11TH ANNUAL UNDERGRADUATE RESEARCH DAY

MAY 2ND • 9 TO 3PM
ACADEMIC CORE BUILDING

ALL STUDENTS, FACULTY & STAFF ARE INVITED!

Research Day celebrates the accomplishments of the undergraduate researchers and their mentors. Research or creative work encompasses all the disciplines at York College.

KEYNOTE SPEAKER
Francesco Ramirez, DSc,
a leading expert in Marfan syndrome

Register to attend
or submit abstracts at:
www.york.cuny.edu/academics/
undergraduate-research

YORK College | CU NY

11ᵗʰ Annual Undergraduate Research Day

Goals of the Student Research Day

To provide a forum to celebrate and recognize the results of scholarly collaboration between York's student scholars and their faculty mentors.

To foster communities built around common themes that are aimed to nurture intellectual growth, reduce isolation, and prepare students for professional success in their chosen fields.

Brief History of the Student Research Day

Every April for the past decade, the Office of Undergraduate Research organizes Student Research Day to highlight the accomplishment of our undergraduate researchers and their faculty mentors. The undergraduate researchers present their findings through poster and panel presentations, art exhibits, and music or dance performances, among others.

Historically the Student Research Day has hosted illustrious keynote speakers from diverse fields of interest. The inaugural Student Research Day was held on April 15th, 2010. In 2011, the 2nd Annual Student Research Day featured the keynote speaker Staceyann Chin, performer, and Co-writer of Russel Simmons Def Poetry Jam on Broadway, The Other Side of Paradise. In 2012, the 3rd Annual Student Research Day featured award-winning novelist Hari Kunzru, author of "Gods Without Men." The 4th Annual Research Day had Dr. Partha P. Mitra, Professor of Neuroscience and Theoretical Biology at Cold Spring Harbor Laboratory as our keynote speaker. The hallmark 5th Student Research Day showcased the Pulitzer Prize-winning author Charles Duhigg and former York College Provost Ivelaw Griffith. The following year featured science evangelist and author Dr. Ainissa Ramirez and event honoree Dr. Beth Rosenthal. The tradition continued for years.

Participation in the annual celebration of undergraduate researchers and their mentors grew from the inaugural 150 students to around 250 participants in the previous years. Most recently, due to the pandemic, the event had been tabled. The 11ᵗʰ Annual Student Research Day hopes to renew the tradition.

The success of our student researchers depends on their faculty mentors. We invite faculty from all disciplines to mentor our students.

Message from Provost Derrick Brazill

As a Biologist, research is near and dear to my heart, and expanding opportunities to engage in this rewarding pursuit of knowledge has been a main motivating factor in my academic journey. Therefore, I cannot fully express my joy in welcoming you to the 11th Annual Undergraduate Research Day, the first since the COVID-19 pandemic. Our presence here today is evidence of the persistent power of intellectual enquiry, innovation, and the irrepressible human spirit.

The past few years have been unprecedented in numerous ways, altering our lives, upending our routines, and modifying many aspects of our academic community. Yet, in spite of all of this, we have thrived, embracing new modes of learning and research with determined diligence.

Today's Undergraduate Research Day represents not only a return to normalcy but also a celebration of our consistent commitment to advancing knowledge and supporting scholarship. It is a testament to resilience, ingenuity, and the impressive achievements of our student researchers.

This conference is a supportive forum for our students to showcase their amazing work and novel discoveries. From labs to libraries, from databases to DNA, our students have embraced experimentation and exploration. Let us appreciate this opportunity to come together once again to laud our young scholars' passion for inquiry and commitment to excellence.

In celebrating our students, let us also recognize the invaluable assistance and guidance provided by their faculty and staff mentors. Underpinning every student breakthrough is a complex network of support and collaboration, fostering the development of these future leaders of academia and beyond.

So, let us engage today with keen minds and eager hearts, open to inspire, and be inspired. May this Undergraduate Research Day serve as witness to the unlimited impact of student research and the unmitigated joy of discovery that drives all of us. York's motto, "Sapere Aude, Incipe!" translates to "Dare to Know". Today, I would say "*Exlplorare* Aude, Incipe!", "Dare to Explore!".

Message from the Director of the Office of Undergraduate Research

Welcome to the 11th Annual Student Research Day at York College. Help us in celebrating the achievements of our student scholars and their mentors. Students from various disciplines present their findings through posters and seminar presentations and a music performance. Research Day is being held for the first time in 5 years, making this event particularly significant.

Like most faculty, I believe that promoting student engagement in research or scholarly work helps students become more well-rounded, confident, and prepared to seek a rewarding career path. In the past, some students that chose to work with a faculty mentor moved onto promising professional endeavors, such as completing a PhD program, earning Medical or Pharmacy Degree and excelling once they joined the workforce.

This year we have *Micaela Ribeiro*, who have been accepted to the *Stony Brook Chemistry Graduate Program*, *Iliana Vigil*, who will be going to the *Biochemistry Program at the CUNY Graduate Center*, and *Taskeen Karim*, who will be headed to *University of Buffalo's Pharmacy School*. Ribeiro, Vigil, and Karim will be presenting their research on this year's UR Day. Congratulations to them and everyone who will be transitioning out of York for a career path of their choosing.

Please join me in welcoming this year's keynote speaker, Francesco Remirez, DSc. Dr. Ramirez is a professor and principal investigator of Pharmacology and Systems Therapeutics at the Icahn School of Medicine at Mount Sinai. His Keynote Speech will center on his work on Marfan Syndrome.

Thank you and hope you enjoy today's event.

About the Speaker

Dr. Ramirez is the Dr. Amy and James Elster Professor (Connective Tissues Diseases) in the Department of Pharmacology and System Therapeutics of the Mount Sinai School of Medicine in New York City. Dr. Ramirez graduated in 1969 from the University of Palermo (Italy) with a doctoral degree in the Biological Sciences (genetics). After postdoctoral training at Columbia University working on the molecular characterization of thalassemias, in 1979 he joined the faculty of Rutgers Medical School where his laboratory cloned several human collagen genes and defined the underlying defects in osteogenesis imperfecta, Ehlers Danlos syndrome and chondrodysplasias. In 1989, he joined the Ichan School of Medicine at Mount Sinai where he began his work on Marfan syndrome which led to the identification of the underlying genetic defect and the demonstration of the direct involvement of extracellular microfibrils in modulating TGFb and BMP bioavailability. Current research effort of his laboratory focuses on the cellular and molecular mechanisms responsible for musculoskeletal and cardiovascular manifestations in mouse models of Marfan syndrome using a combination of *in vivo*, *ex vivo* and *in silico* approaches with the long-term goal to identify suitable biological targets for therapeutic interventions.

Highlights of Students Activities

NSF S-STEM scholars, accompanied by their mentors, completed internships at the Tech Incubator at Queens College.

The three graduating seniors who are moving on to various graduate programs. From left to right, Micaela Ribeiro, Iliana Vigil, and Taskeen Karim.

Jonathan Shields giving a seminar at the "CATA 2024 39th International Conference on Computers and Their Application", March 18-19, 2024, New Orleans. He co-authored a paper on the subject with his mentor, Dr. Srivatanakul.
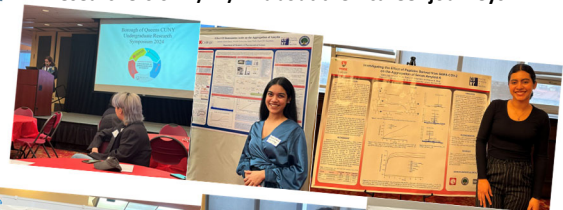

Students and their mentors at the "1st CUNY-wide Celebration of Undergraduate Research" help at BMCC on 5/24/23.


Pamela Lebron, MPA, MS (second from the left) and David Olayinka Ola, MD (first on the right) spoke to our student researchers on 4/12/24 about their career journeys.

A field trip to Regeneron Pharmaceuticals Inc on 5/12/23.

York student researchers presented at the "Borough of Queens CUNY Undergraduate Research Symposium" held at QC on 4/1/24. Taskeen and Iliana won awards for their poster presentations (top right corner). Lower row, Samantha, Ranjit, Julian and Sophia.
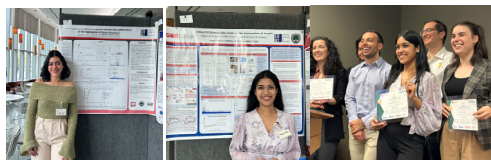
Iliana and Taskeen presented their posters at the "CUNY ASRC: The Big Science and Technology Symposium" on 4/19/24. The farthest picture to the left is Taskeen standing with her peers who won an award for poster presentation.

Program Itinerary

Registration
8:30 – 9:00 am
AC-2D01

Opening Remarks
9:00 – 9:30 am
AC-2D01

Poster Session
9:30 – 10:30 am
Atrium

Seminars/Band Performance
10:30 – 11:30 am
AC-2D01, AC-2C05, AC-2C06, Atrium

Lunch
11:30 – 12:00 pm
AC-2D01

Keynote Lecture
Francesco Ramirez, DSc
12:00 – 1:30 pm
AC-2D01

Awarding of Certificates & Extended Poster Session
1:30 – 2:30 pm
Atrium

Closing Remarks
2:30 – 3:00 pm
Atrium

Emcee: Dean George White

Seminars/Music Performance
10:30 - 11:30 AM

Seminar Room #1   **2D01**
Moderator: *Adam A. Profit, PhD*

"My Journey as a Latino Scientist: From York to Yale and Columbia"
by Robert Fernandez, PhD

"Nanotechnology Training Opportunities for Students" *by Yolanda Small, PhD*

Seminar Room #2   **2C05**
Moderator: *Kathariya Mokrue, PhD*

"Unveiling the Relationship Between Autistic Traits and Negative Self-perception: The Role of Camouflaging Strategies" *by Elisheva Conway, Ayala Feder, Reyana Persaud, Amanda Seepersaud & Faiza Mughal*

"Embracing Possibility or Embracing Illusion? Openness and False Memory"
by Ayala Feder

"Transdiagnostic Dimensions to Validate a Profile Approach to Classify Premenstrual Dysphoric Disorder" *by Betty Yuabov, Amisha Tewari, Simona Iskander & Kayla Castellanos*

Seminar Room #3   **2C06**
Moderator: *Thitima Srivatanakul, PhD*

"RSA Encryption Vulnerabilities: Shor's Algorithm and Quantum Computing Implications" *by Andrzej Klocek*

"Beyond Classical Methods: Quantum Vector Embeddings for Data Transformation" *by Jonathan Shields*

Music Performance   **Atrium**
Moderator: *Tom Zlabinger, PhD*

Choosing Together: The York College Band's Shift to Student-Chosen Repertoire
by Jonathan Archer, Steven Baez, Che Bedward, Brandon Diaz, Kylian Elliott, Joe Ferrari, Shauna McCrea, Amanda Mohamed, Max Murgan, Isaiah Sands, Ajanee Smith, Terell Springer

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STUDENT ABSTRACTS

Probing the Role of Ser-5 on the N-Terminal Region of Serum Amyloid A

Sophia Rodriguez, Jalena Baker & Julian Feliciano

Mentors: Marvin Bilog, Adam A. Profit & Ruel Z.B. Desamero

Discipline: Biochemistry

AA Amyloidosis is a systemic disorder that results from the aggregation of Serum Amyloid A (SAA) protein. Patients who experience AA Amyloidosis often see severe symptoms of organ or tissue failure which can result in a poor quality of life or death. This degenerative disease is thought to be due to a conformational change of Serum Amyloid A protein from alpha helix to beta sheets, the hallmark of from the. Changing the conformation not only changes its overall shape but interferes and/or hinders the interactions between amino acids which can affect the protein's ability to function. The fibrils formed are then deposited into the affected organ tissues leading to Amyloidosis. Finding a way to prevent the aggregation of SAA will in turn prevent the formation of beta sheets that leads to fibrils thus delaying or stopping the onset of Amyloidosis. AA Amyloidosis has been seen in patients dealing with cancer as well as deceases like, Alzheimer's, Huntington's, Parkinson's, Type II Diabetes, Rheumatoid Arthritis, and recently COVID-19.

SAA1-13 is a peptide consisting of the first 13 amino acids of Serum Amyloid A protein with the sequence of RSFFSFLGEAFDG. From previous studies revealed that this region of SAA is the least stable and most amyloidogenic and the least stable region of SAA. Recent mutational studies in our group indicated that Ser-5 in the sequence plays an important role, though mechanistically unclear, in modulating aggregation. It is therefore the goal of this work to understand at the molecular level the role of Ser-5 in the misfolding of SAA.

Our investigation will consist of mutating Ser-5 of SAA1-13 Ser-5 to homoserine, aspartic acid, and threonine. These mutated SAA peptides along with wild type were synthesized using Fmoc Solid Phase Peptide synthesis. Analytical methods like High Performance Liquid Chromatography (HPLC) and Mass Spectroscopy (MS) helped identify and confirm the purity of our peptide samples. Thioflavin T (ThT) Fluorescence Assay was used to determine the amyloidogenic propensity of our peptide samples We characterized associated conformational change using Circular Dichroism (CD) and identified the morphology of that fibrils formed using transmission electron microscopy (TEM). The data obtained were analyzed in terms of the mechanistic implications of replacing Ser-5 with other groups.

Assessing Cyber Security Vulnerabilities in the Aviation Industry and the Implications for Space Exploration

Jessie Chen, Rozalia Lakhram, Roziya Lakhram, Andrew Singh, Atiqa Tirmizi, Kevin Singh & Nazrul I Khandaker

Mentor: Andrew Singh

Discipline: Earth Science Education

NASA's MUREP Aerospace Academy (MAA) at York College of C.U.N.Y trains students who are underrepresented and financially disadvantaged to several STEM courses like cybersecurity, robotics, programming languages, etc. According to the Cybersecurity & Infrastructure Security Agency (CISA), "47% of American adults have had their personal information exposed by cyber criminals." Cybersecurity continues to pose problems for security to everyone; it perseveres even in the aviation industry. Aircraft can be prone to vulnerabilities. If planes and spacecraft both use autopilot and even similar technology like computing systems and antennas, then they logically have similar vulnerabilities. A Boeing 737 test proved that this aircraft could be "remotely hacked." The group doing the test "accessed the aircraft's systems through radio frequency (RF) communications." NASA's spacecraft, Orion, has eight power and data units (PDU) which "connect the flight computers and the software to the rest of Orion." If any of Orion's systems get hacked, the citizens' reactions might be similar to when the Pentagon got hacked. The Pentagon represents the Department of Defense, serving as the headquarters of the United States. In 1999, a 15-year-old hacked into NASA computers and this incident alarmed many people, causing them to worry about their safety. Improving cybersecurity nationally requires both civilians and professionals to be educated in the cybersecurity field. NASA, CISA, DHS (U.S. Department of Homeland Security), NFS (National Science Foundation) and others could reap long term benefits by investing in teaching young teens by offering more official cybersecurity certifications and internships. Once someone is exposed to cybersecurity, they may pursue it as a job in the future, and gain novel perspectives for problem solving. Any STEM education should address cybersecurity. One has to be trained from earlier on, particularly focusing on first generation Americans.

The Adverse Respiratory Effects of the Increased PM 2.5 Concentrations in New York City During the Canadian Wildfire Incidents in June of 2023

Afnan Joarder

Mentor: Andrew Singh

Discipline: Environmental Health Science

In June 2023, Canadian wildfires affected the east coast of the USA through the spread of smoke and other pollutants. In NYC, the recorded daily average amount of fine inhalable particles with diameters that are 2.5 micrometers and smaller (PM 2.5) was 203.5 $\mu g/m^3$ on Wednesday June 7. The New York Times cited a peak value of 460 based on revised provisional data from the Department of Environmental Conservation (DEC). The Environmental Protection Agency (EPA)'s 24-hour standard for safe levels of PM 2.5 is 35 $\mu g/m^3$.

In a 2019 study, a statistical function model called the concentration response function (CRF) was used to estimate the relative risk from air pollution for a health outcome such as premature death, heart attack, asthma attack, emergency room visit, hospital admission. Findings indicated daily all-cause mortality (as observed in a joint analysis of data from 652 cities worldwide) resulted in a 0% change in mortality at 75 $\mu g/m^3$, -1% at 50 $\mu g/m^3$, and -2% at 25 $\mu g/m^3$. As a result, the World Health Organization (WHO) set new incremental targets in 2021, from 75, 50, 37.5, and 25 $\mu g/m^3$.

The Public Health Agency of Canada released a document on June 23, 2023, stating that there is no safe level of exposure for some pollutants associated with wildfire smoke, and that the primary component impacting public health is PM 2.5.

Short-term exposure to wildfire smoke or wildfire-PM 2.5 has been strongly associated with all-cause mortality, acute bronchitis, exacerbation of chronic respiratory conditions such as asthma and chronic obstructive pulmonary disease, as well as increases in respiratory emergency room visits and hospitalizations. Increasing evidence suggests an association between wildfire smoke exposure and respiratory infections.

New York City Department of Health data for respiratory overall emergency department visit count remained relatively constant between June 6-8 when the concentrations of PM 2.5 (due to the wildfires) had reached their peak. However, there was a 35% increase in visits related specifically to Asthma in that timeframe, increasing from a 90-day average of 194 visits to 261 visits. This study will continue to collect health data from reputable sources as more information is released to the public in the coming months. Representative statistical analysis involving new data will be presented.

Investigating the Relationship Between Sulfur Dioxide Concentration Levels and Hospital Admission Rates for Asthma in New York State

Noora Nizar, Atiqa Tirmizi, Andrew Singh, Afnan Joarder & Daniela Brillon

Mentor: Andrew Singh

Discipline: Environmental Health Science

In recent decades numerous advances in technological innovations and industrialization dominated many megacities around the world. This is especially true in New York City, where the demand for rapid urbanization due to increased population is becoming a major impetus in current and future urban planning. With rapid urbanization comes both financial benefits and environmental hazards. Air pollution may be causing health related issues such as asthma. Common air pollutants include Carbon Monoxide (CO), Lead (Pb), Nitrogen Dioxide (NO_2), Ozone (O_3), PM10, PM2.5, and Sulfur Dioxide (SO_2). This research focuses on the SO_2 concentration levels in New York and its relationship to respiratory illness. Data from 2009 to 2020 was analyzed. Air pollutant concentration data for New York State (SO_2, NO_2, Ozone) was collected from the Environmental Protection Agency's (EPA) Air Quality Download database. Asthma-related Emergency Department (ED) visit rate per 10,000 people was collected from the New York State Department of Health. Correlation coefficients and r-squared values were calculated to investigate the relationship between the variables. The Center for Disease Control confirms that SO_2 is known to cause irritation to the eyes, nose, and throat. Consequently, it is very common for respiratory issues to occur, including bronchitis and asthma attacks, and are commonly associated together. It was hypothesized that an increase in SO_2 levels will have a directly proportional relationship with the amount of hospital visit rates relating to asthmatic issues. SO_2 concentrations showed an overall decrease in AQL over time. Ozone and NO_2 both depicted no clear trend for their AQL. Relative to ED visits in NYC: SO_2 and NO_2 showed a correlation coefficient of 0.47, with 0.26 for ozone. The hypothesis was not fully supported. Correlation coefficients between the ED asthmatic visit rates and the air pollutants in NYS are concluded to have some significance at a lower level. High SO_2 levels in the air may have contributed to respiratory issues. Future research will explore different time parameters such pollutant concentrations prior to 2008, and concentration variation based on time of day. Additional pollutants like PM 2.5 and CO can be analyzed, as well as a larger database of medical records beyond ED visits in order to establish statistically valid conclusions.

Cyberattacks may Increase the Risk to the Resilience of Critical Mineral Infrastructure

Kevin Singh, Somdat Kissoon, Adriana Sanchez, Jessie Chen, Mariana Londono, Arli Hasa & Raffi Uddin

Mentor: Andrew Singh

Discipline: Earth Science Education & Geology

The Energy Act of 2020 defines a "critical mineral" as a non-fuel mineral or mineral material essential to the economic or national security of the U.S. and which has a supply chain vulnerable to disruption. Critical minerals are also characterized as serving an essential function in the manufacturing of a product, the absence of which would have significant consequences for the economy or national security. Current research deals with cybersecurity concerns related to the resilience of critical mineral infrastructure. As with the increased use of ICS (Industrial Control Systems) in other industries, the use of automation and greater connectivity in the mining industry and metal manufacturing increases the risk to the resilience of critical mineral infrastructure by increasing the attack surface available. Several motives for cyberattacks will be highlighted. Given the importance of critical minerals in the supply chain of many products, cyberattacks can be motivated by an intent to harm public or private interests further down the supply chain. Information stolen from mining records can be monetized by attackers. Espionage for competitive advantage through attaining industry secrets may occur. Finally, APTs (Advanced Persistent Threats) may be of increased significance to these industries given geopolitical concerns over the control of critical mineral markets. Of particular interest is the possibility that short-term damage may be used to diminish the perception of investor trust while presenting foreign companies as more trustworthy stewards of the global market. It must be remembered that failure to manage cyber risk strategically can affect more than the actual intrusion, as investigations have to be done which may require temporary shutdowns of other equipment. Given current policy goals of greater independence and supply chain resilience for critical minerals, along with ethical and environmental targets, a consistent presence of cybersecurity standards in these industries may be one useful means of reducing risk.

Toxicity Study for the Preclinical Development of High Density Aromatic Peptide

Sara Arain & Malik Kamassi

Mentor: Alexander Birk

Discipline: Biology

In preclinical drug development, it is important to determine the therapeutic window of new compounds. The therapeutic window (TW) refers to the dose range between the medial effective therapeutic concentration (EC50) and the medial lethal dose (LD50), which is calculated as the ratio of LD50 over EC50. Currently, our lab has been testing High Density Aromatic Peptide, specifically HDAP2, which is shown to preserve mitochondrial membrane potential, support cultured cell survival, and promote survival of ganglion cells in optic nerve crush model in mice. All up to date animal studies were conducted with a low concentration of HDAP2 of 3 mg/kg via systemic intraperitoneal injection, which shows no adverse effects while providing protection to the retinal ganglion cells. However, LD50 values are required to assess the therapeutic window for preclinical studies and future clinical studies of HDAP2. To determine LD50, we conducted a toxicity study in adult C57BL/6 mice via daily intraperitoneal injections of HDAP2 at dosages ranging from 3 mg/kg to 300 mg/kg. The mice were observed daily post-injection for adverse side effects such as sedation, seizure, and death for up to 14 days. Based on our survival curve and toxicity score, LD50 for HDAP2 was found to be 52 mg/kg and 59 mg/kg, respectively. In addition, sedation is the primary observed adverse effect post systemic administration of doses between 30 mg/kg to 300 mg/kg. 30 mg/kg to 50 mg/kg HDAP2 demonstrates tachyphylaxis for the adverse effect of sedation in mice. At higher doses of 100mg/kg to 300 mg/kg, systemic administration of HDAP2 results in a rapid onset of sedation followed by seizure and death. In conclusion, TW of HDAP2 is about 55, suggesting that HDAP2 is safe to use at the concentration of 3 mg/kg. HDAP2-mediated sedation at the highest concentration indicates that the peptide works through inhibitory neurotransmitters such as serotonin or GABA. Interplay between sedation and seizure suggests rapid downregulation of inhibitory neurotransmitter pathways at lethal dose of the peptide and onset of excitatory stimulation, suggesting a GABAergic mechanism for HDAP2. Our future studies will focus on the understanding of the role of mitochondria in regulation of GABAergic pathways for therapeutic applications of HDAP analogues.

Association between Social Media Use, Muscle Dysmorphic Disorder and Psychological Health in Urban College Students

Andy Velasco-Arriola

Mentor: Galila Werber-Zion

Discipline: Health and Human Performance

The online fitness industry has expanded significantly in recent years. Since 2014, TikTok, Instagram and Snapchat have also grown tremendously, resulting in young adults spending hours scrolling on their smartphones looking at perceived ideal-body images. Muscle dysmorphia is a form of body disorder indicated by a pathological desire for increased muscle mass. Among American college students, the most prevalent diagnosed mental health problems are anxiety disorder and/or depression. PURPOSE: This pilot study evaluated the relationship between social media use, psychological health, and muscle dysmorphic disorder in ethnically diverse students attending an urban commuter college. METHODS: Forty-three students (mean age = 21.9 ± 3.61 years) attending York College's fitness center in Jamaica, Queens, participated in the study and answered questionnaires about social media use and exercise habits. Muscle dysmorphic disorder was assessed by using the muscle dysmorphic disorder inventory (MDDI). Mental health was assessed using self-report measures of anxiety, perceived stress, depression, positive affect, and self-efficacy from the NIH Toolbox. The bivariate Pearson Correlation analysis was conducted to correlate social media use and psychological health scores with muscle dysmorphic disorder. RESULTS: No correlation was found between social media use and MDDI scores ($p < 0.56$). A significant positive correlation ($p < .05$) was observed between exercise frequency, exercise duration, and MDDI scores. In addition, there were significant positive correlations between MDDI scores and levels of depression ($r = 0.38$; $p < 0.01$), anxiety ($r = 0.55$; $p < 0.001$), and perceived stress ($r = 0.50$; $p < 0.007$). Positive affect and self-efficacy demonstrated significant negative correlation with MDDS scores ($r = -0.42$, $p < 0.006$ and $r = -0.46$, $p < 0.002$, respectively.) CONCLUSION: These findings indicate that increased severity of muscle dysmorphic symptoms is associated with higher levels of depression, anxiety, and perceived stress. Moreover, these findings suggest that both positive affect and self-efficacy are inversely associated with symptoms of muscle dysmorphic disorder.

Investigating the Effect of a Peptides Derived from Sars-COV-2 on the Aggregation of Serum Amyloid A

Iliana Vigil

Mentors: Marvin Bilog, Adam A. Profit & Ruel Z.B. Desamero

Discipline: Biochemistry

The aggregation of serum amyloid A (SAA) leads to a long-term complication of inflammatory disorders such as rheumatoid arthritis, Crohn's disease, etc. The misfolding or aggregation of SAA is a hallmark of systemic AA amyloidosis. Preventing the aggregation of SAA should help prevent the health problems associated with amyloidosis. Recently, the overexpression of SAA has been found to be a marker for COVID-19 severity. A computational study found that a nine-residue segment in SARS-CoV-2 envelope protein (SK9) promotes the aggregation of SAA. Introducing species that can hijack the interaction could potentially suppress SAA aggregation aggravated by SARS-CoV-2.

Interestingly, according to another computational work, human islet amyloid polypeptide (hIAPP) binds SK9 with no increase in amyloidogenicity. SK9 in fact stabilizes the helicity around residues 20-29, the aggregation prone region of hIAPP. Besides SK9, it was also reported that a ten-residue segment of SARS-CoV-2 spike protein (FI10) also stabilizes the helicity of the same hIAPP region.

We hypothesize that the SARS-CoV-2 derived peptides could potentially promote the amyloidogenic propensities of SAA and that the presence of hIAPP suppresses these effects. To test our hypotheses, we synthesized using solid-state techniques and characterized spectroscopically the peptides SK9, FI10, and the amyloidogenic fragments of both SAA and hIAPP. We probed the interaction formed between the different peptides by measuring changes in the amyloidogenic propensities and analyzed the results in terms of the influence in the misfolding mechanism of SAA. We used molecular modeling techniques to correlate spectroscopic data to changes in the conformation of the peptides studied.

Relationship Between Synapses and Mitochondrial Density in the Auditory Cortex of Macaque Monkeys(A1)

Subrina Purnima

Mentor: Virginia Garcia-Marin

Discipline: Biology

In the primary auditory cortex(A1) of macaque monkeys, sensory processing relies heavily on thalamocortical (TC) inputs, particularly from the ventral division of the Medial Geniculate thalamic nucleus (MGv). Mitochondria are essential for cellular metabolism and neuronal function, especially in regions like A1 where sensory information is processed. We examined the distribution of mitochondria across different synaptic terminals (asymmetric excitatory, symmetric inhibitory, and TC asymmetric synapses) to uncover potential correlations between synaptic input and mitochondrial abundance. Balancing excitation and inhibition are crucial for processing auditory information effectively. VGlut2 is found in TC terminals and plays a role in releasing glutamate onto target neurons. We hypothesized that neurons receiving ASY, TC input would exhibit a higher density of mitochondria compared to those receiving SYM and ASY input. Using VGlut2 antibodies, and transmission electron microscopy, we labeled terminals from the MGv to quantify the density of mitochondria in different terminals of A1. Our findings revealed that VGlut2 terminals are 3.5-2.3 times larger than ASY and SYM, respectively. SYM and VGlut2 terminals exhibited the highest mitochondrial area. Interestingly the percentage of area occupied by the mitochondria was approximately 20% for all three of them. These results suggest that larger boutons have higher mitochondria density to compensate for the higher metabolic activity.

RSA Encryption Vulnerabilities: Shor's Algorithm and Quantum Computing Implications

Andrzej W. Klocek (Seminar Presentation)

Mentor: Thitima Srivatanakul

Discipline: Computer Science

The RSA (Rivest–Shamir–Adleman cryptosystem) is a widely employed encryption method for securing data transmission, relying on the computational complexity of factoring large composite numbers derived from the multiplication of two large prime numbers. While this system facilitates the generation of public encryption keys and private decryption keys, it faces potential vulnerabilities from algorithms like Shor's algorithm, which can efficiently factorize integers using principles of quantum computing. This project seeks to deepen understanding of RSA encryption and its susceptibility to Shor's algorithm when applied to classical and quantum computing platforms. Specifically, the project aims to investigate Shor's algorithm, assess its potential implementations on classical and quantum computers, and evaluate their respective effectiveness. By accomplishing these objectives, the project aims to provide foundational insights into the potential ramifications of quantum computing for cryptographic security.

Investing the Impacts of War on Carbon Dioxide Levels and the Environment

Avishai Ramnauth

Mentor: Andrew Singh

Discipline: Environmental Science

For centuries wars have been like a plague on our planet, with endless deaths and destruction. Today we will look at the impact that war and the military have on our planet. We will look at carbon dioxide (CO_2) levels in the atmosphere, and deaths across various. CO_2 levels raised during the houthi insurgency war in Yemen that took place between 2004 to 2014 (Macrotrends, 2018). An average of 700,000 people died in this war. Wars may directly or indirectly cause damage to the environment and humans, not just through loss of life, but also by contributing to (CO_2) emissions. During this discussion we will answer; how does the military influence CO_2 levels? What are the impacts of war on the environment? According to Figure 5, in Vietnam War 5 billion acres of land were destroyed which killed 50% of the mangrove population in that area, and killed 2 million people. The bombing of Nagasaki and Hiroshima killed in total 105,000 innocent people. Temperatures in Hiroshima got up to 7200*F. All infrastructure, Flora and Fauna were destroyed instantly due to the high temperatures. By way of conclusion: wars do directly and indirectly cause damage to the environment, loss of human lives, and contribute to CO_2 levels one way or another. Military activity does appear to contribute to CO_2 levels, especially during war. The impacts of war on the environment as seen by the examples given would be a spike in CO_2 levels, Deforestation, loss of human lives, pollution and higher temperatures.

Investigating Childhood Trauma and Resilience in York Undergraduates

Cecilia Mendes

Mentor: Olga Berwid

Discipline: Psychology

Introduction and Significance: Understanding trauma prevalence and protective factors among college students is crucial. Research suggests a high prevalence of trauma among psychiatric patients, with 90% reporting lifetime exposure. Additionally, 70% of adults in the U.S. have experienced traumatic events. Given the already high stress levels among college students, identifying protective factors becomes paramount. This study is significant as it delves into factors that may alleviate chronic trauma symptoms, potentially enhancing resilience and academic performance. The aims of this proposed study are to: (1) explore the prevalence of childhood adversity/trauma within the undergraduate population at York College, CUNY, and (2) examine the degree to which current spiritual connection, compassion, and gratitude moderate the relationship between retrospectively assessed childhood adversity and current post-traumatic stress symptoms. Proposed Methodology: An anonymous questionnaire-based approach will be employed to ensure participant confidentiality and safety. Students will be recruited from the York Undergraduate Research Pool. Participants will complete a variety of valid and reliable standardized questionnaires assessing childhood stress/trauma, spiritual connection and meaning, self-compassion, compassion for others, gratitude, and ratings of positive and negative affect and symptoms of post-traumatic stress. Statistical analyses will examine the moderating roles of spiritual connection and meaning, self-compassion, compassion for others, and gratitude in the relationship between retrospectively assessed childhood adversity and composite indices of post-traumatic stress symptoms using mixed factorial analyses of variance.

Response Coherence in Cued Fear Learning

Tasheka Lassiter, Maria Fuentes & Kristina Marshall

Mentor: David Johnson

Discipline: Psychology

Exploring response coherence among different systems involved in fear acquisition and regulation. A number of different indices are used to assess the acquisition of conditioned fear in humans, including physiological, neurobiological, behavioral and self-report measures, with evidence suggesting different measures track different facets. US expectancy is a self-report measure in which participants report the probability of experiencing an aversive event (the US) when a cue is presented. Skin conductance response (SCR) is a marker of physiological arousal. The nature of the relationship between these two measures remains somewhat unclear. There are ongoing theoretical debates in the field about whether difference measures of threat emerge from a single, unitary source, or if subjective experiences are, to some extent, independent of physiological responses. While resolving this discrepancy requires examining the relationship between measures, very few studies have done so. Here, we set out to test the relationship between explicit and implicit measures of fear learning while varying two factors that could potentially mediate the strength of this relationship: learning experience (low vs high) and time of reporting (immediate vs delayed). Preliminary analysis of our data (n = 59) showed a small correlation between implicit and explicit measures, with the strength of the correlation being higher for immediate vs delayed self-report, but not impacted by learning experience. Contrary to our expectations, participants expectancy estimates got "worse" with more learning experience, but were no less accurate when reported immediately vs after a delay. Research such as this will be necessary to develop a more holistic understanding of the processes underlying fear-related psychopathology.

Fish Authentication by MALDI Mass Spectrometry

Ranjit Singh

Mentors: Muhammad Ali & Emmanuel Chang

Discipline: Chemistry

Authentication of fish involves using a MALDI machine for mass spectrometry to analyze the chemical composition of fish samples. This method helps identify and verify the species of fish by measuring the mass-charge ratio (m/z) of ions produced from the fish's biological makeup. By comparing the obtained mass spectra with known reference data, we can confirm if a fish is authentically and accurately labeled or also conclude for certain if it isn't the case. In summary, this helps to prevent fraud and ensuring proper labeling of fish products in the food industry for consumers all around the world.

Beyond Classical Methods: Quantum Vector Embeddings for Data Transformation

Jonathan F Shields (Seminar presentation)

Mentor: Radoslaw Wojciechowski

Discipline: Computer Science

An important component for neural networks to understand prompts, the contextual input has to be represented numerically.

These numerical representations consist of a collection of values that can be plotted in an n-dimensional space. This point can be represented as vectors, which allows for the use of efficient analysis of the input. Typically, these vectors would represent points in infinite n-dimensional space, but with the use of quantum algorithms these points can instead refer to a specific state in Hibert Space. With the use of quantum mechanics such as superposition and entanglement, quantum algorithms enable the manipulation and representation of data in high-dimensional quantum space. This can have profound impacts on data representation and processing which can lead to significant advancements in database optimization.

In this presentation we will provide the thought process and procedure on how quantum embeddings can be created using currently available Python libraries.

Revolutionizing Plant Gene Editing: A Compact Vector Design for Efficient CRISPR/Cas9 Genome Editing in Plants

Anthony Abreu & Gavin Greenidge

Mentor: Louis Bradbury

Discipline: Biotechnology

In recent years, the transformation of plants via Agrobacterium-mediated methods has seen significant advancements. Among these, the application of CRISPR/Cas9 for targeted gene editing has been a pivotal development in plant science. Furthermore, the employment of developmental regulator genes to induce meristem formation, bypassing the need for labor-intensive tissue culture, has expedited plant genetic modification processes from six months to as little as one or two months. The use of chickpea dwarf virus replicons for initiating rolling circle replication facilitates the extra-chromosomal replication of the T-DNA carrying the CRISPR/Cas9 cassette. This method enables gene editing without the permanent, random integration of T-DNA into the plant genome and obviates the need for selectable markers, such as antibiotic or herbicide resistance genes. Plasmids integrating these elements—CRISPR/Cas9, viral replicons, and developmental regulator genes—are now available to the plant science community. However, given their proximity to the size limit for plasmids (~20kb), there is insufficient space to include additional elements, such as templates for homologous recombination-mediated repair (typically >3kb). Consequently, these plasmids are suitable for generating gene knockouts but not for gene substitution or overexpression. Moreover, the lack of straightforward cloning mechanisms for new guide RNA sequences complicates their use. This project aims to optimize one of these plasmids by relocating three genes essential for plasmid replication to a secondary plasmid, thus saving an estimated 3.5 kb. This reduction will make room for the insertion of DNA sequences necessary for homology-directed repair at the target site. Additionally, we plan to incorporate recognition sequences for two different type-IIS restriction enzymes, facilitating the golden-gate cloning of new guide RNA and homologous sequences for Cas9-targeted homologous recombination.

Patient Experiences in In-Patient Mental Health Settings

Christy Richard

Mentor: Kathariya Mokrue

Discipline: Psychology

Healthcare interpreters serve an important role in improving communication between patients with limited English proficiency and their providers. Yet, there is very little research on interpreters' experience navigating situations where there may be more nuances, such as in mental health encounters. This study examines the experiences of interpreters in the NYC area, including their training, perceived stress, challenges, and rewards that accompany working in mental health encounters. A survey will be sent to community centers and clinics and posted on social media sites. We are also interested in potential differences in experience among interpreters of commonly used languages and less commonly used languages. Findings shed light on an understudied area and may potentially lead to ideas for improving interpreter-health care provider communication.

Metformin: An Old Drug is Still the First-Choice for Treating Type 2 Diabetes

Angeliisa Arjune

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Science

Diabetes is a disease that develops when the blood glucose level remains too high. Human body can generate glucose, but it comes mainly from carbohydrates in foods and drinks consumed. Glucose is the body's main source of energy. Insulin, a hormone made in the pancreas, helps glucose obtained from food to enter into cells to be used for energy. When glucose accumulates in blood, it causes health issues, such as diabetes, of which the most common is type 2 diabetes. In type 2 diabetes the body does not make enough insulin and/or the body's cells do not respond normally to the insulin. This causes glucose to remain in the blood without entering the cells and the cells in the body are unable to utilize insulin properly. Insulin may be produced in the pancreas but not in enough quantity to keep the blood glucose level in the normal range. One medication approved by the US Food and Drug Administration for type 2 diabetes is Metformin, a biguanide antihyperglycemic, which when used in conjunction with diet and exercise is prescribed for glycemic control in type 2 diabetes. Metformin is a very old generic drug with brands like Glucophage. This class project will review available information on pharmacodynamics, pharmacokinetics, mechanism of action, dosage forms and administration of Metformin. The comparison of Metformin with other type 2 diabetes drugs, such as Amaryl, Bydureon and Januvia will also be provided.

Comparing the Agriculture and Commercial Sectors in New York With Regard to Greenhouse Gas Emissions and Climate Change Impact

Meherunnesa Momo

Mentor: Andrew Singh

Discipline: Environmental Science

Emissions from burning fossil fuel and livestock raising activity significantly contribute to climate change in New York City. In the past few decades, greenhouse gases from the Agricultural and Commercial sectors in New York have increased significantly. Examples of greenhouse gases include methane (which can be produced by livestock), carbon dioxide, nitrous oxide, carbon monoxide, and more. Data from the Environmental Protection Agency (EPA) was used to analyze the emissions in each sector to compare and explain how livestock and fuel combustion can affect the change in climate in the state of New York. Other data from the New York City EPA was used to analyze heat vulnerability in the state. Methane produced from livestock and cattle farming represents over a quarter of the greenhouse gas emissions from the Agriculture sector. Increase in Carbon Dioxide in the Commercial Sector comes from electricity and vehicles that are produced. The data illustrates the severe changes in temperature over the recent years in New York. The hypothesis was proved to be true according to the analysis of the two maps and graphs. It is possible to reduce greenhouse gas emissions in New York by shifting from the use of fossil fuels to renewable energy sources.

Application and Benefits of X-Rays in Aviation Maintenance and Safety

Arli Hasa & Soomdat Kissoon

Mentor: Andrew Singh

Discipline: Earth Science Education

Although radiology is mainly used in medicine, x-raying may be beneficial in the field of aviation. Wings and other parts of the airplane experience stress and can potentially be damaged. While aircraft manufacturers have established recommended ranges of motion, it is still possible to have problems within the aircraft components. It is expensive and dangerous to dismantle the airplane, which is why x-rays can be a useful tool in assessing the condition of the aircraft. Aircraft crashes from improper maintenance and design failures cause tragedies that may be avoided with proper testing and maintenance by utilizing x-rays. Aircrafts are made of thousands of parts which require engineers to develop and analyze complex solutions to create a vehicle that flies. During flight, any maneuver that causes acceleration or declaration increases the forces and stresses the wings and fuselage. Tension, compression, shear, bending, and torsion are issues that airframes must endure during flight. Aircraft need maintenance hours for the aircraft to be allowed to fly. Faults in the structural integrity of the aircraft can be fatal. X-raying aircraft is the future for aircraft engineers to examine aircraft hardware without damaging the airplane as X-ray allows for direct viewing of the components of the aircraft. Direct viewing of the components of the aircraft will allow for less maintenance time and for most of the issues of the aircraft to be addressed and fixed.

Neuronal Quantification in Primary Auditory Cortex (A1) of Macaque Monkey

Kerryann Van Velzen

Mentor: Virginia Garcia-Marin

Discipline: Biology

Quantitative studies of brain anatomy are crucial for understanding the relationship between its function and structure. Large-scale confocal imaging combined with automated segmentation methods has proven to be effective in accurately quantifying neuronal density across different regions. Our study focused on macaque auditory cortex (A1), which receives direct input from the thalamus. Our aim is to determine neuronal density in the A1 region from layer 1 to white matter, using confocal imaging and automated neuronal quantification analysis. Neurons are labeled with the pan-neuronal marker NeuN and Parvalbumin (PV) to identify a subpopulation of inhibitory neurons. Later sections were counterstained with DAPI. Our current dataset, obtained from two columns of two monkeys' A1 region, resulted in an average total neuronal density of 115,680 neurons/mm3, with a parvalbumin (PV) density of 6,941 neurons/mm3. Notably, PV neurons constitute 6% of the overall neuronal population. Compared with previous data in macaque V1, the density in A1 is approximately half. This difference in the total neuronal density could potentially contribute to differences in information processing capacities between these two areas. Despite variations in total neuronal densities, both regions exhibited a comparable percentage of PV cells, indicating that the excitation/inhibition ratio is preserved across different primary sensory areas.

Sudoku C++ Project

Luis Santana

Mentor: Thitima Srivatanakul

Discipline: Computer Science

This project presents the development of a Sudoku game in C++. The game is designed with an interface that guides users through the puzzle with a hints system. Through iterative testing and debugging, the codebase has been refined for precise functionality. This project showcases the application of algorithmic thinking and C++ programming skills to create a functional and user-friendly Sudoku game.

Molecular Authentication of Fish Species Using Mass Spectrometry and Sequence Analysis of Parvalbumin

Brindia Joseph

Mentor: Emmanuel Chang

Discipline: Chemistry

The authentication of fish species is vital for ensuring food safety, quality, and regulatory compliance. In this study, we utilized mass spectrometry coupled with Matrix-Assisted Laser Desorption/Ionization Time-of-Flight (MALDI-TOF) technology to analyze parvalbumin, a prominent protein in fish, for the molecular authentication of Tilapia species (Oreochromis niloticus, Oreochromis mossambicus, Oreochromis aureus). Sequences obtained from the UniProt database were employed for multiple sequence alignment (MSA) of the three tilapia species, followed by a BLAST analysis to assess similarities with other fish species. The results uncovered subtle sequence differences among the three species, suggesting challenges in their differentiation. Comparative analysis with sequences facilitated the identification of species-specific regions. This approach highlights the potential of molecular techniques for fish authentication and underscores the practicality of parvalbumin as a target protein. By integrating mass spectrometry with sequence analysis, our study proposes a promising method for accurately identifying fish species.

The Effect of Large Language Models on the Integrity of Information

Darryl Nurse

Mentor: Abu Kamruzzaman

Discipline: Computer Science

The Research focus is to analyze the accuracy of Large Language Model (LLM), and the ability to maintain data accuracy and integrity, the project focuses on the ability of Langchain powered LLM models to retrieve and precisely generate consistent information. The study is to provide limited and controlled textual data to the Model and assess the success rate through the factual data returned to the user. Ultimately, this study aims to produce quantifiable insights into the dependability, constraints, and range of information sources of existing LLMs.

Song Learning in Zebra Finches

Adesewa Oyewo & *Melissa Benavides*

Mentor: Dina Lipkind

Discipline: Biology

The project is primarily focused on studying how juvenile male zebra finches learn to match the sounds they produce to a memory of an adult males song. The specific topic of our research is animal behavior. Animal behavior includes all the ways animals interact with other organisms and the physical environment. Behavior can also be defined as a change in the activity of an organism in response to a stimulus, an external or internal cue or combo of cues. Zebra finches have long captivated researchers as an exemplary model for studying social behavior and vocal communication in avian species. This research spans between behavioral ecology, neurology, to elucidate the intricate social dynamics and communication patterns exhibited by zebra finches. The social structure in zebra finch societies is characterized by monogamous pairs and bonding. Cooperative breeding offers unique insights into make selection, parental care, and territoriality. Studies have revealed the role of hormonal regulation, genetic predispositions, environmental cues and shaping social behaviors. Additionally, investigations and zebra finch vocalizations have uncovered, a rich collection of calls and songs, providing a fertile ground for understanding the mechanisms, underlying vocal learning, cultural transmission, and communication strategies. The general problem that is addressed in the research is whether the zebra finches are capable of learning a song within the first thirty-five days of the experiment. Most importantly, if the birds are capable, the real task is to see how well the zebra finches can transition to learn a second song. Previous research has enabled us to know that only male zebra finches are able to learn songs and sing in which they use to court females. The expected outcome of this project is to gain a deeper understanding on the experimental techniques and analysis methods for studying song learning in zebra finches. The second latter of this research switches gears. The primary objective of the second latter of the research is to emphasize analytics. During the first half of the research, majority of the data collection took place during the experiments. However, the current focus will be on analyzing the collected data with the hope of generating compelling results. We began by directing efforts towards comprehending the interpretation of data by using a software Sound Analytics Pro (SAP), which assigns numerical values to each millisecond of sound. The software identifies instances where sounds coincide and recognize the sequences as specific label such as syllables apart from typical, sounds, like subjects, eating or jumping. Additionally, fundamental care routines for the subjects, including cleaning, feeding, maintaining temperatures and establishing optimal conditions were covered. All in all, the importance of this experiment is to help us to understand how listening to speech when young shapes the way we hear and speak for the rest of our lives as animals. Surfacing trends and future directions in zebra finch research, including the integration of multidisciplinary approaches, such as behavioral genomics and computational modeling, unravel the underlining, genetic and neural mechanisms, governing social behavior and vocal communication. Understanding the complexity of zebra finch behavior enhances our knowledge of avian biology, as well as provide insight into fundamental principles of social cognition and communication across a variety of animal species.

Is Anxiety on the Rise in College Students? A Longitudinal Examination of Trait Anxiety Over Time

Taylor Averymalik, *Christy Richard* & *Samantha Cruz*

Mentor: David Johnson

Discipline: Psychology

Prevalence of anxiety disorder has been increasing over the past decade, particularly in young adults. There are several possible explanations. One is that a decrease in the stigma associated with anxiety disorders has motivated increased numbers of individuals to seek treatment. This would suggest there hasn't been a change in anxiety per se, just willingness to report it. Another possibility is that diagnostic criteria has been lowered and/or changed in some way; that is, clinicians may have decreased the threshold or altered the criteria necessary for a clinical diagnosis. Again, this would be consistent with no change in anxiety levels over time. Alternatively, it might be that anxiety symptoms (particularly among young adults) are in fact on the rise across both clinical and non-clinical populations alike. To test whether this is the case, this study is examining trait anxiety scores in four non-clinical studies involving young adults (as indexed by scores on the STAI-T, a common measure of trait anxiety) occurring approximately five years apart over the past 20 years. Analysis is currently underway. If the data shows no increase in trait anxiety scores, then the increased prevalence of anxiety-related disorder in recent years might be better accounted for by explanations such as stigma reduction or changes in diagnostic criteria. An increase in trait anxiety over time would be more consistent with an actual rise in anxiety. Whatever the present data show, any inferences we are able to make here is based on a small subset of the relevant existing research. A more robust test will require a comprehensive assessment of the literature (e.g., a systematic meta-analysis).

Exploring the Impact of Stimulus-level Uncertainty and Individual Differences in Intolerance of Uncertainty on Fear Acquisition Processes

Noelle Batista, Alicia Oquendo & Evelyn Arpi

Mentor: David Johnson

Discipline: Psychology

Learning to predict the arrival of threat, and to discriminate between cues signifying safety vs threat, is crucial to survival. Central to the construct of threat is uncertainty, which can be manipulated by adjusting threat reinforcement rate (the frequency at which a cue is paired with an aversive event). Individuals also vary in their tolerance for uncertainty, with these differences shown to influence threat acquisition processes. This study tested the effects of stimulus-level uncertainty, and individual differences in tolerance of uncertainty, on threat- safety discrimination. Using a within-participant design, participants (n = 42) completed a task in which three different colors were paired with an electrical shock at three different reinforcement rates: 100%, 50%, or 0%. Our primary outcome measures were self-reported threat expectancy and evaluative ratings, and skin conductance response (SCR). We found evidence that reinforcement rate modulates the speed but not the magnitude of threat-safety discrimination learning. Furthermore, individuals with higher intolerance of uncertainty (IU) scores demonstrated poorer discrimination, as measured using SCR, but not by self-report. Finally, higher total IU was associated with more negative evaluative ratings of the uncertain threat cue. These results contribute to a growing body of research exploring how uncertainty at the level of the stimulus and individual sensitivity to uncertainty affect threat learning, and provide further evidence for IU as an important measure of individual differences in threat conditioning.

Associations Between Contingency Awareness and Implicit and Explicit Measures of Fear Acquisition

Aniya A. Morene, Wensheng Wu & Aniya Morene

Mentor: David Johnson

Discipline: Psychology

Learning about predictors of threat is crucial to survival. However, the adaptive value of this type of learning is diminished when an individual fails to discriminate between cues signaling threat vs safety, a process referred to as threat-safety discrimination. When this process goes awry, it can lead to maladaptive patterns of fear expression that set the stage for the emergence of psychopathology. Contemporary fear research uses many different outcome measures to measure learning. Explicit measures include questions that assess contingency awareness, referring to the conscious discrimination of cues signaling threat vs safety. Whether discrimination learning occurs for any given individual can also be assessed via differential patterns of physiological activity to threat cues (e.g., the skin conductance response). In any given sample of research participants, a moderate proportion will fail to demonstrate contingency awareness for either or both measures, but why this occurs has yet to be resolved. Historically, researchers have excluded participants who fail to show evidence of learning in order to maintain high signal/noise ratios. However, recent research has suggested that learners and non-learners might differ systematically, suggesting exclusion of non-learners could lead to sample bias and decreased generalizability. Here, we examined the impact of including non-learners on the results and conducted some exploratory analysis on potential systematic differences between them. Our preliminary analysis confirmed that including non-learners adds significant variability to the outcome measures. However, learners did not differ from non-learners on dispositional measures (e.g., trait anxiety), as has been demonstrated in previous research.

Rapid development of A.I and its role in future Cyber Security Vulnerability Detection

David Ramales

Mentor: Abu Kamruzzaman

Discipline: Information Systems

This is a paper on the recent developments of Artificial Intelligence and how elements of it will be used to further enhance vulnerability scans and tedious cyber security work. I will dive into the many elements of the topic. This research paper highlights where A.I can be used and how it can be implemented in existing systems as well as review the success of research in this area. My research goes thoroughly through articles containing various experimental explanations and discoveries made about exploration into how all these can be implemented into cyber security. As I go into the paper, I will present my arguments as to why I believe A.I will be a much more daily factor in the dealings of threats that systems may need to handle and better advances in how to mitigate the false alerts from the real ones.

Evaluating Lead (Pb) Contents in Topsoil and Soil Fractions in Queens New York

Thalia Singh & *Paul Aishwari*

Mentor: Ratan Dhar

Discipline: Environmental Health Science

Lead in residential areas, have far been an overlooked issue, since many lack the education and information about the harmful effects of lead in soil. Exposure to Lead in soil can be detrimental and is also considered to be one most hazardous source of lead exposure to young children. Residential/private housing tends to conduct many activities from gardening to recreational activities in the comfort of their own home, especially given the recent covid-19 pandemic. Lead in topsoil can be carried into the home by children and pets as lead dust. Families spending more time at home may be at risk for lead poisoning especially children if they are exposed to soil contaminated with lead, especially if the threshold is higher than the Environmental Protection Agency (EPA) standards which is 400 ppm in play area residential soil. The testing for lead can be both qualitative and quantitative. This study explored the lead loading in the topsoil as well as to identify soils of finer textures with large surface areas which could easily adsorb or retains the Lead particles. In addition, this study also aims to increase public awareness on the importance of testing their soil for Lead (Pb) and reduce the health risk associated with Lead contaminated soil. Methods- The testing for Lead in residential soil in Queens, New York was done using three methods. The analytical method using the XRF Analyzer (Thermo Scientific Niton XL3t) is used to detect the lead contents in composite soil samples and fractional soil samples (coarse-1-2 mm; medium -0.25-<1 mm; fine <0.25 mm). Recently developed Rhodizonate colorimetric method was used to detect Pb in the soil. Results and Discussion- A total of 23(twenty-three) samples were analyzed using the XRF where about 40% samples have shown high level of lead in the soil fraction (<250 µm), and for the bulk samples (entire soil composition) where about 17% of the samples shown high lead level above EPA permissible limit of 400 ppm for play area. Wet chemistry colorimetric method consistently showed exceeding level of Pb for those samples with a purple to dark purple color change which is the detection limit (400-500 ppm) based on Rhodizonate colorimetric method. However, most of the samples with very deep purple color were found to be very high in lead by XRF (600-1500 ppm). This preliminary data suggests that Pb in soil is persistent and highly immobile and therefore accumulate throughout the years.

Probing the Role of Phenylalanine Residues on the Amyloid Formation of the N-Terminal Fragment of Serum Amyloid A

Samantha Mariano

Mentors: Marvin Bilog, Ruel Z.B. Desamero & Adam Profit

Discipline: Biochemistry

AA amyloidosis is a severe complication of chronic inflammatory disorders and is potentially fatal. The amyloid fibrils involved in AA amyloidosis are derived from serum amyloid A (SAA) which is an acute phase reactant protein. In AA amyloidosis, circulating amyloid fibrils are deposited in organs and tissues ultimately leading to their failure. While SAA has been identified as the major component of amyloid fibrils, little is known about the mechanism by which it misfolds to form aggregates. Presented herein is a study probing the role of the 4 phenylalanine residues on the amyloidogenic fragment of SAA, SAA_{1-13}. After systematically replacing Phe-3, Phe-4, Phe-6, and Phe-11 with Leu, we characterized the amyloidogenic propensities of the mutated fragments relative to the wild-type sequence. The peptide sequences were synthesized based on Fmoc-solid phase chemistry and purified using high-performance liquid chromatography. To ensure and verify the sequence, mass spectrometry was done. Results of turbidity and thioflavin fluorescence assays to reveal amyloidogenic propensity were analyzed in terms of its implication on the mechanism of misfolding. Data reveals that Phe-3 and Phe-6, and to some extent Phe-11, play a crucial role in the aggregation of SAA_{1-13}.

Transgenic Tomato Plant

Aisatou Y. Diallo

Mentor: Louis Bradbury-Boyd

Discipline: Biotechnology

This project involved making A genetic modified tomato. These transgenic tomato plants that will produce astaxanthin which will give the tomato a pink, red color. Astaxanthin is a carotenoid produced by algae and it's very beneficial when consumed. For example, it can help protect against macular degeneration. This process involves constructing a plasmid carrying crisper cas9 gene to allow gene editing in plants. This plasmid will be introduced into agrobacterium.

Examining Sex Differences in Threat Acquisition and Trait Measures of Negative Emotionality

Zaria Garrett, Heidy Miranda & Lorna Barnaby

Mentor: David Johnson

Discipline: Psychology

Compared to men, women show substantially higher prevalence of stress and anxiety disorder. Evidence from research in both humans and non-human animals suggest that sex-based differences in the learning processes engaged during trauma experiences play an important role. One such process is known as threat acquisition, in which an individual learns about cues that predict the arrival of danger. Central to the adaptive value of this process is the ability to discriminate between threat and safety-related cues, referred to as threat-safety discrimination. Diminished capacity to engage this process can lead to maladaptive fear expression and set the stage for the emergence of stress and anxiety disorder, providing one possible explanation for the higher prevalence of fear-related disorder in females. Personality is a potentially important mediator. Women show higher scores on trait anxiety (STAI-T) and intolerance of uncertainty (IU), which are dispositional measures associated with many affective and fear-related disorders. Higher scores on these trait measures are associated with diminished threat-safety discrimination. Thus, in this study, we examine sex-specific differences in (1) threat-safety discrimination, (2) scores on the STAI-T and IU-12 and (3) interactions between these two variables on threat-safety discrimination. Preliminary analysis of our data shows higher STAI and IU-12 scores for women vs men, but no difference in threat-safety discrimination and no statistically significant interaction between these factors (but analysis is still underway). This research is inspired by efforts to shed light on factors that place women at heightened vulnerability for fear-related disorders.

History of Agriculture in Aviation

Ansa Abbasi, Jaime Friedman, Somdat Kissoon & Kevin Singh

Mentor: Andrew Singh

Discipline: Earth Science Education

Aviation is the process of using airplanes or other heavier-than-air aircraft. It has many applications, and this presentation will go on to focus on a very important use of aviation, agriculture. In the past, agriculture, especially fertilizing, was mainly done by hand using plows. The first aerial application of fertilizer was done by a U.S. Army pilot named John Macready, using insecticides to eradicate an infestation of larvae in Ohio. This would eventually achieve nationwide and worldwide success with the development of the first commercial aerial crop dusting business, Huff-Daland Dusters, which would eventually become Delta Airlines. Farmers from the 1900s were not able to grow crops as quickly as farmers today. With the help of technology, manual agriculture is becoming less popular. Since the development of aerial crop dusting, many new influential innovations have been made in the field. Most of these innovations have been stemmed from John Macready and also Leland Snow, who flew the first Air Tractor in 1973. Modern aircraft designed for agricultural use have allowed large areas to be covered quickly, nutrients to be delivered to crops, and they also help better control pests and diseases. Finally, aviation and technology have helped to greatly control pests and diseases, having a great effect on the world's plants and animals through agriculture.

Password Security

Yanique K. Royes

Mentor: Thitima Srivatanakul

Discipline: Computer Science

This project focuses on raising awareness about the importance of password security as a fundamental aspect of daily security. The goal is to develop a program that analyzes passwords provided by users and rates them on their strength or weakness. The program will discourage the users from using personal details in their passwords. It will then evaluate the complexity of passwords based on the use of uppercase and lowercase letters, numbers, and special characters, as well as the simplicity of passwords that might use consecutive numbers or letters and repeated characters. By evaluating the use of different characters, the program aims to highlight common mistakes made in password creation and help users develop stronger passwords. Additionally, to address the issue of password reuse, the program will compare the previously input passwords similar to plagiarism detectors to output how similar they are to one another. This especially is for those who regularly are supposed to change passwords for security and instead increment whichever number in the password The project aims to assess the effectiveness of a passwords linked to personal effects, to contribute to the development in enhanced cybersecurity training for personal and professional use.

Choosing Together: The York College Band's Shift to Student-Chosen Repertoire

Jonathan Archer, Steven Baez, Che Bedward, Brandon Diaz, Kylian Elliott, Joe Ferrari, Shauna McCrea, Amanda Mohamed, Max Murgan, Isaiah Sands, Ajanee Smith & Terell Springer (Performance)

Mentor: Tom Zlabinger

Discipline: Music Performance

Over the course of the pandemic, the York College Band shifted from the traditional director-led model of band direction to a more student-centric approach. Normally, band directors choose the repertoire (or tunes) the band performs each semester. But after discussions during the pandemic, the selection of repertoire organically shifted from solely director-chosen to a more student-chosen model. The process will be explained by the current members in the York College Band. The band members will then share their experiences of how the student-center process affected rehearsals and performances. The session will include a performance by the band.

How can Various Countermeasures Used in Aviation to Control Bird Strikes be Improved to be More Environmentally Friendly?

Elise Leon, Diamond Haynes, Alan Propisnoy, Isaiah Jamna, Somdat Kissoon, Kevin Singh & Nazrul Khandaker

Mentor: Andrew Singh

Discipline: Earth Science Education

Birds are a vital part of our ecosystem. They are also the most common wildlife threat to airplane landing and takeoff. Some airports will kill thousands of birds annually to preserve commercial airplanes and the lives of passengers, which are at significant risk due to bird strikes. Most of the wildlife prevention methods being used today, such as habitat modification, shooting, trapping, repellants, toxicants, and many others, do not take into consideration how it will negatively affect the birds and the environment we live in. An innovative solution to mitigate bird strikes involves utilizing drones to mist bird repellent in areas prone to bird activity around airports. Citrus oil, while fettering birds due to its strong scent, is non-harmful to avian species, ensuring the well-being of wildlife in the vicinity. The misting process, carried out by drones, allows for precise and targeted application, reducing the overall environmental impact. Additional ideas such as augmenting radar-based systems with artificial intelligence to allow for more accurate bird detection and avoidance strategies are considered. Using sustainable materials and production processes can contribute to an overall environmentally friendly solution. This combination of precision, eco-friendly components, and bird-friendly outcomes makes it a promising and sustainable method to enhance aviation safety.

Synaptic Composition of Layer 4B of Macaque V1

Darlina Ramdhanie

Mentor: Virginia Garcia-Marin

Discipline: Biology

Studying the synaptic composition of the primary visual cortex (V1) in primates is fundamental to understanding the neural processes responsible for visual perception. V1 is organized in 6 layers, with layer 4B playing a crucial role in integrating information from different layers. For this research, excitatory synapses were characterized by number of synapses and presence of mitochondrion as single synaptic bouton (SSB), SSB with mitochondria (SSBm) and multiple synaptic boutons with mitochondria (MSBm). Our aim was to measure bouton and mitochondria volumes, surface area and morphology of the postsynaptic density (PSD) and to compare with boutons in other V1 layers. FIBSEM was used to obtain 6 serial sections of $12 \times 11 \times 5$ µm3 from V1 in 3 macaque monkey samples. We traced 150 axons, their mitochondrion, identified their target, and obtained the surface area of each PSD. Our results showed that MSBm were the largest boutons, 4X larger than SSB and 3X larger than SSBm. SSBm and MSBm had the largest PSD surface area. Around 60% of the SSBm and MSBm established synapses with spines and only 50% in SSB. The percentage of axonal volume occupied by mitochondria was around 25%. Of the SSB synapses, 83% had a macular morphology and 65% are macular in SSBm. This research demonstrates that the composition of the synapses in the neuropil of layer 4B is different from other layers of macaque V1, reflecting the different functional implications of each layer in visual processing.

Computational Simulations to Investigate Alterations in the Amino Acid Side Chains of hIAPP

Tatiana Alexis-Mclaren

Mentors: Evgeniy Slinin, Adam A. Profit & Ruel Z.B. Desamero

Discipline: Computational Chemistry

Human islet amyloid polypeptide (hIAPP), also known as amylin, is a 37-residue long peptide hormone that is stored and co-secreted with insulin in the pancreas. Amylin aggregations and amyloid deposits have been found to be a root cause of many neurodegenerative diseases and type 2 diabetes with a focus on the 22-28 region (NFGAILS) having been found to give rise to the rigid inflexible beta sheet structures that propagate the formation of amyloid deposits. Possible intervention in the formation of amylin fibrils have been found in the form of making alterations to this region of the polypeptide in order to disrupt and inhibit the formation of beta sheet structures. Utilizing molecular mechanics software, GROMACS, the structural behavior of unaltered NFGAILS was observed in 100 ns and 300 ns simulations, the objective this semester is to develop a general framework to computationally handle nonnatural and natural amino acid sidechain alterations and run such simulations through GROMACS in order to observe whether these alterations will lead to an inhibition of the formation of beta sheet structures. Alterations include the addition of methylene groups into the side chain and completely substituting certain amino acids in NFGAILS for naturally occurring amino acids that contain an additional methylene in the chain already.

Potential Impacts of Aircraft Noise and Air Pollution near JFK Airport in New York City

Hugh M. Allen, Thalia Singh & *Jamelia Jordan*

Mentor: Dawn Roberts-Semple

Discipline: Environmental Health Science

To determine the variations and potential effects of noise and air pollutants (APs) emitted from low-flying aircraft on local communities, the NOISY device was deployed at 18 residential homes of six neighborhoods in the airshed of John F. Kennedy (JFK) International Airport in New York to record daily aircraft noise levels in November and December of 2021. Daily measurements of fine particulate matter (PM2.5) and gaseous APs: nitrogen dioxide (NO_2), sulfur dioxide (SO_2), and ground-level ozone (O_3) were obtained from the nearest regulatory monitoring station in Queens, NY over the corresponding two-month period. Our preliminary findings showed that 100% of all noise levels across the six neighborhoods were above the daily safety threshold of 55 decibels (dB). Noise levels were positively correlated to NO_2 (r=0.15, p=0.00), O_3 (r=0.14; p=0.01) and PM2.5, (r=0.13, p=0.01). Hence, with an increase in noise levels, there was a corresponding increase in NO_2, O_3, and PM2.5 concentrations in the study areas. Although conclusions about the association between local airport exposures and health outcomes cannot be drawn from this pilot study, the results imply that there is a correlation between noise and AP levels which should be explored in future studies, to inform mitigation efforts.

Analysis of the Dynamic Microbial Community of Sourdough Across a 7-day Time Period

Huangshen Chen, Karen Alban, Monisha Sherpa & Abid Ally

Mentor: Louis Levinger

Discipline: Biotechnology

Sourdough breads, baked from leavened natural starters, have dynamic microbiomes sourced from grains including wheat and rye berry. This microbial community undergoes significant shifts in composition during regular feedings, influenced by starter maturity. Fungal fermentation of flour sugars and acidification by lactobacillus bacteria drives leavening and souring of sourdough. We examined the microbiomes of two starter cultures—rye and wheat grain mix (RWG), and rye and unbleached white flour mix (RWF) over eight days with daily feedings. Using Illumina paired-end reads and 16S rRNA and ITS primers for bacteria and fungi, respectively, we identified bacterial genera largely replaced by lactobacillus (LAB) within three days of culture. This was accompanied by pH readings which plateaued to 4 after two days of feeding, thus signifying lactobacillus-driven acidification. The lactic acid's pKa is 3.8. Fungal results varied, however both ground grain and flour starters supported sourdough leavening. To overcome the limitation of metagenomics on total cell density, we applied serial dilution and plating of RWG culture after the two days of feeding. This further confirmed the dominance of LAB with pin prick colonies when visually inspected.

Effect of Homoamino Acids on the Aggregation of Amylin

Taskeen A. Karim

Mentors: Jennifer Cersosimo, Marvin Bilog, Adam A. Profit & Ruel Z.B. Desamero

Discipline: Biochemistry

Homo amino acid means that there is an addition of a methylene (CH_2) group to the α-carbon of an amino acid. In homologous series, the amino acid is extended by using an extra carbon chain in the side chain of the amino acid. Human islet amyloid polypeptide (hIAPP), also known as amylin, is a 37-residue peptide hormone that is produced and co-secreted alongside insulin by the pancreatic beta cells. Its misfolding and aggregation can lead to the development and progression of type 2 diabetes, primarily by affecting pancreatic function and insulin production. NFGAILSS (hIAPP22-29) is an amyloid forming fragment of amylin. We hypothesize that the elongation of amino acids of the NFGAILSS sequence should slightly alter the structure and affect interactions consequently reducing aggregation. The objective of this project is to synthesize six homopeptides of the NFGAILSS sequence and evaluate how the incorporation of homoamino acids affects aggregation. The homopeptides studied are- QFGAILSS, NhFGAILSS, NFGhAILSS, NFGAIhLSS, NFGAILShS and NFGAILhShS. They were synthesized using 2-chlorotrityl resin via Fmoc Solid phase peptide synthesis (SPPS). Synthesized peptides were identified using mass spectrometry. The aggregation propensities of the homologues were assayed using turbidity measurements and thioflavin T fluorescence assays. The data obtained were analyzed in terms of how the homoamino acids affect structure and consequently aggregation propensity. Peptides substituted with homologues that do not aggregate will be tested on how they may affect the aggregation of the full-length amylin.

Embracing Possibility or Embracing Illusion? Openness and False Memory

Ayala Feder (Seminar Presentation)

Mentor: Justin Storbeck

Discipline Psychology

Individuals who are high in the trait of openness to experience, one of the Big Five personality traits, are more adventurous, intellectually curious, and imaginative. While this is a positive thing, it may also make them more susceptible to false memories on the DRM, a task used to study false memory where participants are read a list of associated words and then asked to recall them. Participants often falsely recall associated words that were not on the list, known as critical lures. Because individuals who are high on openness are more creative thinkers, which has previously been linked to increased semantic associations (forming connections between related words), it was hypothesized that they would falsely recall more critical lures. The present correlational study aimed to examine the relationship between the trait of openness to experience and false memory on the DRM. The participants were 114 Queens College undergraduate students consisting of 56 females and 58 males, ages 18 to 54 (M= 21.08, SD = 4.858). The researcher collected data by computerized administration of various questionnaires (including the Big Five Factor) and executive functioning tasks (including the DRM), and then ran correlation analyses using SPSS. The results confirmed the hypothesis, indicating that the trait of openness to experience is positively correlated with false recall on the DRM. These findings support the activation monitoring and fuzzy trace theory of false memory on the DRM, which both attribute the false recognition of critical lures largely to the process semantic associations.

Towards a Reliable Synthesis of Oxazolone – Optimization of the Initial Anodic Oxidation

Jennifer Duverge

Mentor: Stephen Phillip Fearnley

Discipline: Chemistry

Oxazolone has proved a useful starting material in the synthesis of several alkaloid natural product targets. We therefore need a reliable route to this heterocycle. We currently use an electrochemical method but this has proved unpredictable and we therefore seek to optimize this process. Starting with oxazolidone, this initially undergoes an electrochemical oxidation process in order to produce methoxyoxazolidinone, which is then eliminated to oxazolone itself. In order for this to be successful, the starting material must be pure. The initial goal of our research is thus to optimize its production to yield the purest product we can. Using a simple undivided cell, we are presently investigating key factors in the anodic oxidation of this molecule. This includes co-electrolytes, concentration, solvent, and current/voltage. Proton NMR is then used to monitor the reaction in D-chloroform as the solvent. Our recent progress will be discussed.

Cipher Puzzle Game: Decipher Dash

***Mahfuza Naima**, Annebelle Phanor & Tamica Sylvester*

Mentor: Thitima Srivatanakul

Discipline: Computer Science

Cryptography is comparable to a secret code language. It's a method of ensuring that data is transmitted or kept securely and that only the intended receiver can decipher it. It entails employing strategies like message scrambling and special key unlocking. It is used to protect sensitive data from hackers and unlawful access, including bank account information, passwords, and messages. Classical ciphers are antiquated encryption algorithms that rely on straightforward substitution or transposition methods, such as the Caesar and Vigenère ciphers. To offer better security in the current digital era, sophisticated mathematical algorithms and secret keys are used in modern ciphers like AES and RSA. The goal of this project is to raise awareness of cipher algorithms by developing a manual puzzle game that can be used as a teaching tool to help others comprehend the principles of network security and cryptography. This entails understanding the ciphers' general operation as well as their strengths and limitations. This multi-level problem will employ the following ciphers: Vigenere, Playfair, Book, Scytale, Affine and Pigpen.

Password Manager using AES Encryption

David Herrera

Mentor: Thitima Srivatanakul

Discipline: Computer Science

The project addresses the need for robust encryption techniques in safeguarding sensitive data. Specifically, we focus on understanding the Advanced Encryption Standard (AES) and its role in securing digital communication and information. Our goal is to delve into the fundamental functioning and security features of AES. By exploring its inner workings, we aim to demystify this widely adopted encryption algorithm and highlight its strengths and vulnerabilities. The password manager utilizes the AES algorithm. The manager allows users to add passwords along with corresponding sites or service names and usernames. Upon adding, passwords are encrypted using AES with a predefined encryption key. When a user needs to retrieve a password, they can input the site or service name, and the manager decrypts and displays the corresponding password. Additionally, the manager provides a function to view and obtain all stored passwords for easy reference. The user interface is minimalistic, operating through a command-line prompt to ensure simplicity and ease of use. While this implementation provides basic password management capabilities, it serves as a foundation for understanding encryption principles and constructing more sophisticated password management solutions. It emphasizes the importance of protecting sensitive information and encourages users to adopt secure practices in managing their digital credentials. Methodology: Through practical exercises using Python, we will be able to - Implement AES encryption and decryption. - Analyze AES's response to common cryptographic challenges. - Investigate its resistance to attacks such as brute force, differential cryptanalysis, and chosen-plaintext attacks. Objectives: The project seeks to achieve the following outcomes: - A comprehensive understanding: Gain insights into AES's design principles, key expansion, and substitution-permutation network. - Evaluate AES's robustness against various cyberattacks and its vulnerabilities. - Contribute to the development of improved security practices for encryption algorithms.

Analyzing Protein Inclusions that Contribute to Huntington's Disease

Grigoriy Fayzibayev

Mentor: Lesly Emtage

Discipline: Biology

Inclusions of disordered proteins are a characteristic feature of most neurodegenerative diseases, including Huntington's disease. Huntington's disease is caused by the expansion of a polyglutamine tract in the huntingtin protein; mutant huntingtin protein (mHtt) is unstable and accumulates in large intracellular inclusions in affected individuals and when expressed in eukaryotic cells. Using mHtt-GFP expressed in Saccharomyces cerevisiae, we find that mHtt-GFP inclusions are dynamic, mobile, gel-like structures that concentrate mHtt together with the disaggregate Hsp104. Although inclusions may be associated with the vacuolar membrane, the association is reversible, and we find that inclusions of mHtt in S. cerevisiae are not taken up by the vacuole or other organelles. Instead, a pulse-chase study using photoconverted mHtt-mEos2 revealed that mHtt is directly and continuously removed from the inclusion body. In addition to mobile inclusions, we also imaged and tracked the movements of small mHtt-GFP particles and determined that they move randomly. These observations suggest that inclusions may grow through the collision and coalescence of small aggregative particles.

Loratadine: A Blockbuster Antihistamine Drug

Saeen Seikh

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Science

Loratadine belongs to a class of non-sedating antihistamine drugs used to treat allergies. It is a second-generation antihistamine used for seasonal allergic rhinitis that causes runny nose, nasal congestion, sneezing and itchy nose, throat, eyes and ears. It is also used to treat chronic idiopathic urticaria. Loratadine was developed at Schering-Plough Corporation (now Merck) and patented as a new chemical entity in 1980. It was approved by the US Food and Drug Administration (FDA) in 1993 as a prescription medication and launched under the brand name Claritin. In 2002 it was switched from a prescription to an over-the counter medication by the FDA. After expiration of Schering-Plough's patent in 2002 and subsequent loss in patent lawsuit, Loratadine became available as a cheaper generic drug and is sold worldwide. Histamine is the chemical produced by our immune system which binds to histamine H1 receptors to trigger an allergic reaction. Antihistamines, such as Loratadine, work by binding to the histamine H1 receptors to prevent or reduce the severity of histamine mediated symptoms. Loratadine belongs to the family of tricyclic anti-histamines and is a fast-acting drug. This class project will summarize the pharmacodynamics and pharmacokinetics of Loratadine, including information on absorption, metabolism, elimination, half-life and clearance. Loratadine is available in various dosage forms, such as tablets, syrup or as an oral solution. Some common side effects of Loratadine are headache, feeling tired or worn out, nausea, vomiting and dry mouth.

Noise Pollution and Green Airports

Jeisnet Araujo

Mentor: John Kolmos

Discipline: Aviation

How could green airports deal with noise pollution? As we all know, noise issues are not a new topic. If we go back in time, the first cases of noise disturbance were the Causby's case of 1942, and the Griggs v. Allegheny County's case of 1962, these demanding encounters allowed the U.S. supreme court to become aware of a new perspective about the current environment, style of living and public airspace. As a result, this caused the federal government to create the aircraft noise abatement act of 1972 and the noise control act of 1972. Today, given the massive growth of population during the past decades, the problem with noise has been aggravated. According to the U.S. Government Accountability Office, "…the Federal Aviation Administration (FAA) predicts that air traffic in the United States will increase 20 percent by 2024. If not mitigated, the noise associated with these flights could significantly diminish the quality of life for communities surrounding airports and constrain an airport's ability to expand" (U.S. Government Accountability Office, 2012). This means that the population rate is expected to increment closer to airports, an issue that is currently limiting the prosperity of the aviation industry, drastically affecting the local communities that surround it, as well as travelers recurring airports for flying. One-way airports can reduce the pollution of noise, is by projecting operational and structural transformations that aim for a much sustainable or "green" airports. This could be done by implementing as well as modifying a number of tactics, operational procedures and structural additions to different areas of an airport. Noice Abatement Approaches: Tactics, and Procedural Practices There are several ways to reduce noise pollution at airports, and some of those practices will be addressed bellow through the following bullet points: Tactical procedures to reduce noise pollution in airports. • The inclusion of programs: -"San Francisco International Airport's Fly Quiet Program influences airlines to operate as quietly as possible in the San Francisco Bay Area" (flysfo.com:: Fly Quiet Program | San Francisco International Airport (flysfo.com)). According to the data gathered on the article Major Changes are Coming to These U.S. Airports - AFAR in 2021, after the implementation of this program there has been a great reduction on the levels of stress experienced by travelers. -The Continuous Lower Energy, Emissions, and Noise (CLEEN) Program aims to reduce noise pollution. The CLEEN Program develops technologies that decrease land area exposed to noise by an estimated percentage which varies between airports. These technologies reduce nitrogen oxide and soot emissions from aircraft operations. (Continuous Lower Energy, Emissions, and Noise (CLEEN) Program | Federal Aviation Administration (faa.gov)) -The FAA Airport Noise Program is a voluntary program that addresses noise near airports since 2010. The program specifically identifies compatible land uses such as industrial or commercial areas, large highways or water, and develops air traffic arrival or departure procedures that help reduce noise by routing flights over those less-populated, less noise-sensitive areas (Federal Aviation Administration, 2015). - The FAA also provides funding for airports to expand towards this idea through the AIP or Airport Improvement Program. All these programs are additions to Part 150 Regulation: Airport Noise Compatibility Planning, which provides a checklist of items that identifies the necessary components of Part 150 Noise Compatibility Programs taking into consideration DNL or

day-night average sound levels. Technical procedures to reduce noise pollution in airports. • Promote the use of Green Materials: -Airports can design structures reducing their environmental impact by utilizing techniques like renewable energy, water recycling, natural lighting, and inventive ventilation. For instance, Indira Gandi International Airport uses a water recycling system, constructed to use the maximum amount of sunlight or, Zurich Airport in Switzerland which uses rainwater for toilets and leverages geothermal energy for heating-cooling systems. Moreover, all these transformations were accomplished using only recycled materials (From Use of Green Materials to Renewable Energy: Green Airports are the Future of Air Travel | Aviation Pros). • Expand Greener area divisions: -Airports can set aside interactive space for travelers who might require additional private areas to unwind or regroup. For instance, Pittsburgh International airport and Phoenix Sky Harbor international airport in Arizona has installed a soundproof sensory room for passengers with developmental issues or for families who need to "de-escalate" before or after their flight, called Presley's Place, inaugurated in 2019 and 2020. In addition to a terrace space where passengers can relax and enjoy fresh air from natural vegetation at Pittsburgh's new terminal. (Puckett, 2022) - Phoenix Sky Harbor international airport plans in delivering unexclusive multipurpose soundproof room for all travelers (Puckett, 2022). Although main objective of this project is to promote a meaningful experience for passengers by facilitating a quiet space that anybody to enjoy, this multipurpose rooms can alleviate the constant flow of imperative movements, crowded areas, and the overall human noise inside airports. (Airports Are Creating Inclusive Quiet Spaces Where All Travelers Can Find Calm | Condé Nast Traveler (cntraveler.com)) • Implement operational procedure systems: -London set to practice a procedure referred to as the Quota Count system. This system predicts and limits the amount of noise pollution at Heathrow, Gatwick, and Stansted international airports by imposing night-time operating restrictions. This procedural system over time developed into a complex classificatory system that assigns values to different take-offs and landings based on a given aircraft's noise certification. Thus, Aircraft are listed by their certification noise values, and then grouped into bands by steps of three decibels. For each band, aircraft are assigned a number of points or quota counts. In the middle of the noise level range, they get 1QC; for noisier aircraft it is 2QC or even 4QC; and for quieter aircraft 0.5QC or 0.25QC. (Reducing noise | Airlines (iata.org)). -At London City Airport in England, announcements are only made for flight disruptions or emergencies, not to call passengers to the boarding gates. (The Trouble With Airports, and How to Fix Them - The New York Times (nytimes.com)).

The Surrounding Shame Before Masking Your Soul

Amanda R. Seepersaud

Mentor: Usha Barahmand

Discipline: Psychology

Autistic traits refer to subtle and subclinical manifestations of features linked to autism spectrum disorder, exhibiting a normal distribution within the general population. Research indicates that individuals displaying these traits engage in camouflaging to conceal their condition in social contexts. This encompasses the suppression of autistic inclinations and deliberate participation in socially conventional behaviors. Empirical evidence indicates that individuals with autistic traits are often rejected by peers, marginalized by social groups, and experience greater levels of loneliness compared to matched controls. The present study examines whether feelings of shame mediate the association of autistic traits and camouflaging. Data were collected from 283 individuals from ages 18 to 69 years with a mean of 27 years (SD = 9.4). Most participants were female (59.7), White (54.4%), working part-time or full-time (61.8%), single (70.3%), and had college degrees (54.4%). Participants responded to self-report measures assessing autistic traits, experiences of internal and external shame, and camouflaging. Data were analyzed using SPSS version 29 and the PROCESS macro was utilized to test the hypothesized mediation. Results revealed that autistic traits correlated positively and significantly with both external and internal shame as well as camouflaging. Both direct effects and indirect effects of autistic traits on camouflaging were observed. Only internal shame served as a significant mediator linking autistic traits to camouflaging. Findings imply that interventions targeting the experience of internal shame in individuals with autistic traits can help these individuals reduce their motivation to camouflage. Keywords: autistic traits, shame, camouflaging, community sample

Top Causes of Elder Mortality in NYC: SPARCS Data from 2021

Arianna J. Texidor

Mentor: Griselda Chapa

Discipline: Health and Human Performance

The purpose of this study was to examine the top causes of elder deaths across NYC boroughs.

Investigate Cryptanalysis Techniques

Kahmal Johnson, Farhan Ahmed & Mohammed Arafat

Mentor: Thitima Srivatanakul

Discipline: Computer Science

This cryptography project delves into the foundational principles of encryption and cryptanalysis, with a focus on a variety of techniques essential for understanding and decrypting classical ciphers. The project explores known plaintext analysis, frequency analysis, Kasiski examination, and crib dragging, as well as introduces the basic concepts of differential and linear cryptanalysis. Known Plaintext Analysis involves examining patterns between plaintext and ciphertext to deduce encryption keys. Frequency Analysis exploits language patterns to decode messages. Kasiski Examination breaks polyalphabetic substitution ciphers by identifying repeating patterns. Crib Dragging decrypts one-time pad messages by leveraging known content. Differential Cryptanalysis observes how differences in plaintext affect ciphertexts to retrieve encryption keys, while Linear Cryptanalysis uses statistical analysis to derive key information from plaintext-ciphertext pairs. Problem Statement: Cryptography is all about keeping data safe when it's sent or stored. But as encryption methods get fancier, it's harder to make sure they're really secure. We need to figure out where these methods might be weak so we can potentially create solutions to improve them. Purpose: This project investigates different ways to crack old-fashioned codes, like known plaintext analysis and frequency analysis. We want to see how good these methods are at breaking simple codes and what that means for today's encryption. Methodology: We'll mix theory with practice. First, we'll learn the basics of how codes work and what makes them strong. Then, we'll try out these code-breaking tricks using Python. By doing this, we can see which tricks work best and where they fall short, especially with modern codes. Objectives: Our main goal is to understand how to break old codes using different tricks. By testing these tricks out, we hope to see where they work well and where they need improvement. This will help make encryption stronger and keep data safer. Conclusion: Participants will gain insights into classical ciphers and key space concepts, applying Python libraries or online tools to solve problems involving ciphers like Caesar and Vigenère. They will evaluate cryptanalysis techniques against various cipher complexities. The project concludes with a comprehensive summary, discussing the strengths, weaknesses, and limitations of different cryptanalysis methods against modern ciphers. A report or presentation will document the research, activities, and conclusions, contributing to cryptographic understanding and security enhancement.

Using Low-Cost Sensing Technology to Assess Ambient and Indoor Air Quality in New York During and After the Covid-19 Pandemic

Kera Johnson, Jamelia Jordan & Thalia Singh

Mentor: Dawn Roberts-Semple

Discipline: Environmental Health Science

Air pollution is a leading cause of death in the U.S. Although ambient air quality mostly improved during the COVID-19 pandemic, indoor air pollution (IAP) remains a concern, yet data are seriously lacking. Understanding the role of IAP in respiratory illnesses is critical, as Americans generally spend about 90 percent of their daily lives indoors. With no indoor air quality (IAQ) health standards, high IAP levels imply greater health risks among vulnerable groups especially children, the elderly and persons suffering chronic respiratory and cardiovascular diseases. Even under normal conditions, infiltration of particulate matter with a diameter of 2.5 micrometers (PM2.5) through ventilation systems could further degrade IAQ. This study utilized the AirBeam2, to measure concentrations of PM2.5 to investigate the differences between indoor and ambient PM2.5 levels in New York at seven private homes during the COVID-19 pandemic in winter, spring and fall of 2020 and in fall 2022. PM2.5 concentrations were two times greater indoor than outdoor, $p = 0.03$ and exceeded the safety levels. Indoor spaces with little or no ventilation and direct emission sources such as smoke from cooking, particularly in kitchens and basements, resulted in higher PM2.5 levels that momentarily exceeded outdoor levels and those in more ventilated areas. Higher ambient PM2.5 levels were attributed to vehicular traffic at a street-facing sampling site. The identification of PM2.5 sources in this study can be useful in devising control strategies for improvement of IAQ and consequently, the alleviation of respiratory health effects. Further, these findings may be used as a basis for in-house modifications including natural ventilation and the use of air filters to reduce exposures, mitigate future risks, and prevent potential harm to vulnerable residents.

Cephalexin: An Invaluable First-Generation Cephalosporin Antibiotic

Kerryann C. Van Velzen

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Sciences

Cephalexin, belongs to the first-generation of cephalosporin antibiotics. It occupies a pivotal role in the arsenal against bacterial infections. Drawing parallels to the mechanism of action of penicillin, cephalexin functions by impeding the synthesis of bacterial cell walls, thereby compromising their structural integrity, and leading to the demise of the offending pathogens. Within the expansive cephalosporin family, antibiotics are systematically categorized based on their generation and spectrum of activity. Among these, first-generation cephalosporins, typified by cephalexin, exhibit remarkable efficacy particularly against gram-positive bacteria, including notorious pathogens such as Staphylococcus aureus and Streptococcus species. However, their efficacy against certain gram-negative strains may be limited, as these bacteria possess additional protective mechanisms, such as outer membranes, rendering them less susceptible to the action of these antibiotics. Despite this spectrum of activity, first-generation cephalosporins like cephalexin remain invaluable therapeutic agents, especially in scenarios where gram-positive bacterial infections predominate or where their use is warranted based on susceptibility testing. Moreover, they often serve as a first-line option for treating a variety of common bacterial infections, including skin and soft tissue infections, urinary tract infections, and respiratory tract infections.

CETIRIZINE: Anti-Histamine Drug for Allergic Rhinitis and Chronic Urticaria

Sujoya Paul

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Sciences

Cetirizine is a second-generation antihistamine drug used for allergic conditions like rhinitis and urticaria. It blocks histamine release providing short-term relief from symptoms such as sneezing and hives. Notable for its non-sedating nature, it selectively inhibits histamine H1 receptor making it suitable for daytime use. Derived from Hydroxyzine, Cetirizine effectively treats chronic idiopathic urticaria and allergic respiratory diseases displaying its anti-inflammatory properties. In terms of pharmacokinetics, Cetirizine is rapidly absorbed orally with consistent bioavailability in tablet or syrup form. It is primarily eliminated through urine and feces. The drug's plasma elimination half-life is 8.3 hours. Its unique features, such as rapid action, prolonged duration and minimal metabolism contribute to its effectiveness. The drug acts by inhibiting peripheral histamine H1 receptors demonstrating antihistamine activity with minimal anticholinergic effects. However, clinical studies indicate a higher incidence of dry mouth with manageable side effects. Like other H1-antihistamines, Cetirizine impedes histamine activity at the histamine H1 level. It also enhances mast cell stability by decreasing calcium ion concentration to prevent histamine release. Cetirizine appears non-carcinogenic and non-mutagenic at various therapeutic doses in a two-year carcinogenesis study in rats. Breastfeeding mothers are recommended to avoid Cetirizine since it is excreted in breast milk. This drug is available over the counter in various dosage forms including tablet, chewable tablet, oral-capsule; and an oral solution form with prescription.

Impact of Neglected Ecological Considerations in Economic Models on Societal Well-being Student

Thalia Singh

Mentor: Ratan Dhar

Disciplines: Environmental Health Science and Economics

Economic models are widely used as a foundational tool to analyze market behavior, but they glaringly ignore the complex interplay between the environment and economics. This is not just an academic error; it has far-reaching consequences for the planet and society. This study explores the reasons behind economists' disregard for environmental factors, examines the effects of this disregard, and proposes a paradigm shift that includes ecological factors in economic models. This discussion highlights the need to incorporate environmental concerns into economic discourse to promote a sustainable and harmonious coexistence between ecological well-being and economic prosperity. It is a call to action, highlighting the necessity of an all-encompassing strategy that takes into account the demands of the environment and the economy before irreversible effects materialize.

Chat Messaging System

Shashank Sigdel

Mentor: Thitima Srivatanakul

Discipline: Computer Science

The York Chat System is a tutorial-based messaging app developed using ReactJS, Firebase, and ChatEngine.io, designed to guide developers through creating their chat applications with a focus on security and usability. It offers step-by-step instructions for integrating user authentication, real-time messaging, profiles, chat management, search features, and online presence. Built on ReactJS for the interface, Firebase for user and data management, and ChatEngine.io for messaging, it lays a solid groundwork for developing secure, interactive communication platforms. Originally a personal project, it evolved into a comprehensive tutorial for developers to learn by doing, aiming to equip them with the necessary skills to build their chat systems. Future updates aim to introduce file sharing, emojis, and more customization options, further enriching both the educational value and functionality of the system.

Assessing Quality of Life Among Assisted Living Residents in Queens: A Study of Variables Influencing Resident Satisfaction

Jada Dougal

Mentor: Erin Toussaint-Jacques

Discipline: Public Health

The purpose of this study is to identify different variables associated with the level of satisfaction of residents at an assisted living facility in Queens. The sample, consisting of N=100 was selected from a population of 226 residents. The sample showcases a range of diverse characteristics including gender, age and race. A cross-sectional study was conducted in April 2024, examining 100 annual reports of geriatric patients at a residential facility in Queens, NY. To maintain HIPAA guidelines the identity of the participants were concealed. Participants were labeled by numbers. The selection of participants were conducted through a self-selection process, identifying participants who are more likely to communicate since the data from the annual reports were self-reported. Participants range from ages 53-95 years old, both male and female representing the following racial groups; African American, Caucasian, Latino,and Asian, some with existing health conditions. The researcher of the study collaborated with another researcher to organize, code, and operationally define constructs, discuss and agree on the questions that would be represented under each category/construct. Due to the amount of variables included in this study, 100 was selected as a reasonable number of participants. The sample size provides a diverse pool for sufficient and practical data. This research evaluation was conducted using data from the residents' annual report with the goal of identifying areas and actions that could be taken within the facility to improve residents' satisfaction levels. As such, the questions selected were those that would yield actionable insights within the facility's capacity to enhance residents' quality of life and satisfaction. Therefore, the included questions are referred to as 'Core Impact Questions.' These questions aim to identify areas where changes can enhance the living environment and overall satisfaction of residents. These areas include adjustments in mindset, support structures, educational opportunities, access to services, medical compliance, and engagement in activities. Thus, the data can directly inform practical interventions, supports, education, access to services, and engagement in meaningful activities within the residence. The constructs included were: Resident Socialization, Family/Friend Support, Unmet Medical Care Needs, Medical Compliance, Aspiration for Self, Strengths and Weaknesses, Interests, Accomplishments, Religion, Community Familiarity, Weight, Knowledge of Residential Services, Patient/Education Support, Self-Awareness, Wishlist, and Cellphone Access. View Appendix I The questions from the annual report that were not included in the assessment were grouped under the category of 'Preferences.' Questions about preferences, ranging from social interactions to daily routines and environmental comfort (View Appendix II) capture the diverse characteristics and expectations residents bring with them. The following two reasons help explain why preferences were not included: First, while there is intrinsic value in understanding residents' individual preferences, the broad and varied nature of such preferences makes it challenging to provide recommendations that could universally benefit all residents. Secondly, the potential variations in responses would reflect personal predispositions more than actionable insights for systemic improvements within the residence. The data retrieved from the annual reports was organized within a google spreadsheet. The information that comes from the descriptive data will be used to find associations between different variables assessed from the self reported annual and the level of satisfaction of residents assisted living facility homes in Queens. Additional statistical analysis will be conducted using ToolPak data analysis. The research results will include descriptive tables and statistical output tables, which will be supported in narrative form. The truncated contents will be displayed on a poster board presentation.

Fear-Induced Camouflaging: Investigating the Interplay between Autistic Traits and Camouflaging Mediated by Fear of Negative Evaluation

Amanda R. Seepersaud, Faiza Mughal & Reyana Persaud

Mentor: Usha Barahmand

Discipline: Psychology

Broader Autism Phenotype (BAP) refers to a range of subclinical autistic traits linked to Autism Spectrum Disorder (ASD). Individuals with autistic traits experience significant difficulties in social interactions due to challenges such as interpreting social cues, understanding unwritten social rules, and maintaining reciprocal conversations. Empirical evidence indicates that individuals with autistic traits engage in camouflaging, hiding or suppressing these traits, to appear more neurotypical. The present study was designed to investigate whether fear of negative evaluation drives individuals with autistic traits to engage in camouflaging. An online survey was used to collect data from 372 individuals aged 18 to 41+ years. Most participants were female (50.8%), White (76.1%), employed (65.6%), single (59.4%), had a college degree (50.1%), and had a psychological or neurological disorder (65.4%). Participants responded to self-report measures assessing autistic traits, fear of negative evaluation, and camouflaging. Data were analyzed using correlations and mediation analyses on Jamovi, a statistical software. Results revealed autistic traits correlated positively and significantly with the fear of negative evaluations and camouflaging. Both direct effects and indirect effects of autistic traits on camouflaging were observed. Findings imply that interventions targeting social anxiety levels among those with autistic traits in clinical settings can help reduce these individuals' desire to camouflage. Findings inform clinical practice and interventions and contribute to fostering greater understanding and acceptance of neurodiversity in society. Keywords: autistic traits, fear of negative evaluation, social anxiety, camouflaging

How does anthropogenic and ecological factors influence the Counts of Fecal Indicator Bacteria at the Meadow Lake and Baisley Pond in Queens, NY?

Jamelia Jordan, Toodashwarie Singh, Amin Ullah1, Turjoy Dhar and Ratan Kumar Dhar

Mentor: Ratan Dhar

Discipline: Environmental Health Science

Recreational waterbodies that are polluted by contaminants pose serious health effects to the public. In Queens, New York, Baisley Pond, and Meadow Lake are public recreational waterbodies that were tested against biological contaminants called Fecal Indicator Bacteria (FIB). These public recreational waterbodies were chosen because of their sizes, salinity, and the human and animal activities that took place. The Baisley Pond is a freshwater pond with less anthropogenic and animal activities, whereas Meadow Lake is more brackish and had more anthropogenic and animal activities. The FIBs including Total coliforms (TC), Escherichia coli (EC), Fecal coliforms (FC), and Enterococci (ENT), were monitored at these waterbodies. EPA approved IDEXX method was used to obtain the bacterial counts in MPN (Most Probable Number) per 100 ml of sample. The average MPN for FIBs were higher at Meadow Lake (TC = 97,303, EC = 12,033, FC=51,230, ENT=5,703) as compared to Baisley Pond average MPN for FIBs (TC = 35,653, EC= 11,876, FC=11,898, ENT=2,721). All these numbers were above the norms set by the U.S. Environmental Protection Agency (USEPA). Based on observation, the reasons for the high FIBs occurrence at Meadow Lake are perhaps linked with intense recreational activities post pandemic period in the summer. Moreover, birds such as Canadian geese were seen at Meadow Lake, contributing to high fecal matter in the water body. In addition, the lake is surrounded by a large cemetery (Cedar Grove Cemetery) and road networks which could contribute intense nutrients loading to lake water consistent with the algal bloom in late spring due to eutrophication. The physical parameters were also assessed to determine the possible correlation with the number of microorganisms. The high conductivity clearly showed that Meadow Lake is brackish water compared to Baisley freshwater pond. The relatively low dissolved oxygen in Meadow Lake is also consistent with a higher occurrence of FIBs. Further investigation will be continued to assess the seasonal variation of FIB concentration in Meadow Lake and Baisley Pond.

Salbutamol: Receptor Agonist for Treatment of Asthma and COPD

Priscilla Sipka

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Science

Salbutamol is a widely used drug to relieve symptoms of chronic obstructive pulmonary disease (COPD) and asthma. COPD is a collection of lung diseases that causes breathing problems or airflow restriction. Common disorders observed in COPD patients are emphysema or chronic bronchitis. People with COPD have lungs that are damaged or clogged with phlegm resulting in wheezing, tiredness, difficulty of breathing, cough or sometimes cough with phlegm. COPD patients are at a high risk for other health issues. Although there is no good cure available, the symptoms can be prevented to reduce damages by using rescue inhalers, such as Salbutamol or oral steroids. Asthma is a long-term chronic condition that affects the airways in the lungs. These airways are the tubes that carry air in and out of the lungs. People with asthma have their airways inflamed or narrowed at times and this makes it harder for air to flow out of airways when breathing out. Just like COPD, asthma has no cure but its symptoms can be controlled with rescue inhalers to treat them and controller inhalers to prevent them. David Jack discovered Salbutamol in Ware, England in 1966 and Ventolin was launched in 1969. The US Food and Drug Administration approved the first generic of an Albuterol Sulfate inhalation aerosol in 2020 for treatment or prevention of bronchospasm in people four years or older. This poster discusses the pharmacodynamics, pharmacokinetics, mechanism of action, as well as adverse effects and toxicity of Salbutamol.

Craft, Connect, Create; MakerSpace - Where Education Meets Innovation

Asa Rahman

Mentor: Xin Bai

Discipline: Teachers Education

A group of Maker Space Scholars are collaborating with department faculty members to conduct action research in the York College Department of Teacher Education's Maker Space. This team of undergraduate and high school students are inaugurating this vibrant new learning environment by creating technology-based and computational thinking experiences, shooting and editing instructional videos that demonstrate technology resources, and designing lesson plans for K-12 and college students. In the Maker Space visitors have the opportunity to explore Cricut Maker, Arduino, Microbits, Makey Makey, and more, with activities targeted to the appropriate age. The Scholars support visitors to the Maker Space as they engage in the planned activities and utilize the resources in the space. The Scholars are also developing the recruitment materials for Maker Space events and suggesting strategies for maximizing attendance. Through attendance monitoring, satisfaction surveys, analysis of student work products, and reflective journals, the Scholars are analyzing the effectiveness of the different event components and making improvements through an iterative process. The undergraduate Maker Space Scholars and the Makespace itself are supported through funding from CUNY Central grant funds. The high school scholars are supported by the NYC Industry Scholars Program (ISP).

Microfluidic Analytical Devices

Mohammed Salem

Mentor: Jong-Ill Lee

Discipline: Chemistry

Microfluidic paper-based analytical devices (μPADs) have emerged as a promising technology for point-of-care diagnostics and environmental monitoring due to their low cost, simplicity, and portability. These devices leverage the capillary action of paper to manipulate fluids and perform various analytical assays without the need for external equipment. In this presentation, we provide an overview of the design principles, fabrication methods, detection methods, and applications of μPADs. We discuss the versatility of μPADs in detecting analytes making them suitable for a wide range of fields including healthcare, environmental monitoring, and food safety. In addition, we are gonna be using μPADs for detecting anemia.The integration of multimeter technology holds promise in enhancing the precision and reliability of μPADs by providing real-time monitoring of electrical properties associated with blood components. Additionally, UV spectroscopy offers a non-invasive approach to analyze blood composition, potentially enabling comprehensive diagnostic capabilities within μPADs. This abstract underscore the importance of ongoing research and innovation in the field of anemia detection, with a focus on integrating advanced technologies into μPADs. By harnessing the potential of multimeter and UV spectroscopy techniques, future μPADs could revolutionize point-of-care diagnosis, ultimately improving healthcare outcomes for individuals affected by anemia worldwide.

Computational Study of Potential Scaffold to Mediate the Delivery of mRNA

Micaela V. Ribeiro

Mentor: Jong Ill Lee

Discipline: Chemistry

Anthocyanin is an incredibly versatile pigment that can be used in a variety of fields. It can be used as a natural dye to create color in food, cosmetics, and even pharmaceuticals. It is an entirely natural UV absorber, an antioxidant with antibacterial potential. Due to its ability to transform in different pH levels and with light (intensity) into different isomers in equilibrium, anthocyanin can be used in non-invasive drug delivery of the desired drugs to the target areas in the body using pH change and light. mRNA-lipid nanoparticles (LNP) are designed to deliver the mRNA that codes for the SARS-CoV-2 spike protein to host cells. The outer layer of LNP is composed of neutral lipids that encapsulate the mRNA. Cationic lipids and water are part of the core of these LNP. The cationic lipids have a positive charge that binds via ionic bond to the mRNA, which has a negatively charged backbone, and delivers it to the cell to synthesize antibody proteins. However, these LNPs face hydrolysis of unstable mRNA. In acidic pH (below 3), Our target anthocyanin for this investigation can be protonated and produce flavylium ions; their positive charge enables them to act like cationic lipid, and bind to the negatively charged backbone mRNA, stabilizing it for delivery to the cell. Therefore, by controlling the pH of the delivery environment, anthocyanin can replace the cationic lipids used in BioNTech/Pfizer Covid vaccine to stabilize the mRNA-lipid nanoparticles (LNP), protect them from hydrolysis, and make a safe delivery and long-term storage at a higher temperature. This study uses Gaussian to design for oligomers and monomers/polymers of nthocyanin that can stabilize nRNA strands. In order to design a more stable mRNA-LNP this study evaluated different structures for the LNP technology. In addition, docking experiments are performed to approach the LNP design with the most effective scaffold for the mRNA of COVID vaccines.

Artificial Intelligence Systems and Predictive AI: Creating Solutions to the Climate Crisis While Ensuring AI's Cybersecurity

Roziya Lakhram, Rozalia Lakhram, Jessie Chen, Afnan Joarder, Kevin Singh, Andrew M Singh, Atiqa Tirmizi & Nazrul I Khandaker

Mentor: Andrew Singh

Discipline: Earth Science Education

In 2016, the U.S. measured 6,340.2 million metric tons of carbon dioxide in GHG (greenhouse gas) emissions. GHG emissions are produced due to the energy, building, transport, land usage, food production, and agricultural sectors. Recent developments to combat climate change have introduced AI systems (artificial intelligence systems) in modern sectors to monitor their carbon footprint and GHG emissions. AI systems are now used to analyze, interpret, and assess large data sets on industries' operations and value chains to provide sectors with vital information on their GHG emissions. Predictive AI utilizes data analysis and machine learning (ML) to forecast an industry's future GHG emissions and carbon footprint, equipping industries with statistics to make better-informed decisions to achieve net-zero emission goals. While AI systems show great promise against climate change, they are vulnerable to cyberattacks. Two possible cyberthreats to AI technology are data poisoning and evasion attacks. In data poisoning, hackers manipulate parameters of ML training data and feed the AI system with malicious information, causing the system to learn fraudulent data which disrupts the system's proper functionality. Evasion attacks subtly alter input information to fool the ML system, creating inaccurate predictions and misclassifications. Evasion attacks and data poisoning can sabotage industries' operations and jeopardize AI systems combating climate change. With the growth of AI systems, Cyber Magazine projects 3.5 million potential job openings in cybersecurity, particularly targeting underserved communities, by 2025. The NASA MAA K1–12 STEM Education Project seeks to increase STEM professionals in minority areas to build a diverse future STEM workforce. Through experiential learning, hands-on curriculum, and extensive team-building activities, NASA MAA introduces career paths in STEM for youth to augment the STEM ecosystem and increase the cybersecurity of AI systems.

A Python-Driven Analysis and Visualization of Nike Shoe Sales Data

Rajheem N Kiem

Mentor: Thitima Srivatanakul

Discipline: Computer Science

This study explores consumer reception of Nike shoes, utilizing a dataset obtained from Kaggle. Using this dataset, we can explore what was a favorite on the market by importing the dataset into Google Colabatory and using Python coding language to help find an analysis with Nike shoe sales.

Unveiling the Relationship Between Autistic Traits and Negative Self-perception: The Role of Camouflaging Strategies

Elisheva Conway, Ayala Feder, Reyana Persaud, Amanda Seepersaud & Faiza Mughal (Seminar presentation)

Mentor: Usha Barahmand

Discipline: Psychology

To better navigate the social world, many individuals with autistic traits tend to engage in camouflaging. Camouflaging is made of three factors, compensation, employing strategies to overcome social difficulties, masking, employing strategies to hide autistic traits, and assimilation, employing techniques to blend in with others in uncomfortable social settings. In a previous study, we found the link between camouflaging and self-efficacy was meditated by self-compassion and self-critical rumination. This study focused on determining which of the three camouflaging strategies links autistic traits to self-critical rumination and self-compassion. There were 283 participants in this non-experimental study, 169 females, 96 males, and 18 non-binary individuals between 18 and 69 years old (M = 27, SD = 9.44). The participants were recruited through social media platforms where they were invited to complete a Microsoft Form which included various self-report measures. The data were compiled in Excel, and JAMOVI and SPSS were used to run correlation and mediation analyses. The results indicated that the relationship between autistic traits and self-critical rumination was significantly positively mediated by assimilation. Additionally, the relationship between autistic traits and self-compassion was significantly negatively mediated by assimilation. These findings highlight the important role that the specific factor assimilation plays in the relationship between autistic traits and the cognitive processes of self-critical rumination and self-compassion. Our findings imply the necessity for efforts toward reducing stigma and discrimination experienced by people with autistic traits, which contribute to these individuals feeling pressured to camouflage.

Transdiagnostic Dimensions to Validate a Profile Approach to Classify Premenstrual Dysphoric Disorder

Betty Yuabov, Amisha Tewari, Simona Iskander & Kayla Castellanos

Mentor: Usha Baramand

Disciplines: Psychology and Philosophy

In response to the widely recognized limitations of the Diagnostic and Statistical Manual of Mental Disorders (DSM), a proposal has been made that emotional disorders be conceptualized using a set of transdiagnostic dimensions that could be plotted into a visual profile and categorized/labeled based on empirically derived cut-points or subgroupings. This study aimed to investigate the applicability of the dimensional approach to premenstrual dysphoric disorder (PMDD), currently classified as a depressive disorder. A sample of 337 menstruating women (91 with PMDD and 246 without PMDD) between the ages of 18 and 51 were recruited for the study. Data were collected through self-report measures assessing the proposed emotional dimensions as well as the severity of PMDD symptoms. Data were analyzed using multiple regression and logistic regression analyses. Results revealed that the dimensions of neurotic temperament, depression, autonomic arousal, somatic anxiety, and traumatic reexperiencing explained significant amounts of variance in PMDD symptom severity, while intrusive cognitions, social concerns, and avoidance failed to make significant contributions. Logistic regression was performed to determine the contributions of neurotic temperament, depression, autonomic arousal, somatic anxiety, and traumatic reexperiencing on the likelihood of identifying the individual as having PMDD. The logistic regression model was statistically significant, explaining 29.9% (Nagelkerke R2) of the variance in PMDD and the percentage accuracy of classification was 78.1%. Results show that greater traumatic reexperiencing was associated with an increased likelihood of PMDD diagnosis. Findings provide support for the proposed transdiagnostic dimensions. Keywords: dimensional view, emotional disorders, premenstrual dysphoric disorder

Assessing the Historical Water Quality of Jamaica Bay, New York

Kera Johnson

Mentor: Ratan Dhar

Discipline: Environmental Science

Jamaica Bay offers a unique setting for wildlife conservation and urban recreation. The bay is located on the southern shore of Long Island's western side, New York. The bay covers approximately 100 square km in area. Despite the reality that New York has cleaned most bodies of water including the Jamaica Bay, the bay's ecosystem has had a lot of environmental issues in the last several decades. Large volumes of partially treated sewage are discharged into the bay. This study analyzed how urbanization affected the water quality of the Jamaica Bay and to discover which location has the highest level of contaminants. We used harbor water quality data generated by NYC DEP (New York City Department of Environmental Protection) for Jamaica Bay. Five sample locations were selected for detailed water quality assessment. Different water quality components such as pH, temperature, salinity, electrical conductivity, dissolved oxygen, chemical nutrients such as phosphate and nitrate, as well as fecal indicator bacteria were assessed, and the data was logged on an excel sheet and the results were presented in a graphical format. We also compared enterococci level with the different water quality parameters for each site. The analysis of the data show that at site BB2 which is located at the center of urban development, had the greater level of enterococci (59,000 cells/100ml). This indicates that there is a higher level of contaminants discharging from this region into the bay than the other four sampling sites. The trends indicated that the salinity levels increase over the decades in all five sites. It was also noted that during warmer temperature enterococci levels tend to increase as opposed to the cooler temperature. The trend also depicted higher nitrate levels in each site which ranged between 0.1 and 1 mg/L. When dissolved oxygen (DO) levels was compared with the level of enterococci in each site, the results indicated that with an increase in DO there is a decrease in the enterococci levels for all sites. The results also show a constant level of pH for the five sites which ranges between 7.0 and 8.5. In conclusion, we observed higher levels of contaminants are discharging from sites BB2 and BB4 which are surrounded by urban development. It is an indication that wastewater runoffs are entering into the bay.

Cybersecurity and Critical Infrastructure in the Geosciences – Essential Education for the Cyber-physical Future

Andrew Singh, *Kevin Singh, Nazrul Khandaker, Jessie Chen, Adriana Sanchez, Daniela Brillon, Nazifa Maher & Ashley Sawh*

Mentor: Nazrul Khandaker

Discipline: Geology

The Cybersecurity and Infrastructure Security Agency (CISA) specifies 16 critical infrastructure (CI) sectors which are so vital that their destruction or incapacitation would have a debilitating effect on national security, economy, public health, and safety. For geosciences, these include critical manufacturing (which relies on critical minerals and equipment), the energy sector, nuclear reactors and water. CISA notes that today's attacks are a result of hybrid attacks targeting both physical and cyber assets. For example, CI's rely on industrial control systems (ICS) for safe and efficient operation. In 2010, the Stuxnet malware targeted a multinational vendor's control systems - disrupting machinery employed in power plants, resulting in physical damage. As long as we rely on digital connectivity, cyberspace, internet, and a generally technologically driven future, cyber threats will persist. Given that these are persistent threats, the estimated budget for civilian cyber security expenditure is 12.7 billion for FY 2024. These attacks often carry a monetary motivation. Ransomware payments amounted to 400 million in 2020 according to whitehouse.gov. The true extent of damage may never be fully known, as energy.gov states that no lasting damage to US utilities has been publicly reported. Based on a detailed analysis of numerous well-prepared government and industry-professional reports, one author is inclined to conclude that while cyber security is paramount, it is already well in hand. Several US government agencies are hard at work protecting America from numerous persistent cyber threats. Government agencies and privately held companies provide their employees with excellent training in cyber defense. This training is largely available to the public for free. The York College NASA STEM Cybersecurity Program powered by AT&T was designed to provide this to students who would not otherwise have access to digital literacy while opening the door to opportunities in the rapidly growing industry of cybersecurity. York has been offering lessons to high schoolers since 2022 to create more good-actors who are cyber-literate, particularly within underrepresented groups from southeast Queens, New York city. Regardless of their job title or industry, all good-actors who receive sufficient training will be an asset to their employer or shareholders in the future.

York College-Hosted STEM Program Continues to Pique Students Interest in STEM Disciplines and Building STEM Learning Ecosystems

Andrew Singh, Tyler Shirrekrisengee, Afnan Joarder, Krishna Mahabir, Matthew Khargie, Omadevi Singh & Adacia Teemal

Mentor: Nazrul Khandaker

Discipline: Earth Science Education

Allowing urban students (K9-12) effective access to NASA STEM education-related resources is becoming a formidable pathway to augment outreach initiatives of the MUREP Aerospace Academy (MAA), housed in York College (City University of New York). The free NASA program aims at increasing STEM awareness, training, engaging, and motivating underserved students from the community. Grade-specific representative STEM lessons covering fundamental mathematics, science, engineering design, python-based programming language, cybersecurity, rocketry, aerodynamics, earth and space, science literacy and effective communication skills were disseminated through interactive, hands-on and experiential learning environments. MAA succeeded the previous NASA program known as the Science, Engineering, Mathematics and Aerospace Academy (SEMAA). Between SEMAA and MAA, York has served over 30,000 students since its inception in 1999. In terms of demographic distribution, African American students always led the bulk of the attending students, followed by Asian and Hispanic representations. Many students who participated in the program went on to complete STEM majors, several who earned PhDs in STEM fields. A notable aspect of the program is the involvement of the parents and caregivers through the Family Focus Group (FFG). FFG meets regularly during the operation of the program and acts as a catalyst to conveying STEM resources to the community, making Earth and space science compelling for diverse participants. The recently concluded summer 2023 in-person session ended with over 200 enrollments. This is remarkable, and testifies to the notion that students' continued participation throughout the year in STEM-related after school programs can foster their affinity towards STEM subjects and build their knowledge base to become college ready. A few students who participated in the summer program have already received an acceptance to begin their undergraduate education in STEM fields in fall 2023. Students communicated with the MAA staff and were very appreciative of the experiential knowledge gained through the program and how timely corporate partnerships rendered by the AT&T, Con Edison and National Grid made the program attractive and relevant, and how favored their eventual selections to the undergraduate program in reputed colleges/universities.

How has Introducing Cybersecurity Lessons Improved K9-16 Participation in York College Hosted STEM Program?

Andrew Singh, Brian Sukhnandan, Sol De Leon Cruz, Coreyn Roman, Farhan Tanvir & Ality Aghedo

Mentor: Nazrul Khandaker

Discipline: Earth Science Education

The newly introduced cybersecurity lessons have resulted in increased participants due to rising student interest. Corporate funding from the AT&T enabled York's STEM Program to devise lessons on three specific themes. 1) Technical Capabilities: Exploring tools and concepts which cybersecurity professionals may use to aid students who want to make this career choice. 2) Unconventional Perspectives: Inspiring creative thinking so that students can understand how exploits are discovered and fixed. 3) Strategic Reasoning: Encouraging students to think about the tradeoffs between access, usability and security, and reminding them that steps like securing their Wi-Fi or to avoiding clicking links in email to prevent phishing are low-cost high-reward practices. In addition, the early involvement of undergraduate and high school students in research training yielded fruitful outcome. Presentation of their summer research outcomes to professional organizations such as the Geological Society of America and American Geophysical Union-hosted annual meetings created a conducive academic environment for these students. Since 2015, York's program has trained pre-service teachers, teachers' aides, and geology undergraduates and offered the rare opportunity to attend and present their STEM research posters. This milestone can only be accomplished through well-coordinated planning during the summer months. It demonstrates a major fulfillment of imparting STEM education and validates the direct involvement and peer mentoring of K9-16 students in research. As many undergraduates and high school students are applying for summer internships, prior STEM experience is a desirable credential to better compete with their peers. In terms of gender, male and female students' enrollment amounted to 60% and 40% respectively. Based on K9-12 participants, an increased junior and senior high schoolers will positively impact on the York's STEM program by ensuring greater research productivity, an increased number of college-bound students with a STEM preference, and sustained growth of the program for years to come.

Preliminary Geochemical and Mineralogical Assessment of the Beach Sand, Vieques, Puerto Rico

Kathy H. Robbins, Andrew Singh & Toralv Munro

Mentor: Nazrul Khandaker

Discipline: Geology

Representative beach sand samples were collected from Vieques (18.095901948142554, -65.49229758368986; Puerto Rico) and chemically analyzed for provenance interpretation. Puerto Rico is the eastern-most island of the Greater Antilles, which is a group of islands in the Caribbean Sea that includes the countries of Cuba, Hispaniola (Haiti and the Dominican Republic), Jamaica, and the U.S. territory – the Commonwealth of Puerto Rico. Puerto Rico (and its outlying islands of Culebra and Vieques), along with the U.S and British Virgin Islands are the subaerial form of a microplate that exists at a seismically active plate boundary between the North American plate and the northeast margin of the Caribbean plate (United States Geological Survey Bulletin #1042-1, 1957). The Black Sand Beach is a short drive from the town of La Esperanza and it's about a quarter of a mile long. Samples were collected from low-and high tide dominated areas. The most abundant heavy mineral in the beach sands of Puerto Rico is magnetite. It occurs on all shores of the island. Ilmenite is present, associated with the magnetite. The beach sands also contain minor amounts of chromite. The west and southwest shores, from Punta Guanajiba to Ponce, are composed of weathered rocks, mangrove swamps, and beaches composed of shell fragments. Heavy minerals are a major constituent of the beach sand in many places on the south coast and magnetite often constitutes more than 15 percent of the sand. The east coast, from the Rio Grande de Patillas to Naguabo, consists of outcropping volcanic and intrusive rocks of Cretaceous and early Tertiary age and sandy beaches. Rich concentrations of heavy minerals occur locally. Both bulk oxide (silica, alumina, soda, potash, magnesia, both ferrous and ferric oxide, calcium oxide, etc.) and trace elements (Ti, Zr, Y, Cr, Sr, Rb, Ce, La, etc.) analyses were performed on collected sands by using both X-ray Fluorescence (XRF) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Based on geochemical discriminating factor, there seemed to be an affinity of most of the black sands with volcanic-sourced derivation. Ceaseless shoreline processes ultimately fractionated heavy mineral concentrations in black sands due to hydraulic sorting.

Assessment of Peer Mentoring in Geoscience Research shows Positive Outcome

Andrew Singh, Charren C. Cabaroy, Ali Zarine, Atiqa Tirmizi, Zachary A. Sanichar, Shirley Jackson & Krishna Mahabir

Mentor: Nazrul Khandaker

Discipline: Geology

Our current peer mentoring is heavily tied up with students - both undergraduate and high school - and their early involvement in geosciences-related research. Since 2004, through our various initiatives, over 1200 students have benefitted from this opportunity and successfully presented their research outcomes related to surficial geology, resource geology and infrastructure developments, geoscience education and outreach, introducing innovative geoscience curriculum, soil erosion, natural hazards, extreme-weather related events, natural resource managements, and python-based programming in assessing ancient and now-a-days active geological phenomena. Many student authors from urban, non-urban, and overseas settings have demonstrated their first-hand learning on various topics listed above and showed the potential to seek or undertake graduate admission to further their knowledge in the geosciences. Also, students who joined the workforce expressed their satisfaction to us in how an early involvement in research piqued their curiosity and thirst for knowledge to focus on a topic and bring it to fruition. Many employers valued the undergraduate research experience and provided favorable comments to the hiring team. While at the meeting, presenting students faced both academics and professionals from industry, private enterprise, local city and federal agencies. The close encounter with a diverse group at the poster session brought in a plethora of direct communication opportunities for the presenters and allowed students to get a feel for the breadth of the geosciences as it relates to practical application. It is extremely vital for undergraduates and high school students to see for themselves the way geosciences are getting diversified and prepare adequately to join the next generation of geoscientists. Given the dwindling enrollment in many geoscience programs, particularly in the aftermath of COVID-19, encouraging students to participate in summer research, internships or faculty-supervised independent study can alleviate the situation. The demand for well-trained geoscientists is not going to diminish, rather increase with the increase of infrastructure development, maintenance and capital construction projects, and overcoming the shortage of critical minerals will necessitate an additional pool of well-trained geologists.

Geochemical Analysis of Recent Volcanic Ash Blanketing Barbados and Constraints on Magma Composition

Krishna Mahabir, Surendranauth Mahabir, Lloyd Kiefer, Juan C. Campo & Andrew Singh

Mentor: Nazrul Khandaker

Discipline: Geology

Like the ash itself, the scientific literature on the properties of volcanic ash is fragmented and dispersed. We produced new chemical and physical measurements from 40 ash samples sourced from airfall deposits from across the globe. Samples were sieved to <25 μm and 25-45 μm diameters, grainsizes that are most relevant for sustained atmospheric residence and widespread dispersion, and compared to data from the bulk sample to investigate size-dependent variation. Our samples come from 25 volcanoes, classified primarily as intraplate or arc-related, with a few in complex environments. Here, we present a set of novel methods and results for XRF, XRD, LA-ICP-MS, and SEM-based image analysis measurements on the samples. We demonstrate that the fractions of volcanic glass, feldspars and clinopyroxenes (on average constituting 86 wt% of all samples) are correlated and may be constrained from tectonic setting, eruption style, and grainsize. Such data-based estimations of modal data allow fundamental properties to be derived on a weighted basis. We illustrate this by calculating the pore-free density of all samples; our results show that the density may be estimated from the clinopyroxene fraction alone, providing a better fit to chemistry-based estimates. We worked on a method to obtain a full set of major and trace element data from LA-ICP-MS measurements on powder pellets, which we validate against external XRF data and literature values for each eruption. Fine ash differs from the bulk ash deposited at the same location by its modal composition, bulk chemistry, and particle morphology. We found that bulk chemistry and phase assemblage are predominantly determined by tectonic setting and deep crystallization, while eruptive and atmospheric processes modify the petrography and the physical and chemical attributes of the fine ash. The characteristics of fine ash reported here are more appropriate than comparable measurements for larger particles or bulk measurements as inputs for ash cloud forecasting and retrieval algorithms, modeling of atmospheric impacts and interactions, and medial-to-distal assessments of environmental impacts. Our data provides a consistent reference database for the atmospheric science and volcanological community on the physical and chemical properties of fine volcanic ash.

Sedimentology and Chemical Composition of the Silurian Binnewater Sandstone, Ulster County, NY

Nazifa Haniff, Machel Hoden, Atiqa Tirmizi, Andrew Singh & Stanley Schleifer

Mentor: Nazrul Khandaker

Discipline: Geology

The Silurian Binnewater Sandstone (Sb), outcropping in Rosendale, N. Y., was studied in the field and in the laboratory using petrographic, sedimentological and X-Ray Fluorescence (XRF) techniques. The investigation focuses on the Taconic Highland, the probable source area for the sediments of the sandstone and the Acadian Orogeny, the major tectonic event affecting the sandstone and adjacent strata; it also considers provenance, sediment characteristics and diagenesis of the sandstone. Standard field tests including mineral identification, texture, degree of induration, and type of cementation were conducted. Primary sedimentary features, including asymmetrical ripple marks, interference ripple marks, low angle cross-bedding, and mud cracks were observed in the field. Sporadic distribution of ichnofaunal assemblages was very apparent in several horizons, suggesting a shallow marine to near shore, wave-dominated depositional setting. Shale of varying composition and color was observed interbedded in the sandstone. Laboratory work was carried out at York College on collected samples. The laboratory work included thin section analysis of samples from different outcrops in the study area which revealed minerals such as chert, plagioclase feldspars, microcline , muscovite, biotite, mono-and polycrystalline quartz. Among the heavy minerals, well-rounded tourmaline, zircon, rutile, and trace garnet were the dominant constituents. In situ XRF, (hand-held type), readings taken in the field recorded a relatively large concentration include Fe, K, Ca, Ti, and Mn; present in lower concentration are Cr, Ni, Cu, Zn, As, Rb, Sr, Zr, Ag, Ba, and Pb. These elements were cross potted, and the statistical correlation as well as ratios of key element-pairs were used to interpret provenance, maturity of sediments, environment of deposition, tectonic setting, and diagenesis. A mixed provenance, dominated by both reworked clastic and proximal source, was suggested by the chemical composition of the analyzed sandstone. Overall, the depositional environment of the Sb was dominated by deltaic to fluvio-deltaic, with occasional incursion of nearshore marine environment.

Exploring the Impact of Work, STEM and Non-STEM Status on Grit, Self-Efficacy and Academic Achievement

Aniyah Bradley

Mentor: Kathariya Mokrue

Discipline: Psychology

STEM (Science, Technology, Engineering, and Mathematics) fields are highly competitive and promising fields of study, but they also require a lot of work from students, making them extremely demanding. STEM fields are often perceived to be more challenging due to rigorous coursework and high expectations. The present research uses Grit as a factor in line with academic achievement and self-efficacy to examine how these factors impact both STEM and non-STEM major undergraduates while also controlling for part-time work and full-time status. Based on their field of study and employment status, participants, which include both STEM and non-STEM majors, are divided into groups using a factorial design. While controlling for these factors, the study aims to explore the roles of grit and self-efficacy on academic achievement and give light on the relationship between these factors across different academic domains. This allows for the assistance and tailoring of student success to enhance undergraduate academic achievement, irrespective of a student's field of study or status as a part-time worker. Keywords: STEM, non-STEM, grit, self-efficacy, academic achievement, part-time work

Sedimentology of the Beach Placer Deposit, Montauk Point, Long Island

Andrew Singh, Nazifa Haniff & Stanley Schleifer

Mentor: Nazrul Khandaker

Discipline: Geology

Garnet and magnetite rich sand, also enriched in monazite and zircon, has been observed and sampled near Montauk Point, Long Island. Hydraulic segregation of these components, by wave action, is responsible for producing a placer deposit of heavy mineral-rich sand. The loosely consolidated material is directly exposed to ocean waves, thus acting as a sediment source for long shore transport of sand sized sediment in a westward direction along the southern shore. Groins, built on the south shore of the island, trap the sand from the long shore transport to protect the beaches in the east but cause depletion of sand for the beaches at the western end of the island. This sediment was analyzed for its relative abundance of certain trace elements and it was shown to share similar concentrations of the same elements in the till and stratified drift of the Ronkonkoma Moraine. However, although the placer beach deposits are closer in proximity to the Ronkonkoma Moraine, further chemical analysis may indicate some similarities between the trace element compositions of the placer deposits and the stratified drift of the Harbor Hill Moraine. It is believed that sand transported along the coast comes from erosion of the bluffs at Montauk, but studies of the composition and erosion rates of these bluffs indicate that their erosion alone is insufficient to account for the entire volume of sand. (Tanski, 2007) It is possible that some originates from the erosion of the mainland and barrier beaches, and peArhaps from offshore deposits, as well. Finally, beach replenishment may have taken place, where sand is placed on the shore to build up the beach. The relative contribution of these sources is not yet clearly identified.

Income Disparity and the Black Community

Kerryann Van Velzen

Mentor: Selena Rogers

Discipline: Social Work

Enhancing mental health outcomes within Black communities necessitates addressing both economic disparities and gender inequalities. Economic insecurity, stemming from lower income levels, creates barriers to accessing fundamental necessities such as housing, healthcare, and education—key factors influencing mental well-being. The intersectionality of race and gender intensifies these obstacles for Black women, placing them at a dual disadvantage. Persistently earning less than their male counterparts, Black women face a compounded challenge, perpetuating the pervasive gender wage gap evident across racial and ethnic lines. This compounded disadvantage exacerbates the detrimental mental health effects of income disparities. To tackle these issues effectively, it is imperative to delve into the central research question: How do economic disparities shape mental health outcomes among the Black population? Investigating this query can guide initiatives aimed at narrowing the gender wage gap, fostering equitable professional opportunities, and enhancing access to affordable mental healthcare for marginalized communities. Addressing these challenges offers a promising path toward achieving positive mental health outcomes for Black individuals.

The Rise and Fall of Rofecoxib

Mahabuba Akter Lovely

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Sciences

Rofecoxib (brand name: Vioxx), a Nonsteroidal Anti Inflammatory Drug (NSAID), was developed as a selective Cyclooxygenase-2 (COX-2) inhibitor by Merck to treat adult acute pain, rheumatoid arthritis, osteoarthritis, primary dysmenorrhea, and acute migraine headaches with or without auras. Merck embarked on researching COX-2 specific inhibitors after the discovery of two different forms of cyclooxygenases, Cyclooxygenase-1 (COX-1) and Cyclooxygenase-2 (COX-2) in 1991. COX-1 is involved in providing protection of the gastrointestinal tract and in blood platelet aggregation. On the other hand, COX-2 is expressed in the vicinity of the sites of inflammation and injury. It was hypothesized that COX-2 specific inhibitors would provide relief from pain and inflammation, without interfering with the activity of the COX-1 enzyme involved in protecting the stomach. At the medically prescribed doses of 125, 25, and 50 mg, Rofecoxib has a half-life of 17 hours and an approximate 93% oral bioavailability. Rofecoxib targets proteins such as prostaglandin G/H synthase 2 and elastin. It is known that Rofecoxib is metabolized via Cytochrome P450 1A2, Cytochrome P450 3A4, Cytochrome P450 2C9, Cytochrome P450 2C8, and Prostaglandin G/H synthase 1. The pharmacodynamics, pharmacokinetics, mechanism of action and metabolism of Rofecoxib will be discussed. Rolecoxib was voluntarily taken off the market by Merck on September 30, 2004, due to concern about the elevated risk of heart attack and stroke that comes with long-term, high-dosage use.

Sedimentology of Island Beach State Park, New Jersey

Zarine Ali, Andrew Singh, Stanley Schleifer & Manpreet Kaur

Mentor: Nazrul Khandaker

Discipline: Geology

Island Beach State Park, at almost 10 miles in length, is the largest undeveloped stretch of barrier islands on the New Jersey coast, and one of the largest in the United States. This barrier island is situated between the Atlantic Ocean and Barnegat Bay. The research includes sample collection and laboratory work at York College (CUNY). Preliminary laboratory work includes grain size analysis, heavy mineral separation, and XRF chemical analysis. Sieve analysis data is represented statistically and graphically. Results indicate that the sediments are well sorted, having an average standard deviation of 0.43Φ, with a near symmetrical distribution (average skewness -0.10). The sediments are mesokurtic, and are predominately medium grained sand of average Mean 1.24 Φ. Initial heavy mineral separation revealed the sand is composed predominately of minerals of low specific gravity, such as quartz and feldspars. These minerals comprise 91-99%, by weight, of the sand grains. Trace amounts of heavy minerals such as well-rounded to subrounded zircon, rutile, magnetite, and tourmaline are present indicating that the sand was reworked from older Tertiary and Quaternary marine and barrier island sediments. Trace elements such as Zr, Hf, Ti, Ce, Cr, and Cu also suggest winnowing of sediments by hydraulic sorting and ultimate enrichment of these elements in the sand. The deposition and winnowing of sand on the barrier island is apparently in equilibrium. What this means, is that there has been little change in the overall size of the barrier island. Since the park is relatively untouched by human development, the geologic and biologic forces that shape the barrier island have been undisturbed for hundreds of years. This makes the park an ideal environment for scientific study, particularly from environmental conservation point of view.

Famotidine: Histamine-2 Receptor Antagonist

Meagan Stefanek, Jamar Weatherhead & Dylan Williamson

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Sciences

Histamine is present in different parts of the body and contributes to many important functions. The histamine produced in the stomach plays a key role in digestion by stimulating the parietal cells which are responsible for gastric acid secretion, without which digestion would be impossible. However, sometimes the stomach produces too much acid which can cause problems in the stomach and the esophagus. If left untreated, this can cause serious complications. Famotidine is a histamine-2 (H-2) receptor antagonist that blocks the histamine receptors involved in gastric acid release, causing relief in patients experiencing overproduction of acid.

Has Airbus Historically Demonstrated Greater Safety Than Boeing?

Crystal Lin, Ipsita Paul Michael Nasiukiewicz & Isaiah Jamna

Mentor: Andrew Singh

Discipline: Earth Science Education

Based on previous data, Boeing is evidently more dangerous to fly than Airbus. Airbus is the first ranked aerospace company in designing, manufacturing and delivering aerospace products, services and solutions. Boeing is one of the largest global aerospace manufacturer companies, that engage in the manufacture of commercial jetliners and defense, space and security systems. Airbus is a safer commercial aircraft company compared to Boeing. In the past year, Boeing had safety issues in regards to mechanical errors leading to fatal accidents. If we were to compare the actual amount of accidents from 2013-2023. Airbus had 29 accidents, while Boeing sticks with 32. Recently, Boeing's quality control has been called into question. Following an incident on January 5th, 2024 where a door blew off, the FAA released an Emergency Airworthiness Directive and an investigation about the cause of loosened bolts. Former and current Boeing employees have reported multiple attempts of Boeing circumventing quality procedures. Airbus had one major accident, that being the Concorde getting lit on fire in 2000. The situation started due to a DC-10 taking off prior to the Concorde, and there was sheet metal from the engine on the runway. We believe that if we compare Airbus and Boeing, Airbus is the safer company to fly with. In the past, and currently, Airbus was always second best while Boeing was top of the top, but if we compare quality control and safety, Airbus is concluded to have a safe flight to fatality ratio higher than that of Boeing.

Drones and Global Warming in Aviation

Darius Farmer & Isaiah Jamna

Mentor: Andrew Singh

Discipline: Geology

Today, airplanes release 920 million tons of CO_2 per year which is 2.5 percent of the globe's CO_2 because of the size of its combustion engine. This is more than most vehicles. On the other hand, drones emit 94% less CO2 into the air than other vehicles such as cars, boats, and planes. Drones also release little to no heat. They are powered by a small motor powered by a battery, minimizing the amount of heat transferred into the air. This makes them a lot cleaner when it comes to air quality. A similar situation can be seen in the emissions of cars. Gas cars such as the Lamborghini emit CO_2 because of its combustion engine. Unlike the Lamborghini, the Tesla does not run on a combustion engine, it runs on a battery, which helps to transition to "sustainable energy by avoiding 5.0 million metric tons of CO_2 emissions." Heat pollution is very harmful to the earth and everything in it. It impacts the climate and melts the ice of the arctic, making it harder for arctic animals to live. Drones can be used for commercial use and delivery. To conclude, drones are a better way to get around in the air without warming the globe.

Levodopa: Symptomatic Relief in Parkinson's Disease

Angelica Galicia, Milan Frazier, Lennin Garcia & Kayleen Gutierrez

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Sciences

Levodopa is one of the main medications used to treat Parkinson's Disease for which there is no cure available yet. Treatment with Levodopa is offered to patients to help relieve their symptoms, such as, for reducing tremors and muscle stiffness. Patients living with Parkinson's Disease navigate through medications, surgical procedures, changes of lifestyle, home remedies, as well as alternative medicines. Those living with Parkinson's Disease find coping strategies and support groups to be beneficial. Levodopa can pass through the blood-brain barrier and can be taken orally. It has been suggested that Levodopa may slow down the progress of Parkinson's Disease. A common off-label use for Levodopa is restless leg syndrome and periodic limb movement in sleep. Patients with Parkinson's Disease take therapies in order to help keep moving and have the ability to move. In this class project, it has been explained how Levodopa works as the precursor for dopamine along with information on available dosage forms, contraindications, pharmacodynamics, adverse effects, etc. Information will also be provided on "The Parkinson's Outcomes Project" started in 2009 by The Parkinson's Foundation and recognized as the largest-ever clinical study of Parkinson's Disease with more than 13,000 participants in five countries. Links to additional clinical trials conducted on Parkinson's Disease and Levodopa will also be provided.

Fentanyl: Key Pharmacological Characteristics

Sylvia Ayala

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Sciences

The increasing prevalence of opioid-related overdoses has prompted an urgent need for a deeper understanding of potent opioids such as fentanyl. This pharmaceutical class project aims to provide a comprehensive analysis of fentanyl, focusing on its chemical properties, pharmacological mechanisms, therapeutic uses, and potential risks. The project explores the synthesis of fentanyl and its derivatives, shedding light on the pharmaceutical processes involved. Through an extensive literature review, this study examines the historical context of fentanyl use, its evolution in the pharmaceutical industry, and its role in pain management. Emphasis is placed on elucidating the unique pharmacokinetic and pharmacodynamic characteristics of fentanyl, contributing to a nuanced understanding of its efficacy and potential adverse effects. The project also addresses the current regulatory landscape surrounding fentanyl, exploring recent developments in pharmaceutical formulations and delivery methods to enhance safety and efficacy. Special attention is given to innovations aimed at minimizing the risk of addiction and overdose associated with fentanyl use. This project seeks to provide pharmaceutical professionals with a well-rounded understanding of fentanyl, offering insights that can inform responsible prescribing practices and contribute to the ongoing efforts to mitigate the opioid crisis. By bridging the gap between theoretical knowledge and practical applications, this analysis aims to foster a more informed and conscientious approach to the utilization of fentanyl in pharmaceutical contexts.

Overview of Zocor

David Burjak

Mentor: Deb Chakravarti

Discipline: Pharmaceutical Sciences

Statins comprise of a class of drugs that can help lower the blood level of low-density lipoprotein (LDL) cholesterol, also called "bad cholesterol" that can cause plaque to build up in the arteries. Plaque deposition can lead to a number of diseases, such as, heart disease, stroke. Statin therapy is used to prevent or reduce mortality due to fatal and non-fatal heart attacks and strokes, as well as to decrease the risk of atherosclerotic cardiovascular disease (ASCVD). Patients are screened for ASCVD risk in order to determine their chance of experiencing the first cardiovascular event during the next 10-years of their life. Examples of statins include atorvastatin (Lipitor), lovastatin (Altoprev), pitavastatin (Livalo), pravastatin (Pravachol), rosuvastatin (Crestor), simvastatin (Zocor), and fluvastatin (Lescol). This class project will focus on simvastatin (Zocor). The mechanism of action of the drug, its indications, dosing, warnings/precautions, contraindications as well as pharmacodynamics, pharmacokinetics will be reviewed along with the clinical study – Heart Protection Study, also known as HPS.

About the Office of Undergraduate Research

Program Missions

To promote and facilitate student engagement in research, scholarship, and creative activity to provide experiential learning and develop well-prepared and confident students ready to embark on a career of their choice.

To coordinate and sponsor activities that foster learning communities built around common themes aimed at eliminating student isolation and passivity. A goal achieved by assembling students and faculty with synergistic academic interests and aspirations.

Participating in Undergraduate Research

Based on the definition provided by the Council on Undergraduate Research, undergraduate research is "an inquiry or investigation conducted by an undergraduate student that makes an original intellectual or creative contribution to the discipline". Students from all backgrounds and disciplines are eligible to participate in undergraduate research; the only thing required is an expressed interest to inquire, explore, and discover new ideas under the guidance of a faculty facilitator. You can start by registering with the Office of Undergraduate Research. See also the Resources for the Undergraduate Researcher.

Benefits of Undergraduate Research

- An opportunity to inquire, explore and discover ideas under the mentorship of York's esteemed faculty.
- Expand problem-solving techniques, creativity, teamwork, and critical thinking abilities.
- Gain "hands-on" experiences that are translatable to real-world skills.

Experiential learning provides students with the skills to be inquisitive, critically evaluate information, and use their ingenuity to explore, discover, and create.

Program Sponsored Activities

The Office of Undergraduate Research provides undergraduate researchers guidance to become well-rounded scholars destined to be movers and leaders of their communities. The following are examples of activities the Office works to facilitate:

- Linking undergraduates and faculty members with similar research, scholarship, and creative endeavors.
- Providing access to workshops, career talks, field trips, and other academic enrichment activities.
- Helping students apply for scholarships and/or paid internships, when available.
- Developing the undergraduate's written, oral, and poster presentation skills.
- Seeking financial support for the undergraduate researcher's participation in on-campus, regional, and national conferences. This includes sponsoring York's Annual Undergraduate Research Day held in spring.
- Advising students on how to put together job applications or how to go about submitting applications to pursue graduate degrees.
- Sponsoring faculty mentor recognition events and, when possible, providing grant writing aid in collaboration with the Office of Research and Sponsored Programs.
- Highlighting a repository of student results, findings, and/or creative works that is accessible to the York College population.

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Office of Research and Sponsored Programs

Dawn Hewitt, *Director*
Desirelyn Haliburton, *Grants Assistant*
Makesha Balkaran, *Senior Administrative Assistant*

Office of Undergraduate Research (OUR)

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Artwork: Kenny Beck, Laura Pugliese & Makesha Balkaran
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Research Funding Agencies

About York

York College has over 60 undergraduate majors, to name a few: Accounting, Aviation Management, Anthropology, Art History, Biology, Biotechnology, Black Studies, Business Administration, Chemistry, Communications Technology, Computer Science, Economics, English, Movement Science, Music, Nursing, Physics, Psychology, Social Work, Speech Theatre Arts, Art Studio, and Teacher Education.

The College also offers the following graduate programs: MS in Pharmaceutical Science and Business, MS in Clinical Trial Management, MS in Aviation Management, MS in Nursing Education, MS in Physician Assistant, Master of Social Work (MSW), and one combined program in Occupational Therapy (BS/MS). In addition, in some programs York offers unique degrees known as 4+1. In a 4+1, undergraduate students are allowed to take up to 16 graduate credits, and then be able to receive a master's degree in one additional year.

An emphasis at York College is to connect majors to experiences and careers. Some examples are: York College offers a baccalaureate degree in Aviation Management, capitalizing on the many job opportunities available at Kennedy Airport and other local and national airports. The Music program includes an emphasis on jazz, with the opportunity to play in the college's popular jazz band. The English major includes an optional minor in journalism, with hands-on training available with the multiple-award-winning York College newspaper, "Pandora's Box." York also offers a Journalism major, designed to feed into the CUNY Graduate School of Journalism.

York's award-winning faculty members pride themselves not just on their teaching abilities, but on their dedication to the development of their students into successful global citizens. It is not unusual for a York professor to spend countless personal hours ensuring that their students succeed in their classes and career choices.

York College students are a cross-section of New York City's diverse population, representing at least 80 countries, from Algeria to Zambia, and speaking over 50 languages. Our students consistently win prestigious academic awards. Recent recipients include back-to-back Salk Scholars, Fiona Smith ('05) and Max Seanz ('06); Yi Di Zhang ('06), recipient of a full graduate fellowship from the Stevens Institute of Technology; Yisa Rumala ('06), recipient of a National Science Foundation Graduate Research Fellowship; Vanessa Crevecoeur ('07), winner of a UNCF/Merck Undergraduate Science Research Fellowship; Robert Fernandez '13, winner of a $90,000 Soros Fellowship toward his PhD in Molecular Biophysics at Yale University; and Clinton Ehidom '18, the 19 year-old graduate who received seven medical school acceptance letters and now attends the Zucker School of Medicine at Hofstra/Northwell (Hofstra University).