach to local communities, schools, organizations
- Support the Urban Park Rangers in programs and events
- Connect patrons to their local parks and greenspaces

Science Education and Public Engagement

Aristotle Aung

Mentor: Yael Wyner

ABSTRACT

A Museum Educator:

- facilitates scientific conversations among the many dioramas and exhibits at the American Museum of Natural History (AMNH);
- conducts research on specific displays using AMNH resources, libraries, and archives to create a facilitation guide;
- understands museum visitors identities and behaviors to better adapt conversations
- educates AMNH patrons to improve overall visitor experience.

Science Education and Public Engagement

Tiana Lewis

Mentor: Yael Wyner

ABSTRACT

OpenSpace is an open source software that is essentially like Google Earth but for the known universe and is very often used in planetariums like the American museum of Natural History. It uses data that has been collected about our solar system and the space beyond and presents it visually.

During my internship, I have done a multitude of things using OpenSpace that are geared towards teaching and learning. I have coded my own assets - that is coding that would be visualized in the program - to create training paths, which create rings that one may fly through much like a video game. Flight training helps to practice moving the camera while doing planetarium shows and making a smoother ride around the worlds. In addition to coding, Dr. Hedberg and I have worked on reopening the CCNY planetarium after COVID forced it to be shut down. In the process, I have not only created a script for my own planetarium show, but also performed that very planetarium show to several classes of the STEM Institute in the month of July.

Summer Student Program at Jackson Laboratory

Aria Hossain

Mentor: Kevin Peterson

ABSTRACT

Gli3 and Hand2 have previously been shown to engage in a synergistic relationship during craniofacial development; specifically, they are required for proper patterning of the mandible. However, it is not clear how the genomic context influences Gli3 and Hand2 interactions. We applied genomic and transcriptomic approaches to further understand the molecular basis governing Gli3 and Hand2 activity in the mandible using epitope tagged mouse models. Phenotype enrichment analysis in shared and unique Gli3-Hand2 ChIP-seq peak datasets suggested that Gli3 and Hand2 interact with each other during craniofacial development. Further, bioinformatic analysis of RNA-seq data highlighted genes bound by Gli3 and Hand2 are linked to severe craniofacial abnormalities and identified top differentially expressed genes in Gli2/Gli3 and Hand2 conditional knockouts. Motif enrichment allowed us to confirm most frequently occurring E-box variants and Gli binding sites within bound regions. To determine if Hand2 and Gli3 directly interact in vivo, we applied Proximity Ligation Assay; however, there were numerous unspecified signals that prevented us from distinguishing between background and real signals. As future directions, further optimization of the protocol and additional quantification using imaging software may help to resolve this technical issue.

Sustainability Public Service Announcement (SPSA) Project at City College

**Mustafa H. Almarzouq, Anisa Haxh, Albane Hoxha,
Sheilla D. Marquez, Bryants Mendez, Elizabeth Pena
Santana, Lasha Sidiiani**

Mentor: Stephanie Rose

ABSTRACT

There is a great interest amongst City College of New York (CCNY) students to learn about environmental issues, internship opportunities, and what's happening on campus around sustainability. In addition, there are public display screens all around the City College campus that are an effective way to convey information to the college community. Some of the information on the public display screens are Public Service Announcements (PSAs) that take the form of static infographics, and others use video, photos, and moving animation elements to engage viewers. Yet there hasn't been much digital signage content created by students for campus.

We created an engaging 30-45-second digital Public Service Announcement focused on experiential learning opportunities to take action on sustainability and environmental projects (e.g. about an environmental organization in NYC and their internships offerings, or a City College environmental club or campus sustainability project). Our digital PSA were shared with our class, as well as shown on the public display screens around the whole City College campus for Earth Week in April 2023.

The City College Initiative to Advance Academic Success in STEM (CiPASS)

Nadia Ben Slima

Mentor: Francesca Anselmi

ABSTRACT

This presentation encapsulates a transformative journey from a computer science student at the City College of New York (CCNY) to a dedicated and proactive Project Engineering Co-Op at Collins Aerospace in Rockford, Illinois. It traces the multifaceted roles undertaken during the academic tenure, participation in extracurricular activities, and attendance at the prestigious 2023 BEYA conference. It further delves into the pivotal transition from a Software Engineering Internship offer to a Project Engineering Co-Op position, highlighting responsibilities, collaborations, and personal growth. This comprehensive account underscores the value of diverse experiences in shaping an engineer's professional and personal development.

The City College Initiative to Advance Academic Success in STEM (CiPASS)

**Fares Allahabi, Brandon Flores, Aswin Menon,
Atique Shafi**

Mentor: James Scholtz

ABSTRACT

Component Design and Development to Enable a Novel Infrared Camera

Infrared cameras are tools that allow people to see what their eyes cannot, enhancing awareness of their surroundings. However, the current technology, the components used in the cameras and the manufacturing process, highly increase the price for a single camera. Infrared cameras are useful and have multiple applications in many settings such as security, intelligent systems, safety, etc. Vvir Inc. is working on the design of a new infrared camera that would be smaller in size and cheaper compared to other infrared cameras in today's market. Students/interns are broken into different teams according to their major and will work on sub-projects. These individual team projects will be different aspects of the whole infrared camera project and in the end everything will come together to create a single product. Our team was in charge of creating the necessary electrical components and the development of a PCB or printed circuit board, that will control the functionality of the camera. This is achieved by implementing a component called "Laser Driver" that controls the laser that is needed for the camera). Another component is the "TEC" and this controls the temperature of the laser. First two versions of the PCB have been developed.

The City College Initiative to Advance Academic Success in STEM (CiPASS)

Ethan Hack Chabot, Nicolas Mateus, Antony Takla

Mentors: Ali Sadegh, Salih Yildiz

ABSTRACT

The medical manufacturing sector is continuously looking for new ideas to improve output, accuracy, and product quality. In this study, a cutting-edge Robotic Autonomous Catheter Packaging System (RACPS) that will revolutionize catheter packaging operations has been designed and researched. Robotic applications are used by the RACPS to automate the packaging of catheters, lowering the requirement for manual labor and boosting productivity. A crucial phase in the production of this medical device is the packing of catheters, which necessitates precision and attention to detail. In medical robotics, quality and safety are of vital importance. The gripper mechanisms on the robotic system ensure gentle and controlled manipulation of fragile catheter components during packaging. This reduces the possibility of catheter damage and ensures that each package complies with stringent quality and sanitary standards.

We assessed the current HDPE card's adaptability during the design phase of this process and developed a comparable design to adapt a cogent design created to function with our RACPS robot. In this procedure, user-friendliness and easy integration into current manufacturing environments were given top priority. With a customizable architecture that can accommodate different catheter sizes and packing styles. The RACPS offers Edward Life Sciences an adaptable solution to suit their particular requirements. Operators can precisely control the packing process thanks to the system's user-friendly interface, which streamlines production and ensures reliable output. To show how successful the RACPS is, validation and performance testing are crucial. Diverse HDPE card designs and prototypes were produced for this intensive testing encompassing diverse packing circumstances.

The RACPS increases productivity by reducing human error, streamlining manufacturing workflows, and automating the catheter packing process.

The medical manufacturing sector is expected to undergo radical change as a result of the RACPS adaptation. Due to its automated capabilities, manufacturing processes are optimized, leading to higher output. Packaging time is also ensured to be consistent. The RACPS enables operators to concentrate on crucial quality control and process optimization elements by relieving them of manual activities. The RACPS also has the ability to improve the integrity and safety of products. Its accuracy in handling catheters during packing lowers the possibility of contamination and guarantees that each catheter is sealed securely. A more reliable product and happier customers are also benefits of consistent packaging.

The Robotic Autonomous Catheter Packaging System (RACPS), in conclusion, exemplifies the promise of contemporary medical robotics in the manufacture of catheters. It revolutionizes catheter packaging procedures with its cutting-edge innovations, safety features, and user-friendly design. The RACPS provides a valuable solution that enables the industry to supply superior catheter goods to healthcare practitioners and, ultimately, improve patient care, at a time when medical manufacturers are looking for creative methods to increase production and product quality. The RACPS offers a significant advancement in the pursuit of improved catheter packing efficiency and quality in the field of medical production by combining precision, automation, and adaptability.

The City College Initiative to Advance Academic Success in STEM (CiPASS)

Nelson Molina, Defne Sener

Mentor: Bingmei Fu

ABSTRACT

Cardiovascular disease is the number one killer worldwide. Real-time monitoring of blood pressure (BP) and cardiovascular health are critical for the early diagnosis of cardiovascular diseases. PPG is the only low-cost medical-grade biosensor on the market that can continuously detect blood volume changes in the body. However, decoding the PPG signal in real-time to extract relevant information is still in its infancy. In collaboration with Neudigi Inc., a machine learning hemodynamic (AI/ML) algorithm made for real-time BP monitoring was developed. The algorithm aims to denoise a PPG readings to reconstructed signal harmonic peaks and taking the second derivative to correlate to the signal wave pulse. The purpose of this experiment was to test this new algorithm and see how precise and accurate it is. This was done by acquiring participants' BP values at various rates of rest and a PPG reading. A linear regression was derived from the BP readings and AI/ML was used to interpret the PPG readings. The calculations show the predicted systolic and diastolic pressures in accordance to the HR obtained through PPG. The results show that majority of PPG HR and predicted systolic pressures are similar to the actual values acquired. Despite this, the predicted diastolic pressures have shown inaccuracies, suggesting to tweak the algorithm. After revisions to the algorithm are implemented, arterial stiffness and vascular aging will be derived.

The City College Initiative to Advance Academic Success in STEM (CiPASS)

Amina Shamraze

Mentors: Zeeshan N Chaudhry, Mohamed Haroun

ABSTRACT

Metals are significant in various industries and there is promising potential of 3D printing for fabricating metal components.

Due to challenges related to oxidation and moisture absorption, there is the need for a specialized secondary storage container to enhance the printing process.

This container, equipped with a dehumidification system and humidity sensors, addresses these challenges and ensures optimal printing conditions.

The design allows for future modifications, including enhanced dehumidification capabilities, fostering continuous improvements in metal 3D printing technology.

The City College Initiative to Advance Academic Success in STEM (CiPASS)

**Andro Abdelmalek, Tad Jerzy Misztal,
Tasfia Kabir Pushpita**

Mentors: Xiaoxiao Zhang, Haipeng Zhang, Yang Liu

ABSTRACT

Offshore wind energy has emerged as a thriving industry due to the abundance of wind resources available in the open ocean. The Department of Energy Wind Vision Report has set an ambitious goal of establishing an offshore wind project pipeline with a capacity of 86 GW by 2050, considering the existing 3 GW of installed capacity. Achieving this growth requires a thorough understanding and management of potential risks associated with offshore wind turbines, especially the erosion, corrosion, and icing issues caused by ocean spray droplets in marine settings. In this study, an experimental study was conducted to investigate the saline droplet impinging dynamics on a multilayered porous surface. This study will pave the way for developing an innovative droplet-absorption-based surface technology for mitigating the hazards posed by ocean sprays and enhancing the sustainability of offshore wind turbines.

The City College Initiative to Advance Academic Success in STEM (CiPASS)

Queen Carrasco

Mentor: Alison Conway

ABSTRACT

Covid-19 modified the way in which New York City's economy, workforce and overall daily life have changed. Restaurants were once solely indoor dining- now, there are added outside structures, providing additional seating. What was once the normal of commuting into the office has now been replaced by a hybrid work structure with some people coming in three days per week. Working with partners at the Department of Transportation, the goal here was to use open data sources (American Community Census Survey, MTA Rider-Ship Data, MTA Travel Survey, etc) to analyze changes in travel activity within New York City.

The Climate Policy Fellows Program

Jennifer Zingone

Mentor: Alison Kirsch

ABSTRACT

During the summer, I had the privilege of interning at The Sierra Club's Washington DC office through the Climate Policy Fellowship program at The City College of New York. My internship spanned various campaigns aimed at shifting the United States' energy landscape away from fossil fuels towards clean energy.

My initial assignment revolved around the Abandoned Wells and Beyond Dirty Fuels Campaign. I was tasked with curating datasets to identify prominent private landowners in California counties hosting numerous idle oil and gas wells. This initiative, led by The Sierra Club's Environmental Law Program, aimed to gather data for potential external lawsuits on behalf of affected landowners. By pinpointing major landholders, we sought to initiate impactful legal actions compelling the plugging of these dormant wells. The results of my database survey research were subsequently used by the senior analyst for comprehensive geospatial analysis. This research also provided the foundation for an article I authored titled "The Silent Threat: Health Impacts of Living Near Idle Wells."

Following the successful completion of the article, I shifted my focus to public transit electrification as part of The Sierra Club's Clean Transportation For All (CTFA) campaign. My responsibilities included researching and summarizing organizations involved in public transit. This research culminated in the creation of a PowerPoint presentation, enabling the team to better understand the organizational landscape for future discussions.

Concluding my internship, I conducted an evaluation of the integration of the Inflation Reduction Act (IRA) within utility providers' operational frameworks, supporting The Sierra Club's Beyond Coal Campaign. My task involved reviewing the Integrated Resource Plans of 24 utilities referencing the IRA and evaluating them against specific IRA-related metrics. The insights gained from this will be integrated into the iteration of The Sierra Club's "Dirty Truth" report.

The Grove School of Engineering

Hana Kassem

Mentor: A.H Rezwanuddin Ahmed, Alessandra Carriero

ABSTRACT

The complex microarchitecture of tissues is a crucial component of tissue function. The ability to mimic in-vivo physiological transport phenomena for a tumor tissue explant strongly determines how effective a drug will be in patients and offer the best treatment. Recent developments in microfluidic cell culture systems include the capability to simulate a cell's natural microenvironment closely, but only for a short-term duration. Here we present a microfluidic system, compatible with conventional 96-well formats, that integrates 3D tumor tissue explant cultures with an embedded-channel platform that allows testing of up to 12 independent conditions with four replicates each, providing a physiological representation of flow velocity throughout the surrounding tumor tissue explant, and preserves the explant with a mid-to-long-term culture duration. We aim to provide users with a portable, mid-throughput, low-cost system to emulate physiological perfusion and nutrient exchange for accurate drug screening.

The Zahn Innovation Center

Omar Addasi, Geoffrey Turberville

Mentor: Chris Bobko

ABSTRACT

WindReader is an atmospheric measurement UAV platform. Our goal is to enable atmospheric scientists to gather more data, more easily, in the Atmospheric Boundary Layer. The ABL, from ground level up to approximately 1km, is of particular interest, as it is where we live. By tracking wind direction, aerosol concentrations, and scalar values such as Temperature, Pressure, and Humidity, we can characterize the atmosphere on a local scale, and gain a better understanding of anthropogenic and climate events affecting us. This project was developed and guided along with the Zahn Innovation Center and Dr. Prathap Ramamurthy's Urban Flux Observatory.

Writing About New York

Nelson Igunma

Mentor: Felice Neals

ABSTRACT

Students in in “Writing About New York” (IAS 32177), a class taught by Felice Neals at the Downtown Campus, were asked to construct “tourist pages” about New York inspired by Jamaica Kincaid’s “A Small Place.” Jamaica Kincaid, a longtime Vermont resident born in Antigua, published a portrait and critique of her home country (population: approx. 100,000) to both acclaim and criticism. As we read her guide and warning to a fictional tourist, we collectively examined our varied experiences of New York as a place or concept using our creative and pedagogical instincts while considering Kincaid's insights about a place she knows as both local and tourist, two roles that every New Yorker has an opinion on.

Zoo Miami Research Experience for Undergraduates

Aleyna Singer, Kelsey Felder

Mentors: Anna Wilkinson, Steven Whitfield, Tom Pike,
Elisa Frasnelli; CCONY Mentor: Ana Carnaval

ABSTRACT

In Florida, the Gopher Tortoise, (*Gopherus polyphemus*), is recognized as a keystone species and through their unique behavior of creating burrows in the ground, provides habitat to 350+ other species, some of which are endangered. Gopher Tortoises are considered Vulnerable, and commonly occur alongside suburban neighborhoods and development sites. Due to the nature of development in Florida, tortoises can be displaced from their natural place of origin, and when this happens, they need somewhere to go. With no known point of origin, these tortoises become considered waif tortoises. They can be found at development sites and or around neighborhoods. Once removed from the wild, these tortoises are incapable of surviving on their own. A partnership between FWC and Zoo Miami, place waif tortoises in protected areas to be released into federally-protected areas after 6 months. Monitored by zoo staff, a unique behavior was observed: Fence pushing. Thought to be motivated by either exploratory or escapist behavior, tortoises have been observed intentionally leaning against fences as they walk along the perimeter. Concerned for injury and escapism, our study aimed at improving the conservation of the species by examining two elements of gopher tortoise management: 1) adjusting the fence material to reduce the fence-pushing behavior to provide better standards for the conservation and management of the species, and, with the mission to improve the welfare of waif tortoise, designate species-specific behaviors as indicators for welfare.

The City College of New York

2023