PRISM
at JOHN JAY COLLEGE
PROGRAM FOR RESEARCH INITIATIVES
IN SCIENCE AND MATH

Undergraduate Research
CHRONICLE

2023

choose your future

challenge yourself

investigate

engage

network

inquire

examine

build connections

question

choose your future

Cover Shot:
Agar plates with colonies of the pathogenic yeast *Candida albicans*. *C. albicans* is a member of our human microbiota and normally lives in our gastrointestinal track and our mouths. Although it is a normal resident of our body's microbial community, this fungi can cause disease (candidiasis) in immunocompromised patients or switch to a more pathogenic form under various environmental conditions.

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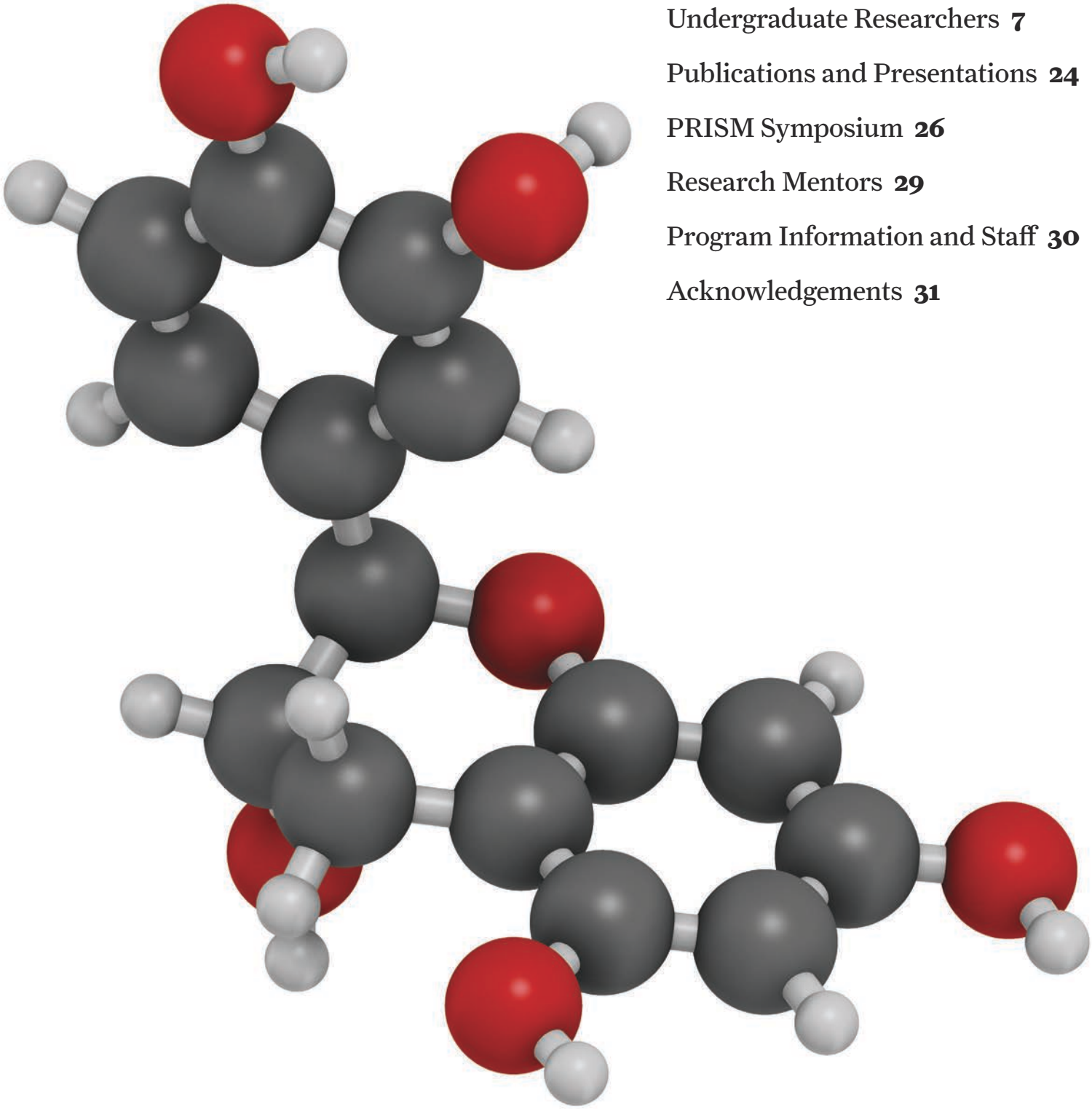
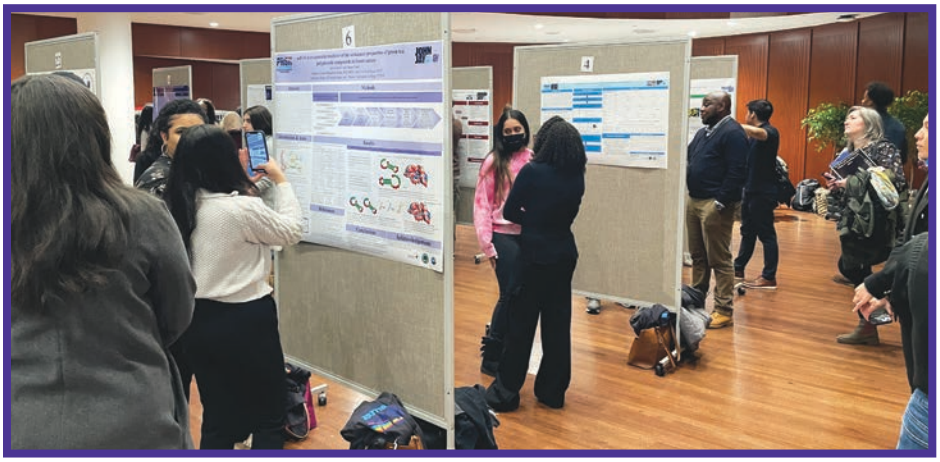
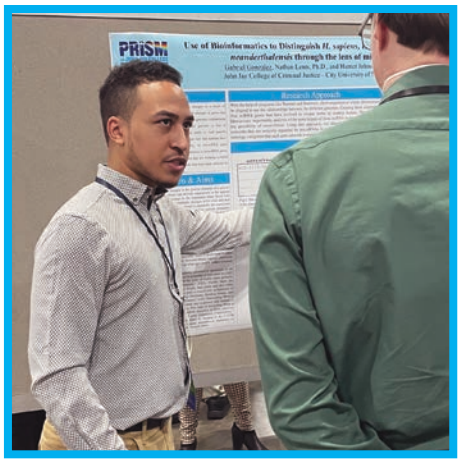


This publication was produced by the Program for Research Initiatives in Science and Math (PRISM) in collaboration with the Office of Marketing and Development at John Jay College of Criminal Justice of the City University of New York. For more information please email the staff at **PRISM@jjay.cuny.edu** or visit **www.jjay.cuny.edu/PRISM**

> **PRISM is comprised of some of the best scientists at John Jay, among whom I have thrived as much as I have because of their endless respect and support.**
>
> **—Tahya L. Hurn**





> **My experience in PRISM's URP has made significant contributions to my development as a scientist, and it taught me that I enjoy doing research.**
>
> **—Daniel Aguilar**

ANTHONY CARPI
PRISM Director

Democratizing Science

EDGARDO SANABRIA-VALENTÍN
PRISM Associate Director

AS BUDDING SCIENCE AND TECHNOLOGY PROFESSIONALS, you will have the opportunity to contribute to discoveries, develop new tools, and impact the day-to-day life of millions of people. Your voice and the unique set of experiences you bring to this work will directly influence how these contributions advance humanity towards our common future. Long gone are the days in which only certain people were allowed to formally participate in the process of discovery, although we still have work to do to ensure everyone's voice is taken into consideration. This is why John Jay College and PRISM remain committed to our common mission: *To educate fierce advocates for justice in its many dimensions and to diversify the STEM workforce.* Our hope is that your education, your training, your drive, and your voice will empower you to be part of the decisions that impact scientific advancement.

Sixteen years ago, when PRISM was founded, only the field of forensic science was represented among our students. With the diversification of our science majors, the inclusion of math and computer science researchers, and the increase in the number of faculty mentors and the fields they represent, you are poised to expand the reach our alumni have in shaping the future. Nowhere is this more notable than in the large diversity of programs and careers you and your peers are pursuing in the coming year. Our Outstanding Undergraduate Researcher, Kimberly Nunez (p. 14), will begin a marine sciences master's program at University College Cork in Ireland. Tahya Hurn (p. 8) will help produce life-saving treatments developed at Regeneron as a Biotechnology Production Specialist. Faton Haxhiu (p. 22) is putting his cybersecurity training to work as a Helpdesk Analyst at Skopein Technology Solutions. Tyra Volney (p.18) will begin a master's program in forensic science at Sam Houston University in Texas. Alyssa Reynolds (p.23), Camilla Marino (p. 21), Nora Zadori (p. 21), and Sara Elshaer (p. 11) will participate in internships at criminal justice institutions like the Federal Bureau of Investigation, the NYC Office of the Chief Medical Examiner, and the Suffolk Crime Laboratories, among others.

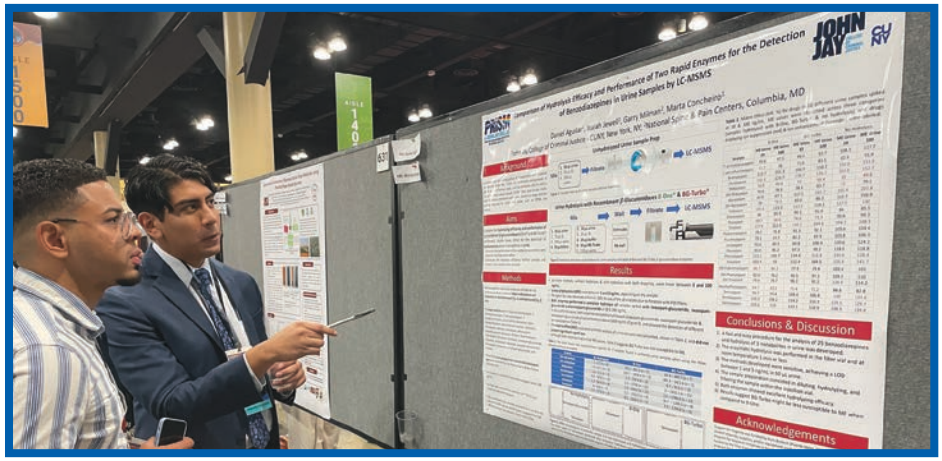
Our commitment to ensure you are equipped to become professionals in science and technology remains steadfast. We are and continue to be exceedingly proud of you and your accomplishments as you become FIERCE ADVOCATES FOR DIVERSITY, INCLUSION, AND JUSTICE IN SCIENCE!

“PRISM offered me the opportunity to learn how research is performed through practice and to build a network with my teammates, mentor, and other faculty members.”

—Ayesha Akhter

“I choose to be involved in scientific research because, through it, we gain insights into the workings of the universe, from the smallest subatomic particles to the largest celestial bodies.”

—Sara Elshaer



UNDERGRADUATE RESEARCHERS

John Jay PRISM Undergraduate Researchers conduct mentored research in five broad disciplines—forensic science, biomedical sciences, toxicology, organic chemistry, and computer science. Together with their Faculty Mentors, they are pushing the boundaries of science. The following pages contain more detailed information about our incredible students and the innovative research projects on which they work.

FORENSIC SCIENCES

The field of forensic science applies varied disciplines—including biology, chemistry, anthropology, and psychology—to investigate crimes related to criminal and/or civil law. A forensic scientist preserves and analyzes evidence using techniques from these scientific disciplines, while maintaining legally-mandated standards so that the evidence is allowable in court.

Criminalistics

Criminalistics uses scientific methods and principles during the criminal investigation process to analyze physical evidence—such as chemical traces, ballistic evidence, controlled substances, genetic material, and marks on tools employed in a crime. PRISM students use the latest technologies to develop more and marks on tools employed in a crime. PRISM students use the latest technologies to develop more sensitive methods for the detection of illicit substances and to analyze evidence found during criminal investigations.

Suleidy De La Cruz Baez

The Battle of the DNA Bots (Dr. Mechthild Prinz)

I have always been described as an inquisitive and creative person, constantly trying to figure out how things around me worked or trying to create something of my own. For me, explaining scientific concepts, successfully carrying out experiments and learning new things always makes me feel an indescribable sense of joy. Even as a child, I knew I wanted a career in science. In high school I was placed into a forensic science class, and I loved every second of it. I yearned to learn more and decided I wanted a career in forensic science. Thanks to Dr. Prinz I was able to discover my passion for working in a lab. As a member of PRISM, I have learned that research takes a lot of time and dedication, but it is worth every second.

My research compares manual and automated DNA extraction methods for biological evidence to compare the quality and quantity of extracted DNA. The manual method explored is the Chelex 100 protocol and the automated DNA extraction methods to be compared in this research will be the EZ1 Advanced and QIAcube robots from QIAGEN. Our work will allow other forensic scientists to determine which method is best to use in different types of evidence.

Brooke Fontaine

Assessing the Impact Dynamics of Less Lethal Bean Bag Ammunition (Dr. Peter Diaczuk)

Growing up, I was always curious about the world around me. From the first time I used a microscope when I was young, I knew that I wanted to pursue a career in science. I first learned about forensic science through popular crime television shows. Ever since taking a forensics class in high school and interning at my local forensics' laboratory, my passion for this field only grew. Joining PRISM has not only helped me become more confident in researching and problem solving, but it has provided me with unique opportunity to learn and work with experts in their fields.

Bean bag ammunition is one of the many types of less lethal ammunition used by law enforcement to control various situations. For my research, I investigate the effectiveness and potential damage of bean bag ammunition on simulated body tissue to provide guidelines to law enforcement for the use of this ammunition in crowd control.

Forensic Entomology

Entomology is a branch of biology that studies insects. Forensic scientists often use the identification of insects in or around a cadaver or other remains to determine the time of death, or whether a cadaver was moved after death. Our students are studying how environmental and ecological factors found at a crime scene affect the determination of a victim's time of death.

Tahya L. Hurn

The Microbiome of Blow Fly Eggs: Understanding the Role of Bacteria in Blow Fly Colonization and Postmortem Decomposition (Dr. Jennifer Rosati)

My passion for science started when I lost my dad, sparking my interest in forensic science. The idea of being able to bring closure to others brings closure to me. I aim to start in an entry-level lab and increase my experience as much as possible. Eventually, I want to pursue an master's degree in forensic science or biology. Completing my degree at John Jay will allow me to achieve my goals; I now have the confidence to expose myself to varying opportunities. PRISM is comprised of some of the best scientists at John Jay, among whom I have thrived as much as I have because of their endless respect and support.

Our lab investigates the identification of bacteria on blow fly eggs to determine relationships between egg microbiome, blow fly recruitment, and colonization in cadavers. This will further our understanding of the bacterial microbiomes present during decomposition and their influence on blowfly recruitment and colonization.

Amarelis Lava

Case Simulation Micro-Study: The Effect of Body Exposure on Blow fly Colonization (Dr. Jennifer Rosati)

When young, I was obsessed with documentaries revolving around true crime and how forensics aided in crucial discoveries postmortem. I was always curious about how these discoveries were made and asked my parents questions like "how" and "why", although my parents could not give me many answers. My curiosity continued to grow, leading to my decision to pursue science to find out for myself. I want to pursue a career that involves being in the field, such as a forensic autopsy technician or a forensic medical examiner. PRISM has helped me become more confident in my abilities and challenged my critical thinking skills in addition to opening different roads for me to pursue within forensics.

My research quantifies changes in blow fly colonization behavior by measuring its time and location of colonization. Small changes in the colonization (or egg-laying) behavior of blow flies can have large impacts when using their larval developmental cycles in post-mortem investigation estimations.

BIOMEDICAL SCIENCES

Biomedical scientists apply observations of the natural world along with biological and physical scientific techniques to create interventions and develop technologies that improve healthcare and public health worldwide. Biomedical sciences apply the principles of these disciplines to topics related to infectious or non-infectious diseases that affect all humans.

Cell Biology

Cell biology studies the structure and functions of cells. This discipline looks at the physiological properties, metabolic processes, signaling pathways, life cycle, and interactions between cells in an organism and between cells and their environment. At John Jay, our students are trying to understand the function of genes that control cancer development and inflammatory disorders.

Melissa Rosas

Identification of Potential Cellular Responses Triggered by Stereoisomeric DNA Interstrand Crosslinks Produced by Mitomycins in MCF-7 Cells (Dr. Elise Champeil and Dr. Shu-Yuan Cheng)

I was always a curious child, constantly questioning why things occur. In high school I liked chemistry and math, which led me to pursue a degree in forensic science. Doing research has allowed me to critically think more, and it taught me patience. Not every experiment will go the right way. Mistakes will happen, and it is how we learn. I have grown the past two years, academically and professionally, to the point I have lost the fear of making mistakes. Recently, I finished applying to research post- baccalaureate programs. I hope to pursue my PhD in medicinal chemistry after I graduate. Exploring different pathways allowed me to find my true calling. I have enjoyed the networking and the friendships made through PRISM. Having emotional support is essential to me because it is great to have people on my side with whom I can relate.

Mitomycin C is a known antitumor drug. My research focuses on a derivative of Mitomycin C and how it might target cancer cells by interacting with their DNA. In the lab, we synthesize the derivatives and crosslink them to small DNA molecules to study their effect on cancer cells. Our work will help us find new ways to treat cancer.

Veronika Zenkeviciute

Identification of miRNAs Associated with Neuropathic Pain in Hispanic Patients with Rheumatoid Arthritis (Dr. Lissette Delgado-Cruzata)

I have always had a strong interest in medicine and in helping people fight the conditions they might have. Majoring in cell and molecular biology has allowed me to better understand the role of genes in disease development. My research experience taught me new laboratory techniques and to think critically, leading to a positive progress in our research. My goal is to continue developing my skills as a scientist by seeking a PhD in biomedical sciences. Joining PRISM gave me an opportunity to continue working with my mentor and to present our work at multiple conferences. This allowed me to further develop my communication skills and to share our work with other scientists.

Racial and ethnic minority groups in the United States experience poorer health outcomes for several diseases, including rheumatoid arthritis (RA). Our research findings show that there is a potential in using gene targeting therapies that could alleviate the burden of neuropathic pain in patients with RA.

Genetics

Evolution results from changes in the genetic material, or genes, of a species over time. These genetic changes can provide adaptations that give an evolutionary advantage to the organism when faced with changes to its environment. Evolutionary genetics aims to identify changes in genes that lead to the evolution of species. At John Jay, our students compare the genes of primates to those of humans to understand what makes humans unique and study how urbanization affects the genetic diversity of invertebrates in NYC.

Jhoanna Diaz

Exploring the Associations of Triple Negative Breast Cancer and Race in Brazilian Women (Dr. Lissette Delgado-Cruzata)

As a child, I wanted to be an astronaut and explore all the bright things in space. As I got older and started understanding science on a deeper level, I fell in love with biology and the idea that organisms can function, interact, and evolve in many different ways. I decided to pursue a career in science because I want to help find treatments for diseases. I aspire to become a geneticist and evolutionary biologist. Working with my mentor and with the PRISM URP program, I have learned different scientific skills in the lab and how to communicate my ideas and scientific experiments to others, allowing me to develop self-confidence and patience.

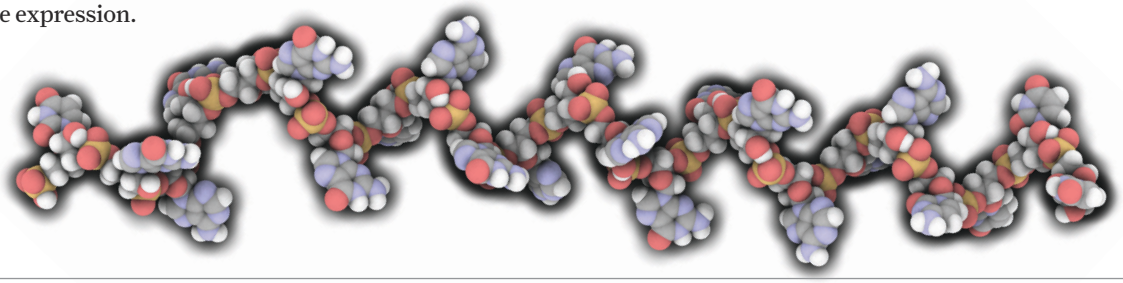
Differences in breast cancer mortality exist among ethnic and racial groups. Black and Brown Brazilian women experience a higher mortality rate than women who identify as White. My research looks at the epidemiology of this phenomena, focusing on the link between genetic factors associated with different types of breast cancers and ethnicity/race.

Sara Elshaer

MicroRNA-Mediated Evolution in Human-Specific Gene Expression: A Comparison to Neanderthals and Denisovans (Dr. Nathan Lents)

Science helps us to better understand the natural world, including the physical, biological, and social systems that surround us. I choose to be involved in scientific research because, through it, we gain insights into the workings of the universe, from the smallest subatomic particles to the largest celestial bodies. My research focuses specifically on the genomics and evolution of Homo sapiens in comparison to other primates.

Studying the genetic differences between modern humans and our extinct relatives, such as Neanderthals and Denisovans, can provide valuable insights into human evolution and the genetic basis of human traits and diseases. We aim to build a model of human-specific changes in gene expression.



Gabriel R. Gonzalez

Use of Bioinformatics to Distinguish *Homo sapiens, H. denisova,* and *H. neanderthalensis* Through the Lens of microRNA (Dr. Hunter Johnson and Dr. Nathan Lents)

Since I was a little kid, I was captivated by science. Science YouTube always caught my attention and fascinated me with science as a whole. I entered John Jay to study biology and never looked back. I plan to pursue a career in content creation and combine my love of video editing and science.

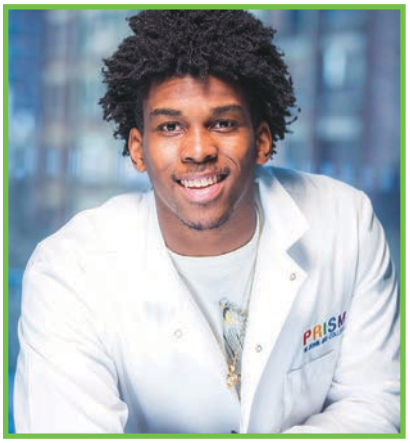
My research uses computer coding to compare microRNA gene expression in the human genome to that of Neanderthals and other primates. Our goal is to lay a foundation of information and a path for future labs to follow when looking at microRNA for gene expression in human genes.

Brianna Jenkins

African Genetic Ancestry and the Slave Trade in Brazilian Women with Triple-Negative Breast Cancer (Dr. Lissette Delgado-Cruzata)

I remember watching TV shows about forensic science on television when I was younger. This piqued my interest in science. I was always curious how the body works and what we can learn from the human body post-mortem. Research is not linear by any means. It has taught me that you keep learning throughout the process. Participating in PRISM showed me that research is hard work, but it is rewarding when you get to share your findings with others. My goal is to apply to medical school after which I aspire to become a neurosurgeon or cardiothoracic surgeon; or to purse a MD/PhD program to get both aspects of a scientist and a physician. I really enjoyed learning the process of research from beginning to end with my mentor.

Triple-negative breast cancer is the most aggressive form of breast cancer in women. My research entails studying what causes higher mortality rates from triple-negative breast cancer in women of African-descent compared to White women. Our goal is to help develop proper evaluations and treatments that might ease this racial health disparity.



Marc Louis

Comparing Single Nucleotide Polymorphisms between Neanderthals and Humans to Identify Variations in Xenobiotic Metabolism (Dr. Nathan Lents)

My love for science started during middle school when one of my teachers introduced me to the fascinating world of chemistry. Nearly 10 years later as a junior I have the privilege to be majoring in toxicology and making my younger self proud. After John Jay, I would like to enter a physician assistant master's program and further seek out research opportunities in pharmacogenetics. Research as a whole taught me that the most important thing is staying disciplined throughout the entire experience. As scientists we have to continue to pursue and stay focused despite tribulations.

Our research aims to identify variations between the genomic sequences of Neanderthals and humans, focusing on genes involved in xenobiotic (drug) metabolism. Understanding allelic variations in this category of genes can help us discern their potential function and further the field of pharmacogenetics.

Fatima Topia

miR-16-5p is a Potential Mediator of the Anticancer Properties of Green Tea Polyphenolic Compounds in Breast Cancer (Dr. Lissette Delgado-Cruzata)

I have always been passionate about discovering new knowledge and curious about the world around me. My recent experiences have drawn me to science due to its potential for making important contributions to society. Through research experiences, I learned valuable skills such as critical thinking, problem-solving, and communication. My goal is to become a medical doctor, as I am passionate about positively impacting people's health. At PRISM, I have gained a deeper understanding of the scientific process. I appreciate the opportunity to collaborate with diverse peers and participate in hands-on learning experiences, including research, internships, and community service activities.

Our work investigates the interaction between catechins, anti-oxidants present in green tea, and miR-16-5p, a tumor suppressor gene. Our findings suggest a potential mechanism for catechins' anticancer effects, which might be useful for developing breast cancer prevention and treatment strategies.

Microbiology

Microbiologists study the structure, function, and classification of microscopic organisms such as bacteria, fungi, and some parasites. The discipline also tries to understand how these microorganisms interact with humans and how they can cause, or protect us, from diseases. Our students are researching molecular processes in microorganisms that have the potential to help us find new cures to infectious diseases.

Maisha Ahmed

The Use of Transformation in *Candida albicans* to Localize Fluorescent Phb12p-Gfp Fusion Proteins (Dr. Jason Rauceo)

I discovered my love for research in my high school biology class. From discussions on CRISPR and designer babies to stem cell therapy and the ethics of obtaining stem cells, I was drawn to biological research. I knew that I would pursue my career in it. That passion for research stayed with me throughout my academic career at John Jay. Joining Dr. Rauceo's lab as part of the PRISM program allowed me to channel my passion into real research that has convinced me to pursue a PhD in biomedical research. PRISM allowed me to meet peers who are as passionate about research as I am.

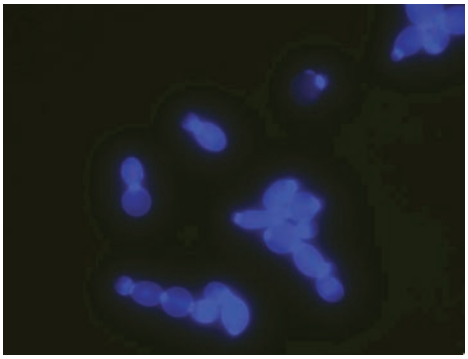
Determining the location of intracellular proteins can help reveal its function. My research focuses on determining the location of prohibitin 12 (Phb12p) in *Candida albicans* by observing its location using fluorescent proteins. My research can help identify a potential target for *C. albicans* infections treatments.

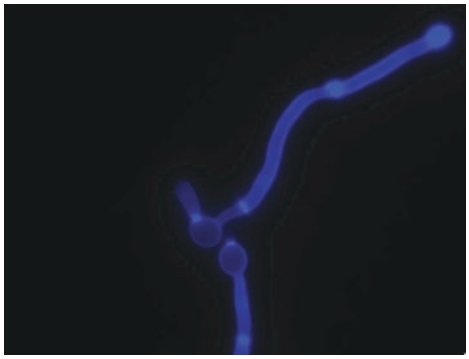
Hyunjeong Kim

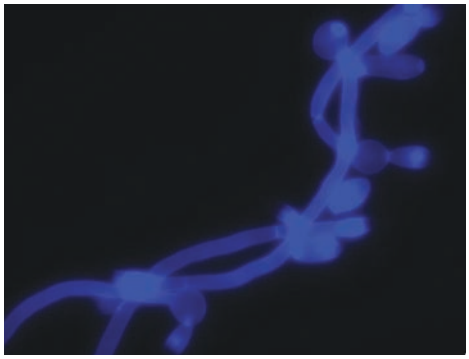
Analyzing the Phenotype of *Candida albicans* in Different Environments (Dr. Jason Rauceo)

My passion for biology research began when I read an article about a mysterious case from 15 years ago being solved through advanced forensic science. From forensic investigations based on DNA analysis to the invention of medicines for the treatment of various diseases, my interest in biology gradually grew. The PRISM program gave me the opportunity to participate in various research projects, and to design experiments and derive results suitable for those projects. My short-term goal now is to go to graduate school and continue my biology research, which I started with the PRISM program.

My research studies the behavior and appearance (also known as phenotype), of a disease-causing fungus called *Candida albicans* when grown in environments containing antifungal agents. Determining what causes those phenotypic changes may help discover effective treatments for infections caused by *C. albicans*.





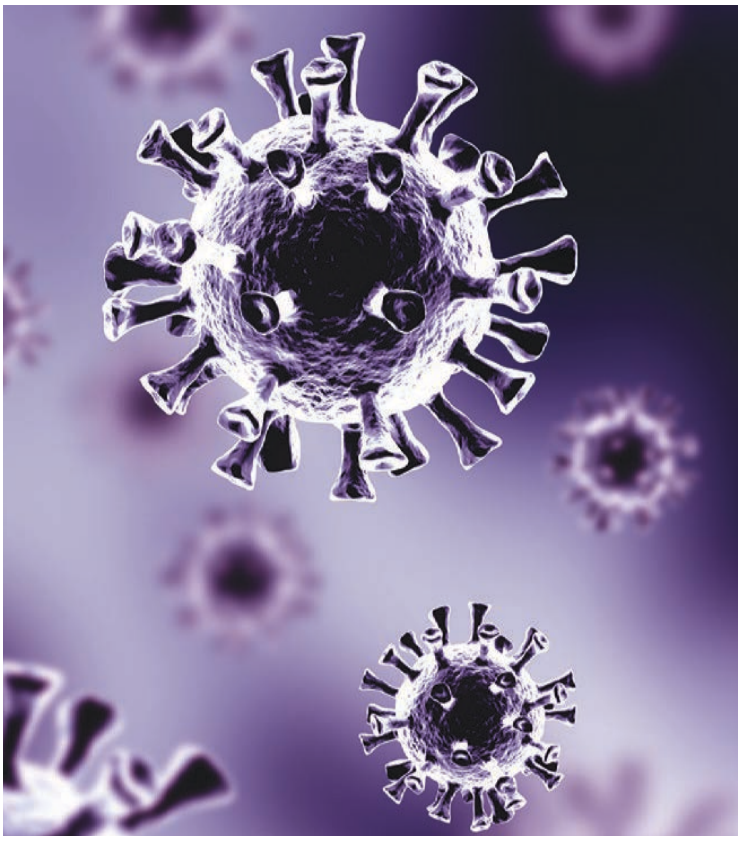


Mateo Sáenz

Bat Immunity and Anatomy in SARS-CoV2 (Dr. Angelique Corthals)

I want to combine the fields of medicine, entrepreneurship, and research in an effort to bring healthcare to the most underserved, hard-to-reach and dangerous regions of the world. I am originally from the Andean region of Quito, Ecuador, where in 2016 a devastating earthquake destroyed various cities. This inspired me to use science to develop new technologies and ways to help first responders save lives.

We are working with Yale and Stony Brook universities to figure out why bats carring SARS-CoV-2, the virus that causes Covid-19 in humans, are immune to illness. Goblet cells in the bat's nose create mucus and an immune response, which we think can affect transmission and infection rates.



TOXICOLOGY

The field of toxicology studies the adverse effects of chemical substances on living organisms and the environment. It also concerns the detection of toxins and other harmful substances, and the diagnosis and treatment of their effects.

Environmental Toxicology

Environmental toxicology looks at how pollutants, pesticides, and some biological agents interact with the environment. PRISM students are looking at how mercury, a heavy metal that can cause severe neurological conditions in humans, is modified in the environment by physical and chemical factors that can result in this metal being present in common household products.

Kimberly Nuñez

Identifying Mercury-Reducing Microorganisms in Soil (Dr. Anthony Carpi)

During high school, I loved my ocean science class and teacher, and wanted to continue exploring marine biology. The career exploration PRISM offers made me realize that I wish to pursue a graduate degree in marine biology so that I may work at a government or non-profit agency to ensure informed conservation policies are implemented. My research experience has taught me that science consists of the unexpected and you can never prepare for the results that you are going to get. My favorite part about my PRISM experience has been gaining more confidence in my research abilities.

My research aims to determine what microorganisms are involved in reducing and emitting mercury from soil by suppressing and stimulating them. Mercury is a global pollutant and understanding its movement in soil helps us determine what effects it has on humans and the environment.

Lakshmi Rao

The Effect of Drought Versus Rainy Conditions on Mercury Emissions from Soil (Dr. Anthony Carpi)

I am a junior studying forensic science at John Jay College. I chose to study science to help me understand our world better. My goals are to develop my skills as a researcher and to gather experience and knowledge to prepare myself for a career in a laboratory. I hope that one day, my research will help my community help those that live in it. PRISM has taught me new skills that I hope I can use in the future when I design other research projects. I am grateful for the support I receive from PRISM, my mentor, and from the other undergraduate researchers in the program who offer their guidance and have taught me to become a better researcher.

I am researching the effect of water on the emission of mercury from soil samples when the frequency of watering times varies. This could determine which geographical regions are more susceptible to higher levels of mercury emissions and its influence on surrounding populations based on how often it rains.

Forensic Toxicology

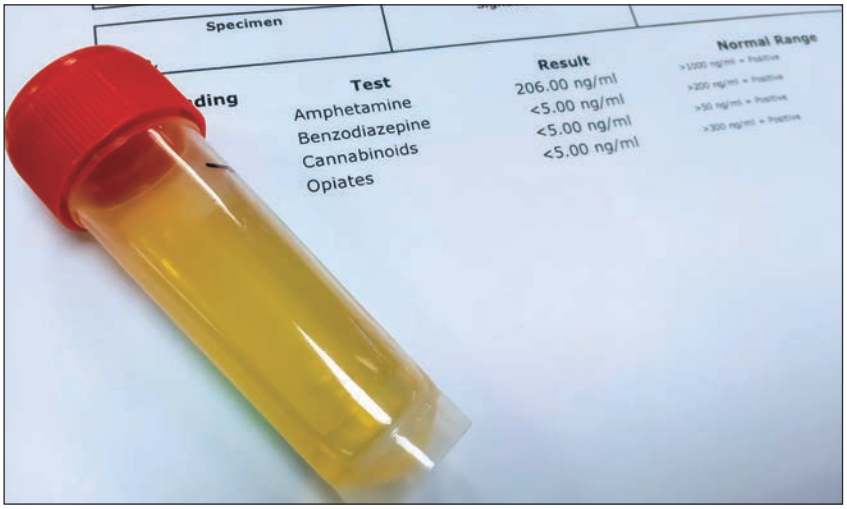
Forensic toxicology analyzes samples for the presence of toxins and illegal drugs in cases related to the judicial and medical systems. At John Jay, our students develop more sensitive methods for drug detection in biological specimens.

Daniel Aguilar

Comparison of Hydrolysis Efficacy and Performance of Four Synthetic Enzymes for the Detection of Opioids in Urine Samples by LC-MS/MS (Dr. Marta Concheiro-Guisan)

Seeing how the building blocks of the world are classified into something called the periodic table, and that there's a discipline dedicated to how said building blocks interact, fascinated me when I was younger. My experience in PRISM's URP has made significant contributions to my development as a scientist, and it taught me that I enjoy doing research. Finding new correlations and overcoming obstacles through testing brings great satisfaction. To continue doing research after graduation, I applied to post-baccalaureate programs to help me transition to a PhD program in pharmacology.

Due to an increase in opioid overdoses across the country, our work emphasizes developing new sensitive methods to detect this drug in biological matrixes. My project focuses on testing synthetic β-glucuronidase enzymes, which hydrolyze drug metabolites, on opioids to enhance their detection in urine via LC-MS/MS, an analytical method that can find minute traces of compunds in complex mixtures.



Rachel Calvagna

Determination of Cortisol in Hair as a Stress Biomarker in Pregnant Women (Dr. Marta Concheiro-Guisan)

My interest in science has always been a part of me, and my junior year biology and chemistry classes in high school allowed me to flourish. I had no idea my love for chemistry would continue to grow the way it has until organic chemistry here at John Jay. Being a part of PRISM has connected me with similarly oriented peers and amazing mentors, which has made me more confident as a scientist.

Cortisol, also known as the stress-hormone, is produced by our body in response to external stimuli and stressors. I use LC-MS/MS to detect cortisol in the hair of pregnant women as a biomarker for stress. I am working to create an optimal analytical method for detecting these trace amounts of hormone.

Viviana Chavez

Pharmaceuticals and Drugs of Abuse in the New York/New Jersey Harbor Estuary Water (Dr. Marta Concheiro-Guisan)

I want to be one of the scientists that helps our world be better every day by doing what I am passionate about. At first, I was not sure of my abilities to carry out a scientific investigation of anything; however, I am one of those people who first tries and then decides my path based on my experience. Working with my mentor and my peers has taught me new procedures, how to review data, and the importance of reading research papers, which have helped me to be more patient. I am sure that all that I learned in my research will help me become an excellent student in graduate school and pursue a career as a professional toxicologist.

Our research work focuses on the detection of drugs, such as cannabinoids and opioids, in the New York/New Jersey Harbor to estimate the level of drug consumption in different regions. Specific areas of the city's waterways that get contaminated with wastewater from sewers are tested to see where the drugs are being used. This work will inform public health strategies to prevent the use of harmful illegal drugs.

Patricia St. Fleur

The Washing of(f) Cocaine to Prevent False Positives (Dr. Ana Pego)

Science enables me to learn what exists in nature, how it functions, and how it came to be the way it is. It is more than just a series of data; it is a journey to understanding. This concept is relevant not only to the work I did in the laboratory but also throughout life. PRISM strengthened my ability to pose questions by challenging my thinking and by teaching me to consider new approaches to tackle these challenges. The skills I learned in PRISM—critical thinking, problem-solving, and persistence—will assist me in pursuing a career as a medical professional.

My research entails determining the best washing procedures to remove external cocaine contamination from various hair types that have undergone different hair treatments. My research could help prevent false positives in drug tests for people who have been exposed to cocaine.

Molecular Toxicology

Molecular toxicology studies the way that toxins work: how these toxins interact with biological molecules inside of cells and the effect of these toxins at molecular levels. PRISM students are researching how pesticides containing the heavy metal manganese affect neurons and how some psychoactive drugs are distributed throughout the body.

Antonio Aviles

Effect of Curcumin on Atrazine-Triggered NF-kappa B Activation in PC12 Cells (Dr. Shu-Yuan Cheng)

Through PRISM, I have learned about the research process as a whole and how much goes into it. I thought this would just be an extension of a normal lab class, but it is much more than that. When I first started, my hands would shake to the point that I would need to use two hands to pipette any solvent. My anxiousness has decreased a lot since I began working with my mentor. I have enjoyed the technical aspects of research the most because it is very fulfilling when you finish your experiments and feel confident about your results. I was missing this fulfillment in my online lab classes and now despite the stress, I would not want to switch back to online.

Atrazine, an herbicide that can be found in contaminated drinking water, belongs to a chemical class known as endocrine disturbers, molecules which are linked to chronic inflammation. We hypothesize that the antioxidant curcumin can nullify atrazine's inflammatory properties since curcumin is known to have anti-inflammatory properties.

John Ford

Effect of Mitomycin C on HDAC1 Expression in MCF-7 Breast Cancer Cells and K562 Leukemia Cells (Dr. Shu-Yuan Cheng)

I am an aspiring forensic science major, where I can combine my love for science with my goals of improving the criminal justice system. Forensic science has drastically evolved within the past 20 to 30 years alongside our understanding of molecular biology and genetics. Forensic science has empowered the criminal justice system to employ precise mechanisms to right its past wrongs. I hope to improve upon that so I can bring justice for the people the system has falsely convicted and bring truth to any investigation before the law.

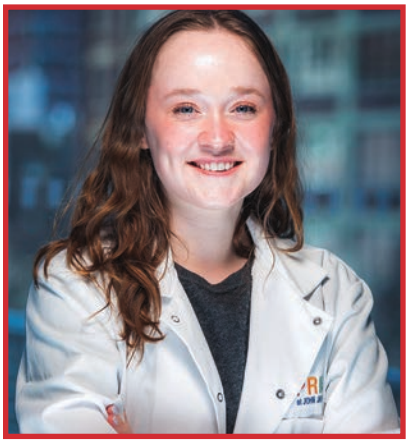
I study how an anti-tumor drug, Mitomycin C, affects expression of a specific epigenetic modification protein, HDAC1, in *in-vitro* models. The aim of my research is to figure out how altering the dosage of Mitomycin C can modify the expression of HDAC1, and how this in turn affects cell growth in cancerous cells. The significance of my research is to give a possible avenue to help treat cancer.

Ingrid Lopez

Exploring the Toxicological Effects of Mancozeb on GSH/GSSG Status in Neuronal PC12 Cells (Dr. Shu-Yuan Cheng)

In my second-grade classroom in my home country of El Salvador, I remember that an environmental booklet was given to me by my teacher. This simple book ignited my curiosity about science as I saw brief descriptions of how environmental pollutants harmed our fish's ecosystems and other species living in it. As I flipped the pages in the booklet, I was excited to learn about something completely new to me which ultimately opened the doors to the world of science. Throughout my undergraduate years, I learned that science is never perfect and that sometimes mistakes can lead to greater discoveries!

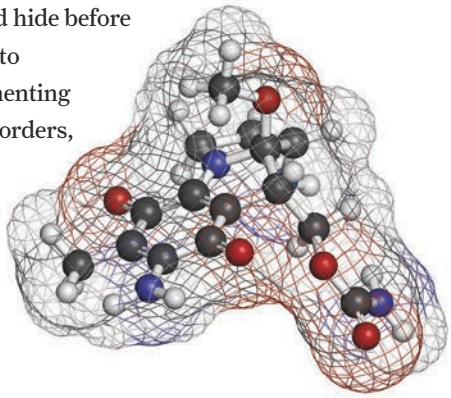
In this research we explore the possible toxicological effects that an agricultural fungicide, known as Mancozeb, can have on healthy neuronal PC12 cells. This will help us understand how cells react to toxic substances and what can be done to counteract the toxicity.



Hannah Tetreault

Effect of Mitomycin C and its Analog on Cell Cycle Progression in MCF-7 and MDA-MB 468 Cells (Dr. Shu-Yuan Cheng)

I loved experiments as a kid, mixing things together to try to make something new or trying to see if I could throw something at my siblings and hide before they caught me. Over the moving from annoying siblings to neuroscience, but the childhood fascination with experimenting is unchanged. I know I want to research neurogenetic disorders, but I have not decided whether that will be with a PhD or an MD. PRISM has helped me realize I am strong enough to handle whatever challenging work I want to pursue, and it is always okay to ask for help.



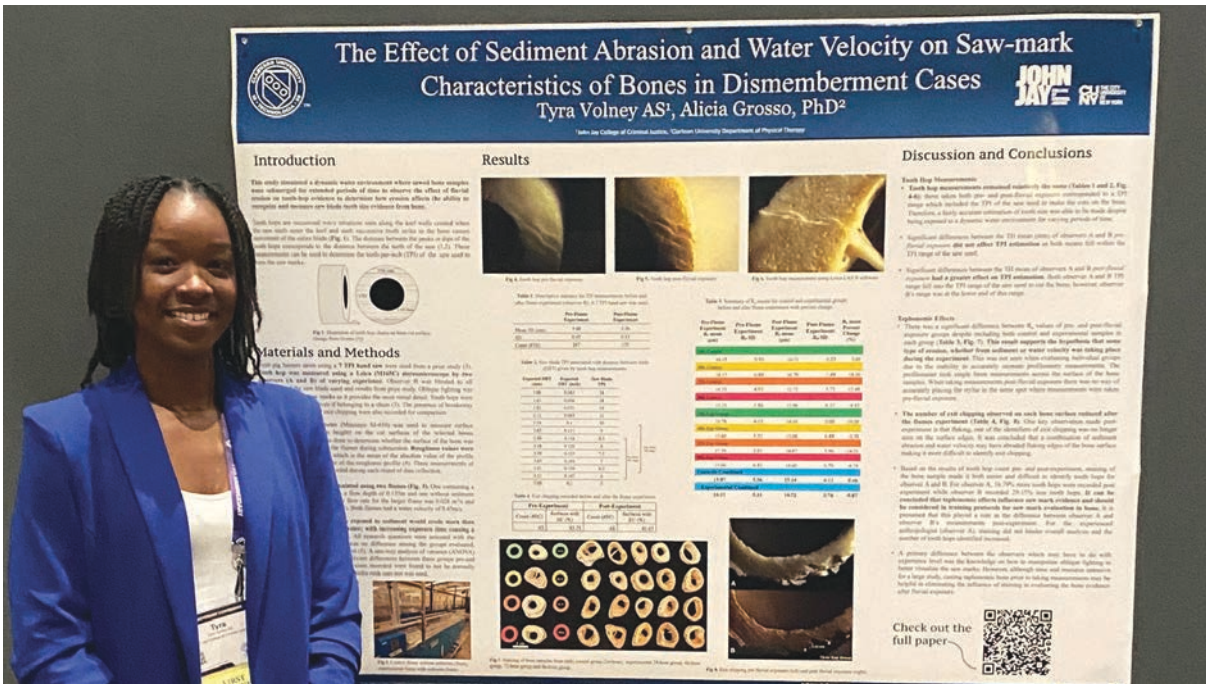
Mitomycin C and its chemical analog are two drugs used to fight off several types of cancer through different pathways. My research explores the effect these drugs have on the cell cycle, specifically the phase of the cell cycle where DNA replication takes place.

Tyra Volney

The Effects of Coenzyme Q_{10} on Reactive Oxygen Species Production Induced by Propazine (Dr. Shu-Yuan Cheng)

My path in research began by chance, and since getting involved it has pushed me to think independently, helping me realize my potential to be well-versed in several fields of science. I have also learned my way around the lab and how to use instruments that I had never used before. I aspire to become an all-rounder in the forensic science field. I hope to earn my PhD and gain a lot of experience through research. So far, being a part of PRISM has allowed me to build on my knowledge outside the classroom, formulate my own research methods, and perform hands-on experiments.

My research project aims to test whether natural antioxidant coenzyme Q_{10} reduces oxidative stress from cells affected by propazine to prevent degenerative diseases. Propazine is an herbicide frequently detected in groundwater, and has been linked to increased oxidative stress associated with these diseases.



ORGANIC CHEMISTRY

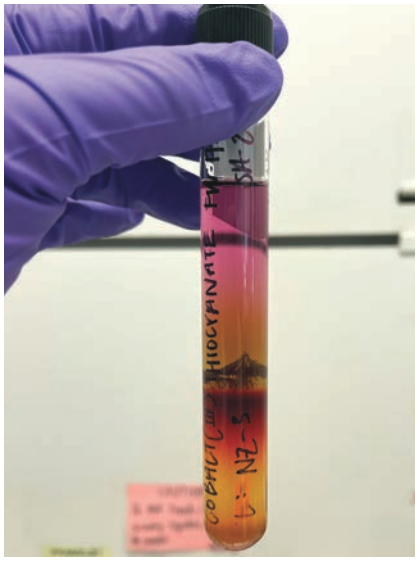
Organic chemists work with chemical molecules that contain carbon, the backbone of all biological substances. Organic chemistry looks specifically at the structure, reactivity and synthesis of these molecules. Our students are developing new reagents to run environmentally-friendly chemical reactions in the lab. They are also studying the chemistry of chemotherapeutic agents in the human body.

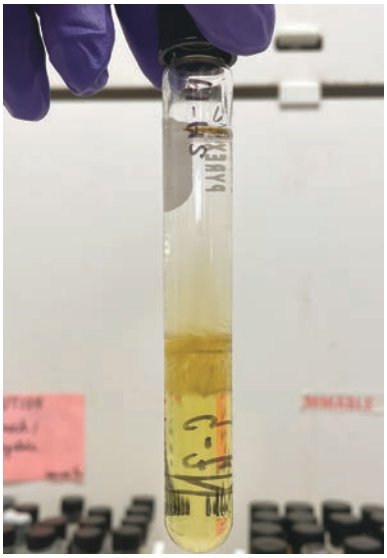
Selin Ates

Discovering Small Molecular Metallic Anticancer Drugs with Base Metals (Dr. Guoqi Zhang)

Though I have always had an interest in science, I never would have guessed that I would be pursuing it as a career. My interest in forensic science really grew in high school after realizing I could combine two interests: science and crime-solving. Joining PRISM allowed me to apply what I have learned and put my knowledge to the test. Being able to explore the unknown and experiment in the lab has been exciting and eye opening since I never know what my experiment will result in. Drawing on my PRISM research experience, I plan to continue onto graduate school and get my master's in forensic science.

Cancer has always been a point of focus in the medical world as it can indiscriminately affect anyone. My research project involves the development of metal-organic complexes which are essential for biological activity and have the potential to be used as anticancer drugs. We are using metals such as copper, magnesium, cobalt, manganese, and nickel to create these novel molecules.





Jayla Evans

ATP Degradation in Honey (Dr. Gloria Proni)

I grew up in a family with members that are part of the criminal justice system. Crime shows were always on throughout the day and stories of work were told at dinner. There was no mistaking my interest in this field, but the approach to it was the hazy part. I was always strong in math and science and in high school I discovered forensic science was ideal for my future. Here at John Jay, my love for science grew and flourished into becoming a research student. By joining PRISM, I have been able to meet such great companions as well as professors that believe in my work ethic and help guide me into my next adventures.

Our research involves everyone's favorite sweetener, honey. Honey is generally known to never expire, but we are here to challenge that. By extracting adenosine triphosphate (ATP), a nucleic acid present in all living things, as well as its breakdown products from the honey, we can then calculate how much of each is present in the honey and from there figure out the age of the honey.

Nicholas Fraschilla-Brodkin

Determination of the Biochemical Age of Honey by Analysis of ATP and its Derivatives Using High Performance Liquid Chromatography (Dr. Gloria Proni)

Science has always been fascinating to me. Curiosity for why certain things happen in the world quickly blossomed into a love for organic chemistry. My research has taught me what benchwork in the lab is really like, which helped me realize the importance of staying organized and focused while still being efficient. Performing research in our lab prepared for my pursuit of obtaining an MD/PhD degree. Working with Dr. Proni in the lab furthered my knowledge and taught me how rewarding research can be.

Honey has a long shelf-life and is thought to never expire. My goal is to determine if this is true by quantifying the compounds found in honey to determine its biochemical age. The methods we develop could be adapted for other foods with similar long shelf-lives.

Danny Jamoul

Purification and Characterization Procedures of the Products of 2-Hydroxy-1,4-Naphtoquinone and Basic Amino Acids (Dr. Gloria Proni)

I have always been interested in understanding the microscale level world, and its effects on our macroscale environment. Doing research under Dr. Proni allowed me to apply the knowledge I have gained in class and in the laboratory to increase my detective-reasoning skills, and to use my imagination to get results. It showed how vital cooperation and teamwork are to get the job done and allowed me to be a better scientist. After John Jay, I plan to obtain an MD/PhD in neurology. Being part of PRISM has increased my research skills in applying and innovating while also connecting me with like-minded individuals and new lifetime friends.

Our work looks at how lawsone, a pigment derived from henna, reacts with various amino acids found typically in sweat to develop a new finger-printing reagent. The analysis is done using analytical chemistry methods to understand the different products formed, their structure, and their colors.

Khilola Khusanova

Developing Earth Abundant Metal Catalysts with Terpyridine Ligands (Dr. Guoqi Zhang)

I have been interested in the causes of natural occurrences and how they affect our daily lives from an early age. I only discovered how much I loved performing technical work after I started participating in research. Since the pandemic, I have struggled to apply my knowledge in lab assignments since I do not feel confident in it. Yet, after working in research for a while and receiving Dr. Zhang's mentorship, I became more at ease entering the lab and realized how much I enjoyed being a part of the scientific community. I have learned a lot from my mentor. As I study more, my interest in science grows, which inspired me to seek a career in healthcare as a physician assistant or registered nurse.

Our work investigates the synthesis, crystal structures, and catalysis studies of earth-abundant metal complexes with redox non-innocent terpyridine ligands. Our goal is to create a new class of catalyst systems that can eventually replace existing expensive phosphine ligands and precious metals.

Camila Marino

Earth Abundant Metals to Anticancer Drugs (Dr. Guoqi Zhang)

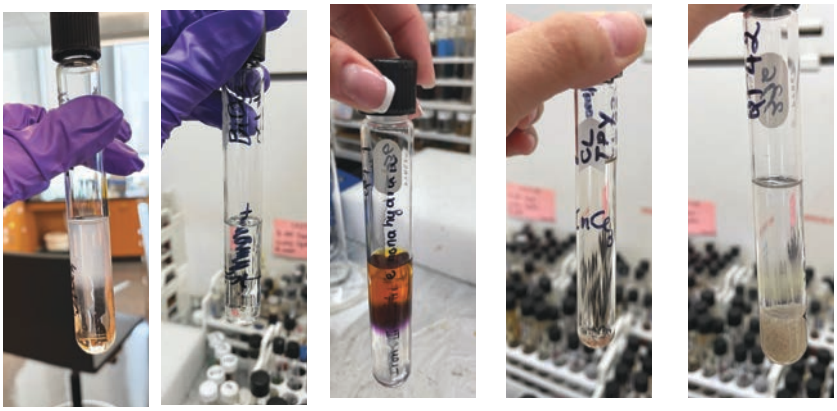
My career goal is to become a forensic toxicologist and further my education by obtaining a master's in forensic science. Performing undergraduate research helped me gain more knowledge within a lab setting and joining PRISM allowed me to be more social and comfortable around my peers.

Coordination compounds can play a role in cell death when interacting with the DNA of cancer cells. Our research deals with the discovery of anticancer activity of various coordination compounds that can be used in chemotherapy and immunotherapy treatments for tumor causing-cancers.

Quan Khanh Tang

The Application of Metal Organic Coordination Complexes in Treating Breast Cancer (Dr. Guoqi Zhang and Dr. Shu-Yuan Cheng)

As a curious person, I'm always interested in science topics. I have expanded my perspective on science since I started research with my mentors, who are experts in my field and always help me understand the scientific process. My career goal is to pursue an MD/PhD degree because I want to use the knowledge I have gained from my research to ensure my understanding of medical concepts. PRISM is not only an organization for people who want to participate in science, but it is also a place that teaches me how to be successful and achieve my goals.



My project focuses on synthesizing metal-organic coordination complexes and using X-ray crystallography to determine the structure of the synthetic compounds. Later, these metal complexes will be evaluated for cytotoxicity to determine whether they are the proper drug treatment for breast cancer.

Nora Zadori

The Design of Novel Metal-Based Anticancer Drugs with Terpyridine Ligands (Dr. Guoqi Zhang)

I went into science because I wanted to know how the world works. I love to see things happening right in front of me because it allows me to come up with ideas to explain what I am observing. Research has allowed me to build upon the knowledge I gained in class by applying that knowledge to the observations of my experiments. I also love working with my peers and collaborating on what we should do next. This collaboration allows me to be more comfortable with my own voice and to not fear new experiences, which showed me that I am capable of continuing my education by pursuing a master's degree in toxicology or forensic science.

A ligand is a molecule that binds to a metallic element. In the lab we can purify these ligand-metallic complexes by crystalizing them using various methods. If a crystal forms, we can analyze the structure and determine if it is a good candidate for toxicity experiments.

COMPUTER SCIENCE AND SOFTWARE DEVELOPMENT

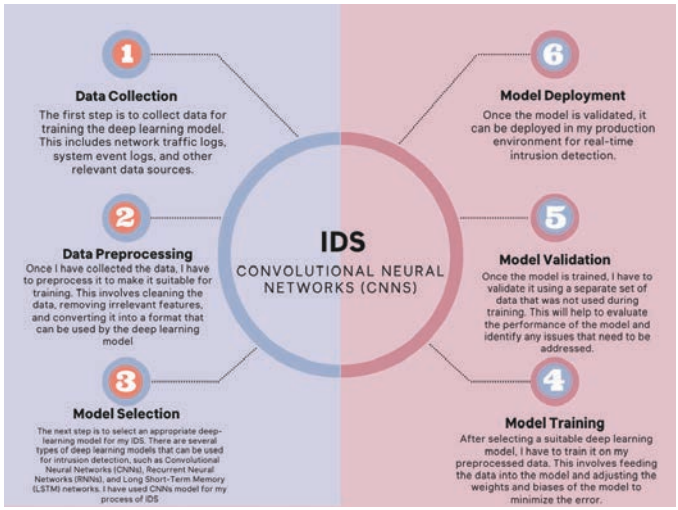
From smart phones to the "internet of things," technology plays a critical role in our lives. At John Jay, our students are improving the safety of computer networks, and developing new ways to use smart technology in our everyday lives.

Ayesha Akhter

Machine Learning and Intrusion Detection Systems: Convolutional Neural Networks (Dr. Muath Obaidat)

As a kid, I was always deeply passionate about understanding the unknown and solving any issue, even if was complex. Taking science courses in high school led me to pursue a career in science and technology, especially in neuroinformatics. I am majoring in computer science and information security. PRISM offered me the opportunity to learn how research is performed through practice and to build a network with my teammates, mentor, and other faculty members. I plan to go to graduate school to pursue my master's degree in data science in the fall of 2023.

Machine learning implements human learning behaviors in computer programming, and it can be a useful tool for Intrusion Detection Systems (IDS). IDSs are designed to detect unauthorized access, misuse, or other forms of malicious activity on a network. Our work will implement an IDS using machine learning and neural networks to automatically learn features from the data, which can then be used to classify network traffic or system behavior as normal or malicious.



Faton Haxhiu

Integrating Blockchain Technology with Internet of Things (Dr. Muath Obaidat)

Ever since I was a kid I have been interested in how devices, phones, and the internet work; I always look at how to solve different issues related to technology. My PRISM research experience is one of the best opportunities I had in my academic career. It provided me with the chance to learn stuff about myself as well as how to do research. My future goals are to continue my studies and pursue a master's degree in cybersecurity, to continue my research on the Internet of Things (IoT), and to present our work at conferences and other research events.

The data collected by most internet-connected devices is stored in a centralized location, which can be vulnerable to hacking. If someone gains access to this data, they could control your devices or learn sensitive information about your home. By integrating blockchain technology with the IoT, we can create a more secure and trustworthy network of devices. Ultimately, this has the potential to create a safer and more secure environment for individuals and organizations using IoT technology.

Jayantika Nandy

How Blockchain can Address Cybersecurity Concerns on the Internet of Things: A Review (Dr. Muath Obaidat)

Studying science provided me with a better understanding of our world. PRISM has been instrumental in helping me to develop my skills, and I look forward to applying what I have learned in future projects. I found that doing undergraduate research allows me to develop my writing and communication skills, in addition to improving my technical skills. Research helps me to define my goal of pursuing a doctorate degree. After graduating from John Jay, I plan to go to CUNY Graduate Center for my doctorate degree in computer science. The most enjoyable part of this research was flexibility and tremendous help from the mentors and directors.

Blockchain technology has emerged as one of the promising technologies for overcoming some of the limitations associated with the Internet of Things (IoT), including cyber security limitations. We have found that attempts to use blockchain to overcome cybersecurity limitations associated with the IoT are divided into four categories: end-to-end traceability, data privacy and anonymity, identification, and authentication, as well as security, integrity, and availability.

SCIENTIFIC COMMUNICATION AND EDUCATION

It has never been more important for scientists to develop new ways to communicate their disciplines to the masses and to improve the ways we teach science. An informed populace makes better decisions, lives longer, and can lead better lives. At John Jay, our students and faculty are taking novel approaches to the teaching of physics to undergraduate students.

Justin Colón

Unmasking Physics: An Experimental Education Tool (Dr. Daniel Yaverbaum)

I fell in love with science when I was in the 6th grade. I was assigned a project on blood spatter analysis and since then, forensic science was the only career for me. As a child, I was always curious about the world around me. I asked questions to the point where people became annoyed with me but I was never satisfied with the answers; I needed more. Now as an adult, I am still not satisfied. Not only do I want to find the answers of our universe for myself, but I want to answer them for all those little kids like me. STEM education has become one of the greatest passions of my life.

My personal goals tie directly to my research. This passion project was designed to educate various age groups on selected STEM topics. A graphic novel is being created to make physics concepts like relativity and waves not only understandable, but easily accessible and fun for the public.

Alyssa Reynolds

Unmasking Physics: An Experimental Education Method (Dr. Daniel Yaverbaum)

I have been interested in science for as long as I can remember whether it be observing insects and plant life in elementary school or solving physics problems in high school. Science was able to engage my critical thinking skills in ways other topics could not. My research has allowed me to gain a better understanding of how I want to impact the world through science. Working with PRISM has allowed me to understand that there are endless possibilities when pursuing a career in STEM.

In my research project, we are focusing on new ways to teach both physics and forensic science to a wider audience and bring awareness to the world of STEM. Our goal is to educate people of all different age groups and backgrounds in a more engaging way.

PUBLICATIONS AND PRESENTATIONS

IN ADDITION TO OUR Annual Symposium, PRISM students regularly present their research to their peers on CUNY campuses and at scientific conferences and professional events. Below are a few of the many professional accomplishments our student researchers achieved this past academic year (2021-2022).

Publications

Cheng, Shu-Yuan, Lissette Delgado-Cruzata, Cristina C. Clement, Owen Zacarias*, Marta Concheiro-Guisán, Nicholas Towler*, Timothy Snyder*, Maggie Zheng*, Nickolas Almodovar*, Christina González*, Marian Romaine, Anne-Marie Sapse, Elise Champeil. "Cytotoxicity, crosslinking and biological activity of three mitomycins." *Bioorganic Chemistry* 123 (2022): 105744.

Concheiro, Marta, Frank Martin Gutierrez*, Alejandro Ocampo*, Elena Lendoiro, Eva González Colmenero, Ana Concheiro Guisán, Patricia Peñas Silva, Macías-Cortiña A., Cruz-Landeira A., López-Rivadulla A., de-Castro-Ríos A. "Assessment of biological matrices for the detection of in utero cannabis exposure." *Drug Testing and Analysis* 13, (2021).

Delgado-Cruzata, Lissette, Milena Rodríguez Alvarez, Veronika Zenkeviciute*, Nickolas Almodovar*, and Toni-Ann Bravo. "Identifying MicroRNAs Associated with Neuropathic Pain in Patients with Rheumatoid Arthritis (RA)." *Arthritis & Rheumatology* 74 (2022).

Grosso, Alicia R., and Tyra L. Volney*. "Effects of a low velocity fluvial environment on saw mark evidence in bone." *Journal of Forensic Sciences* 68, (2023).

Harun, Kameza, Owen Zacarias*, Cristina C. Clement, Shu Yuan Cheng, and Elise Champeil. "Potential Signaling Regulations of Stereisomeric DNA Interstrand Crosslinks Produced by Mitomycins in K562 Cells." *The FASEB Journal* 36 (2022).

Johnson, Hunter R., Jessica A. Blandino, Beatriz C. Mercado*, José A. Galván*, William J. Higgins*, and Nathan H. Lents. "The evolution of de novo human specific microRNA genes on chromosome 21." *American Journal of Biological Anthropology* 178, no. 2 (2022).

Johnson, Hunter R., José A. Galván*, William J. Higgins*, Samy Gadi*, and Nathan H. Lents. "A Global Examination of microRNA Genes in Modern and Ancient Human Genomes." *American Journal of Biological Anthropology* 177 (2022).

Lents, Nathan H., Hunter R. Johnson, Beatriz Mercado*, José A. Galván *, Jessica Blandino, Samantha Vee*, and William Higgins*. "Evolution of de novo microRNA Genes in the Human Lineage." *American Journal of Physical Anthropology* 174 (2021).

Lents, Nathan H., and Richard T. Piszczatowski*. "Cell Division/Death: Cell Cycle–Cyclins, Cyclin-Dependent Kinases, and Cyclin-Dependent Kinase Inhibitors." (2022).

Mahadeo, Arianna, Leslie Ramirez Medrano*, and Lissette Delgado Cruzata. "Effect of Green Tea Catechins on the Growth of MDA MB 468 Breast Cancer Cells." *The FASEB Journal* 35 (2021).

Obaidat, Muath A., Joseph Brown*, and Abdullah Al Hayajneh. "A novel Paradigm for Access Control Trust in IoT Applications: A Distributed Cross-Communication Approach." *2021 13th IFIP Wireless and Mobile Networking Conference (WMNC)*, (2021).

Obaidat, Muath, Joseph Brown*, and Awny Alnusair. "Blind Attack Flaws in Adaptive Honeypot Strategies." *2021 IEEE World AI IoT Congress (AIIoT)*, (2021).

Ramírez Medrano, Leslie*, Arianna Mahadeo, and Lissette Delgado Cruzata. "The growth of the MDA MB 468, but not the MCF 7 breast cancer cell line, is inhibited by ( ) catechin hydrate." *The FASEB Journal* 35 (2021).

Rosas, Melissa*, Owen Zacarias*, Cristina C. Clement, Shu Yuan Cheng, and Elise Champeil. "Identification of Potential Cellular Responses Triggered by Stereoisomeric DNA Inter-strand Crosslinks Produced by Mitomycins in MCF 7 Cells." *The FASEB Journal* 36 (2022).

Zacarias, Owen*, Ana G. Petrovic, Rinat Abzalimov, Padmanava Pradhan, and Elise Champeil. "Synthesis of Oligonucleotides Containing Trans Mitomycin C DNA Adducts at N6 of Adenine and N2 of Guanine." *Chemistry–A European Journal* 27 (2021).

Conferences

Conrad, Karen*, Jagoda Tarnawa, Britney Vasconcellos*, and Jason M. Rauceo. "Analysis of Prohibitin Ligand Treatment in the Fungus *Candida albicans*." *2022 American Society of Microbiology (ASM) Microbe Conference*, June 9th -13th, 2022.

Delgado-Cruzata, Lissette, Shu-Yuan Cheng, Christina Clement, Maggie Zheng*, Marian Romaine, Marta Concheiro-Guisan, Elise Champeil. "Gene expression changes and cell survival of breast cancer cells exposed to a mitomycin-lexitropsin conjugate." *ASCB/EMBO Meeting*, December 1-10, 2021

Gonzalez, Christina*, Scarlet Martínez Cardoze, Luis Barrera*, Chanté Guy*, Yoel Rodríguez, Lissette Delgado-Cruzata. "Green tea catechins can potentially regulate miR-125b-5p in breast cancer cells." *Society for the Advancement of Chicanos and Native Americans in Science (SACNAS)*, October 25-29, 2021.

Gonzalez, Christina*, Scarlet Martínez Cardoze, Yoel Rodríguez, Lissette Delgado-Cruzata. "Bioinformatic prediction identifies interactions between miRNA and green tea catechins." *American Society of Cell Biology (ASCB)*, December 1-10, 2021.

Harun, Kameza, Owen Zacarias*, Christina Clement, Shu-Yuan Cheng, and Elise Champeil. "Potential signaling regulations of stereisomeric DNA interstrand crosslinks produced by mitomycins in K562 cells." *61st Annual Meeting of the Society of Toxicology,* March 27-31, 2022.

Johnson, Hunter, José A. Galván*, William J. Higgins*, Samy Gadi*, Nathan Lents. A Global Examination of microRNA Genes in Modern and Ancient Human Genomes. *91st Annual Meeting of the American Association of Biological Anthropology*, March 26, 2022.

Obaidat, Muath, Joseph Brown*, and Abdullah Al Hayajneh. "A novel Paradigm for Access Control Trust in IoT Applications: A Distributed Cross-Communication Approach." *2021 13th IFIP Wireless and Mobile Networking Conference (WMNC)*, Oct. 25-28, 2021

Obaidat, Muath, Joseph Brown*, and Awny Alnusair. "Blind Attack Flaws in Adaptive Honeypot Strategies." *2021 IEEE World AI IoT Congress (AIIoT)*, Oct. 25-28, 2021

Obaidat, Muath, Kutub Thakur, and Jian Choong*. "A Secure Authentication and Access Control Scheme for CoAP-based IoT." *5th Conference on Cloud and Internet of Things*. March 2022.

Rosas, M*, Owen Zacarias*, Christina Clement, Shu-Yuan Cheng, and Elise Champeil. "Toxicological mechanism of stereisomeric DNA interstrand crosslinks produced by mitomycins in MCF-7 cells." *61st Annual Meeting of the Society of Toxicology*, March 27-31, 2022.

***Denotes PRISM student or alumnus.**

2023 PRISM SYMPOSIUM

ESTABLISHED FORMALLY IN 2006, but building on the foundations of a program that began as early as 2000, the Program for Research Initiatives in Science and Math (PRISM) strives to promote research achievement among John Jay students and prepare them for professional careers as scientists. By establishing and supporting close mentoring relationships between students and faculty, PRISM embraces the apprenticeship model of science.

The Program not only seeks to train students in the language of science, but to immerse them in its practice. Students participate in all aspects of scientific exploration, from the formation of research questions to the presentation and publication of new research studies. Along the way, they learn from their successes, and they learn to appreciate their failures. Exposed to the culture of the scientific community, many students find themselves irresistibly drawn to the profession. To date, more than 150 students have moved on from PRISM to post-graduate training in the sciences, a path that will lead to them becoming scientists themselves.

The Annual Research Symposium is a celebration of this year's student researchers and the work that they have accomplished over the past academic year.

2023 PRISM Keynote Speaker: Dr. Shanelle Shillingford

DR. SHANELLE SHILLINGFORD was a PRISM undergraduate researcher from 2015 to 2016. Under the mentorship of Dr. Gloria Proni, Dr. Shillingford focused on the separation of the enantiomeric forms of two organophosphate pesticides, methamidophos and N-methylmethamidophos. Enantiomers are pairs of chemically identical molecules that exist in two forms that are mirror images of one another but cannot be superimposed one upon the other. This is like how both your hands are identical (in most cases they have five fingers, one of them an opposable thumb), but if you put one on top of the other, they "don't match." Dr. Proni's lab looked at how to separate enantiomeric forms of the same compound using various analytical chemistry techniques. Their goal was to test if one of the two enantiomeric forms was more toxic than the other to humans while retaining their pesticidal properties. While at John Jay, Dr. Shillingford also served as a tutor for chemistry and calculus at the Math and Science Resource Center, in addition to working as a College Lab Technician for various lab courses.

In 2016, after graduating from John Jay with a bachelor of science degree in forensic science and a concentration in toxicology, Dr. Shillingford began her doctoral studies at Yale University in New Haven, CT. At Yale, Dr. Shillingford worked on her dissertation with her advisor Dr. Anton Bennett in pharmacology. Her dissertation focused on studying small-molecule inhibitors of MKP5, a mitogen-activated protein kinase (MAPK) phosphatase (MKP). MPKs and MAPKs are pairs of enzymes that serve as master regulators to many important cell-signaling pathways. Specifically, MPK5 is a regulator of our innate and adaptive immune responses, the way our bodies have evolved to combat disease and, in many cases, tumor formation. Researchers look for small-molecule inhibitors of these molecules to mine for potential therapeutics for many human conditions.

During her training, Dr. Shillingford served as a teaching fellow for organic chemistry at Yale, preparing explanatory presentations for students on the intended experiments for each class. She also presented her research dissertation work at conferences like the *Pfizer Chemistry Connect Symposium, The National Organization for the Professional Advancement of Black Chemists and Chemical Engineers* (NOBBChE) *Symposium, and The Protein Society's 35th Anniversary Symposium.* Her work has been published in peer-reviewed journals like the *Journal of Biological Chemistry* and the *European Journal of Medicinal Chemistry*. She honored PRISM's tradition of mentored research by working with undergraduate and graduate students. During the summers of 2019 and 2021 she served as a coordinator for Yale's Summer Undergraduate Research Fellowship (SURF) program, advising students in their career aspirations and helping them develop their research presentations. In addition, she still serves as a fellow of Yale's Office for Graduate Student Diversity and Development.

Currently, Dr. Shillingford is a Senior Scientist at the pharmaceutical multinational company Merck, in Rahway NJ. There, she serves as an analytical chemist in pre-clinical development within the animal health department. At the Symposium, Dr. Shillingford will discuss how her John Jay experiences have influenced her professional path, from immigrating to America through her journey to graduate school. She will discuss her research, her current work, and also how there is not one single path in your education and personal life.

2023 PRISM Outstanding Undergraduate Researcher

2023 PRISM Outstanding Undergraduate Researcher: Kimberly Nuñez

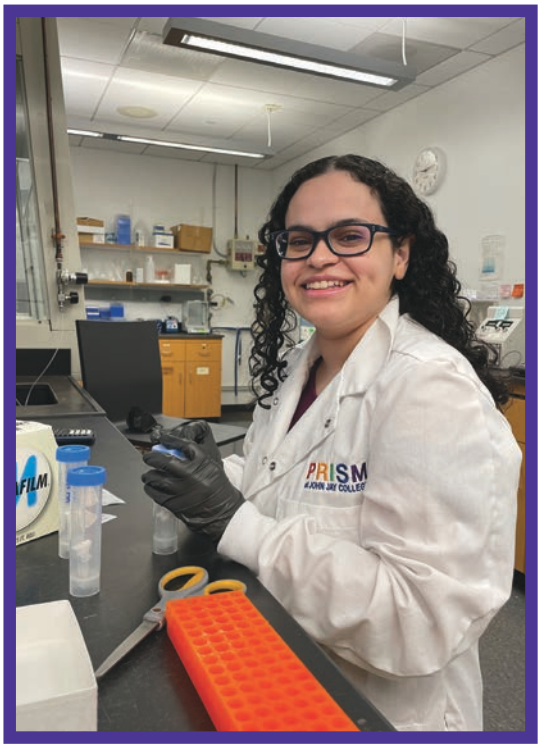
This year, Ms. Kimberly Nuñez has been selected as PRISM's Outstanding Undergraduate Researcher. This award recognizes the exceptional progress and commitment to research displayed by one of our students, and their development as a scientist.

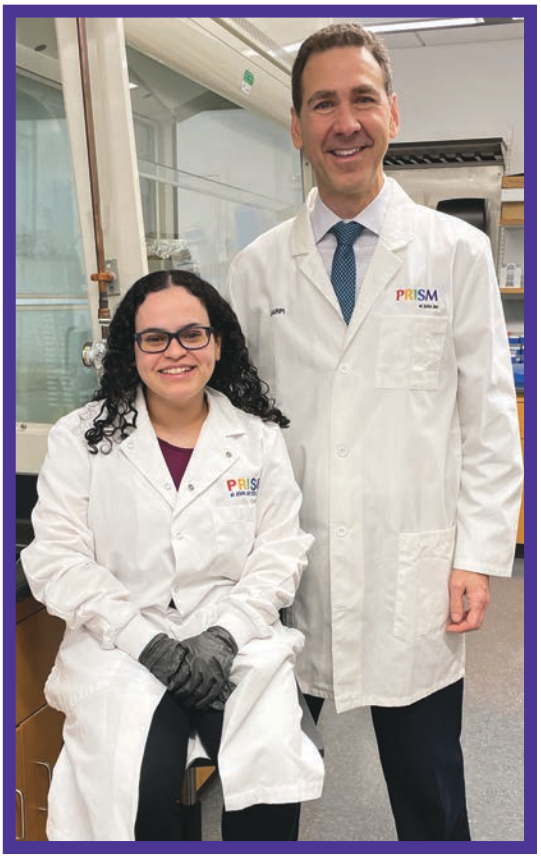
Kimberly joined John Jay as a freshman Macaulay Honors student in 2019. She joined the PRISM Jr. Scholars Program that year and learned about the Undergraduate Research Program through this initiative. She was selected to be one of our Undergraduate Researchers during the spring of 2020, as NYC and CUNY went into the lockdown caused by the pandemic. Prior to that, she was already working under the mentorship of Dr. Anthony Carpi. Their research project investigates the effect of water on the transport of the heavy-metal mercury in soil. Together with other members of the Carpi lab, Kimberly's work is producing some ground-breaking results. It has been known for several decades that water elicits a spike of volatile mercury emissions from soil. The leading mechanism proposed for this phenomenon was physical displacement; water goes into the soil and gaseous mercury comes out. Over the past two years Kimberly and her colleague Darrien Maynard, a PRISM alumnus ('18), have devised a series of experiments that have all but proven this hypothesis incomplete (learn more about Kimberly's work in page 14).

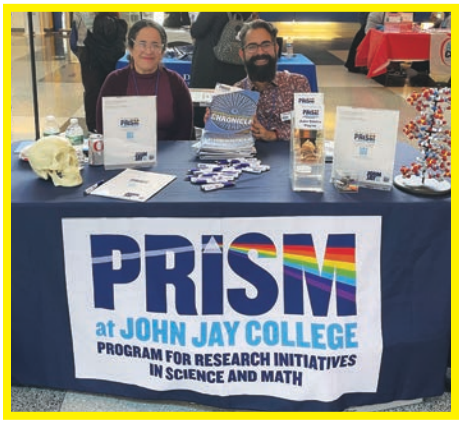
In his nomination letter, Dr. Carpi noted that Kimberly "impressed me from day one in the lab. Not only did she come eager to start research, but she came fully prepared—she understood how to do a literature review and had already completed a review of the work done by my lab to understand our niche focus." He continues "She grasps concepts quickly and can turn ideas into concrete experiments with skill. She has very strong writing skills, among the best I have seen for a person her age. And she has high ambition. She has continued to push forward despite the significant barriers that this pandemic has raised, and despite contracting COVID-19 herself in fall 2020."

Kimberly is completing her undergraduate degree this spring and continues to work in Dr. Carpi's lab. During her time at John Jay, she has also been committed to working with younger scholars as a tutor at our Math & Science Resource Center. With plans to attend graduate programs in marine biology after John Jay, she completed a prestigious fellowship at the Woods Hole Oceanographic Institute of in summer 2022. She returned from this fellowship even more motivated to pursue this dream and is now enrolled in an outstanding marine sciences program at University College Cork.

The PRISM Outstanding Undergraduate Researcher Selection Committee evaluates nominees based on their research mentors' nomination letters, as well as their current research progress. Reaching a decision is never a simple task as all nominees demonstrate outstanding research skills. In addition, each mentor submits a nomination letter that is not only impressive but also heartfelt, highlighting the close working relationship between mentor and student.







Top left: PRISM class of 2022. Top Right: 2018 Keynote Speaker Dr. Zuleyma Peralta addresses our students.

Former PRISM Symposium Speakers and Outstanding Undergraduate Researcher Award Recipients

2022
Keynote: Lauren Weidner, PhD (Rutgers University)
John Jay class of 2010
Award Recipient: Christina Gonzalez, currently at John Jay College

2021
Keynote: Eugene Gonzalez-Lopez, PhD (Penn State University School of Medicine)
John Jay classes of 2012 (BS) and 2014 (MS)
Award Recipient: The Entire Class of 2021

2020
Keynote: Olivia R. Orta, PhD (Harvard University)
John Jay Class of 2007
Award Recipient: Alejandro Ocampo, currently at John Jay College

2019
Keynote: Roselynn Cordero, PhD (Cornell University)
John Jay Class of 2012
Award Recipient: Marienela Heredia, currently at University of Wisconsin at Madison

2018
Keynote: Zuleyma Peralta, PhD (Icahn School of Medicine at Mount Sinai)
John Jay Class of 2009
Award Recipient: Lisset A. Duran, currently at Princeton University

2017
Keynote: Christopher Pedigo, PhD (Yale School of Medicine)
John Jay Class of 2009
Award Recipient: Ronal Peralta, currently at University of Pittsburgh School of Medicine

2016
Keynote: Anastasiya Yermakova, PhD (University at Albany's School of Public Health)
John Jay Class of 2008
Award Recipient: David Rodriguez, currently at BASF

2015
Keynote: Daniel Cocris, DMD (Rutgers School of Dental Medicine)
John Jay Class of 2006
Award Recipient: Yessenia Lopez, currently at Weill Cornell Graduate School of Medical Sciences

2014
Keynote: Alison Keenan, PhD (University of CA-Davis)
John Jay Class of 2007
Award Recipient: Eugenia Salcedo, PhD, currently at IAVI

2013
Keynote: Lisa DeWald, PhD (Stony Brook University)
John Jay Class of 2004
Award Recipient: Anna Stoll, currently at Michigan State University

2012
Keynote: Damon Borg, PhD (St. John's University)
John Jay Class of 2005
Award Recipient: Roselynn Cordero, PhD, currently at 3M

2011
Keynote: Kimberly Papadantonakis, PhD (California Institute of Technology)
John Jay Class of 2002
Award Recipient: Richard Piszczatowski, currently at Albert Einstein College of Medicine

2010
Keynote: Julie Layshock, PhD (Oregon State University)
John Jay Class of 2005
Award Recipient: Jason Quiñones, PhD, currently at Synchrogenix, a Certara company

2009
Keynote: Bladimir Ovando, PhD (SUNY—Buffalo)
John Jay Class of 2002
Award Recipient: Kana Noro

2008
Keynote: Marcel Roberts, PhD (Boston College)
John Jay Class of 2002
Award Recipient: Nicole DeLuca

RESEARCH MENTORS

Faculty Member	Area of Expertise
Aftab Ahmad, DSc	Object-oriented programming, computer architecture, and data communications and forensic security
Anthony Carpi, PhD	Environmental chemistry and science education
Leslie Chandrakantha, PhD	Statistics, regression analysis and logistic regression, time series analysis, and computer simulation
Elise Champeil, PhD	Synthetic chemistry and bioorganic chemistry
Shu-Yuan Cheng, PhD	Toxicology, pharmacology, molecular biology, and neuroscience
Marta Concheiro-Guisan, PhD	Forensic and clinical toxicology
Angelique Corthals, PhD	Pathology, biomedical and physical anthropology, and archeology
Lissette Delgado-Cruzata, PhD, MPH	Epigenetics and cancer epidemiology
Peter Diaczuk, PhD	Ballistics, trace analysis, blood splatter, microscopy, image analysis, and evidence examination.
Artem Domashevskiy, PhD	Biochemistry, biophysics, and molecular biology
Yi He, PhD	Analytical chemistry and environmental sciences
Shweta Jain, PhD	Wireless and social networks and delay tolerant networks
Hunter Johnson, PhD	Mathematical logic
Ekaterina Korobkova, PhD	Biochemistry, biophysics, and physical chemistry
Thomas Kubic, JD, PhD	Light and electron microscopy, vibrational spectroscopy, and image analysis to physical evidence examinations
Nathan Lents, PhD	Cell biology, forensic biology, genetics, and bioinformatics
Richard Li, PhD	Forensic DNA analysis, forensic molecular biology, and forensic genetics
Yi Li, PhD	Applied mathematics, nonlinear elliptic and parabolic differential equations applied to physics, biology, and medicine
Mauth Obaidat, PhD	Computer and mobile networks, wireless and mobile security, network security and forensics, IoT security and privacy
Ana Pego, PhD	Forensic, *postmortem*, and analytic toxicology.
Mechthild Prinz, PhD	Forensic biology and forensic genetics
Gloria Proni, PhD	Supramolecular and molecular chirality, optical spectroscopy, and synthesis and characterization of small molecules
Jason Rauceo, PhD	Molecular biology, molecular genetics, and mycology
Marcel Roberts, PhD	Electrochemistry, spectroscopy, and analytical chemistry
Jennifer Rosati, PhD	Forensic entomology, biology, entomology, ecology, entomotoxicology, and insect behavior
Daniel Yaverbaum, MS, MPhil	Physics education and cognition, Galilean and special relativity, and astronomy
Guoqi Zhang, PhD	Inorganic/organometallic chemistry, chemical catalysis, forensic chemistry, and metallic anticancer drugs

PROGRAM INFORMATION AND STAFF

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PRISM at JOHN JAY COLLEGE
PROGRAM FOR RESEARCH INITIATIVES IN SCIENCE AND MATH

PROGRAM FOR RESEARCH INITIATIVES IN SCIENCE AND MATH (PRISM) groups various initiatives aimed to support science and math students at John Jay College. The PRISM Undergraduate Research Program provides students with the opportunity to engage in long-term, close mentoring relationships with faculty who provide training, personal and career advisement, and professional encouragement. Our newest initiative, The Junior Scholars Program, offers academic advisement, tutoring, and professional development activities to an additional 60+ science and math students per year. In addition, we support the CUNY Justice Academy (CJA), a series of articulation agreements with partner CUNY Community Colleges, by providing academic advisement and outreach activities to CJA students transitioning to our forensic science major.

By building a relationship between the students and John Jay, PRISM has significantly reduced attrition from STEM majors and helps underserved students to see themselves as scientists, rather than outsiders in the discipline. The program relies on these relationships, as well as peer cohort building and professional development to engage students in science and prepare them for success in science careers. Importantly, it does this in an environment that explicitly considers the backgrounds of the underserved populations that participate.

Since its founding in 2006, almost 350 students have participated in PRISM, of whom more than 99% graduate. More than 150 students have moved on to post-graduate programs, almost half from underrepresented minority groups and the majority of whom are women. And 67 PRISM students have gained admission into doctoral programs in STEM fields, half of whom come from underrepresented groups. PRISM has been recognized by CUNY, the National Science Foundation, and the National Academy of Sciences as a model of excellence for improving diversity in the STEM pipeline.

For more information about PRISM and our incredible students, visit:
www.jjay.cuny.edu/PRISM
Follow us on Twitter and Instagram **@JJCPRISM**

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For information about the Program for Research Initiatives
in Math and Science, please email the staff at PRISM@jjay.cuny.edu
or visit **www.jjay.cuny.edu/PRISM**

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