2•0•1•5

PRISM
at John Jay

Undergraduate Research
CHRONICLE

Program for Research Initiatives in Science and Math

choose your future

engage

challenge yourself

investigate

opportunity

determination

persistence

network

rewarding

stimulating

build connections

question

examine

inquire

About the Cover:

Image credit: A stylized version of images depicting the formation of, first radial (sunburst pattern) and then tangential (circular pattern), fractures in glass after a projectile is shot through the pane. These images were obtained as part of a PRISM-sponsored research project by PRISM student Glen Mahon and his mentor Dr. Peter Diaczuk.

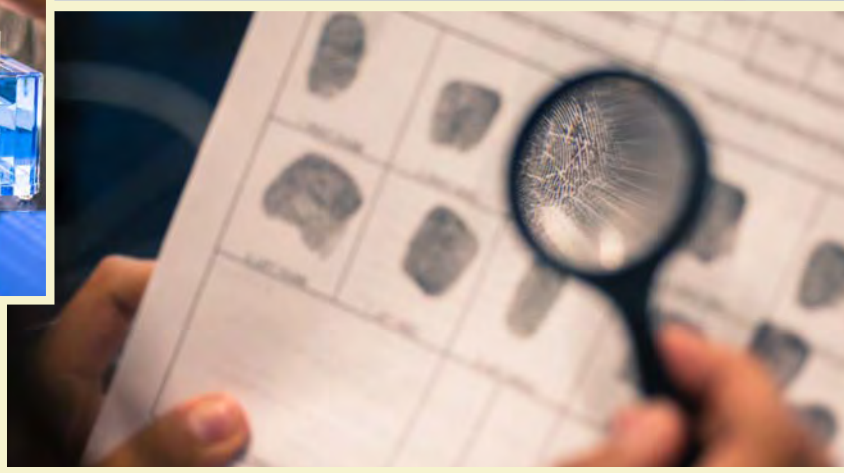
Glen Mahon's pioneering discovery proves what had previously been widely theorized in the field but never documented - that radial fractures appear before tangential fractures when a pellet or bullet penetrates glass. Using images from a high-speed camera purchased with PRISM funding, Mahon documented the specific patterns created when glass breaks mechanically due to an applied force. The images illustrate how radial fractures first spread out from where the force was applied and then tangential fractures occur in a circular pattern around the impact area.

50 Fiftieth Anniversary
John Jay College of Criminal Justice

CUNY The City University of New York

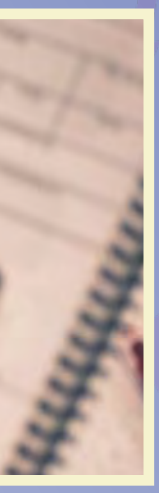
Contents


© Allison Domzalski 2014




COLLEGE
OF
CRIMINAL
JUSTICE

a growing community



As the College celebrates its 50th anniversary this year, it's fascinating to reflect on its past, present, and future. Fifty years ago the institution had no laboratories, offered no science major, and had no program for undergraduates to conduct research. However, as the College has grown, the faculty that have joined the institution have enriched its history and the opportunities available to students. We now offer science majors in Forensic Science and Cellular and Molecular Biology, and continue to create new ones. Our students are part of a community exposed to science through lectures, laboratories, seminars, and undergraduate research. Whether they are examining the radial fracture patterns of bullet impacts, the antiviral activity of plant proteins, the detection of drugs and metabolites in urine, or the catalytic capability of chemical complexes, PRISM students are learning from their mentors and from each other about how to be a scientist.

And members of our community are moving on to great things and expanding their horizons. Like Shawn Williams, featured on page 27, who is going on to graduate school at Brown University; Tanya Napolitano, on page 16, who is going on to graduate school at St. John's University; or Samuel Reinfeld, on page 19, who is going on to the New York College of Osteopathic Medicine. Like Jiwon Seo (p. 21), Shanelle Shillingford (p. 22), Porfirio Fernandez (p. 8), and Desiree Williams (p. 26), who are each going on to prestigious summer research programs at Harvard University, the Scripps Institute, the University of Miami, and CUNY, respectively. Or like the dozen PRISM students who attended the Annual Biomedical Research Conference for Minority Students in San Antonio, Texas this past fall (p. 32).

Our PRISM community continues to grow. This year we welcomed our first freshman, Lisset Duran (p. 7), into PRISM; and we celebrated our 54th student moving on to a post-graduate degree in science. The work and achievements of our students have enriched the institution throughout its 50 years and we thank everyone for their contribution.

Congratulations!

~ Dr. Anthony Carpi

Undergraduate Researchers

Student researchers

Valentina Aitbakieva

I am a born and raised Russian native. Before I came to the United States, I attended the University of Cinema and Television in Sankt-Petersburg with a major in electrical engineering. During my first few years living in America, I mostly dedicated my time to exploring American culture. I cannot remember how and when I became interested in science, but now I can certainly see that to be my future career path. Science is an open field, and molecular biology seems to be the most plausible opportunity for me to enjoy myself and make a difference. As of now, I am unsure of a specific career I wish to pursue, but I am confident that my participation in PRISM will lay the foundation for making that decision.

Isolation and Characterization of Different Isoforms of Pokeweed Antiviral Protein (PAP) from *Phytolacca americana* (Dr. Domashevskiy)

Ribosome-inactivating proteins (RIPs) are found in a wide range of plants. Their antiviral, antibacterial and antifungal biological activities indicate that RIPs are major contributors to the plant's defense mechanisms. RIPs prevent viral infections through the inhibition of protein synthesis by inactivating host ribosome. *Phytolacca americana,* the common pokeweed plant, produces pokeweed antiviral protein (PAP), a type 1 RIP, that exhibits lower toxicity toward eukaryotic cells in comparison with type 2 RIPs (such as ricin toxin from *Ricinus communis*), yet possesses high antiviral activity. Pokeweed plant produces nine distinct isoforms of PAP. These develop in different parts of the plant throughout its lifetime. Several isoforms have been shown to exhibit stronger enzymatic activity than others (e.g., PAP-S isolated from seeds). The exact mechanism of how PAP selects its viral RNA substrates is not well understood, and is an interest of our laboratory research. The essence of my project is to isolate and characterize PAP isoforms, and compare their enzymatic activities towards tobacco etch virus RNA. This research will contribute to better understanding of how PAP exerts its antiviral mechanism and activity. Understanding of how PAP selects its target RNA substrates may find several applications, including biomedical and agricultural fields. Our future goal is to study conditions for the liposomal encapsulation of the most potent PAP isoform that can be used as a treatment for a variety of human diseases caused by viruses, including HIV and influenza.

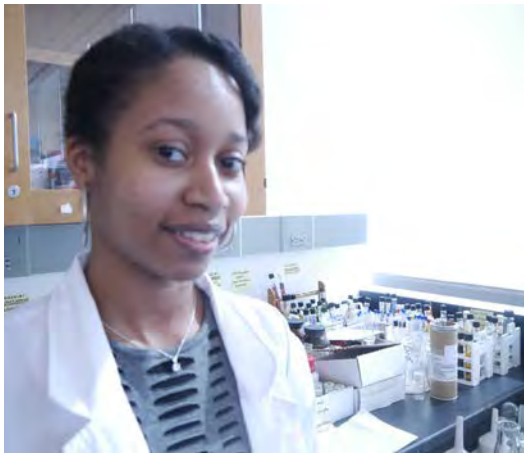
Brianna Bell

Ever since I can remember, I have always had an interest in science, especially chemistry. During high school, I fell in love with Forensic Science and decided that I would major in this at Long Island University. However, due to financial reasons, I made the decision to transfer after being at LIU Post for two years. Although this is only my second semester at John Jay College, I can sincerely say how pleased I am that I transferred based on all of the opportunities available at this institution. The Toxicology track allows me to combine my love for Forensic Science and Chemistry in a fun and interactive way. My dream goal is to work for the FBI or DEA as a Forensic Drug Chemist and I know that this will be achievable with all the skills I am learning at John Jay College and through my research with Dr. Champeil.

Detecting Amoxicillin in Water-Based Media (Dr. Champeil)

Amoxicillin is a common antibiotic administered to individuals with various infections caused by bacteria, such as pneumonia, *H. pylori*, bronchitis, etc. Amoxicillin is detectable eight hours after an orally administered dose. In the blood, the antibiotic is about twenty percent protein-bound and diffuses into the body tissues. Amoxicillin is excreted in urine unchanged. As a result testing amoxicillin levels in urine is a good method to determine its concentration in the body. Nuclear Magnetic Resonance (NMR) Spectroscopy is a technique that enables the determination of chemical structures. Our hypothesis is that we can detect amoxicillin in a urine matrix using NMR spectroscopy and a water suppression technique.

The current objectives are to 1) optimize the NMR conditions to detect amoxicillin in water using purge, an NMR water suppression technique, and 2) detect and quantify amoxicillin in a urine matrix using NMR spectroscopy. Experiments will start by testing how the acid or base affects the chemical shifts of the signals of amoxicillin. To date, I have begun pH experiments (acidifying or basifying amoxicillin in urine using HCl or NaOH) to determine the influence of acidity and basicity on the chemical shifts of amoxicillin.



Nyeisha Brathwaite

My experience at John Jay has been nothing short of a journey and discovery of myself. I began the Forensic Science Program for many reasons, though those may have evolved now that I am near completion of my degree. Laboratory research allowed me to better assimilate into John Jay as a transfer student, and fulfill the internship requirement quite early. Also I feel as though it has allowed me a peek into some aspects of graduate school. I am now intrigued by the idea of applying my unique forensic background to earn a medical degree and maybe follow in the path to become a forensic pathologist. Many doors have opened as an array of newly learned skill sets have been great additions to my resume for the worrisome job search during Senior year. This indispensable lab experience has also complemented my core science courses, allowing me to greatly improve in both respects. The PRISM program and Dr. Zhang have helped me perform beyond my once personally perceived potential, and I thank them for such.

Non-Precious Metal Complexes Based on Multidentate Ligands for Catalysis and Fluorescence Sensors (Dr. Zhang)

An aim of this study is the investigation of the catalysis and fluorescence capabilities of metal complexes. Various metal complexes were synthesized using multidentate Schiff base ligands. The facile condensation of aldehydes and amines under mild conditions, affords a variety of multidentate Schiff base ligands as potentially excellent precursors for some metal complexes. X-ray crystallography, combined with various spectroscopic and mass analyzing techniques were utilized to identify the structures of the formulated crystalline metal complexes. In the next steps, these newly synthesized metal complexes could be tested in catalytic reactions for alcohol oxidation and/or various zinc and copper metal complexes could be further characterized as possible luminescence sensors, for their consequent application to the detection of various toxic molecules or ions.

Ashley Brown

From a young age, I can remember science has always been a subject of high interest to me. I was fascinated watching the television show *Bill Nye the Science Guy* and not missing a single episode; loving the short experiments he performed and feeling satisfied after truly understanding the concept behind them. Long before high school I was interested in making visual and conceptual comparisons in science and loved performing experiments. It was my first class of organic chemistry when I was introduced to instrumentation and the concept of toxicology. While searching for a senior college, John Jay was mentioned by a friend. Research became a way for me to delve into instrumentation and analyzing chemical fingerprints. My future goal is to pursue a career in toxicology, mainly in chemical identification.

Identification and Individualization of Cosmetics by ATR-FT/IR, and Raman Spectroscopy (Dr. Kubic)

Fourier Transform Infrared Spectroscopy (FT-IR) is an instrumental technique for chemical analysis used in the forensic sciences to distinguish an array of samples including cosmetic foundation makeup both wet and dry. FT-IR measures the vibrational patterns of functional groups to correctly identify them. These vibrational patterns can be found in all samples tested such as liquids, powders and so on. Due to the powdery nature of foundation, it is easily transferred to a number of materials including clothing, cell phone screens, skin, paper, etc. The residue left behind from the make-up is usually a smudge or a smear. In the case of a crime, where the material is smudged or smeared, it can be analyzed by FT-IR analytical techniques. These analyses could be further assisted by a spectral database to help forensic scientists easily and efficiently detect the brand, line, and shade number of the foundation being handled. This research consists of collecting about 36 samples of dry cosmetic foundation different brands. The experiment is to be carried out by swabbing foundation onto a clean slide and smearing onto a clean piece of cloth, then gently applying the sample onto a diamond ATR (Attenuated Total Reflection) crystal and collecting a spectrum. The material is then cleared from the spectral background solely leaving the cosmetics shown. The readings from the FT-IR are then compared to a spectral database hopefully resulting in matches compared to brand and line, but shade may not be determined even by visual comparison because the transfer is often small. Analytical techniques for FT-IR, followed along by a spectral database would aid forensic scientists in quickly and efficiently determining the most popular and recurring brands of foundation.

Melinda Chiu

In high school, I was part of a Science and Math honors research program. I have always liked those subjects, but I had not realized they were something I was passionate about until after going through a difficult time my first year in an out-of-state college. It took hitting a low point before I picked myself up. Transferring to John Jay College was my chance to start fresh, and it was when I renewed my commitment to math and science by choosing to pursue a degree in Forensic Science. It has challenged me in so many ways, and gave me self-pride in knowing that I can accomplish anything I put my mind to. Today, I am proud to say that I am a PRISM research student, and a math and science tutor with the SEEK Department (*Search for Education, Elevation and Knowledge* - a program at CUNY designed to assist students who are both academically and financially disadvantaged). I will be graduating this June 2015, and am excited to pursue a career in the health field.

Separation and Spectroscopical Characterization Complemented with Computational Analysis of Methamidophos, N-methyl Methamidophos and Acephate (Dr. Proni)

Many commercially sold insecticides include a racemic mixture of chiral organophosphorus (OP) compounds. The two enantiomers of the compounds may have different ways in which they either degrade or accumulate in the environment. This becomes an issue when realizing that the enantiomers may have certain toxicities toward several species of animals and insects. For this project, we set up HPLC methods to collect enantiomerically pure OP compounds of N-methyl-methamidophos, methamidophos, and acephate. It is hypothesized that when the OP compounds are separated, one of the configurations, R or S, will have a higher toxicity towards the environment. For this term, my role in Dr. Proni's laboratory is to assist in the separation and collection of enantiomers. I practiced working on the HPLC independently to separate compounds into their pure enantiomers. I worked on separating acephate, a compound that already had an established separation method. These samples were separated and collected to be sent away for further testing. We recently learned of a potential way to separate methamidophos and are working at carrying out this method. Meanwhile, we also will continue trying to find out what conditions were needed to separate N-methyl-methamidophos into its pure enantiomers.

Candida albicans culture

Karen Conrad

I first became aware of my love affair for the sciences during my first science fair in elementary school. While taking a forensic science class at my high school, I realized that biology was the field I enjoyed the most. When applying to colleges, I knew I wanted to pursue my dream and the Molecular Biology track at John Jay seemed like the right fit. As soon as I heard of the amazing research opportunities through the PRISM program, I knew I had to join. I couldn't be happier with the research I am a part of and the opportunity to do what I love. My mentor, Dr. Rauceo, has taught me more than I could have ever imagined, and he continues to encourage all of my dreams. With the knowledge that I have gained from this experience, I feel ready to pursue a graduate degree in molecular biology, and maybe one day, I can be as good of a professor and mentor as I have been lucky to have.

Phenotypic Characterization of HOT1 in *Candida albicans* (Dr. Rauceo)

Candida albicans is a fungus that comprises the normal microflora of its human host. Superficial infections of *C. albicans* include vaginitis and diaper rash; however, in immunosuppressed patients, infections may lead to death. In order to understand *C. albicans* pathogenicity, signal transduction pathways are studied. A highly conserved pathway responsible for response to osmotic, oxidative, cell wall, and heavy metal stress is the HOG pathway. In the non-pathogenic yeast *S. cerevisiae*, a downstream target of the Hog1 kinase is the Hot1 transcription factor; however, the relationship between Hot1 and HOG signaling in *C. albicans* is unknown. In order to determine the role of Hot1 in *C. albicans*, qualitative growth assays were performed on *hot1Δ/Δ* mutants under osmotic, oxidative, and heavy metal stress. Since *hog1Δ/Δ* mutants grow poorly under these conditions, we expected *hot1Δ/Δ* mutants to have similar growth defects; however, our results show no observable growth difference. We propose to further monitor *hot1Δ/Δ* mutant growth phenotypes in quantitative growth assays, because potential growth defects may not be detected in the qualitative growth assays. Furthermore, we propose to microscopically examine vacuolar structure following osmotic stress, because an *S. cerevisiae hot1Δ* mutant strain has altered vacuoles. Lastly, we propose to microscopically observe *hot1Δ/Δ* mutant growth after induction of filamentation with spider medium and serum, due to preliminary findings that suggest this mutant does not filament in the same manner as wild-type. Future work will be focused on determining the gene targets of Hot1 via Real Time-qPCR analysis.

Sabrina de los Santos

I am a senior Forensic Science major specializing in Toxicology and Molecular Biology with a minor in Biology. Science has always been the most fascinating aspect of my academic career; therefore it only seemed logical to pursue a degree in this field. Throughout the past few years I have realized that my intrigue stems primarily from the biological sciences, which has ultimately led to my post-graduate goals. I plan to attend medical school to pursue my career of interest, Forensic Pathology. Research has given me the opportunity to work hands on with fantastic faculty and to properly apply what I've learned throughout the years.

Analysis of the Effects of Turnip Mosaic Virus Protein-linked Genome on Ricin Chain Depurination of Eukaryotic Ribosomal RNA (Dr. Domashevskiy)

Ricin, a toxic protein from the seeds of *Ricinus communis* (castor beans), is a ribosome inactivating protein (RIP) that is potent against eukaryotic ribosomes. The polypeptide chains of ricin, A and B, are capable of terminating protein synthesis via removal of a specific adenine residue in the sarcin/ricin (S/R) loop of large eukaryotic, ribosomal RNA. Pokeweed antiviral protein (PAP), originating from the leaves of *Phytolacca americana*, is a Type I RIP with antiviral properties. Past studies show that turnip mosaic virus protein-linked to genome (VPg), which serves as a cap analog for uncapped viruses, to inhibit both the antiviral and depurinating properties of PAP. VPg was shown to be an effective counteractive protein against the defense mechanisms of plants. We hypothesize that VPg will interact with the ricin A chain (RTA), and will inhibit RTA activity against the eukaryotic ribosomal RNA. Following purification of RTA, steady state fluorescence will be utilized to determine the change in binding affinity after observing RTA-rRNA interactions preceding RTA-VPg interactions in the presence of eukaryotic rRNA. Quantification of the amount of purines released by RTA during both depuration processes will be studied as well.

Laura Duffy

Having been a special education student most of my life, college was never supposed to be in the cards for me. However, once realizing that my profound interest for science was here to stay, I found myself pushing my limits and enrolling in college classes. During this challenging journey, I managed to overcome the barriers that many once thought were impenetrable. As a graduating senior tracking in toxicology, and a PRISM student working under Dr. Angelique Corthals, I hope to establish an active role in this developing field and better understand the pathologies that continue to mystify me. Working on research that intends to determine the architecture of postmortem after trauma in highly decomposed bodies, I hope to make a contribution to my field as well as locate opportunities to pursue further scientific education.

Histomorphology Due to Trauma of Highly Decomposed Bodies (Dr. Corthals)

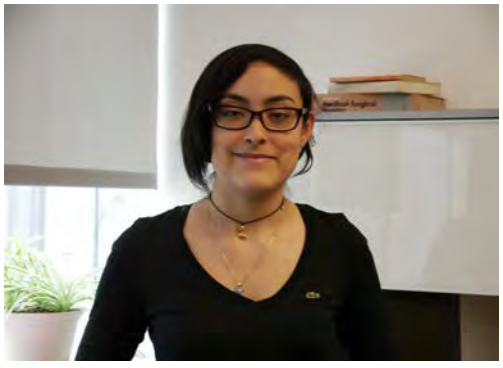
This project is designed to determine the architecture of highly decomposed tissue and bone that underwent several types of physical trauma at the post-mortem stage. Using a pig shoulder and leg, physical trauma will be inflicted on the specimen. The types of physical trauma inflicted include penetration by bullets, forced marks and indentations which including stab marks, and manual assault resulting in bone breaks/fractures, contusions, lacerations, and abrasions in the post-mortem specimen. After decomposition of the specimen by environmental means the histomorphology of the trauma inflicted will be examined using various techniques which include the use of a cryostat, histological stains, and comparison of tool marks to those found in a pre-made database. R Studio software will be used for visual representation and a ballistics tank will be equipped with an x-ray to show trajectory. The resulting structure of the injured tissue in comparison to the controls is intended to assist forensic examiners with future medico-legal investigations of unrecognizable bodies.

Lisset Duran

Albert Einstein once said that "the important thing is to never stop questioning." I have found that my goal as a scientist is to never stop asking new questions, but also never stop searching for answers. I believe knowledge is liberating and that is why I am ecstatic to begin conducting research during my first year of undergraduate study at John Jay College. It is my hope that through research with Professor Delgado-Cruzata on breast cancer, that I will gain knowledge which I will be able to share with the world. In the future, I hope to keep learning by pursuing a PhD in Public Health and conducting research that is relevant to other people lives.

Investigating the Loss of DNMT1 Function in Breast Cancer Cells (Dr. Delgado-Cruzata)

Aberrant DNA methylation is a hallmark of many human cancers, such as breast, characterized by global DNA hypomethylation and site-specific hypermethylation. DNMT1 protein, maintains methylation by catalyzing the addition of methyl groups to CpG dinucleotides on newly synthesized DNA strands, disrupted DNMT1 function and amounts have been associated with aberrant DNA methylation levels. However, less is known about the downstream effect of knockdown of DNMT1 in specific genes related to breast carcinogenesis. In this study, we will investigate the downstream effects resulting from loss of DNMT1 functioning. We propose that the loss of DNMT1 through the treatment with antisense oligonucleotide ASO98, will result in lower promoter methylation, increased genomic instability, and aberrant expression levels of BRCA1, p53, and RASSF1A. We will compare levels of DNMT1 and its target genes before and after treatment with ASO98, by measuring mRNA and protein levels as well as DNA methylation in the promoter regions of these genes.



Natalia Fernandez

Having witnessed crimes, I always knew I would pursue a degree related to law. I have always been interested in sciences, and I even enrolled into medical school in the Dominican Republic in 2010. However, I did not feel satisfied with the degree I was pursing. That is when I decided to leave my home country, and pursue a degree in Forensic Science. I started to do research in spring 2013 with general chemistry professor Dr. Ecevit at BMCC about the anti-cancer activity of phthalocyanines. Then I decided to apply to PRISM and did research last summer in bioremediation with BMCC chemistry professor Dr. Navarro about using spent teabags as adsorbents of heavy metals. Currently, I am working with Dr. Proni at John Jay on synthetizing new lawsone derivatives, and I am really excited that I am finally doing research in my field of interest.

Development of New Reagents for the Detection of Latent Fingerprints on Porous Surfaces (Dr. Proni)

Fingerprint comparison is still one of the most useful techniques for the identification of possible offenders. 2-hydroxy-1,4-naphtoquinone, commonly called lawsone, was proposed in 2009 as a reagent to detect fingerprints. It is a colorful reagent and presents fluorescent properties. The only drawback presented is its solubility: a high concentration of polar solvent is required to dissolve the molecule that could create de-inking problems in documents when searching for fingerprints. We hypothesize that less polar derivatives of lawsone and JM40, which will need a lower concentration of polar solvent, will significantly decrease de-inking issues that occur when fingerprints are taken. During the research, several new derivatives of lawsone and JM40 with improved solubility were synthesized. Lawsone was separately reacted at the hydroxyl functionality with anthracene-9-carbonyl chloride, and JM40 was separately reacted at the hydroxyl group with 2-naphthoyl chloride, 9-fluorenone-4-carbonyl chloride, and anthracene-9-carbonyl chloride. Each derivative was fully characterized by mass spectroscopy and NMR spectroscopy. The derivatives were further analyzed using Ultraviolet-Visible spectroscopy and fluorescence in solution to understand which derivative is more effective to develop latent fingerprinting. Unfortunately, the results obtained are not following the trend expected so the experiments will be repeated. The last step will be to develop latent fingerprints with each derivative that was synthetized, and compare and record the results that will be obtained.

Student researchers

Porfirio Fernandez

I am that student that enters the classroom, sits in the front row, actively participates and when the lecture is over, I leave more confused than when I first sat down. Needless to say, for me, learning never comes effortlessly. Up until this point, my academic journey has been riddled with twist and turns, failures, setbacks, disappointments and if you ask me, everything but the kitchen sink. Despite these challenges, I miraculously earned a Bachelor's degree in Forensic Psychology in 2009. Unknown to me, my relationship with education was in its infancy. It was the passing of my best friend that drove me to pursue a career in science. Shortly after my enrollment in the Forensic Science program at John Jay, I met my mentor, Professor Jason Rauceo. In addition to allowing me to work alongside him and an incredible research team, Professor Rauceo has helped me identify, plan, and pursue a clearly defined role in the sciences. I am excited for my future as a research scientist as I look to apply to graduate school upon graduation.

Characterization of Yeast Chaperones in Processing Cell Wall Amyloid-forming Adhesins (Dr. Rauceo)

Candida albicans is the most common human fungal pathogen. Adhesion is critical for survival and maintaining pathogenicity. The Agglutinin-like sequence (ALS) family of cell wall proteins mediates adhesion to human tissue and yeast cell-cell aggregation through the formation of amyloid domains. Amyloids are insoluble fibrous protein aggregates that are associated with human neurodegenerative diseases such as Parkinson's and Alzheimer's disease; however, in yeast, ALS amyloids play a functional role. Our hypothesis is that chaperone proteins prevent premature amyloid formation of ALS proteins during translation and trafficking through the endomembrane network. It is unknown whether chaperones play a specific role in assisting production of all cell wall proteins or amyloid-forming cell wall proteins. We screened 19 chaperone genes that were selected in part to their associated functions in trafficking throughout the endomembrane system. S*accharomyces cerevisiae*, a non-pathogenic yeast, was used to test ALS function. We transformed plasmids containing ALS1/5 into *S. cerevisiae* strains containing mutations to candidate chaperone genes. We performed binding assay with ALS1/5-expressing cells to examine ALS function, and we performed fluorescence assays to determine ALS cell-surface localization. We measured the enzymatic activity of an unrelated cell wall enzyme, invertase, but the results were not reproducible. We found that most strains containing mutations to particular chaperones (10 of the 19 mutants) were statistically defective in yeast cell-cell aggregation. Our results confirmed the presence of ALS5 on the cell wall for Hsp104, Ssa4 and Sse1 (previously identified by Keisha Alexander). We propose to conduct a second trial of aggregation assays; along with florescence assays for 19 chaperone mutants will be conducted. This project will contribute to developing a network of chaperone proteins involved in amyloid processing.

Stephania Guzman

I took a forensic science class my senior year of high school and found it so interesting that I decided to pursue that as a major and John Jay College was the best and most affordable choice. What I didn't anticipate was the journey I would embark on my freshman year. I took a biology course with my current mentor, Dr. Nathan Lents, and instantly felt engaged by the material. I found out about PRISM from a friend and decided to give that a try only to find out how passionate I am about research. I am thankful to the program and my mentor for all the opportunities. I've presented my work at a national conference and now I look forward to a new journey as I apply to graduate school in the fall. I want to pursue a PhD in cell and molecular biology.

Analysis of the Human Microbiome on Living and Decomposing Bodies (Dr. Lents)

This project is primarily focused around the human microbiome, specifically dead and live subjects. The aim for this research is to determine changes in the bacterial populations that occur after death, which can be helpful in establishing time of death and other information in forensic investigations. The 2013 Fall semester was primarily focused on working with the DNA extraction from swabs taken from ear and nasal cavities in live subjects. We collected bacteria by swabbing the ear and nasal cavities of both living and deceased subjects, then extracting DNA. During the first phase of the project, we took samples from living volunteers to demonstrate that we could perform the intended analysis and to get a basis for our comparison. Then, we collected samples from the ear and nasal cavities of decaying cadavers at the Anthropology Research Facility (the body farm) at the University of Tennessee at Knoxville. Our preliminary analysis reveals a great amount of diversity in the bacterial communities from person to person and an even greater amount of diversity in the bacteria found in the cadaver samples. In order to wade through this diversity to find characteristic changes that occur postmortem, we will need to analyze a large number of samples. This spring semester will involve obtaining the sequencing information from the samples already prepared. Samples were also obtained from the body farm following a body through decomposition. The DNA from these samples will be extracted and then prepared for next-generation sequencing.

Imani Hargett

From a young age science has always interested me; my mother, an ER nurse, allowed me opportunities to see medical practice at work from as early as I can remember. Before coming to John Jay, I attended Virginia State University where I majored in Forensic Chemistry, but due to financial issues had to leave. When presented with the opportunity to attend John Jay, I was elated to continue on my path of scientific exploration and jumped at the opportunity. Since joining PRISM and engaging in research, I have found many new facets that I had never explored before, which have changed my ultimate career aspirations. Upon graduating from John Jay, I intend to pursue an MD/PhD, combining my interest in pathology and cancer research.

Studying Perceived Educational Barriers, Coping Strategies, and Persistence of Minority Women in the Sciences at John Jay College (Dr. Delgado-Cruzata)

While the number of minority women in the science undergraduate majors has increased in the last decade, the number of women in these ethnic groups who pursue a career in the sciences has not increased accordingly. Similarly, the fraction of minority women who continue to study sciences at the graduate level has marginally increased and overall remains very small. We want to explore the various barriers that may be attributed to these low numbers, the coping strategies that are being employed to overcome those barriers, and the overall effects these have on persistence within the STEM majors. Based on prior research we hypothesize that: (1) perceived educational and career barriers will differ by gender and race/ethnicity; (2) students that perceive more barriers would tend to leave the major more frequently (less persistence) than those who perceive less barriers; (3) the relationship between persistence and barriers will be moderated by coping strategies, the students that use more coping strategies will have higher persistence than those who do not. We will conduct an online questionnaire that will collect demographic information and use the Perception of Barriers (POB) Scale, Coping with Educational Barriers (CWB) Scale, and Identification with Major Scale in students who are Forensic Science majors at John Jay College. We will employ statistical analysis to assess the perceived barriers these students face, the coping strategies they employ, and how they affect their overall persistence in the major; and how these associations may differ by gender and race/ethnicity.

Richard Khusial

I am currently a graduating senior in the John Jay College Forensic Science B.S. program. I have completed the Toxicology Track, and a Math Minor. I am currently in pursuit of my minor in Biology. I've been part of PRISM for close to two years under the mentorship of Dr. Anthony Carpi. During this time invaluable opportunities and resources have been provided to increase my scientific knowledge. These resources span from going to scientific conferences, to workshops on scientific writing and poster presentations. I am thankful for the experience of doing research in an environmental toxicology lab and the time Dr. Carpi and PRISM has invested in me. I will use my skills acquired from my time in John Jay to continue my career as a future scientist.

The Role of Temperature and UV Light in the Reduction of Mercury (II) Chloride to Elemental Mercury (Dr. Carpi)

Elemental mercury moves into the vapor phase easily and is readily transported in the environment. It was found that soil can be a significant source of atmospheric mercury because divalent mercury present in soil can be reduced to volatile elemental mercury which is released to the atmosphere. Therefore, our research looks at the mechanisms of this reduction of Hg^{2+} to Hg^{0}. We hypothesize that exposure to UV light will cause the conformational changes in mercury compounds required for elemental mercury to be released into the environment. Preliminary experimental results in our lab, for sand samples doped with mercury (II) chloride, show a spike of mercury emissions of 136.49 ng/m^2/hr and 102.22 ng/m^2/hr for two replicate samples exposed to UV light at a temperature of 25^{o}C. Another set of replicate samples were run at varying temperatures, with one held at 25^{o}C and the other held at 35^{o}C. When exposed to UV light, the sample held at 25^{o}C showed a spike of mercury emissions of 512.98 ng/m^2/hr while the sample held at 35^{o}C showed a spike of mercury emissions of 859.89 ng/m^2/hr. Another replicate sample was run at varying temperatures, with one held at 20^{o}C and the other held at 40^{o}C. When exposed to UV light, the sample held at 20^{o}C showed a spike of mercury emissions of 54.08 ng/m^2/hr while the sample held at 40^{o}C showed a spike of mercury emissions of 240.56 ng/m^2/hr. The preliminary results show that temperature may affect mercury emissions. Further analysis will include multiple samples run at the same temperature and at different temperatures. Based on the changes in flux from mercury (II) chloride, a standard average percent difference and standard deviation will be calculated for comparison among varying temperatures.

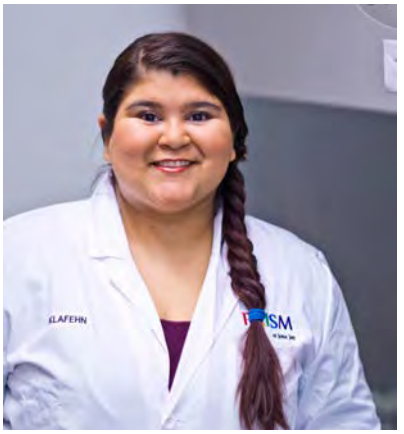
Cristina Kinahan

I am now a senior at John Jay College. I chose to attend John Jay because it is well known for its Forensic Science program and, compared to most schools, financially affordable. I am highly interested in the field of research that I am studying and have been doing undergraduate research for approximately two years. Research with PRISM has been an amazing opportunity as an undergraduate student. It allows us an entirely different type of laboratory experience and the chance to attend conferences all over the nation to present our work. I hope to continue to gain research experience, as I will be applying to doctoral programs in the near future. I am especially thankful for the all of the unconditional support from PRISM, my family, and friends who have made my journey at John Jay memorable.

Separation and Spectroscopical Characterization of Methamidophos, N-methyl Methamidophos and Acephate (Dr. Proni)

Chiral organophosphates are commonly found in their racemic forms in insecticides and lethal chemical warfare agents. We hypothesize that different stereoisomers of organophosphate insecticides will have different levels of toxicity. The purpose of this work is to isolate different enantiomers of the organophosphate insecticide compounds (acephate, methamidophos and n- methylmethamidophos) to test their individual toxicity. These enantiomers are being isolated by HPLC chromatography and their absolute configuration is being determined through the concerted use of three different spectroscopic techniques: optical rotary dispersion (ORD), electronic circular dichroism (ECD), and vibrational circular dichroism (VCD), which works by passing a given type of light (different in three techniques) through an optically active medium and measuring absorption. Acephate has been successfully characterized in the laboratory, and further toxicity tests, ND50 (neurotoxicity) and enzymatic activity, will be conducted by a colleague of Dr. Proni's. The entire separation and characterization process needs to be repeated for the other two compounds: methamidophos and n-methylmethamidophos. The separation of methamidophos has been attempted for the past two semesters but has been only partially achieved. The upcoming plans are to try separating the compound using a different column, a Chiralcel® OJ 250x4.6 mm and using a mobile phase containing n-hexane and absolute ethanol.

Erica Klafehn



My name is Erica Klafehn and I am a junior majoring in Forensic Science-Molecular Biology and double minoring in Psychology and Anthropology. I moved to Manhattan in the fall of 2012 from Rochester, NY to pursue a degree in the field I am passionate about. At John Jay, I have had a wonderful opportunity to work with a variety of faculty and students, and have sincerely enjoyed my time thus far. When I'm not in the lab, you can find me working as a Peer Advisor in the Academic Advisement Center, as a Peer Counselor at the Counseling Department, chilling in a local Starbucks, jamming out to my music on the subway, or playing music in the New Amsterdam Symphony Orchestra. I hope you enjoy learning about the Post Mortem Analysis of the Histomorphology of Trauma in Swine! Live long and prosper!

Post-mortem Analysis of the Histomorphology of Trauma in Swine (Dr. Corthals)

In the field of forensic science, and especially in forensic anthropology, human remains can be discovered days, even years after death occurred. As scientists and researchers, we are trying to determine if we can distinguish certain characteristics in deep tissue morphology that result after intact tissue undergoes a variety of types of trauma: ballistics, sharp tool mark and blunt force. The objective of this project is to gather more information pertaining to specific types of trauma on decomposed tissue and be able to *identify* the type of trauma inflicted since the number of conducted, peer review studies are sparse. There are many difficulties when assessing trauma in highly decomposed tissues. In theory, trauma should be identifiable using specific tissue stains that allow differentiating cytoplasmic debris from pathological trauma on a swine carcass. The carcass will then be left to decompose for one, three, and five weeks; after these times we will gather data and process the tissues to observe changes over time and patterns of trauma.

Anna Lerer

When I first came to the United States, I lived in a neighborhood overrun by drug abuse. Without realizing it, this is how I became interested in toxicology. I decided to take a different approach to the "education" I was receiving on the streets and enrolled into a nutrition program where I earned a Holistic Health Counseling certification. I was on a mission to help my fellow man, but I still wanted to know more. So I enrolled in the Forensic Science program at John Jay where I took my very first science class. The program greatly challenges me, and I find it very exciting. Today, Dr. Lents and I work to determine how certain supplements affect drug tests and how they may cause a false negative read out. When I graduate I wish to work in the healthcare industry and help people lead better lifestyles.

Zinc Reduces the Detection of THC by ELISA Urine Testing, While Copper May Cause a False-positive Result (Dr. Lents)

In today's work place, many adulterants are used in an attempt to pass a routine drug test. Zinc sulfate has been observed to have such an adulterating effect on urine in acute marijuana smokers and may cause a false negative in a standard urine drug test. Zinc does not interfere with the integrity of the urine, possibly making it an effective adulterant. This study focuses on testing the effect of zinc sulfate on THC levels in urine obtained from human subjects. Using a standard ELISA detection kit, zinc was observed to cause a false-negative result in a THC drug test. The higher concentrations of zinc in the urine samples were observed to have a stronger adulterating effect. Because copper is known to compete with zinc, we hypothesize that zinc supplementation may affect urine excretion of copper, which could cause a false-positive result in a standard ELISA drug test. Copper concentrations in the urine samples collected from volunteers who consumed zinc supplements will be determined, to look for a competing effect between copper and zinc, both in excretion and THC detection.

Artist's rendition depicting the loss of connection between neurons

Kathleen Lopez

I like puzzles. I really like puzzles. And as a child, I viewed science as one big never-ending puzzle. I would find the answer to one question I had, only to be plagued by two more. As I grew older, I started wanting to help come up with the answers instead of just being that person who waits for the answer to come to them. That's why I went into forensics and that's also why I joined PRISM. Forensics allows me to use the sciences as the puzzle pieces of a bigger picture and conducting research helps me quench that thirst for answers, and both give me the experience I need for the future. My current research goals consist of determining trace levels of cadmium in the Hudson River. I truly do find what I am researching enjoyable, even on days when I'm left with more questions than answers.

Determination of Trace Level Cadmium in Environmental Water and Sediment (Dr. He)

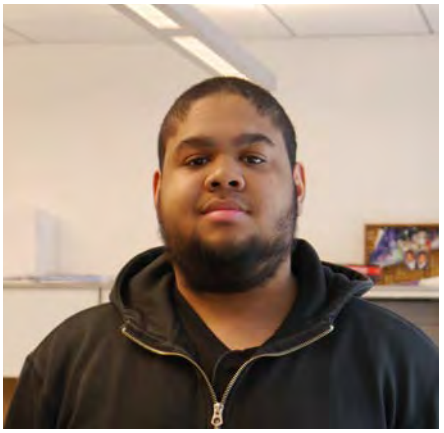
Cadmium (Cd), a naturally occurring metal historically known for being a major pollutant in the New York/New Jersey Harbor affects both human health and the relationship between organisms and their surroundings. In order to prevent consumption of this element by both humans and other animals, close monitoring of the cadmium concentration is important. We hypothesize that although various cleanups of the Hudson River (an EPA Superfund site) have occurred, cadmium may still be present in the water, at a possible depth gradient, and even more in the sediment. Because of this, it is important to monitor cadmium levels in bodies of water and sediment, such as the Hudson River, in order to know whether remediation is necessary. The goal of this research project is to refine the analytical methods we have developed to determine cadmium concentration in environmental water using inductively-coupled plasma mass spectrometry (ICP-MS) and refine the methods for graphite furnace atomic absorption spectroscopy (GFAAS) through modifier comparison. These methods will then be used to analyze samples of water collected from the natural environment to determine their cadmium concentration. So far in our work, we have produced a working calibration curve using the GFAAS and ICP-MS and have analyzed several surface water samples from the Hudson collected during different seasons. For future work, we hope to collect and analyze samples from several locations of the Hudson River and at several depths, and possibly other bodies of water and sediment that may be polluted.

Yessenia Lopez

When I first started at John Jay in 2010, I intended to pursue a double-track in toxicology and criminalistics and to begin working after graduation, until I was invited to a PRISM meeting during my freshman year. After seeing the upper classmen present their projects I became curious about the program and interested in doing research. Dr. Cheng's work with pesticides and neurodegenerative disease appealed to me because of my family's history and experience growing up on a farm. I joined PRISM in the Summer of 2013 and I have enjoyed every single minute that I spent in the lab. The ability to design your own project and carry out the experiments is exciting and makes the hard work worth it. My research experience has been wonderful and has encouraged me to pursue biomedical research after I graduate.

Manganese-containing Dithiocarbamate Pesticides Increase β-amyloid Precursor Protein and β-amyloid Peptide Expression in PC-12 Cells (Dr. Cheng)

Alzheimer's disease (AD), like many other neurodegenerative diseases, has a complex mechanism and is not fully understood. AD patients' brains contain amyloid β-peptides (Aβ) which is the cleavage product of β-amyloid precursor protein (AβPP). Some neurotoxins have shown to elevate AβPP expression, increasing β-amyloid (Aβ) peptide levels. The pesticides used in this study, maneb (MB) and mancozeb (MZ), contain manganese, which in high doses can be neurotoxic. This project will further investigate whether MB and MZ will also increase AβPP and Aβ levels in SH-SY5Y cells, by doing a dose response curve and time course study. In my previous proposed project, the results suggested that MB and MZ produced an overall increase in AβPP protein and Aβ peptide expressions in PC-12 cells and it is expected that it will also increase if SH-SY5Y cells are used.



Glen Mahon*

I am a student in the Forensic Science program, in the Criminalistics track. I came to John Jay to learn forensic science because I wanted to become a crime scene investigator, as TV shows like *Forensic Files* sparked my interest in forensic science when I was in high school. Along the way I entered the PRISM program to gain research experience and I started my own research project under the mentorship of Dr. Peter Diaczuk studying the fracture patterns of glass. My ultimate goal is to become a forensic scientist specializing in ballistics.

Ballistics Examination of Rib Marks and Radial Fractures on Broken Glass (Dr. Diaczuk)

When glass breaks mechanically due to an applied force it breaks in a specific pattern. Radial fractures will occur that radiate out from where the force was applied and tangential fractures will occur in a circular pattern around where the force was applied. The glass will also develop markings called rib marks and these start perpendicular to the side where the force was applied and stop parallel on the opposite side of the glass. These rib marks are useful in that they can tell which side of the glass the force was applied which can aid in investigations. This experiment will investigate if indeed rib marks on glass can give more information about the force applied to the glass in terms of firearms. I hypothesize that changing pellet type will change the size of the rib marks. Three parameters will be tested initially using TLC plates as the glass source and an air rifle to see if they would change the rib marks to determine if they can give indication of the caliber of the pellet or its speed and the parameters are; changing pellet caliber, changing speed of the pellet, and changing the thickness of the glass. If conclusive data is obtained then architectural grade glass will then be used and hopefully a firearm. Through the use of a high speed camera it was determined that radial fractures are the first set of fractures that occur when a pellet or a bullet penetrates a glass plate.

**Glen's research is featured on the cover.*

Colleen McNamara

We all watched *CSI* or *Bones* at some point in our lives, and just like a little kid, we aspired to be a part of that cool techy science that's often portrayed. But beyond the super cool activity of waiting ten seconds for something that actually takes several hours to complete, TV 'science' has unveiled a rather realistic truth, forensics is increasingly prominent and its application is readily expanding in the world today. Characters like Temperance Brennan and Ducky have brought to life intriguing careers in post-mortem analysis, a field that I find highly fascinating. Through their characters I have become enticed to pursue a career of forensic pathology. Who wouldn't want to be in a career that is that interesting? Currently I am funded through PRISM to work with Dr. He in the analysis of polychlorinated biphenyls using GC-MS for environmental analysis.

Determination of Trace Levels of Polychlorinated Biphenyls in Environmental Water Samples (Dr. He)

Regular sampling to test the concentration of PCBs present in the Hudson water is necessary to determine if natural remediation methods are suitable, or if further corrective measures are required. The purpose of this research experiment is to develop a method by using gas chromatography mass spectrometry (GCMS) that yields analytic results for the determination and concentration of trace PCBs levels in water samples. An external standard method was used to establish calibration curves for 16 unique PCBs congener peaks from a standard Restek PCB congener mixture (100μg/mL). Two trials of concentrations of 50 ppb, 100 ppb, 150 ppb, 200 ppb, and 250 ppb were used to establish a range. The chromatograms produced were then analyzed using ChemStation software and their average retention times were recorded and their m/z values obtained from the National Institute of Standards and Technology (NIST) library. For future work, we will apply the methods created, in addition to introducing an internal standard to all future samples, and establishing an extraction method to prepare the collected samples from the Hudson River.

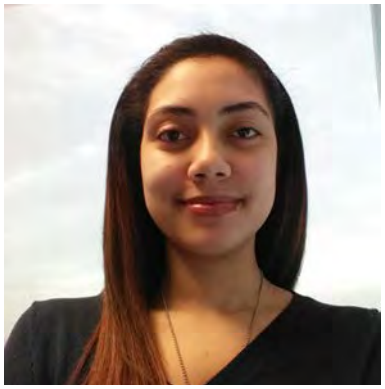
Student researcher

Herold Menier

For a large part of my life, I have dreamt of perfect beings. These perfect beings are incapable of doing wrong, cannot be prevailed over, never being challenged to accomplish their mission nor having to struggle to achieve glory and fame. But those perfect beings that wander the inner corridors of my mind are just that, dreams. I believe a true scientist is someone who aims for perfection and the ideal, all the while never being able to fully achieve it nor being afraid to fail when attempting to do so. My definition of a scientist is the reason that I am pursuing a career in forensics, which in my opinion is one of the most trial-and-error based of the science disciplines. I will then gradually reach a level that allows me to be able to perform crime scene reconstruction, after gaining some years of experience from my successes and especially my failures. After all, it is always better to succeed but you learn so much more from failing.

A Noninvasive Cleaning Method of Primer Impression Marks (Dr. Diaczuk)

Every time a firearm is fired it leaves behind a cartridge case that crime scene investigators must find and then can be used as incriminating evidence against suspect(s). Unfortunately, cartridge cases are not always found after the initial investigation and as such these incriminating piece(s) of evidence can be left buried for weeks to months at a time. Slowly corroding and slowly being destroyed by environmental degradation. That's where this research comes in. Through this experiment, we will be able to measure how long it would take for environmental degradation effects to corrode the impression marks left on a cartridge case to the point that it is no longer capable of being recovered and legitimately used as evidence. We are also trying to create a new highly effective, cost efficient, and simple cleaning procedure in order to extend the salvageable lifespan of cartridge casings that have unfortunately reached the point of not being admissible due to impression marks being altered by grime. To date, this research has shown that colder weather prolongs the corrosion process while warmer and moist weather elevates it. Currently we are analyzing the data that we have collected thus far and are making plans for the next portion of this experiment. We are also determining new methods/techniques to treat and recover the impression marks of the primer. As future work, we plan to elaborate more on the effects the environment plays based on the different seasons, soil sample, and cartridge case types.



Jazlene Montes

I have always had a passion for math and science. Starting in second grade by solving math problems for fun to reconstructing a rodent skeleton from owl pellets in the fourth, as I grew so did my fascination in the subjects. During my senior year of high school, while taking an introductory forensic science course at Hunter College, my mind was set to pursue the degree in Forensic Science. I began attending John Jay College to study Forensic Science to expand my knowledge and enhance my skills. I seek to further my education by obtaining a PhD in the future and hope my research with PRISM support will assist determining my field of study.

The Effects of Manganese-containing Dithiocarbamates on Activated Double-stranded RNA-dependent Protein Kinase (PKR) and Mammalian Target of Rapamycin (mTOR) Signaling Pathways (Dr. Cheng)

Environmental factors may play a critical role in the pathogenesis of neurodegenerative diseases. An association between past pesticide exposure and low cognitive performance may increase the risk of developing Alzheimer's disease (AD). AD is a neurodegenerative disease, which is characterized by a progressive decline of memory. The pathogenesis of AD is not fully understood. The neurodegeneration of AD brains has been linked to activated double-stranded RNA dependent protein kinase (PKR). Down regulation of mammalian target of rapamycin (mTOR) has been associated with the pathogenesis of AD. A molecular connection between PKR and mTOR was recently discovered, demonstrating that PKR is able to phosphorylate p53, which can hinder activity of mTOR in response to amyloid β peptide 42 (Aβ42). Preliminary study from Cheng's lab showed manganese-containing dithiocarbamate, maneb (MB) and mancozeb (MZ), can increase Aβ42 level. The project is proposed to reveal whether MB and MZ can activate PKR and de-activate mTOR in human neuroblastoma cells (SH-SY5Y). The results I obtained have showed MB and MZ have increased the activation of PKR by increasing the phosphorylation of PKR. This experiment will be repeated to obtain the statistical significant data. PKR inhibitor (C16) will be used to confirm the role of PKR in MB- and MZ-induced cytotoxicity by conducting MTT cytotoxicity assay. The level of activated mTOR will be studied in parallel by using Western blot analysis.

Tanya Napolitano

Science has always been my passion. From an early age I always questioned everything and anything, looking for relations, causes, and effects. Science truly opened up a door for me, giving me answers to the harder questions I always asked myself, for example: why is the sky blue? To me, science is like fascinating magic. Therefore, majoring in the sciences was a definite. Only by genuinely dedicating my life to science, can I continue to discover deeper knowledge, because it seems the more I know the more I realize I have no clue. From attending John Jay College as a Toxicology major, I have become deeply interested in the subject and it has inspired me to obtain a PhD in Pharmacology after I graduate. I hope to be a part of many research projects throughout my life, finding answers to questions that no one knows.

Interactive Bayesian Network Tool to Help Quantify the Weight of Evidence in Investigations (Dr. Petraco)

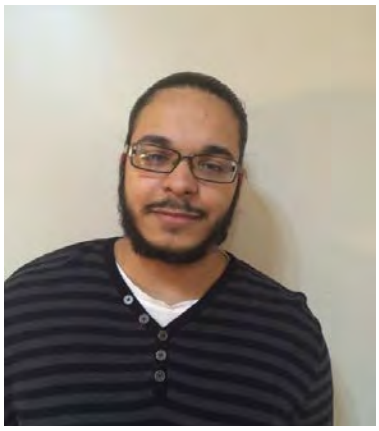
Probability theory formalizes the rules of reasoning. There are, however, two major definitions of probability. If an experiment is repeated n times in exactly the same way, and outcome x occurs a times, then the probability for outcome x is approximately a/n. This is called the “frequentist” definition of probability. However, in most real life situations, experiments cannot be done exactly the same every time. Therefore, to estimate probabilities for real life situations, which may not be repeatable or only repeatable at an enormous expense, we can instead assign a belief value to the outcome. This is called the Bayesian definition of probability. Bayesian probability coupled with “Bayes theorem” allows us to use prior knowledge and new data to update our understanding of a situation. Such Bayesian calculations are becoming increasingly important to forensic science. One way in which these calculations are carried out is with Bayesian networks. Using Bayesian Networks, a “scenario” is represented as a joint probability function that contains several variables relevant to a situation. These variables are “connected” in such a way to form a graph. The graph is a representation of uncertain information and dependencies between the variables in the scenario. Using several different computer programming tools, an interactive piece of software can be implemented to allow a user to change the underlying numeric parameters (i.e. the Bayesian prior probabilities) of the “scenario” to see how they affect the general outcomes predicted by the model.

Jae Hyuk Oh

I was born and raised in South Korea. I came to the U.S. with my dad to explore new experiences including a better life and education. My dad was an electric engineer and an automobile lubrication system designer. His experiences inspired me to learn about computer systems. I am studying Computer Science and Mathematics because I believe that our goal as scientists is to improve the overall systems of the world free of charge. My most respected computer scientist, Alan Turing, decoded German enigma during World War II. Not for his own wealth or recognition, but for the world who needed his help back then. The world needs scientists who are emotionally and morally active. From now on, I really want to contribute as many skills I have to society because that’s what I want to do and that’s what the world needs.

Distinguishing a Frog Species Through a Mobile Application (Dr. Johnson)

This research project is designed to support many biologists and scientists in terms of distinguishing and finding new frog species through the use of their unique voice spectrum. The main goal of this research is to engineer an Android-based smartphone/mobile application that recognizes and distinguishes frog species using their unique voice calls through the built-in microphone available on common smartphone hardware. We are applying the MSAS (multi-stage average spectrum) method as our main method to classify different frog species due to its high level spectrum accuracy of the frog’s unique spectrum.



Ronal Peralta

I have always been a curious person. As a child, I remember always wanting to know how things worked. I always loved math growing up because it was challenging and solving problems made me extremely happy. Throughout high school I never took any science courses. I decided to join John Jay's Forensic science program to challenge myself with something I knew nothing about. After taking many of the introductory courses I fell in love with science, because it answered questions that could not be answered without it. I'm excited by the many prospects of study I can pursue at John Jay, which will help me decide the specific field that I would want to work in after I graduate.

Understanding the Dynamics of Mercury Reduction and Emission from Environmental Surfaces (Dr. Carpi)

The dynamics of mercury (Hg) reduction and emission from environmental surfaces such as soil and sediment will be investigated through several procedures. Mercury is a global health concern because of its toxicity to humans and its persistent cycling throughout the environment. The aim of this research is to identify the mechanisms in which Hg is reduced from environmental surfaces. Mercury instruments such as the Direct Mercury Analyzer-80 and the Tekran Mercury Analyzer 2537 will be used to analyze and quantify Hg species in environmental samples and determine abiotic factors (light, temperature, precipitation) which may facilitate in Hg emissions into the atmosphere. Results will be validated and processed using statistical methods such as Student's T-test and Gaussian. Identifying the mechanism of Hg's reduction may assist in remediation of contaminated sources in the environment.

Tonya Phoenix

I am majoring in Forensic Science, Toxicology, and I hope to continue my education and study pharmaceutical chemistry. As a young girl, I displayed an interest in the scientific field, which only continued to flourish as I entered my high school years. I attended Queens Gateway To Health Science Secondary School. Outside of school, I enjoyed ballet and modern dance, including dancing at an organization in my local community. Here at John Jay, I work with Prof. Guoqi Zhang, spending countless hours under his supervision in the research lab conducting experiments. My most recent project consist of synthesizing ligands that are readily available for the detection of heavy metal toxins. It is my hope to not only continue this research with successful results, but to also be a co-author on Dr. Zhang's newest publication.

Fluorescent Metal-terpyridine Complexes as Probes for Toxic Heavy Metals (Dr. Zhang)

Selective fluorescent recognition of toxic heavy metals such as Hg(II), Cd(II) or Pb(II) by using readily available chemical compounds is much more attractive for chemistry, biology and environmental researchers. In this proposal, we design a new class of chelating ligand candidates based on the traditional terpyridine structural unit for the formation of fluorescent metal complexes that enable selective detection of toxic metal ions by fluorescence spectrophotometric technique. We will utilize the classic Kröhnke condensation reaction for the ligand syntheses and then make their complexes with Al^{3+} or Zn^{2+} ions. These metal complexes will be structurally characterized by spectroscopic techniques as well as X-ray crystallography. Over the past three months, we have synthesized the targeted new organic ligand and use the layering technique to prepare good-quality single crystals of the metal complexes of the ligands with various metal salts. Our goal was to make new metal complexes of this ligand and grow single crystals which are suitable for X-ray diffraction analysis for structural determination. So far, the ligand synthesis and characterization, as well as some of the layering experiments preformed were successful and we already obtain the crystal structure of a novel metal complex. In the future studies, we will further focus on the preparation of more interesting metal assembles and then investigate their fluorescence properties and their abilities to sense other toxic heavy metals for forensic applications.

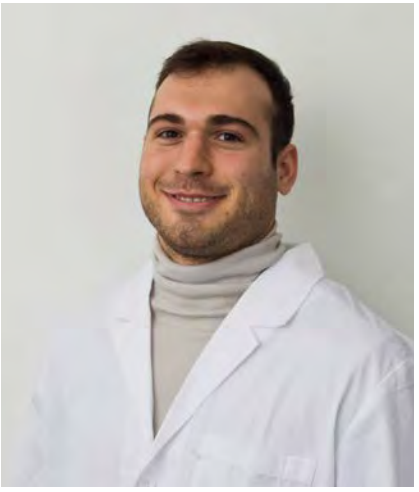
Daysi Proano

Imagining my life as a pyramid, I started from the bottom and little by little I keep climbing with the hope of eventually reaching the top and becoming a medical doctor. I emigrated from Ecuador after graduating from high school hoping to get into a college in the U.S. By becoming a new resident, I realized that if I wanted to go to college, I first had to learn English. Once I got accepted to Queensborough Community College, I found out that science is a fascinating field where experiments allow one to understand and explain phenomena usually taken for granted. As a student that belongs to the CUNY Justice Academy, I had the opportunity to get involved with PRISM, a program offered by John Jay. This opportunity enhanced my laboratory skills and allowed me to broaden my experience in research by bonding with a professor. I intend to earn a BS and then be able to continue with a degree in biomedical sciences.

Determination of the Total Amount of Gallic Acid in Commercial Beverages (Dr. Svoronos, Queensborough Community College)

Commercial beverages are consumed daily by many people and contain water, sugars, natural flavors and phenolic acids. Phenolics have potent antioxidant properties that are believed to help the prevention of diseases that are related to oxidative stress. This project uses High Performance Liquid Chromatography (HPLC) and the Folin-Ciocalteau microspectrophotometric methods to measure the antioxidant capacity and polyphenolic composition present in beverages, which is expressed in terms of Gallic Acid equivalents. The HPLC method determines the amount of monomeric forms of Gallic acid present in the samples in contrast to the Folin-Ciocalteau method that measures all forms of polymeric gallic acid. We hypothesize that the concentration of gallic acid should be higher with the Folin-Ciocalteau assay than the one measured via HPLC. In the HPLC method, the liquid sample is loaded in the injector and is forwarded through the pump into the mobile phase. The different components present in the sample are separated through the column and gallic acid is identified via a standardized curve upon elution. In the Folin-Ciocalteau method, gallic acid and its polymeric forms are oxidized to yield a blue color in the sample allowing the visible microspectrophotometric measurement by applying Beer-Lambert's Law. The exact same procedure is repeated on the same sample after 7 days to measure the degree of gallic acid decomposition by air oxidation. Future studies intend to compare more samples of juices and tea bags with both methods to prove our hypothesis.

American Pokeweed
(*Phytolacca americana*)

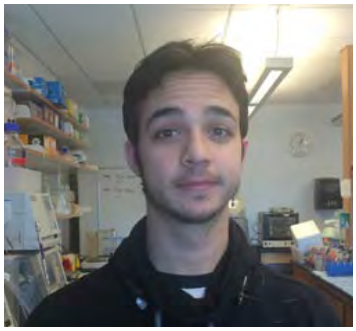


Samuel Reinfeld

I'm a curious guy in the general sense. As a young boy I enjoyed researching miscellaneous topics. The Internet era was just beginning so my thirst for detailed knowledge was thoroughly quenched. Growing older my interests subsequently evolved. I started questioning the very fabric of existence. It wasn't until I entered the Forensic Science program that those questions turned into new ones. That is one of the many things I have learned on my odyssey; the questions will never end but that doesn't matter. The only thing that matters is the quest for truth and I never know what will materialize. Sometimes I don't know what I am doing but that's what learning is about. To quote Wernher von Braun, "Research is what I'm doing when I don't know what I'm doing."

Mapping out Interactions Between Viral Genome-linked Protein (VPg) from Turnip Mosaic Virus and Pokeweed Antiviral Protein (PAP) (Dr. Domashevskiy)

The *Phytolacca americana* produces pokeweed antiviral protein (PAP), a ribosomal inactivating protein (RIP). PAP is an RNA *N*-glycosidase. It enzymatically cleaves purines from the sarcin/ricin loop (S/R loop) of the large ribosomal RNA. This leads to the inhibition of translocation in protein synthesis. Additionally, PAP lowers viral infectivity by binding to the cap structure of the viral RNA and depurinating it downstream of the cap structure. Here, we investigate interactions between PAP and a viral protein (VPg) that is covalently linked to the 5' end of the Turnip mosaic virus (TuMV) RNA. VPg inhibits PAP enzymatic activity, down-regulates cellular mRNA synthesis, and up-regulates viral protein synthesis. Here, we are investigating the binding affinity of PAP and different truncated mutants of VPg to determine the sequence necessary for PAP-VPg interactions. This research will provide an important knowledge about the regions within the VPg that are required for the inhibition of *N*-glycosidase activity of PAP and, perhaps, other cytotoxic RIPs, and may serve as an antidote against harmful RIPs like ricin.



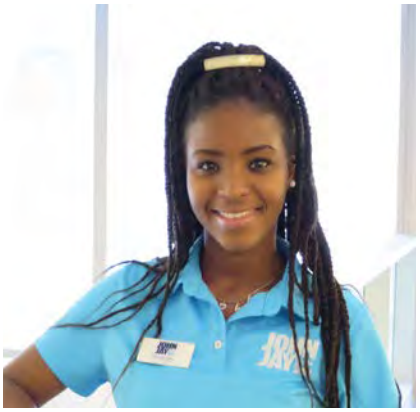
David Rodriguez

I am currently pursuing a degree in Forensic Science with concentrations in Toxicology and Molecular Biology with a biology minor at John Jay College of Criminal Justice. Though I was not always fully engaged during my beginning years at John Jay, I have become very dedicated both academically and in research. Thanks to the unbelievable support and guidance of the John Jay faculty and the opportunities given by PRISM, I feel that I have really come into my own as a scientist. My experiences in research have given me a new love and appreciation for science and discovery. I hope to continue mastering new techniques, expanding my knowledge, and discovering new things in graduate school.

Studying Interactions Between Pokeweed Antiviral Protein (PAP) and Fluorescently Labeled Tobacco Etch Virus RNA (Dr. Domashevskiy)

Nucleotide structural changes can be difficult to monitor. Nucleotides that comprise messenger RNA molecules absorb light at around 260nm. Unlike proteins that absorb light strongly at 280nm and emit at 332nm, nucleotides have poor fluorescence. Similarly, structural changes in protein-protein interaction could be differentiated by extrinsic fluorescent labeling with a group that absorbs and emits light far removed from intrinsic protein fluorescence. By binding an extrinsic flourophore that fluoresces beyond 320nm on to a RNA molecule, a nucleotide/protein complex can be distinguished and monitored. 7-methylguanosine (M7GpppN where N is any nucleotide) serves as a cap structure on the 5' end of the messenger RNA. The cap can be derivatized with a fluorescent anthraniloyl group through modification to either the 2' or 3' hydroxyl group of the guanosine ribose. The synthesis of the anthraniloyl-guanosine triphosphate (Ant-GTP) was accomplished and confirmed using silica thin layer chromatography and UV spectroscopy. This work is aimed to synthesize a fluorescent cap analog -- Ant-m7 GpppG using a previously established protocol and HPLC techniques. Tobacco etch virus (TEV) RNA 5'- leader sequence will be labeled with the fluorescent cap analog and will serve for future studies involving protein – nucleic acid interactions. TEV RNA will be capped with fluorescent analog by means of Vaccinia virus capping enzyme . Fluorescently labeled RNA will serve for subsequent binding studies involving interactions of the viral RNA with pokeweed antiviral protein (PAP). This fluorescently-labeled RNA will prove to be advantageous in distinguishing structural changes in RNA when bound to proteins, and will provide novel information to the mechanism PAP utilizes.

Danielle Rouse

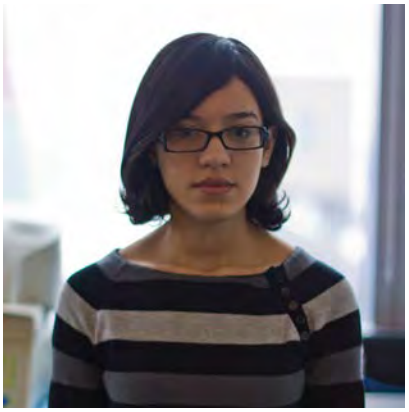


I am a 21 year old Barbadian. My ultimate goal is to be a Forensic Scientist. As a Christian I continue to make it known to all that the honor and glory belongs to God Almighty who continues to provide for my every need. I was born and raised in the beautiful 166 sq. mile island of Barbados. My career journey started at Ellerslie Secondary School, where I pursued three sciences: chemistry, biology, and physics, among others. I graduated from secondary school with 11 certificates awarded by the Caribbean Examination Council. With these qualifications I entered tertiary level education at the Barbados Community College and pursued an Associate Degree in Science majoring in Chemistry, Biology and Mathematics. These were all necessary to meet my ultimate goal. I am currently enrolled at the John Jay College of Criminal Justice in New York pursuing a Bachelor of Science in Forensic Science with a concentration in Toxicology, whilst actively being a research assistant via the PRISM program.

The Reduction Mechanism of Mercuric Oxide in the Environment (Dr. Carpi)

The research our laboratory conducts focuses on examining the mechanisms of reduction of mercuric species like mercury (II) oxide to elemental mercury, and its flux from environmental surfaces like soil. In an effort to understand the mechanisms by which mercury (II) oxide can undergo reduction to elemental mercury, a series of laboratory experiments and molecular modeling studies will be conducted. Previous work in our lab has shown that it is thought that photolysis by low energy, long-wavelength light is the process driving the reduction of mercury (II) oxide. Based on this observation, we hypothesize that levels of elemental mercury emitted from mercury (II) oxide doped samples exposed to low energy light will be significantly higher than controls. I will validate previous observations from our lab, after which I will then conduct experiments using a variety of parameters to further identify the mechanisms and driving forces of mercury emissions in the environment.

Student researchers

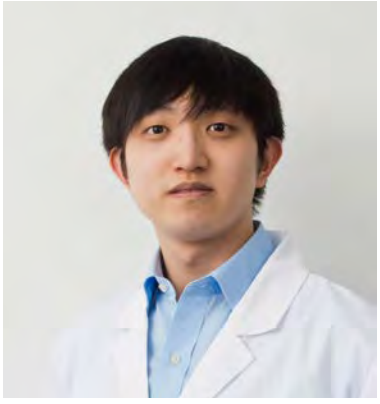


Stephanie Sanchez

I am currently pursuing a degree in forensic science with a concentration in toxicology. Initially, I was a Criminal Justice major at Bronx Community College. However, I wasn't quite motivated. It wasn't until I took my first ever chemistry class that I gained not only a renewed interest in school but a growing curiosity for science. As of now, I look forward to PRISM research where I can further expand or refine my knowledge and skill set.

Cytotoxicity Study of Newly Synthesized Salen Compounds: Trypan Blue Exclusion Assay (Dr. Cheng)

Unsymmetric salen-like ligands were synthesized by Dr. Zhang's lab through a convenient approach known as "CLICK" chemistry. CLICK chemistry selectively binds molecules rapidly and efficiently to yield compounds that can have important applications. In this case, the compounds produced were a series of metal complexes with semi-salen and thiourea moiety constituents using cobalt(II) and copper(II); the compounds titled, GZ-92, GZ-94, GZ-101, and GZ-132. It is speculated that these complexes may demonstrate cytotoxic activity against an array of cancer cells. To evaluate their possible chemotherapeutic applications, a dose response study will be carried out on human breast cancer cells (MCF-7) and human leukemia cells (K562). The study will assess cell viability through the "Trypan blue exclusion" method. Trypan blue exclusion utilizes a dye that penetrates the porous membranes of dead cells, ultimately staining them. Since live cells are intact and impermeable, one can distinguish between the live and dead cells. The resulting data will then be gathered and used to calculate the LD50 of the given compounds.



Jiwon Seo

Forensic Science has that tint of mysteriousness and thrill. It immediately triggers a childish but explosive imagination, blending various *CSI* episodes with Sherlock Holmes deduction. I could spend hours in the fantasy, but a time comes when I have to stop playing a detective and return to the real world: to a very normal circumstance that requires a very normal behavior. I had no choice but to dismiss my childish fantasies and start accepting the dry reality, but PRISM offered a research opportunity. In a stress free and voluntary environment (special thanks to Dr. Cheng), I investigate whatever questions that come into my mind. It gives me the chance to actualize some of the fantasies. I became interested in toxicology while studying the effect of a toxic chemical, and I plan to specialize in toxicology and molecular biology.

Effects of Mancozeb and Maneb on SH-SY5Y: Cellular Senescence Study (Dr. Cheng)

Mancozeb and maneb are structurally similar fungicides that had been shown to cause cell death through DNA damage. The stages preceding and leading up to the cell death are the interests of this study, and the cellular senescence is of particular interest in this investigation. We hypothesize that if the concentration of either compound is increased, the percentage of cells at senescence would also increase. A number of analytical tools will be employed to test this hypothesis: flow cytometry, senescence-associated β–galactosidase (SABG) qualitative assay and quantitative assay. We have already gathered extensive flow cytometry data on mancozeb that there is a direct correlation between the concentration of mancozeb and the proportion of cells resting at G0/G1 phase of the cell cycle. The flow cytometry will be used on maneb to collect comparable data. The SABG quantitative and qualitative assays will be used next to further validate the finding.

Shantoi Shaw

I am currently a junior at John Jay College of Criminal Justice with a major in Computer Science. I am originally from the island of Jamaica and I am the second in my immediate family to attend college. Throughout my three years of rigorous work in my major, no other field of work seemed as appealing. As a result, my decision was final as I visualized my bachelors in Computer Science at graduation. "The opportunities in this field are endless and Computer Scientists are becoming more in demand as the economy evolves," my professors and mentors always remind me. In the future I hope to go as far as gaining my PhD. I am currently undecided on what exactly to do with my major, but I am happy to say that I have been testing the waters as much as I can. I am certified in Cyber Crime Investigations, Fraud, and Law. Currently, I am looking into App Development through PRISM using an open source language called "OpenGL."

Universal Interfaces for App Development (Dr. Ahmad)

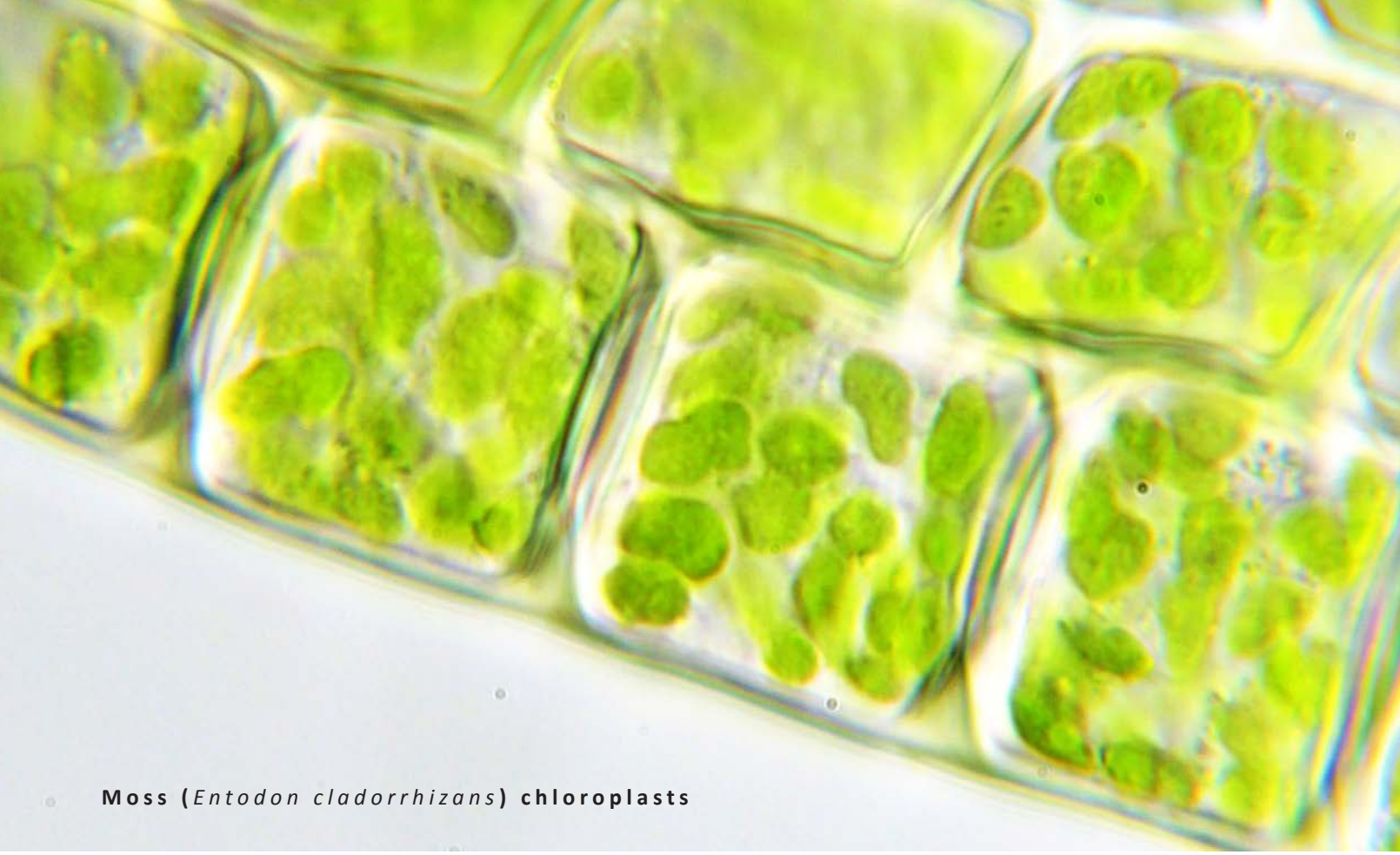
We will perform research on designing universal interfaces for software app development. With the help of such interfaces, future computer scientists can create new apps in a short period of time just by making a block diagram with arrows connecting the various blocks. As a start, our first application will be designed for Android Operating System (OS), because of its flexibility and open interfaces. Subsequently, we will develop a set of code snippets for various atomic block diagrams that could be composed together into complex applications.

Shanelle Shillingford

I have always known that I wanted to pursue a career in science, but I also had an interest in the justice system. Forensic pathology bridges the gap between these two fields. Attending John Jay and majoring in Forensic Science has provided me with great experience along the first leg of my journey to becoming a forensic pathologist. As I progressed in my major, I became motivated to pursue research, particularly research in Organic Chemistry. PRISM has allowed me to fulfill that pursuit and has also made me expand my future goals. Now, not only do I want to obtain an MD, but an MD/PhD so that I can continue to do research in the field of chemistry.

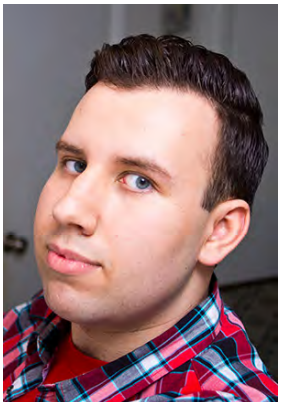
Separation and Spectroscopic Characterization of Organophosphorus Compounds: EPN, Methamidophos and N-methyl-methamidophos (Dr. Proni)

Chiral organophosphorus compounds are usually used as insecticides in their racemic form for economic reasons. However, enantiomers are known to interact stereospecifically with biological systems and in many cases the exposure to the racemic mixture leads to selective microbial degradation of one of the two enantiomers. Moreover, two enantiomers may degrade or accumulate in the environment differently, or may be toxic in different ways toward other species. Currently, in Dr. Proni's lab, three organophosphorus compounds are being investigated to determine if their racemic mixtures can be enantiomerically separated: EPN, methamidophos, and N-methyl-methamidophos. These compounds are to be initially analyzed using chiral high performance liquid chromatography (HPLC). Once they can be effectively separated, their absolute configuration will be determined through the concerted use of three different spectroscopic techniques such as optical rotatory dispersion (ORD), electronic circular dichroism (ECD), and vibrational circular dichroism (VCD). To arrive at the definitive stereochemical assignment of the derivatives, both experimental and predicted ORD, ECD and VCD responses are to be considered. For all compounds, the biological activities of the racemic mixture and of the single enantiomers will be investigated through ND50 (neurotoxicity) and enzymatic activity on electric eel acetylcholinesterase (EE-AChE) studies. During the Fall of 2014 the separation of acephate has been concluded. Now, focus will be placed on developing effective HPLC methods for the separation of EPN, methamidophos, and N-methyl-methamidophos.



Moss (*Entodon cladorrhizans*) chloroplasts

Derek Sokolowski



I came to John Jay College in order to discover how I fit within the sciences, especially in forensic science. I was always the kid in the class who wanted to learn more than what was given in class and I loved doing experiments as simple as mixing vinegar and baking soda to make carbon dioxide gas. I am particularly interested in biology because it is, as some people say, the "Living Environment" and to experiment with something that can affect the world in such a small way is fascinating. I also have a particular interest in photography and I plan to try to integrate photography in my future post-undergraduate career when I pursue a PhD in Biology.

DNA-based Forensic Analysis of Plant Phylogenetic Identification Using Chloroplast DNA Derived from Plant Pollen and Plant Leaves (Dr. Lents)

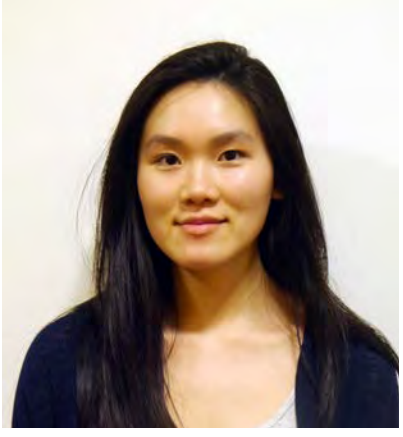
Crime scene investigations utilize tools that are designed to connect suspects to crime scenes and/or the victim's body. However, physical evidence in plant identification can lead to misidentification. Identifying plant pollen and plant leaves found on the human body using both nuclear and chloroplast genetics can go beyond the microscope and advance the accuracy of identification by utilizing 18S and 16S rRNA genes found in all plants. By extracting DNA from both plant pollen and leaves and creating specialized markers to distinguish between the 16S and 18S rRNA gene sequences of an individual species, we hope to be able to connect victims, suspects, crime scenes, and other past locations and activities. Based on the DNA quantitation results, a small amount of pollen and leaves contains a vast amount of genetic material which includes both nuclear DNA and chloroplast DNA (cpDNA), both of which can be useful for forensic analysis. We have extracted DNA from several species of common house flowers - mainly lilies and daisies. We will sequence the 16S and 18S genes of the plant DNA from pollen and plant leaves, and design DNA-based tools to differentially detect individual plant species. These tools will offer considerable value to forensic investigations.

Fidelis Tan

My first biology lab in high school was very memorable, as I got to see visible DNA strands from strawberries. I wasn't sure what DNA was at that time, since I never had a chance to take any science courses in my home country before immigrating here, but it piqued my interest. It was this experience that allowed me to realize that I enjoyed learning science and that I wanted to help people by applying what I've learned. I want to help solve crimes by using what I love; science. That is why I chose to be a forensic scientist since it is a problem solving field with ever changing scenarios. PRISM has allowed me to become an independent and critical thinker from the projects and experiments I've done. It also improved my scientific writing skills and helped me learn efficient organizational skills as needed for the scientific fields.

Determination of Trace Level Cadmium in Hudson River Water Samples Using Graphite Furnace Atomic Absorption Spectrometry (GF-AAS) and Inductively Coupled Plasma Mass Spectrometry (ICP-MS) (Dr. He)

Cadmium (Cd) is an inorganic toxic metal ion that can be found in the environment such as the Hudson River. Cd can be carried through the food chain easily and unnoticeable since it is both odorless and tasteless, which can potentially affect living organisms. This can further proven by the concentration found in major fishery species; Blue crabs (*Callinectes sapidu*). Furthermore, Cd can be ingested and inhaled by humans; which can travel through the bloodstream and deposit at various organs especially the liver and kidney; causing permanent damage to the body. Therefore, the determination of trace level Cd in environmental water is an important safety precaution for all living organisms. Cd can be determined by using graphite furnace atomic absorption spectrometry (GF-AAS) or inductively coupled plasma mass spectrometry (ICP-MS). In present study, GF-AAS procedures was optimized and applied to the trace analysis of river water samples obtained from two sites of the Hudson River. The absorbance of six standards solutions was collected to generate a standard calibration curve. A linear equation was then obtained from the standard curve to calculate the concentration of the river water samples.



Joanne Tan

I was born in China, and moved to the US with my family at a young age. My interest in science didn't start until high school, where I was exposed to the many fields of the natural sciences and a hands-on experience in scientific research. Afterwards, I knew for certain that I wanted to pursue a career in the sciences. Physics, chemistry, and biology helps us understand the world around us. I am currently pursuing a Bachelor's degree in Forensic Science. This field combines the two things that I am most interested in, science and investigating/solving problems. My career goal is to become a forensic toxicologist.

Transition Metal Complexes of Novel Thiourea-containing Ligands for Cytotoxicity Studies (Dr. Zhang)

Metallic complexes are useful in many areas of biological and synthetic chemistry, mainly as catalysts in chemical reactions. Such compounds have allowed for breakthroughs in developing modern organic chemistry, much attention has been paid to the observations of novel, functional metallic complexes. However, bifunctional metal complexes based on a thiourea scaffold that implements hydrogen-bonding supramolecular interactions to a complex were little investigated. In this proposal, we aim to introduce a thiourea unit to various ligand backbones to generate a new class of organic ligands that can form novel metal complexes upon reaction to transition metal ions. New organic and metal-organic compounds will be characterized and characterized by spectroscopic techniques including UV, IR, NMR as well as X-ray crystallography. Further investigation on the cytotoxic properties of these metal complexes will be a part of collaborations with Dr. Cheng's group. This work will be a continuation to the ongoing research project in my lab, where significant results have been obtained and published in peer-reviewed journals. Therefore, this proposed work is anticipated to drive the project forward and to gain new and interesting results that justify publication in peer-reviewed scientific journals in the fields of inorganic or bioinorganic chemistry.

Feather of male Indian peafowl (*Pavo cristatus*)

Carlos Texeira

Born and raised in the Bronx, I have always had an affinity (notice the chemistry terminology) for the sciences. Living in NYC and going to school here was a major benefit and helped to refine my passion in science. From visits to the Bronx Zoo, Botanical Gardens, and The Museum of Natural History, I have always been fascinated with the scientific process. My formal study in an actual science program didn't happen until after my military service. While in Iraq I came to a fork in the road in my quest for eternal glory. The choice was either to stay in the military and make it my career or to get out and go back to school and discover my life's calling. So I decided to go to John Jay and obtain a degree in forensic science no matter how difficult I knew that the mission would be. Research with PRISM has opened up a world of opportunities that I had never known before. From learning about the research process, applying the scientific method to issues involving mercury exposure, and studying monkeys in Uganda, it has definitely been a long and worthwhile journey. My future aspirations are to get into a PhD program for Archaeology and to merge my scientific skills to the problems of archaeology.

Using Bird Feathers as Bio-monitors of Mercury in the Environment (Dr. Carpi)

Mercury is a naturally occurring element that is found in the environment in various forms. Organic mercury bio-accumulates in the food chain, reaching concentrations of biological significance in some animals and humans. Birds can be exposed to mercury via two pathways. Top-level predators, scavengers, and insectivores may be exposed to organic mercury through the food chain, whereas other species accumulate airborne mercury on feathers due to their high surface area. The purpose of our research is to develop a standard reliable methodology that will produce replicable results of concentrations of mercury in bird feathers . Mercury in bird feathers was quantified in species of guinea fowls, zebra finches, tree swallows, red bill magpies, and peacocks which were collected from different areas in and around New York City as well as opportunistic samples found near a local zoo. We suspect mercury to be high in areas where sources of airborne mercury are high. Mercury in feathers is being analyzed using a Milestone Direct Mercury Analyzer (DMA-80). The data suggests that bird feathers have the potential as a bio-indicator of mercury in the environment as different feathers showed different levels of the metal. After determining a reproducible method further research can be conducted to compare mercury intake of birds from the same species at different locations or to compare mercury intake from birds of different species.

Desiree Williams

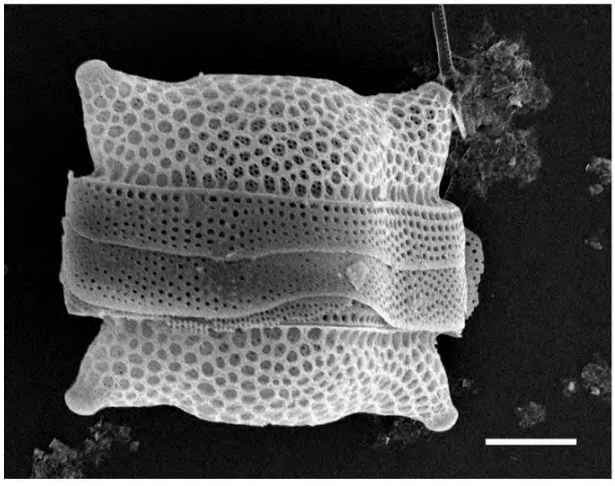
My initial career goal was to work in forensic science but as my studies progressed I also became interested in research within molecular biology. Eventually one interest overpowered the other and I finalized my decision to work towards a PhD in research. Recently I have become interested in studying the function of α-synuclein which is a protein involved in regulation within neuronal cells. The protein can sometimes fold into a diseased state called a prion which can cause Alzheimer's. I would like to study how yeast is able to use this mechanism of protein misfolding to gain an evolutionary advantage. Some scientists propose that when yeast invests in bet hedging, through prion like mechanisms, this allows it to survive in stress induced environments, such as antibiotics. This advantage can then be passed on to their progeny. This has been a controversial topic within prion research as it is difficult to conceive how something associated with disease can also be beneficial.

Forensic Application of Diatoms Through Phylogenetics (Dr. Li)

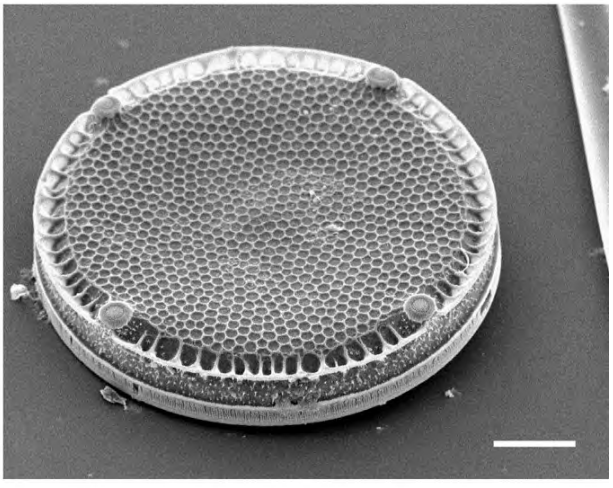
Diatoms have been used in forensic science to help determine whether a person drowned in fresh water lakes, rivers or oceans. The presence of diatoms found in a person's blood stream indicate that they drowned and the absence may indicate that the person may have expired prior to being found in a body of water. We would like to improve on this technique by researching if different species of diatoms are specific to one area, such as the Hudson River, and compare that to species found in another location of the same river. By investigating this we can develop a method to distinguish diatoms on the species level and supply the forensic lab with an additional tool to narrow down the location of where a person drowned. This phylogenetic study will be used to compare the species in the collected samples and evaluate if there is enough variation between them to use as a marker of location. So far, the results have shown that samples collected one week apart at the same location contained a different mixture of major species. One from the genus *Chaetoceros* and the second collection contained a majority from the genus *Navicula*. Before dedicating more resources to the pilot study, in the upcoming semester we will test if this method of DNA barcoding can be sensitive enough to amplify diatom DNA from lung tissues, following current forensic lab procedures for DNA tissue extractions.

Diatoms (size bar = 10 micrometers)

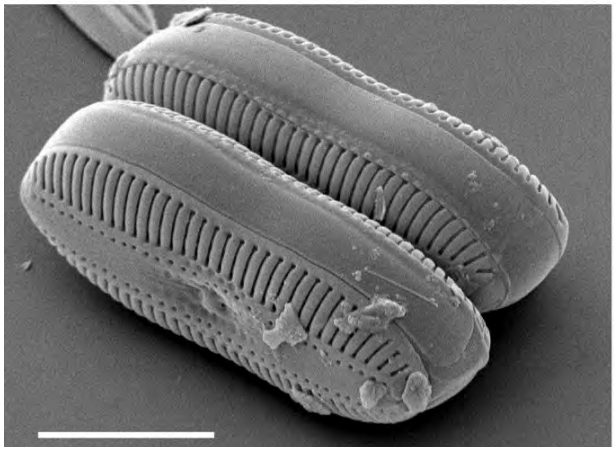
A *Biddulphia reticulata*



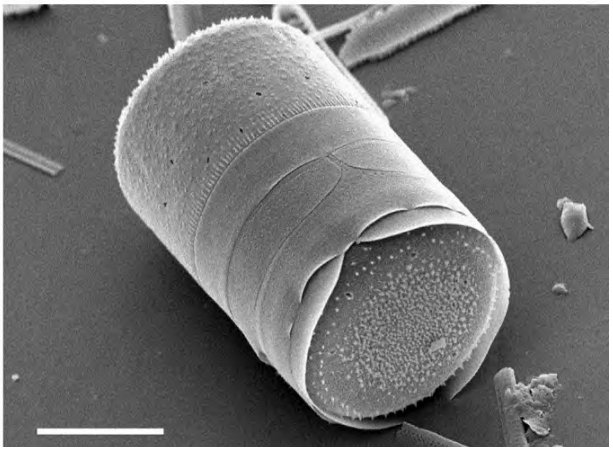
C *Eupodiscus radiatus*



B *Diploneis sp.*



D *Melosira varians*



Shawn Williams

As an avid viewer of *NCIS*, I was quickly drawn to the prospect of being like those TV characters I admired so much, which is why I applied to the Forensic Science program at John Jay. Once in the program I realized that there was a sharp contrast between what is seen on TV and what actually occurs in forensic science. However, I found myself obtaining a deeper appreciation for science, specifically biology and biochemistry, which is why I chose the molecular biology track. I currently work with Dr. Domashevskiy studying Pokeweed Antiviral Protein. This protein is effective against many different viruses and cancers, which makes it an exciting medical prospect; being at the forefront of how this protein works is something I am excited to be a part of.

Examination of the Effects of Translation Initiation Factors on PAP-RNA Interactions (Dr. Domashevskiy)

Pokeweed antiviral protein (PAP) from the *Phytolacca americana* plant is a ribosome inactivating protein (RIP) and RNA N-glycosidase that possesses broad spectrum antiviral properties. PAP removes purines from the universally conserved sarcin/ricin (S/R) loop of large rRNA, leading to termination in translation. Additionally, PAP depurinates viral RNA, and thus lowers the infectivity of many plant and animal viruses. PAP recognizes and binds to the 5' cap of viral RNA, and depurinates it downstream of the cap structure. This, however, does not explain the inhibitory effect of PAP on the replication of uncapped RNA viruses including HIV-1 and influenza. We hypothesize that PAP recognizes and binds to structures present in the 3' untranslated regions (3'-UTRs) of a series of plant viruses. Here, we employ steady state fluorescence to investigate the effect of RNA secondary structure elements on PAP-RNA binding, and correlate viral transcripts' translational efficiency to the affinity of the above interactions. We find that PAP binds strongly to the 3' UTRs of the several non-polyadenylated plant viruses and this binding, is influenced by the secondary structure of the viral RNA. As future work, we will explore the role eukaryotic initiation factors (eIFs) play in PAP-RNA interactions and quantitatively determine the amount of purines released by PAP during RNA depurination.

Tiffany Wong

"Life" was always a word which fascinated my young mind as a child. This fascination stemmed from various sources related to my interests about the world we lived in and myself. In childhood, I often enjoyed observing wild insects' daily life in our environment and, which flabbergasted my mother upon discovering, in captivity. When I learned the existence of science, I believed it to be the answer key to all my questions about why, who and what I am, which lead to deepening questions over time. As my views evolved, I migrated into areas of study that strives to protect the planet I cared about. My current project in analytical chemistry strives to improve methods of monitoring carcinogenic pollutants in the Hudson River, and to evaluate current levels of these pollutants.

Determination of Trace PCBs Concentration in Hudson River Water Using SPME-GC/MS (Dr. He)

Polychlorinated biphenyls (PCBs) are a group of organic and carcinogenic pollutants present in the Hudson River. Consistent monitoring of these pollutants is essential in evaluating success of the current river cleaning efforts by the US Environmental Protection Agency (EPA). The research objective is to develop a method, utilizing solid phase micro-extraction (SPME) and gas chromatography – mass spectrometry (GC/MS) analysis, to identify and quantify current PCBs in the Hudson River. Using results from this study and results from a correlating study, the effectiveness and efficiency of using SPME as an extraction method in determination of PCBs concentration will also be evaluated. Previously, 16 unique PCBs were identified by chromatogram analysis using National Institute of Standards and Technology (NIST) Reference Library. Calibration curves were established using external standard method. Samples were prepared in isooctane diluted from standard PCB Congener Mixture. Extracted ion chromatograms were established from total ion chromatograms using Agilent ChemStation software. The linear range of concentrations investigated was from 50ppb to 250ppb. Currently, research will explore: 1) Improving identification and quantification of PCBs using extracted ion chromatograms to develop a Selected Ion Monitoring (SIM) identification method; 2) Improving standard calibration curves using internal standard method; 3) Utilizing SPME extraction methods with standards to establish a control sample. Continuing research will explore preparing river water samples for analysis using SPME extraction methods, and determine PCBs concentration in the river samples.

Haifeng Wu

Take a moment to look at your phone, your computer monitor, or even a smart watch. It doesn't matter if it is a picture, a text message or simply a document - it is just an illusion formed by a plane of well-arranged pixels. The magic that allows all of these to happen is through binary numbers. It runs behind in these transistors and semiconductors inside every electronic device. Binary numbers are simply a string of zeros and ones. The idea of how devices become alive through electricity blows my mind and left an impact on me for life. Just think about a room-size machine in the early dawn of computational devices, which has since transformed into this little object in your pocket. The rapid technology advancement still gives me inexpressible excitement. It does not matter where you come from, or what you do. As members of the STEM field, we have only one goal and we are working towards this goal: we want to construct a better world and we want to be part of this technological advancement.

Developing a Networking on Demand (NoD) Framework (Dr. Ahmad)

In this research project, we aim to investigate and test a new networking paradigm, Networking on Demand (NoD). NoD has its roots in software defined radios (SDR) and Cognitive Radios (CR). The SDR and CR are defined at lower protocol layers. Our research is to extend the concept to higher layers as well. As a proof of concept, we will install our idea on CR modules, Universal Software Radio Peripheral (USRP) in our Digital Forensics Lab. These devices will be configured in a way that they can change their networking capabilities, such as full-duplex, half-duplex receive, and half-duplex send only. Our research is focused on security of future cyber systems, which could change their networking characteristics in response to a security demand instead of implementing high overhead security protocols for every situation.

Veronika Yakovishina

I was born in Tashkent, Uzbekistan. Science was always my favorite subject throughout middle and high school, and when I took my first chemistry course in Queensborough Community College, I knew that I wanted to work in the STEM fields. My favorite part of doing research at QCC is getting to do hands-on work and learn more about a topic that has always intrigued me. I honestly can't see myself doing anything else in the future. I would like to get a bachelor's degree and then pursue a PhD in Toxicology. My career goal is to work in a laboratory full time.

Study of the Cytotoxic Effects of Carbon Nanotubes on Breast Cancer Cells (Dr. Sullivan, Queensborough Community College)

Breast cancer is a major health concern in America today, with statistics showing that approximately 1 in 8 women in the U.S. will develop invasive breast cancer in her lifetime. It is critical to develop new and innovative methods to treat those with breast cancer without encountering the uncomfortable side effects that typically arise during current treatments. The outlook once diagnosed is especially dim for those with a triple negative breast cancer (TNBC). Biopsies from these patients display cells which are negative for the expression of estrogen receptor, progesterone receptor, and the HER-2/Neu gene. In this study, we will explore the effects of carbon nanotubes on two triple negative human breast cancer lines. Single-walled carbon nanotubes have been proposed as possible candidates for drug delivery vessels; however little is known about the cytotoxic effects of these particles. We will focus on studying the effects of single-walled carbon nanotubes on the mortality and proliferation as indicators of cytotoxicity of MDA MB 231 and MDA MB 468 cell lines.

Shari Yarde

I am an international student from Barbados. I came to John Jay College to pursue studies in Forensic Science because my passion in life has always been science and I knew I wanted a career in this field. I chose to attend John Jay because I was told it was the best college to attend for Forensic Science. After being accepted into PRISM, I was eager to begin working with my mentor Dr. Carpi. My goal after I graduate is to pursue my PhD in toxicology. When I first came to John Jay I thought I would just obtain my degree and graduate, but being at the college has given me a different view of the forensic science field and has also given me many opportunities that I would not receive elsewhere

The Role of Water and pH in the Reduction of Mercury (II) Chloride to Elemental Mercury (Dr. Carpi)

Mercury is a neurotoxin that has varying behavior in the environment depending on its chemical form. Elemental mercury (Hg^0) is a toxic air pollutant that is volatile and deposits into terrestrial and aquatic systems after being oxidized in the atmosphere to Hg^{2+}. Divalent mercury can be reduced on environmental surfaces to Hg^0 and released again to continue the cycle in the atmosphere. Variables such as moisture, UV radiation, temperature, and oxygen/oxide radicals have been proposed to affect the reduction of the metal on surfaces and the subsequent transport of mercury. Our research studies the mechanisms of the reduction of Hg^{2+} to Hg^0 specifically how pH and soil water affects mercury reduction in soil. We hypothesized that the oxide radical is responsible for the reduction of Hg^{2+} compounds in water and the formation of the oxide radical may be pH dependent. To examine the role of aqueous pH, three samples of sand are doped with mercury (II) chloride and placed in a Teflon chamber in the dark where the flux is measured using a Tekran Mercury Vapor Analyzer for 30 hours. Water will be sprayed onto each sample at different pH. The overall effect of the various pH solutions on the flux will be determined. Prior research in our lab suggested that pH may affect surface mercury emissions. We will conduct analyses on wet samples which will provide a more effective mechanism for looking at the effect of pH. The overall effect of the various pH solutions on the flux of mercury will be determined.

Yuan Zhuo Zhang

I developed an interest in Forensic Science at a young age, when I watched series of TV shows related to Forensic Science. But, for some reasons, I didn't choose it as my major. Until one day I saw the CUNY Justice Academy Program, it reminded me the interest. After I got my Associate degree of Science for Forensics at Kingsborough Community College (KCC), I continued my studies as a Forensic Science major, on the Toxicology track at John Jay. In KCC, I started doing research and I had a chance to present my poster at the 18th Annual Green Chemistry & Engineering Conference. As a student that graduated from the CUNY Justice Academy, I had the opportunity to get involved with PRISM and continue doing research. I am currently working with Dr. Zhang on synthesis of multinuclear non-precious metal complexes.

Green Catalytic Oxidations Using Multinuclear Non-precious Metal Complexes (Dr. Zhang)

Multimetallic complexes are attractive catalyst candidates for a variety of organic reactions, and in particular a tetranuclear copper complex has proven to be efficient catalyst for the catalytic oxidation of alcohols recently. In previous work, one of the copper complexes which was designed by using condensation of (R)-(-)-2-phenylglycinol and 3-formylsalicylic acid hydrate as preparation was synthesized successfully and the result for the X-ray measurement showed that the copper complex is polymeric. Meanwhile, another copper complex made by a dialdehyde was synthesized and under testing. In this proposal, we are aiming to design more new multimetallic complexes based on non-precious metals, especially copper, to carry out the catalytic aerobic oxidations of alcohols to carbonyl compounds in a "green" reaction media such as water. The facile one-pot, metal-mediated condensation of aldehydes and amines will still be applied to prepare a range of multinuclear non-precious metal complexes. These metal complexes containing the dialdehyde will be structurally characterized by spectroscopic techniques as well as X-ray crystallography. Catalytic reactions for alcohol oxidations will be performed using the newly synthesized multimetallic complexes, and the reaction will be preferably tested in water.

Publications and Presentations

In addition to our Annual Symposium, PRISM students regularly present their research to their peers on CUNY campuses, scientific conferences, and at professional events. Below are a few of the many professional accomplishments students achieved this past academic year (2013-2014).

Publications

Carpi, A., Fostier, A.H., Santos, J.C., Gittings, M., & Orta*, O.R. (2014) Mercury emissions from soil following the loss of forest cover in the United States and Brazil. *Atmospheric Environment, 96*, 423-429.

Cheng, S.Y., Oh, S., Velasco, M., Ta*, C., Montalvo, J., & Calderone*, A. (2014). RTP801 regulates maneb- and mancozeb-induced cytotoxicity via NF-kappa β. *J Biochem Mol Toxicology* (28) 302-311.

Cross*, S.N., Quinteros*, E., & Roberts, M. (2015). Surface modification for the collection and identification of fingerprints and colorimetric detection of urea nitrate. *Journal of Forensic Sciences, 60*(1), 193-196.

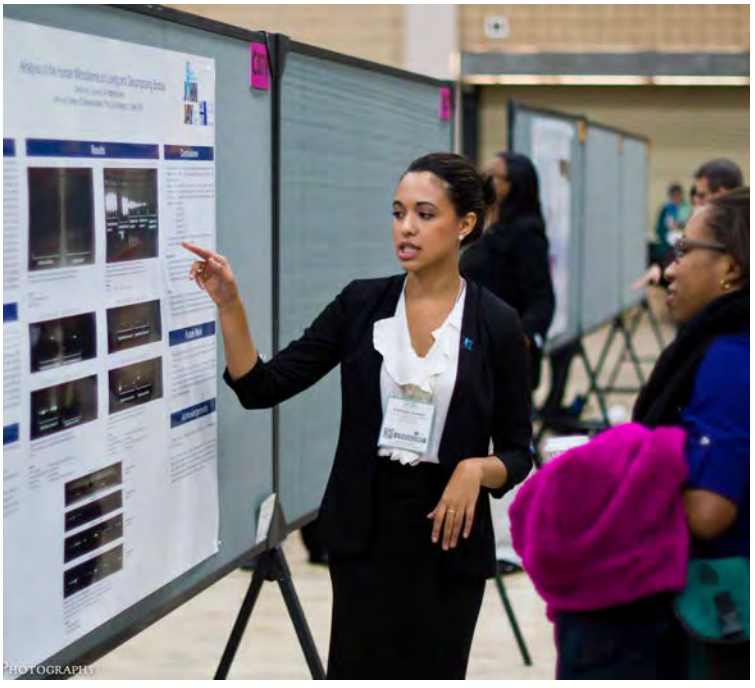
Li, R., Gaud, M., & Nair*, S. An enzymatic method to process decomposed non-human bone for forensic DNA analysis. *J Forensic Res*, 5.220 (2014): 2.

Marotta, D.H., Nantel, A., Sukala*, L., Teubl*, J.R., & Rauceo, J.M. (2013). Genome-wide transcriptional profiling and enrichment mapping reveal divergent and conserved roles of Sko1 in the *Candida albicans* osmotic stress response. *Genomics, 102*(4), 363-371.

Ouedraogo, Y.P., Huang, L., Torrente, M.P., Proni, G., Chadwick*, E., Wehmschulte, R.J., & Nesnas, N. (2013). A Direct Stereoselective Preparation of a Fish Pheromone and Application of the Zinc Porphyrin Tweezer Chiroptical Protocol in Its Stereochemical Assignment. *Chirality, 25*(9), 575-581.

Piszczatowski*, R.T., Rafferty, B.J., Rozado*, A., Tobak*, S., & Lents, N.H. (2014). The glyceraldehyde 3-phosphate dehydrogenase gene (GAPDH) is regulated by myeloid zinc finger 1 (MZF-1) and is induced by calcitriol. *Biochemical and biophysical research communications*, *451*(1), 137-141.

Williams*, C., Lin*, Y., Maynard, A., & Cheng, S.Y. (2013). Involvement of NF Kappa β in potentiated effect of Mn-containing dithiocarbamates on MPP+ induced cell death. *Cellular and Molecular Neurobiology* (33) 815-823.



* denotes PRISM student author

Presentations

Scarcella*, M., Petraco, N., & Carpi, A. “Mechanisms of the Reduction of Mercuric Oxide in the Environment,” 34th Annual Meeting of the Society of Environmental Toxicology and Chemistry, Nashville, TN, November 21, 2013.

Rozado*, A., Piszcazatowski*, R., Rafferty, B., & Lents N. “Regulation of CCN2 and CCN3 in Bone Marrow through Myloid Zinc Finger-1 and Its Medical Implication in Hematopoiesis,” 2014 ASBMB Annual Meeting, San Diego, CA, April 29, 2014.

Huang*, B. & Champeil, E. “NMR Analysis of the Antibiotic Amoxicillin,” Society of Toxicology 53rd Annual Meeting, Phoenix, AZ, March 24–27, 2014.

Cross*, S. & Roberts, M. “Electrochemical Detection of Explosive Compounds and Their Metabolites Using Molecularly Imprinted Polyaniline Films,” 66th Annual Meeting of the American Academy of Forensic Sciences, Seattle, WA, February 17-19, 2014.

Ho*, V., Sukala*, L., & Rauceo, J. “Construction and Functional Characterization of a Mutant Isoform of the *Candida albicans* Adhesin Als1p,” 2013 Annual Biomedical Research Conference for Minority Students, Nashville, TN, November 13-16, 2013.

Adlam*, C. & Carpi, A. “The Photo-reduction of Soil-bound Mercury Species in the Presence of Water,” 2013 Annual Biomedical Research Conference for Minority Students, Nashville, TN, November 13-16, 2013.

Salcedo*, E., Hart, J., & Kogt, P. “Construction of BirA-p110α, and BirA-p110γ Expression Vectors,” 2013 Annual Biomedical Research Conference for Minority Students, Nashville, TN, November 13-16, 2013.

Fong*, J., Korobkova, E., & Williams, A. “Interactions Between Flavonoids and Cardiolipin-Cytochrome c Complex,” 2013 Annual Biomedical Research Conference for Minority Students, Nashville, TN, November 13-16, 2013.

Kelly*, T., Korobkova, E., & Rawal*, B. “Influence of Flavonoids on the Activity of Glutathione Peroxidase,” 2013 Annual Biomedical Research Conference for Minority Students, Nashville, TN, November 13-16, 2013.

Alexander*, K., Sukala*, L., & Rauceo, J. “ Identification of a Chaperone Network for the *Candida albicans* Als Adhesins,” 2013 Annual Biomedical Research Conference for Minority Students, Nashville, TN, November 13-16, 2013.

Cabral*, M. & Madden, P. “Analysis of Nicotine Use and Psychopathology in an Australian Population,” 2013 Annual Biomedical Research Conference for Minority Students, Nashville, TN, November 13-16, 2013.

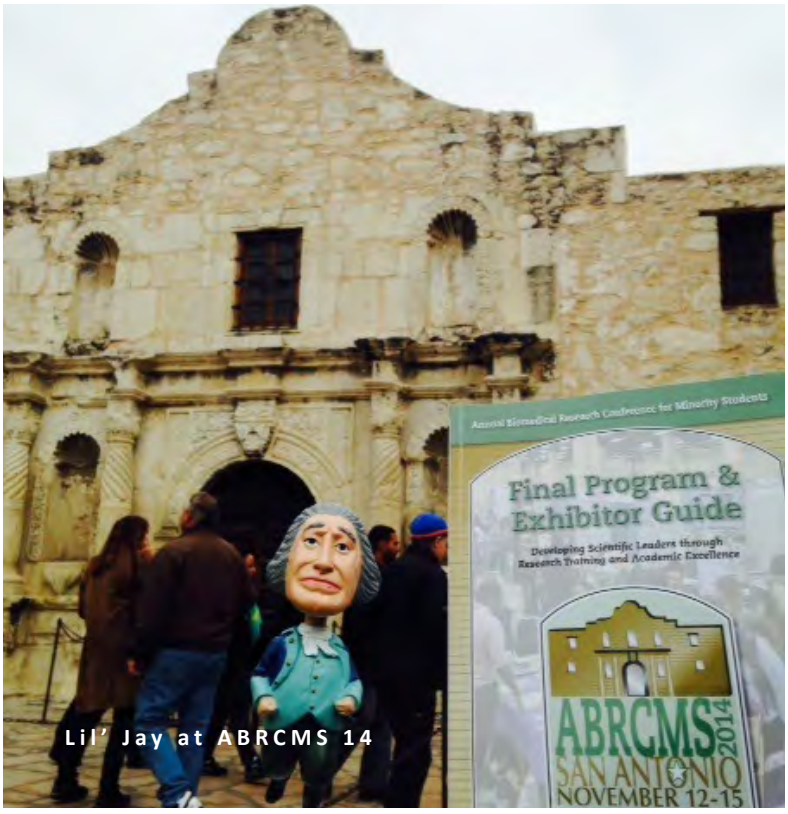
Ta*, C. & Cheng, S. “Manganese-Containing Dithiocarbamate-Induced Cell Deaths Via Senescence Pathway,” Society of Toxicology 53rd Annual Meeting, Phoenix, AZ, March 23–27, 2014.

Chen*, M., Kinahan*, C., & Proni, G. “Spectroscopic Characterization of Organophosphate Compounds,” 247th ACS National Meeting & Exposition, Dallas, TX, March 16-20, 2014.

Napolitano*, T., Fernandez*, N., & Proni, G. “Lawsone Derivatives for Fingerprint Detection,” 247th ACS National Meeting & Exposition, Dallas, TX, March 16-20, 2014.

In Depth: ABRCMS 2014

The 14th Annual Biomedical Research Conference for Minority Students (ABRCMS) was held in San Antonio, Texas from November 12-15, 2014. Twelve PRISM students attended, presenting posters about their scientific research at John Jay.



Lil' Jay at ABRCMS 14

ABRCMS is one of the largest undergraduate research conferences in the United States, with more than 1,700 students presenting their research in about twelve fields in biomedical sciences. Our students presented their work in diverse projects (chemistry, toxicology, cellular and molecular biology, environmental sciences, and microbiology), showcasing the diversity of scientific research being performed at John Jay. Dr. Jason Rauceo and Dr. Garry Brown from the Science Department accompanied the students, as well as PRISM Coordinator Dr. Edgardo Sanabria-Valentin.

To prepare for their presentation, PRISM organized "ABRCMS Boot Camp" the week before departing for Texas. Students got to practice their presentation skills in daily sessions helped by faculty members of the Science Department and the PRISM staff. They also got to learn about networking and perfected their "elevator pitch." At the conference they attended sessions discussing the importance of science communication, how to prepare an application to graduate programs, the different types of graduate programs, and the importance of networking and other professional development events. Of the 12 students who attended, three of them (Yessenia Lopez, Porfirio Fernandez, and Jiwon Seo) received Travel Awards from the conference to defray the costs of their travels.


PRISM attendees at ABRCMS 14

Richard Khusial, senior Forensic Science major:

ABRCMS was an enlightening and unique experience. It is an environment where everyone is concerned about one thing: science.

To be successful in science you have to be able to speak about your research to the average person. I always struggled to communicate my thoughts on research or science topics with the average listener, but PRISM has helped me become a better communicator. The mock poster presentations that were done in preparation for the conference were extremely useful since the mock judges hold positions in the science field. The questions that the mock judges asked were similar to the real judge's questions. After the PRISM preparation, my anxiety and nervousness about presenting at the conference decreased and were replaced with confidence.

ABRCMS was a well invested experience that, I can say, will help me push forward my career.

> "PRISM helped me prepare for ABRCMS in many ways."

Ruth Romero, junior Forensic Science major:

Thanks to PRISM I had an idea of what to expect at this conference. Through PRISM meetings and workshops and the ABRCMS boot camp, I was well prepared to present my research.

At ABRCMS I learned about the many programs and schools I could apply to once I complete my education at John Jay, and the kind of research they do, as well as the summer program opportunities that they offer. I enjoyed the opportunity to network with professionals currently working on research in my field and to be able to talk to them and ask any questions. Also, I got to meet other students from all over the country with the same interests as me. It was my first time attending a conference of this magnitude, and I loved every minute of the experience. I'm definitely looking forward to other activities like this one. I'm really grateful for this opportunity.

> "Thanks to PRISM I had an idea of what to expect at this conference."

Carlos Texeira, senior Forensic Science major:

PRISM prepared me for ABRCMS and other future conferences by setting up workshops and monthly meetings. Every aspect that ABRCMS covered was something that PRISM had already prepared me for. The program also gave me the confidence necessary in order to present in front of judges.

What I enjoyed most about my experiences at ABRCMS were the interactions I had with people who were like me and shared that same drive to strive for excellence in the sciences. In addition, the opportunity to network with other students, professors, and scientists was something that I really enjoyed. I learned that science is more than just working in a lab and isolating yourself from the rest of humanity; in fact, it is the total opposite. In order to be a good scientist you must be able to communicate your knowledge to people who may not have a scientific background so that they understand. We as future scientists have a responsibility to shape the world around us by being able to communicate our research to other people who can influence policy.

2015 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 50 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.

2015 PRISM Keynote Speaker:
Dr. Daniel Cocris


Cocris

Dr. Daniel Cocris's odyssey started in Romania. After high school he continued his education with 2 years of college, studying biochemistry while working as a part time locksmith, jeweler and a casino dealer. He then followed his dream to move to the US where he was employed as a contractor. His adventure continued as a dishwasher, busboy, and waiter, during which time he also attended LaGuardia Community College and John Jay College of Criminal Justice, graduating Summa Cum Laude in 2006 from the Toxicology track of the Forensics major.

As a PRISM student at John Jay, Dr. Cocris worked with Dr. Anthony Carpi on multiple research projects studying mercury emission from soils. This research culminated with an article in the *Journal of Analytical and Bioanalytical Chemistry* and a poster presentation at the Eighth International Conference on Mercury as a Global Pollutant in Wisconsin. He also worked as an adjunct under the tutelage of Dr. Nathan Lents, teaching biology laboratory and recitation.

His journey, however, was far from over. He went on to receive his Doctorate in Dentistry from Rutgers School of Dental Medicine where he was awarded the International College of Dentists Leadership Award, the American Equilibration Society Senior Dental Student Award for Achievement and Excellence, and was selected to be in the prestigious national dental honor society OKU.

In 2012 as part of Community Oriented Dental Education he delivered comprehensive dental care to severely medically compromised patients. The following year he completed his General Practice Residency at Queens Hospital Center in New York City, serving the most diversely ethnic group in US. In August 2014, Dr. Cocris became the newest member of the Advanced Dental Care team, a small dental clinic in upstate NY dedicated to providing complete dental health.

In his talk, Dr. Cocris will share some of the experiences that have helped shape his career path.

2015 PRISM Outstanding Undergraduate Researcher:
Yessenia Lopez

2015 PRISM OUR Winner, Yessenia Lopez, and her mentor Dr. Shu-Yuan Cheng

This year's Outstanding Undergraduate Researcher award has been given to Yessenia Lopez. Yessenia joined PRISM in Summer 2013 under the mentorship of Dr. Shu-Yuan Cheng. The main goal of her research project is to better understand how large of a role environmental factors play in the pathogenesis of Alzheimer's disease (AD). Even though the number of AD patients is rapidly increasing and extensive research has been carried out on the disease, much remains unknown to this day. Identifying potential environmental AD-causing toxins and knowing the mechanism they follow can lead to possible treatment strategy that may improve the lives of millions of patients.

Yessenia's research work involves determining if the pesticides maneb (MB) and mancozeb (MZ) increased the expressions of β-amyloid precursor protein (AβPP) and β-amyloid peptide 42 (Aβ42). Aβ42 is the main component of amyloid plaque which is one of the hallmarks of Alzheimer's disease (AD). Both pesticides contain manganese, which in high doses is known to be neurotoxic. It is known that these pesticides activate a transcription factor responsible for the production of AβPP. Knowing this relationship, it is hypothesized that MB and MZ can increase both AβPP and Aβ42 expressions in rat pheochromocytoma cells (PC12).

Yessenia has applied for post-bachelor study to broaden her experience in research after graduating from John Jay. She also plans on applying to PhD programs to fulfill her career goal to be an independent scientist.

Former PRISM Symposium Speakers and Outstanding Undergraduate Researcher Awards

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

2013
Keynote: Lisa DeWald, PhD (Stony Brook University)
John Jay: Graduating Class of 2004
Award Recipient: Anna Stoll
currently at CUNY Graduate Center

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

2011
Keynote: Kimberly Papadantonakis, PhD (CA Inst. of Tech)
John Jay: Graduating Class of 2002
Award Recipient: Richard Piszczatowski
currently at Albert Einstein College of Medicine

2010
Keynote: Julie Layshock, PhD (Oregon State University)
John Jay: Graduating Class of 2005
Award Recipient: Jason Quiñones
currently at Stony Brook University

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

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

Student Achievements

PRISM students have a strong track record of achievement in acceptance to prestigious summer programs, internships, and graduate schools. Below is a list of PRISM students, their mentors, and the various programs they have attended or will be attending this summer or next year.

Summer Programs

Lisset Duran (Dr. Delgado-Cruzata)

Summer Research Program,
The National Institute of Medicinal & Aromatic Plants
(Morocco)

Porfirio Fernandez (Dr. Rauceo)

Leadership Alliance/Howard Hughes Medical
Institute Summer Undergraduate Research Program,
University of Miami

Daysi Proano (Dr. Svoronos - QCC)

Undergraduate Summer Research in Molecular
Biophysics, Princeton University

Jiwon Seo (Dr. Cheng)

Summer Research Opportunities at Harvard (SROH)
Program, Harvard University

Shanelle Shillingford (Dr. Proni)

2015 Summer Undergraduate
Research Fellows (SURF) Program,
The Scripps Research Institute (California campus)

Desiree Williams (Dr. Li)

CUNY Summer Undergraduate Research Program

Graduate Schools

Shawn Williams (Dr. Domashevskiy)

Molecular Biology, Cell Biology,
& Biochemistry PhD Program,
Brown University

Tanya Napolitano (Drs. Proni & Petraco)

College of Pharmacy and Health
Sciences - Toxicology PhD Program,
St. John's University

Samuel Reinfeld (Dr. Domashevskiy)

Doctor of Osteopathic Medicine Program (DO),
NY College of Osteopathic Medicine

Internships

Carlos Texeira (Dr. Carpi)

African Primates: Diversity, Ecology and
Conservation (Uganda)

Research Mentors

Aftab Ahmad, DSc (George Washington University)
Associate Professor

Areas of Expertise: Object-oriented programming, computer architecture and data communications & forensic security

I have original work published in design of networks of implantable devices, assessment of network security, design of forensic capable mobile networks, and modeling of biological neuron signal. I've authored two books, *Data Communications Principles: For Fixed and Wireless Networks* (Springer-Verlag 2003) and *Wireless and Mobile Data Networks* (Wiley, 2005), and a book chapter "Chapter 7 - Security Assessment of Networked Systems," *Network Security, Administration and Management: Advancing Technologies and Practices*, (IGI Global, 2011). My book chapter "Digital Body" has recently been accepted for publication - it describes a view of the human body as a digital medium for networks of implantable sensors. My Networking on Demand Lab has projects on network signaling in biological neurons, reconfigurable networks for data privacy, and smart web app design.

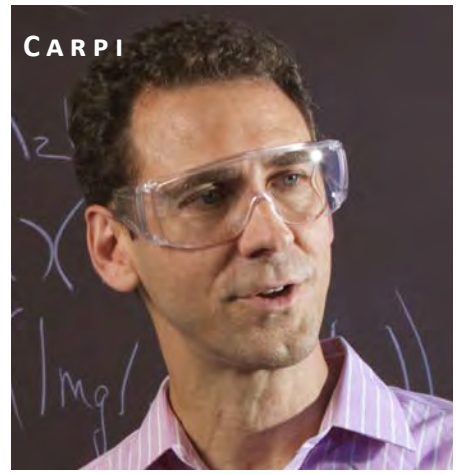
Garry Brown, PhD (University of Mississippi)
Postdoctoral Research Fellow/PRISM Mentor

Areas of Expertise: Analytical and environmental chemistry

My journey in becoming a scientist started in high school when I volunteered at local Home Health Hospital assisting men, women, and children suffering with HIV/AIDS. I became interested in understanding how a virus could trigger a systematic mechanism, leading to damage or even death. I majored in biochemistry at Xavier University of Louisiana in order to understand the complex mechanisms of biological organisms. My goal was to one-day help to find a cure for deadly pathogens that affect humanity.

A key experience in my life, which altered my research career objectives, was the 2010 Deep Water Horizon Oil Spill that occurred on the United States Gulf Coast. As a native of the Louisiana Gulf Coast, my community received significant damage from several disasters. I decided to pursue research that could potentially aid in the recovery and remediation of this region and focused one area of my dissertation work at the University of Mississippi on investigating the impact of the Deep Water Horizon oil spill. I utilized my knowledge of mercury speciation in water to investigate the impact of the oil spill on the speciation of mercury in the Mississippi Coast waters and also its effect on the seasonal hypoxia events in the Gulf waters. My work yielded a much needed speciation profile of mercury in the Gulf of Mexico.

Currently, I am continuing my research on the biogeochemical cycling of mercury by serving as a Postdoctoral Research Mentor for PRISM in Dr. Anthony Carpi's laboratory in the Department of Sciences. My work in his lab includes studying the mechanisms of reduction and subsequent emission of mercury from environmental surfaces such as soils. Through my work, I endeavor to solve environmental problems through analytical chemistry and inspire young scientist curiosity in environmental research.



Anthony Carpi, PhD (Cornell University)
Associate Provost for Research Advancement, Professor

Areas of Expertise: Environmental toxicology and science education

I've been interested in the sciences for as long as I can remember – making small electromagnets as a kid and blowing up hydrogen balloons that I filled by electrolyzing water in my bedroom. After majoring in chemistry at Boston College, I poked around for a year, eventually becoming interested in environmental science. I was lucky enough to get a position as an air pollution engineer with the Connecticut Department of Environmental Protection, and three years later decided to go to graduate school. Not one to be confined to a lab, I completed my masters research roaming around northern New Jersey measuring the impact of a waste incinerator on the local environment, and my doctoral research was spent in Oak Ridge, TN, carting around 200 lbs of field instruments to measure the emissions of mercury from soil.

The work in my lab focuses on understanding the chemistry and transport of environmental mercury. Mercury is a leading cause of advisories on fishing resources, and mercury deposited to the environment can be remobilized by various chemical phenomena. Most recently we have been studying the effect of deforestation on the release of mercury from soils. Intact forests and forest soils serve as a sink of environmental mercury, binding it and preventing its mobilization; loss of forests due to fire, environmental damage, or human encroachment can remobilize this metal and lead to significant human exposure. We are in the middle of a series of laboratory and field studies taking place in both New York and the Brazilian Amazon to quantify how the loss of forests and forest fires contribute to mercury pollution and subsequent human exposure to the heavy metal.

Research training in my lab is best thought of as an apprenticeship: students work closely with me and other students in the lab conducting background research, designing experiments, carrying out experiments while learning about equipment and lab procedures, analyzing and interpreting results, and finally working toward presenting or publishing that work.

Elise Champeil, PhD (University of Ireland, Trinity College)
Associate Professor

Areas of Expertise: Synthetic organic chemistry

I chose to work in organic chemistry because it is a hands-on science with a very creative side. I have always been interested in creating new things and in the scientific process through which matter gets transformed. In this respect, there is some artistic dimension about organic chemistry which has always appealed to me. And of course, I chose it because it is fun!!! New colors, new smells, compounds that glow in the dark… Who's never dreamed of becoming a magician?

My current research interests include: 1) Synthesis of DNA-Mitomycin C adducts. Mitomycin C (MC) is an anti-cancer agent. We are interested in synthesizing various DNA adducts of mitomycin C, and also adducts of an MC derivative: decarbamoyl mitomycin C (DMC). Both adducts have been shown to trigger cell death via different pathways. 2) Analysis of drugs of abuse by NMR spectroscopy to detect the presence of drugs of abuse in human urine or in beverages using water suppression techniques. 3) Synthesis of molecular sensors. We are interested in developing systems of the donor–acceptor kind which can be used to detect the presence of fluoride anions or mercury and glow in the dark at the same time!

CHENG

Shu-Yuan Cheng, PhD (St. John's University)
Associate Professor

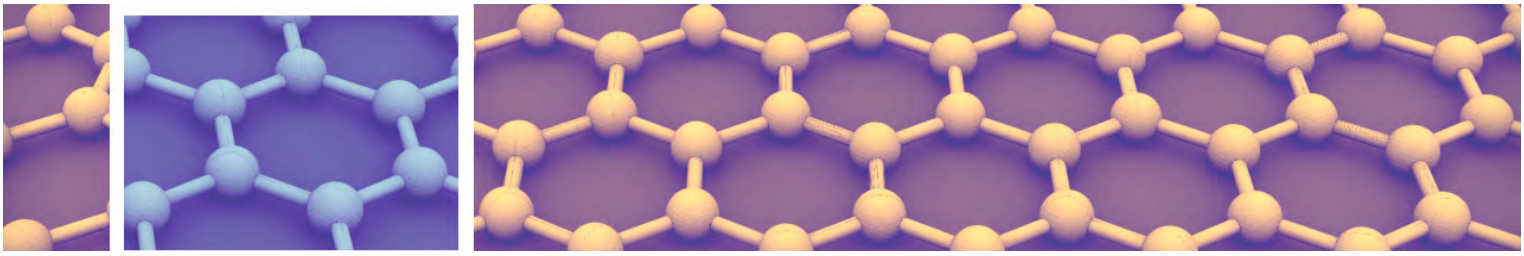
Areas of Expertise: Toxicology, pharmacology, molecular biology, and neuroscience

Science has always interested me and I often think about how it interacts with our daily lives. I love the delight that comes about from the process of discovery. I also enjoy using my findings to help and improve the lives of everyone.

I encourage students to read, think and plan their research before they start. I constantly meet with them to discuss the background of their projects, the data, and the future experiments. I strongly encourage students to present their results at conferences, either at John Jay or national conferences.

My main research is to study the role that environmental toxins (dithiocarbamate compounds) play in neurodegenerative diseases such as Parkinson's disease and Alzheimer's disease and to evaluate the extraction efficiency of cathinones in various biological matrices by using LC/MS/MS.

I also collaborate with my colleagues to study (1) the pharmacological mechanism of mitomycin C and decarbamoyl mitomycin C (funded by NIH), (2) the toxicity of newly synthesized salen which is a popular chelating ligand used in coordination chemistry and homogeneous catalysis, and (3) the structure, function, and regulation of dopamine transporter.



Marta Concheiro-Guisan, PhD (University of Santiago de Compostela, Spain)
Assistant Professor

Areas of Expertise: Forensic and clinical toxicology

I studied Pharmacy and I did my PhD in Forensic Toxicology at the University of Santiago de Compostela (Spain). During my postdoc, I worked in the Clinical and Forensic Toxicology field at the National Institute on Drug Abuse (NIDA) in Baltimore, MD. I really love Forensic and Clinical Toxicology because I think they are a direct application of laboratory work to solve real world problems. Forensic and Clinical Toxicology involves an Analytical Chemistry approach, to develop analytical methods for the determination of licit and illicit drugs in biological specimens, and a Pharmacology and Toxicology side, interpreting these analytical results, what they really mean and their biological implications and consequences.

My main research interests focuses on alternative biological matrices in Forensic and Clinical Toxicology (oral fluid, hair, nails), study of new endogenous biomarkers to detect drug abuse, and the bioanalysis of drug exposure during pregnancy.

CONCHEIRO-GUISAN

Angelique Corthals, PhD (University of Oxford)
Assistant Professor

Areas of Expertise: Pathology, biomedical and physical anthropology, and archaeology

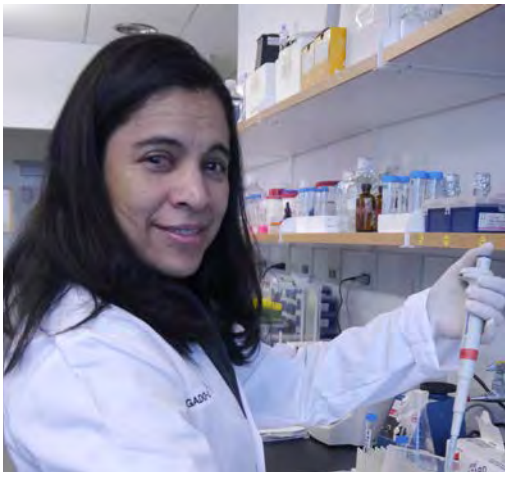
I have always been interested in archaeology. While studying at Oxford, my next door neighbor was a developmental biologist who was doing a study on the genetics of populations in the Nile Valley. She needed someone with expertise in Middle Eastern history and population genetics. As I began to help with her project, this led me to my doctoral work, looking at the relationship between art work styles of historical populations and changes in the genetic makeup of those populations. My current foci of research are the mechanisms of autoimmune diseases (specifically multiple sclerosis), the historical ecology of infectious diseases (specifically tuberculosis, malaria, the plague and HIV), and protocols of recovery of genetic information for ancient or damaged biospecimens. In addition to teaching at John Jay, I am the director of the BioBank and an research professor at the department of pathology at Stony Brook Medical School, and I am also the forensic anthropologist-in-residence on the University of Brussels' TT29 excavation in the Valley of Nobles in Luxor, Egypt. I have appeared in several documentaries for National Geographic and Discovery Channel, as well as in a full length feature IMAX movie currently screening worldwide called *Mummies: Secrets of the Pharaohs*.

Lissette Delgado-Cruzata, PhD (Columbia University), MPH (Mailman School of Public Health)
Assistant Professor

Areas of Expertise: Epigenetics, cancer epidemiology

I have been in a lab for as long as I can remember; my parents are both chemists. When we were not in the lab, we were fermenting and distilling at home. Science always felt like a part of me. I studied biochemistry at the University of Havana, Cuba, and experimented with biotechnology and molecular biology methods. I later came to New York and got my doctorate working in the intersection of molecular biology and public health. Being able to apply what I had learned in the lab to population studies was incredible. I developed markers that could be measured in biological tissues (biomarkers), such as blood, saliva and urine; and studied in association to disease states. The things I have enjoyed the most have been to observe the growth of our field and the many applications we have for molecular biology today. The interconnections of all the new areas of research are mindblowing.

I expect to run the first epigenetics lab at John Jay. I want to investigate further how the epigenetic mark, DNA methylation, is regulated in cells and what role it might have in early steps of cancer development. These studies will be carried on cell culture systems with mammalian cells. We will look at expression of enzymes involved in DNA methylation maintenance (DNMTs) and those involved in processing of DNA methylation, TET family proteins. We will study genetics and protein expression of these, using cells derived from breast cancer patients from the New York Breast Cancer Family Registry. Results from these studies can be very helpful in elucidating which other molecular events mediate familial and sporadic breast cancer. In addition, we will use epigenetics in forensic sciences to determine the type of tissue in an unknown sample, all tissues have different epigenetic signatures and this can be very helpful in a forensic setting.



DELGADO-CRUZATA

Peter Diaczuk, PhD (City University of New York)
Lecturer – Criminalistics

Areas of Expertise: Ricochet analysis and explosives

I got into science because I thought it would be good to know how not to blow myself up on the Fourth of July. So I went to Stuyvesant High School and in my senior year there, I took out a book from the library entitled Science Against Crime. On the cover were two scientists in white lab coats, one of them holding a side-by-side double barrel shotgun for test firing. I knew then that forensic science would be the direction of my application of science. John Jay College was in my home town of New York, so off to Jay I went after graduating from Stuy. A couple degrees later and here I am working in the criminalistics laboratory and I just earned my PhD. Not surprisingly, my interests are firearms and explosives.

Artem Domashevskiy, PhD (City University of New York)
Assistant Professor

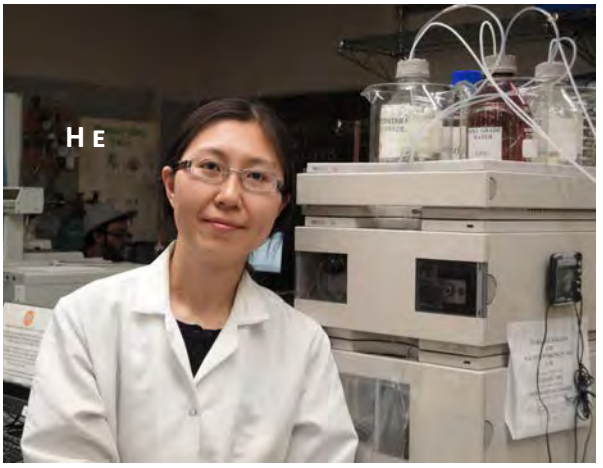
Areas of Expertise: Biochemistry, molecular biology and biophysics

Our laboratory uses methods in molecular biology and biophysics to study structure, function, and properties of pokeweed antiviral protein (PAP) isolated from *Phytolacca americana*. Specific projects interests include:

- Agricultural epidemics can have disastrous effects on the nation's health via crop yield and safety and on its economy through costs of containment and eradication, reduced domestic demand, and global embargoes. A better understanding of the activities of PAP, e.g., how PAP selects its target RNAs for depurination, could help in devising ways to control pathogenic epidemics in plants.
- Experimental cancer chemotherapy uses plant toxins coupled to a cancer marker recognition antibody to specifically deliver the toxin to the cancer cells. Side-effects of the toxin molecules remaining in the circulation or released from lysed cancer cells may be eliminated by using liposomal drug delivery and effective RIP inhibitors. PAP encapsulated into a lipid vehicle is being investigated as an anticancer agent, and the toxin delivery is tested for efficiency.

Students in this laboratory can receive training in enzymology, biophysical methods of analysis of protein-protein and protein-nucleic acid interactions, protein expression and purification. Active collaborations occur with laboratories specializing in NMR, X-ray crystallography, mass spectrometry, synthetic organic chemistry, phytopathology, virology, cancer and medicine.

I prefer using integrations of several mentoring styles: “Prescribing” (for complicated problems I provide solutions to my students for they might not have a good overview in those cases; from my experience I feel entitled to indicate how problems can be solved in the most efficient way; I often insist that students follow my advice; because of my expertise and experience I can point at solutions in an effective way, etc.), followed by “Advisory” and “Cooperative” styles of mentoring.



Yi He, PhD (City University of New York)
Associate Professor

Areas of Expertise: Analytical chemistry and environmental forensic toxicology

When I was growing up, I admired my parents and their scientific careers. My mother was a physician and my father was a senior engineer. Their love of science had a great deal of influence on my interest in this field as well. In high school, I excelled in both chemistry and physics, which also led to my pursuing a scientific career. As a senior in college, I was able to publish my first paper, which was very exciting for me. As one of the top students, I was easily accepted to a prestigious graduate program that allowed me to learn about solid phase microextraction. My lab was one of the first to really develop this relatively new technique. It was exciting to be involved in something so new.

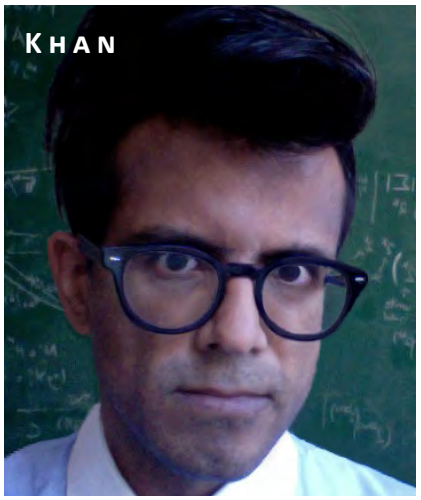
My research interests include method development of novel sample preparation techniques, especially microextraction, and their application to environmental and forensic analysis; elucidation of multi-element fingerprints of forensically important trace evidence; and investigation of trace level arsenic in environmental and biological samples.

Hunter Johnson, PhD (University of Maryland - College Park)
Assistant Professor

Areas of Expertise: Mathematical logic

My parents gave me an Atari 400 when I was very young, and it came with a BASIC interpreter. I somehow got a book that showed how to program short games that would do things like move an "@" symbol around in a field of "*" symbols. I found this deeply impressive. Later, in college, I read a book called Excursions in Number Theory, by C. Stanley Ogilvy, which made me reconsider mathematics. As a philosophy major, I had absorbed a Spinozistic reverence for all things mathematical, and when I realized I was relatively good at it, I decided to make it a career.

Mathematical logic has a lot to do with the definability of concepts in formal languages. So does AI, and I have always been attracted to the confluence between those two things – the interplay of the nature of a concept and how its complexity is reflected in its possible representations. My official research is in what are called NIP theories, which is a subspecialization within model theoretic stability theory. This can be rephrased, without too much loss, as the study of relations with finite VC dimension. When I was just beginning my PhD research, there had been breakthroughs in applying some abstract model theory to practical questions relating to Artificial Neural Networks. For a long time, I tried to improve these results, but ended up doing the opposite of what I meant to do. Namely, I imported an idea from machine learning into model theory, which has proven to be fruitful. Since then, my work has been more model theoretic, but I am always looking for opportunities to go back in a CS direction.



Bilal Khan, PhD (CUNY Graduate Center)
Associate Professor

Areas of Expertise: Computer networks, social networks, graph theory, modeling, simulation

I became interested in computers as a child, because I found the mix of creativity and precision required to design programs that control a machine compelling. I studied computer science at MIT, but then decided that I needed to study mathematics to make computers do the things that we as humans, with our incredible brains, do almost effortlessly. In the succeeding years, I have been working to advance the application of computation and mathematics to uncover hidden dynamics in modern societies, from the perspective of flows (information, disease, money, etc.) that circulate in dynamically changing social networks. The work I do involves discrete mathematics, system modeling, data analysis, simulation, and building real computer systems. I like working with students because they are curious and creative about the world, and have the dedication to invest the time and effort to develop the skills needed to be effective as scientists, engineers, and citizens.

Ekaterina Korobkova, PhD (University of Chicago)
Assistant Professor

Areas of Expertise: Biochemistry, biophysics, physical chemistry

When I was 17 years old and I was a first-year undergraduate student, I became fascinated by chemistry while taking a physical chemistry class. I knew at that time chemistry would become my lifetime occupation. I enjoy the process of solving a chemical problem, experimental or theoretical, and enjoy struggling through it to find a solution.

A substantial number of experimental evidence collected over the last decade supports the involvement of mitochondria in the key processes associated with cancer such as cellular apoptosis, growth, metabolism and energy supply. Oxidation-reduction reactions occurring in mitochondria and endoplasmic reticulum generate the flow of electrons. Leaking electrons may interfere with surrounding molecules, producing reactive oxygen species (ROS). ROS react with DNA, which results in the formation of covalent modifications on DNA bases. In our lab we study the dynamics of the expression of glycosylases, DNA damage repair proteins, in response to stress. We are also interested in the mechanisms of action of cytochrome c, a protein attached to the inner mitochondrial membrane. It has been known for a long time that this protein participates in electron transfer process, which ultimately leads to the synthesis of ATP. Recently cytochrome c was found to play a significant role in apoptosis. In the last ten years, extensive proteomic analysis has been performed on the mitochondria of various types of cancerous cells. One of the proteins found consistently overexpressed in the mitochondria of cancerous cells as opposed to the normal cells is chaperone HSP60. This protein is located in the mitochondrial matrix and plays a significant role in protein folding, assembly, transport and degradation of damaged proteins as well as in the regulation of apoptosis. The identification of small molecules specifically targeting the interactions of HSP60 with other proteins is one of the ongoing projects in our lab.

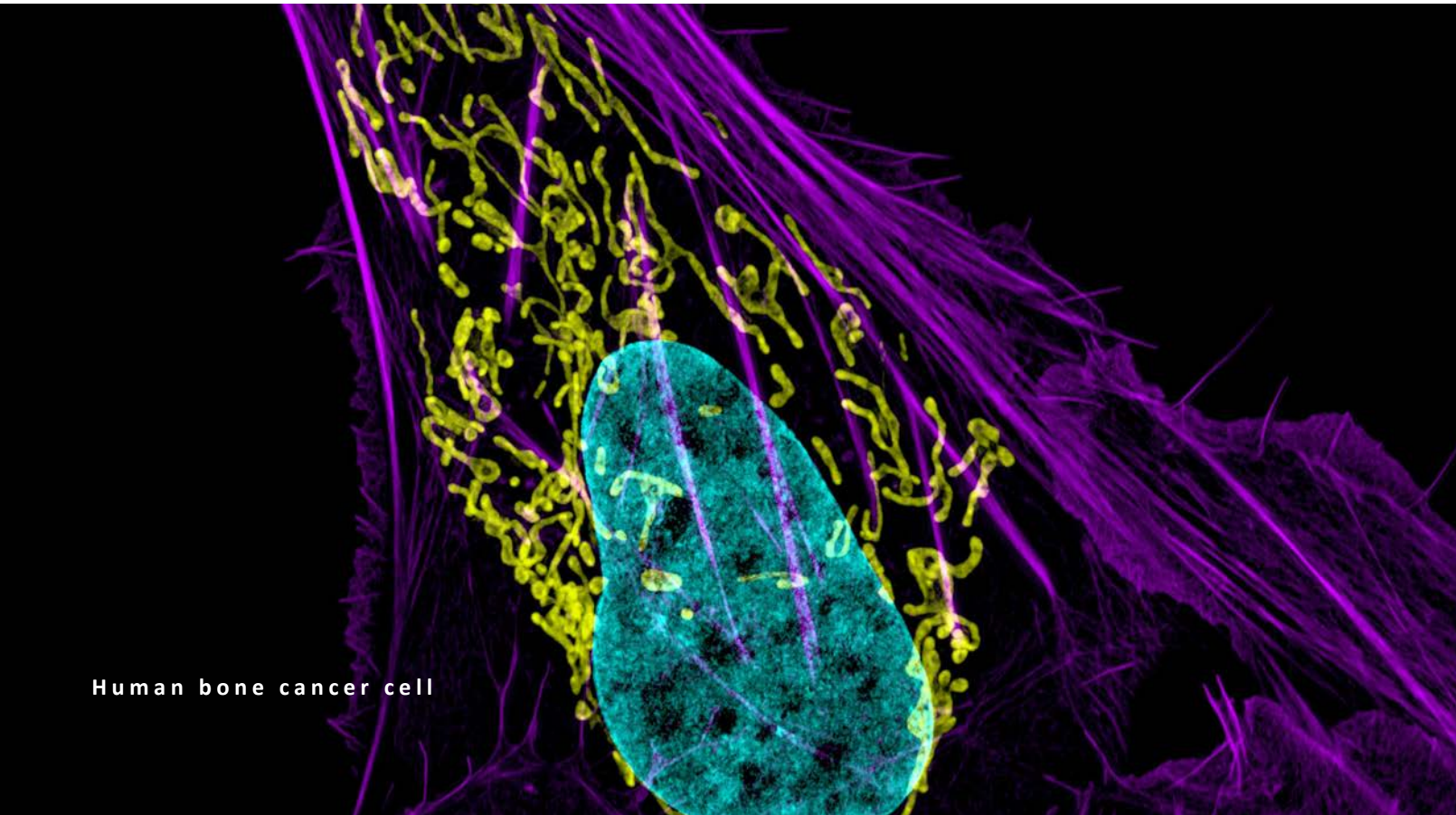
Thomas Kubic, JD (St. John's University), PhD (City University of New York)
Associate Professor


KUBIC

Areas of Expertise: Light and electron microscopy, vibrational spectroscopy and image analysis to physical evidence examinations

I got involved in forensic science by serendipity and long before the advent of CSI television or the O.J. Simpson Case. In the early 1970s the country was in a recession and the research company for which I worked doing government defense research closed. I was in the habit of eating and sleeping in a warm and dry place (so was my wife), so I joined the Nassau County Police Department. After graduating the police academy, I was assigned to patrol duty. After I spent a year on the street, the Department realized that I possessed a MS in Chemistry and transferred me to the crime laboratory. I was eventually promoted to Detective and spent 23 years there until I retired from service in 1995. While at the crime laboratory, I became very interested in the analysis of micro-transfer evidence by light and electron microscopy and micro-spectrometry. The Department was one of the first municipal laboratories to obtain a Scanning Electron Microscope with X-ray Analyzer (SEM-EDS) to perform GSR analysis. While there I obtained my law degree from St. John's University and was admitted to the New York State Bar.

Subsequent to my retirement from law enforcement, I spent three years as the forensic application specialist for a leading SEM Company and was recruited and joined the full-time faculty of the Science Department at John Jay College, where I continued my interest in criminalistics. I was recognized by The Criminalistic's Section of the American Academy of Forensic Sciences with the Paul Kirk Award. Upon my completion of my PhD, I was promoted to Assistant Professor of Forensic Science and Chemistry at John Jay, eventually was advanced to Associate Professor instructing classes in forensic instrumentation, advanced physical evidence, expert testimony and research ethics. I also teach chemical separations and analytical spectroscopy courses within the Doctoral Chemistry Program at the CUNY Graduate Center.


Human bone cancer cell

Nathan Lents, PhD (St. Louis University Medical School)
Associate Professor

Areas of Expertise: Cell biology, forensic biology, genetics, and bioinformatcs

As an undergraduate, I did research on nematodes (round worms) that infect soybeans plants. It was cool because half of the lab members were "plant people" and half were "worm people" but the research was all focused on what happens when plants and worms meet. Of course, the goal of all of this was to protect the plants and kill the worms, and this gave the plant side of the lab a very smug attitude. During breaks from college, I worked in a totally different research environment – industrial microbiology. Specifically, we worked on strains of soil bacterium that are used to synthesize large amounts of amino acids for use as additives in livestock feed. It was very interesting to see how cutting-edge genetic engineering was used for a very complex agricultural need, and it was this experience that led me to change my career path from medicine to biomedical research. I went to graduate school at Saint Louis University and studied control of the cell division cycle by intracellular signaling pathways. I then completed a postdoctoral fellowship at NYU Medical Center where I learned how to use computational techniques to reveal patterns in biological data. This was also where I began learning about the complex control of gene expression.


LENTS

The Lents lab has started two exciting new projects in the area of forensic biology. We are analyzing the community of microbes that live on human skin and how it changes after the death of the human host. This involves collection of bacterial swabs from decomposing human bodies, so this project is in collaboration with the Anthropology Research Facility at the University of Tennessee. Our lab is also involved in developing rapid DNA-based technology for the identification of pollen that is casually inhaled by humans when they are in proximity of a flower in bloom. By identifying which flowers a person was recently exposed to, investigators may get clues to link victims or suspects to specific locations in the hours prior to being swabbed.


LI

Richard Li, PhD (University of Wisconsin–Madison)
Associate Professor

Areas of Expertise: Forensic DNA analysis, forensic molecular biology and forensic genetics

I first became interested in science through reading the detective story of Sherlock Holmes. Currently, my laboratory studies the forensic analysis of biological evidence. The research includes two aspects. The first aspect, the primary focus of my research, is the application of forensic DNA techniques for human identification. The second aspect of my research is forensic toxicology of postmortem samples. In particular, this study is working on the extraction methods of controlled substances from complex matrices, including biological fluids and solid tissue samples.

Mechthild Prinz, PhD (University of Ulm)
Associate Professor

Areas of Expertise: Forensic biology, forensic genetics

My interest in science started with an application in mind: I wanted to work towards environmental protection and wrote my master's thesis on bio indicators for air pollution. It was more of a coincidence that brought me to the university's Institute of Legal Medicine where I became involved in forensic DNA analysis and discovered this fascinating new field with another important application. "DNA fingerprinting," as it was called back then, immediately captured my attention and I haven't been bored since. After many years of casework and applied research in two different forensic biology crime laboratories, I am happy to now be in an academic setting and to be able to share my knowledge. I am going to continue my work on minimal traces of DNA and will pursue research on establishing optimal crime scene collection protocols, improved individualization, and advanced interpretation modes on relevance and statistical significance. I am also interested in other aspects of forensic biology, such a body fluid identification or population genetics.

Gloria Proni, PhD (University of Bologna)
Associate Professor

Areas of Expertise: Supramolecular and molecular chirality, optical spectroscopy (electronic and vibrational circular dichroism, UV-Vis & fluorescence spectroscopy), synthesis and characterization of small molecules

All the students I have worked with in the past know about my deep passion for research and my interest in being a role model for everyone in their research efforts. I am most proud of my "going above and beyond" mentoring effort, which means establishing a personal connection with all my students. I am interested in making everyone who joins my lab an independent thinker and an accomplished researcher. My students will always have my unconditional support in their career choice, life decisions, etc.

The research method applied in my laboratory goes through several steps. First the student will be exposed to a problem (for which we need an answer). The student will go through previous observations and literature work in order to educate him/herself about the problem under investigation. Then he/she will design (with help) and conduct the necessary experiments in order to solve the problem. He/she will also work on control experiments in order to build scientifically sound results. Based on the experiments and with the help of the mentor, some conclusion will be formulated. When the problem under analysis is answered, the results will be organized in order to present them to a larger public.

Currently in my lab we have two major projects running and some collateral ones to complete. During 2014 we will continue to explore the colorimetric and fluorescent properties of lawsone and derivatives. We will also separate and spectroscopically characterize more organophosphorus compounds, as well as try to conclude the other research lines that are still open.

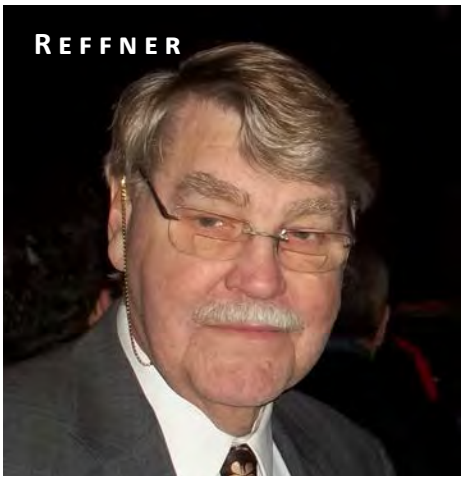
Jason Rauceo, PhD (City University of New York)
Assistant Professor

Areas of Expertise: Molecular biology, molecular genetics, and mycology

I was a late bloomer when it comes to my interest in science. As I became more involved in my science studies, I began to appreciate science for its inquiry and I was able to see all of the possibilities. I pursued a scientific career mainly to understand the mechanisms underlying clinically relevant diseases. Fungi have served as model organisms in which extraordinary biological processes have been elucidated. Thus, mycology lies at the core of my biomedical research career.

Our research focuses on the major human fungal pathogen *Candida albicans*. We are interested in the molecular mechanism underlying the cell wall stress response. We are also interested in how cell-surface glycoproteins mediate attachment to host surfaces. Currently, we are exploring how the transcription factor Sko1 confers stress protection to cells challenged with hyperosmotic stress and antifungal drugs. We are also identifying the chaperone network that governs processing and localization of the Als cell-surface adhesins.

As a mentor, my main goal is to prepare students for graduate or professional school. I assign independent projects that allow students to design and troubleshoot experiments, develop oral presentation skills, utilize scientific databases, and polish their writing skills. Although I do not micromanage students, I regularly hold one-to-one meetings where experimental progress and plans are discussed.



John Reffner, PhD (University of Connecticut)
Associate Professor

Areas of Expertise: Microscopy, molecular spectroscopy and materials science

Mentoring undergraduate students is a process that begins by defining a problem that is meaningful, solvable and provides a challenging learning experience. Observation, documentation, preservation, examination, contemplation, speculation, verification and publication are the stepping stones that lead to a successful research project. As a mentor my role is to be an information resource, a guide, a counselor and a catalyst.

Current research in my lab centers on improving the value of analyzing trace evidence. Specific projects are: evaluation of micro-spectroscopy for the characterization of dyed fibers, developing analytical methods for forensic laboratories in emerging countries, investigating the counterfeit drug problem, and establishing methods for determining match criteria related to trace evidence comparisons.

Marcel Roberts, PhD (Boston College)
Assistant Professor

Areas of Expertise: electrochemistry, spectroscopy and analytical chemistry

I initially got interested in science and performing well in science classes when I was about 11. I was hoping to impress a girl I had a crush on who was top of the class in both physics and chemistry. I never had a chance with her but as I started paying more attention to the sciences, I found an endless source of fascination. The amazing complexity and elegance of the world viewed through scientific lenses has kept me interested since then.

My research interests focus on creating novel devices for identification but also the detection of drugs, explosives and contaminants. My specialty is chemical biology but I have a profound interest in toxicology and biomedical engineering. I am fascinated with creating devices that can have immediate and practical applications in border security, forensic science and food safety. My interest and love for science is linked to my love for science fiction and all things geeky and nerdy.

Jennifer Rosati, PhD (University of Windsor)
Assistant Professor

Areas of Expertise: Biology, entomology, ecology, forensic entomology, entomotoxicology and insect behaviour

My love for insects started during my undergraduate education when I took a course demonstrating how insects related to the world around them. Until then I never really paid much attention to insects, in fact, I often headed in the other direction. This course was a turning point for me and I loved learning how important they were and how each species had a particular role in the environment. From then on, I focused on entomology whenever I could, never knowing it would lead me here. After completing my undergraduate degree in Wildlife Biology, I continued my education in entomology, specifically looking at the ecology and behaviour of forensically related insects using field and lab-based approaches. My graduate work examined the patterns of insect succession during decomposition and how they may change over different habitats and seasons. I also focused on blow fly species interactions to determine how differences in arrival order can influence behavior at adult and larval stages.

My current research interests include furthering our ecological knowledge of what causes the patterns of succession during decomposition. By taking an ecological approach and understanding the mechanisms that determine patterns of assembly in the carrion insect community, we can further the field of forensic entomology. This work will help determine reliable indicator species for minimum time of colonization estimations. My research also focuses on entomotoxicology, where the effect of chemical compounds or toxins on larval development is studied. And finally, my lab examines species interactions in forensically important insects to determine if their colonization and larval behaviors are driven by resource-state or by biological interactions between community members.

Daniel Yaverbaum, MS (City College of New York), MPhil (Columbia University Teachers College)
Lecturer of Physics

Areas of Expertise: Physics education and cognition, Galilean and special relativity, and astronomy

In my lab we organize and analyze the data taken from the 70-odd students who participated in a project known as "Transforming Reference Frames." This project seeks to probe student mental models regarding Galileo's Principle of Relativity. We have started using a state-of-the-art eye-tracking device in order to collect optical data. We will thereby vastly deepen our investigation of student cognition as it applies to relative motion.

Asked whether I identify more with Edison or Einstein, I have to say that I identify more strongly with Einstein: I am fascinated with the mathematical and philosophical properties of electromagnetic radiation – particularly the notion of invariance under reference frame transformation – but could not convert a tungsten into a working bulb to save my light.

Guoqi Zhang, PhD (Chinese Academy of Sciences)
Assistant Professor

Areas of Expertise: Inorganic/organometallic chemistry, inorganic forensic analysis, fluorescence sensors and supramolecular chemistry

I began to love chemistry when I was a middle school student. At that time I was so curious about what our world is made out of and what exactly the things around us are. I believe it was this curiosity that made me learn chemistry very well and eventually choose the chemistry major in college. I started doing my research when I was a sophomore in the research laboratory of an organic chemist, Prof. Yuan, for the synthesis of a medicinal intermediate, 7-chloro-8-methylquinoline. I was able to complete the synthesis of this molecule after winter and summer breaks. Then I worked on my thesis under the supervision of a physical chemist for the thermochemical study of a metal-amino acid complex, which resulted in the publication of my first journal article. Going to a graduate school was quite straightforward and then I got the chance to perform cutting-edge research in chemistry involving synthesis, structures, luminescence and other physical properties of metal-organic complexes. Further research experiences in China, Switzerland and United States have allowed me to build a really international profile.

It has been exciting running my own research laboratory since Fall 2013 at John Jay. Currently in my group we are interested in many aspects of synthetic chemistry of metal-based compounds and their applications in forensics, catalysis and luminescence. Students in our group will receive broad training including synthesis, fluorescence sensors, metal catalysis, crystal engineering, and inorganic forensic chemistry. Hands-on research experience in modern synthetic techniques including Schlenk line and glovebox operations, and a variety of spectroscopic techniques (NMR spectroscopy, gas chromatography-mass spectroscopy (GC-MS), high-performance liquid chromatography (HPLC), FT-IR, UV-Vis and fluorescence spectroscopies) will be invaluable to the careers of my students.

Program Information and Staff

PRISM, the Program for Research Initiatives in Science and Math, was established in the Fall of 2006 by Drs. Anthony Carpi, Lawrence Kobilinsky, and Ronald Pilette to promote undergraduate research in science at John Jay College. The Program was founded in the same year as the adoption of the course FOS 402: Undergraduate Research Internships, an expansion of the capstone offerings in the undergraduate Forensic Science major. These initiatives were part of a broader effort to encourage faculty-student research mentoring. PRISM was the outgrowth of a smaller undergraduate research initiative funded by the New York Education Department, CSTEP. CSTEP funding was critical to first establishing undergraduate research as an important component of the Department of Sciences, and CSTEP along with the US Department of Education and National Science Foundation have been critical support mechanisms contributing to the growth of this initiative. As PRISM has expanded, the number of students served by it has grown commensurately. From its first year of operation, PRISM realized an expansion of student participation from a handful of students a year to over 40 students who actively participate in mentored research, with several dozen additional students who have participated in program seminars and training activities. Since PRISM's inception, 150 students have participated in mentored research and received research stipends. PRISM has been highly successful in increasing the number of students moving on to post-graduate education and successful careers in science. Well over 50 students have matricultated into professional degree programs in STEM, science education, and health.

For more information, contact us at PRISM@jjay.cuny.edu, visit our website www.prismatjjay.org, 'like' our PRISM group on Facebook®, and follow us on Twitter @PRISMatJJAY.

Edgardo Sanabria-Valentín
PRISM Coordinator and Pre-Health/Pre-Graduate STEM Advisor

Frances Jiménez
PRISM Outreach Coordinator

Ron Pilette
PRISM Resource Coordinator

Anthony Carpi, PhD
PRISM Director

Lawrence Kobilinsky, PhD
PRISM Co-Director

Nathan Lents, PhD
PRISM Co-Director

Acknowledgements

Funding for PRISM and student research mentoring is provided by a number of federal and state sources, which we gratefully acknowledge:

- A U.S. Department of Education Title V grant for Institutional Development
- A U.S. Department of Education Title V grant for Collaborative Initiatives
- A U.S. Department of Education Title V HSI-STEM grant
- A White House/National Science Foundation PAESMEM Award
- A grant from the U.S. Department of Education's Minority Science and Engineering Improvement Program
- An award from the Dormitory Authority of the State of New York's Graduate Research and Technology Initiative

Image credits: cover ©P.Diaczuk and G.Mahon; masthead and TOC background image ©Zephyris/CC-BY-SA-3.0; page 1 student photos ©Alison Domzalski; page 2 students photo ©Derek Soko Photography; page 5 ©Sun14916/CC-BY-SA-3.0; page 8 ©Alison Domzalski; page 12 ©National Institute on Aging/National Institutes of Health; page 14 ©Alison Domzalski; page 18 ©H. Zell/CC-BY-SA-3.0; page 23 ©Kelvinsong/CC-BY-3.0; page 25 ©MichaelMaggs/CC-BY-SA-3.0; page 26 ©Mary Ann Tiffany, San Diego State University; pages 30-32 ©Derek Soko Photography; page 38 ©AlexanderAIUS/CC-BY-SA-3.0; page 43 ©Dylan T. Burnette, NICHD, NIH. All other photographs ©PRISM, John Jay College of Criminal Justice or in public domain/creative commons.

PRISM at John Jay

Program for Research Initiatives in Science and Math

NSF

Department of Education, United States of America

Production of this Chronicle was funded through grants from the US Department of Education (Title V, MSEIP, HSI-STEM).

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