



**PRISM**  
at John Jay

2011

Undergraduate Research

**CHRONICLE**

Program for Research Initiatives for Science Majors

# Welcome

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We are happy to be celebrating the 5th anniversary of the founding of the PRISM program. The program has grown tremendously during this time. From a handful of students 5 years ago, the program now supports over 30 students in faculty-mentored research projects and many more students through the seminars and training courses we hold every year. And the growth of our undergraduate research program has not only benefitted our students, it has had significant benefits for our Department. The energy of our student researchers has raised the visibility and reputation of the Department through the many external presentations and posters they have given at regional and national conferences. Several of our students have been recognized for their presentation skills, most recently Justin Walters won an award for his poster titled "The Toxic Mechanism of Manganese Nanoparticles in PC-12 Cells" at the statewide CSTEP student research conference.

For many of our students, these projects are the first step on a journey toward becoming a professional scientist. As such, we are particularly pleased to highlight six of the students featured in this issue of the Chronicle who have decided to pursue their studies via graduate school: Amora Mayo-Perez (p 15), Dominika Mucha (p 16), Latoyia Patrick-Saunders (p 17), Richard Piszczatowski (p 18), Stephanie Watson (p. 27), and Alicia Williams (p 28).

We wish all of the students featured in this issue luck and progress in the coming year. We hope that our new and continuing students see the opportunities that these research projects represent for them, and the successes that are possible in their lives.



A handwritten signature in black ink that reads "Anthony Carpi". The signature is fluid and cursive, with a small dot at the end of the last name.

*Anthony Carpi, PRISM Director*

# Undergraduate Researchers



Andrea Saenz

Our PRISM undergraduate students engaged in a wide variety of research projects in 2011. From studying the genetics of fungus to new fingerprint detection techniques to identifying pharmaceutical pollutants in water, students worked with mentors to design and implement research projects in criminalistics, toxicology, synthetic and environmental chemistry, and molecular biology. The progress and results have been impressive and show that these students are well on their way to promising careers in science. In the pages that follow, our 2011 PRISM scholars provide personal insight into what is driving them in their studies, and what research they have conducted at John Jay College.

## DAVONNE AUGUSTE

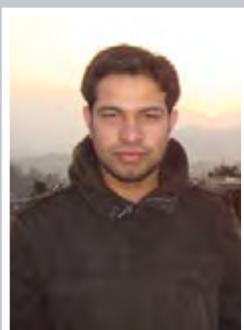
I'm a graduating senior at the John Jay College of Criminal Justice, currently pursuing a Bachelor's degree in Forensic Science with a specialization in Toxicology. With strong ties to my St. Lucian heritage, I ultimately intend to use the knowledge and experience that I have gained from my experience at John Jay to help reform the Criminal Justice system in my home country, and by extension the Caribbean. As a budding forensic toxicologist, I am certain that the experience and requisite skills that I gained through undergraduate research at John Jay College over the past two years will equip me to excel in Graduate School and also set the foundation for my professional career.



### Studying the Effects of Illicit and Antipsychotic Drugs on Hair Melanin Using Attenuated Total Reflection – Infrared Spectroscopy (Dr. Kocak)

Melanin is the major pigment found in the skin, hair and eyes of human beings. Although significant research on the drug interactions with melanin has been conducted, it is still unclear as to what extent these interactions affect human hair from different ethnic backgrounds. Illicit and antipsychotic drugs binds to the melanin of human hair, however the mechanism of this binding is not clear and it may differ depending on the ethnic background of the individual. Advances in the understanding of the binding effect of these drugs can be important as forensic evidences in the court room. In this research melanin was reacted with clozapine at physiological pH. First with synthetic melanin and then

with melanin extracted from hair samples obtained from people of different ethnicities. The results obtained were compared and analysed with pure melanin before and after the reactions. The project is ongoing, however data analysed in the last few weeks indicates that there is a difference in the spectra of black hair as opposed to lighter hair. Successful completion of this project will allow for the understanding of the processes involved in drug incorporation with melanin of different pigmentations. This would yield a greater understanding in the biases that may be involved with drug hair testing and facilitate the detection of drug concentration across various ethnicities.



## ANKIT BHATTA

I'm from Nepal and transferred from a Microbiology program to the Forensic Science Molecular Biology track when I came to the US. John Jay has given me the platform to pursue my educational goals. The Molecular Biology program is a perfect fit to my need to be involved in biology while understanding the molecular basis (chemistry) of the genetic and biochemical processes that occur in nature. In the long run, I hope to work in the field of microbial genetics and research the expression of various traits via metabolic pathways to answer common questions relating to simpler and complex organisms.

### Application of Clostridiopeptidase for DNA Isolation (Dr. Li)

Osteocytes make up bone tissue and contain the DNA embedded in calcified matrix. The application of proteinases like clostridiopeptidase in proper concentration for certain periods could eliminate the physical barrier and give optimum DNA yield. Thus, this project is aimed at determining the optimum concentration and incubation period required for digestion of decalcified osteocytes (using EDTA) via the application of clostridiopeptidase. Furthermore, the genomic DNA will be extracted and the yield will be calculated to determine the effect of clostridiopeptidase treatment on DNA yield.

## SASHA BRITO

As a little girl growing up I was full of curiosity. I always wanted to know why and how certain things happened the way they did. For example, if someone was sick I would be curious as to where they were prior to getting sick, what they ate, or the environment they were in. In high school I did not think of majoring in Forensic Science, I was more interested in human anatomy and physiology. I knew that somewhere down the line I would be working in a scientific field, so I decided to major in Forensic Science because of the tracks offered by it. Once enrolled in Forensic Science it came to my attention that I did not want to be involved with analyzing physical evidence, I wanted to be involved more with autopsy or research. In my opinion, the track most related to autopsy was Molecular Biology. Since Molecular Biology is the study of chemical processes at a molecular level, I realized that it would satisfy my level of curiosity. In understanding biochemical processes, interactions between various parts in a cell, and biochemical signaling, it was very easy to determine that Molecular Biology would be my major point of interest in research studies.



### Study of Human Hair Melanin with Illicit and Antipsychotic Drugs (Dr. Kocak)

The study of the incorporation of illicit and antipsychotic drugs on human hair melanin serves as an important factor in the forensic science field. Most importantly, there have been several drug analyses of a suspect's hair for drug abuse where there were many false results reported. In order to understand drug abuse or use, it is important to understand the drug and melanin interaction. For the research, there was hair collected from a Hispanic female who has never altered the color of her hair. Also, there was a sample of synthetic hair used to incorporate the drugs into. The human hair was dissolved and extracted using 7.2N Hydrochloric Acid and the drug was incorporated in the hair. Once the pellets were formed from the extraction, the human hair melanin was dried in a dessicator and used in the ATR-IR spectroscopy for analysis. Also, there was a control sample prepared where there was just untreated human hair melanin extracted and analyzed in the ATR-IR for comparison to the treated human hair melanin.

## MIKEISHA CADOUGAN

I am an international student, originally from the island of St. Vincent and the Grenadines. In 2007 I came to the United States to pursue studies in Forensic Science at John Jay College of Criminal Justice. I chose to attend John Jay because I wanted to do something that was different and something that would make a difference in my country of birth. I am currently a senior in the Molecular Biology track and have been enjoying my courses thus far. I am also involved in research with my Mentor and I have learned a lot of things that would be applicable in my career. My experience at John Jay has been an enlightening one and I hope to use everything I have learned through research and my courses in the future.



### The Effect of Industrial Pollutants on DNA (Dr. Korobkova)

Many industrial pollutants have been linked to the formation of cancer because of their carcinogenicity. However, the process related to the formation of cancer because of these pollutants is not yet understood. The purpose of this project is to investigate the effects of some of these carcinogenic industrial pollutants on DNA. The DNA will be incubated with the pollutants in the presence of several different oxidation systems. The extent of DNA damage will be evaluated using gel electrophoresis. This study is significant for environmental health studies.

## IRVING CAMPOVERDE

Growing up, I was always interested in the sciences. During my senior year in high school I volunteered at Coler-Goldwater Memorial Hospital in the morgue. There I learned many things that pathologists, toxicologists, and others do in order to identify the cause of death of a patient. This opened my eyes and led me to research how to become a toxicologist. I asked many of my teachers in high school and one pointed me in John Jay's direction. Once I attended the freshmen orientation and learned that forensic science would help me achieve that goal, I quickly chose it as my major. Now a couple of years later I am in the Toxicology track in Forensic Science and am currently part of a research group at the college. It is also through this research group that my involvement with PRISM began.



## NMR-Based Study of Urines of Opioids-Overdosed Patients (Dr. Proni)

The goal of this research project is to understand the advantages and limitations of using nuclear magnetic resonance (NMR) spectroscopy for the identification of opioids, and in particular, morphine, in urine of patients who overdosed with morphine. This will be achieved through preparing urine samples by drying them in an Acid Resistant Centriva Concentrator, in order to remove most of the water. The sample will then be reconstituted in methanol deuterated, MetOD, and then doped using a 2mg/1mL vial of morphine. All data will be collected on a JEOL 300 MHz NMR spectrometer (JEOL USA Inc., Peabody, MA), using a trial and error method in order to determine the degradation period of the sample. Then the doped sample will be run with a Nesy, Cosy NMR spectroscopy in order to characterize the morphine in the urine sample and be 100% certain the morphine is present.

Learning how to use state-of-the-art equipment is an important part of the training PRISM students receive.

Here, Lidissy Liriano sands the outer surface of a bone to prepare it for DNA extraction.

Lidissy Liriano





### DANIELLE CARTHORNE

I am originally from Maryland and I moved to New York in 2006 to attend college. The main purpose for me to relocate to New York was to attend John Jay for Forensic Science because I heard John Jay was the best college to attend for my major. My passion in life has always been science and the idea of being able to help a person or society with my research and/or work fulfills me. After learning about the PRISM program I was very eager to be accepted into the program and I am excited about starting research in my field this semester with Dr. Kubic. My ultimate goal after I graduate is to move back to Maryland and work in Washington, DC in the new crime lab that they are building. I would like to work with the Washington, DC police department or the FBI.

#### Establishing a Pigment Database Using FTIR and Raman Spectroscopy (Dr. Kubic)

Pigments are impacted into our everyday materials and can be used as very influential evidence. The goal is to establish a database of each pigment for Raman and FTIR spectroscopy. An FTIR will be run on all samples and those that are not IR active will be run on a Raman spectrometer. To establish a database, a Raman and FTIR spectroscopy will be run on each pigment to set a standard. Then test will be run on unknown pigments for reproducibility so that the database will be correct.

### CATHERINE CHAMANKOOL

I graduated high school in 2004 and quickly returned to school without a real goal in mind of what to study. I spent two years at another college feeling unfulfilled and bored and decided to transfer to John Jay to focus on sciences in 2007. Science has always been an interest of mine since an early age, but it took me a while to decide that it was the path I wanted to go on. Forensic Science was something I never thought of myself pursuing, but after taking a few courses and labs I decided it was the path for me. Now, I'm on the track to study Toxicology with the goal to pursue medical school and to continue research. With the help of some great mentors, I have come to enjoy my stay at John Jay, in and outside of the classroom and labs.



#### How Mammalian Cells Respond to Oxidative Stress: Kinetic Studies (Dr. Korobkova)

Oxidative stress is caused by the imbalance between oxidants and antioxidants when in favor of the oxidants potentially leading to damage. Oxidative stress has been proven to cause adverse effects on ageing due to oxidative stress inducing mitochondrial DNA damage. Increase in mitochondrial DNA damage leads to compromised mitochondrial function and integrity and increased DNA damage is believed to increase ROS production, which in turn leads to a higher chance in causing oxidative stress. It also causes oxidation of DNA bases resulting in DNA mutations. Repair of the damaged bases occurs by the base excision repair mechanism (BER). BER is performed by glycosylases removing the oxidized bases by hydrolyzing the N-glycosidic bond. Two types of glycosylases are the type I enzymes, which excise the oxidized base on an abasic site on the DNA, and type

II enzymes which excise the base and cleaves the abasic site. Much of the character traits and structure of glycosylases are identified, however the mechanisms behind the glycosylase and how it expresses its inner workings to produce a response for DNA base repair is still not comprehensively understood.

A procedure will be developed to study the dynamics of the expression of glycosylases in rat cells (PC12 – pheochromocytoma cells) in response to UV exposure with OGG1 protein used as a model. Cells will be exposed to UV light at various intervals and the expression of OGG1 level will be measured at different time points following the UV exposure. Various techniques will be employed in order to create a kinetic model for OGG1 expression following exposure to UV radiation.

## ROSELYNN CORDERO

At fifteen sitting in the back of Ms. Khan's chemistry class, I knew that this subject, although challenging, was going to be the grounds for my future. It was a revelation that came to me so early in life that from that moment on I dedicated my high school career to earn the grades that would get me into the college that was going to nurture my flair for science. Two years later, I enrolled at John Jay College for Criminal Justice majoring in Forensic Science. Bright eyed and bushy tailed, I waltzed into my first college chemistry class, and a year later I joined Dr. Gloria Proni's research group. Research is such an important part of my college success because there are so many skills that I have learned throughout my research that I would have never learned in a class setting. It has also opened so many doors for me, including traveling to Italy to work on a project and learning new techniques. I am currently a junior and will be applying for graduate school next year.



### **New Zinc Porphyrin Tweezers in a Host-Guest Complex: Absolute Configuration Determination of Diamines (Dr. Proni)**

Porphyrins are a group of aromatic organic compounds that are heterocyclic and contain pyrrole subunits connected at their  $\alpha$ -carbon atoms through methine bridges. These compounds are frequently used in supramolecular chemistry due to the Lewis acidity of the metal employed. The objective of this research is to investigate the scope, advantages and limitations of three novel dimeric porphyrin hosts (PP, MM, TT) as reliable reporters of the absolute configuration of chiral diamines. The determination of the absolute configuration was achieved via a supramolecular approach developed within the last decade. The protocol relies on a host-guest complexation mechanism between a derivatized chiral substrate (guest) and the dimeric zinc porphyrin host that functions as a receptor. The two porphyrins in the complex adopt a preferred helicity related to the substrate's absolute configuration. The relation between the absolute configuration of the substrate and the interporphyrin helicity is predicted by molecular modeling studies. The tweezer (dimeric

zinc porphyrin) can be used as a CD reporter group; therefore, on the basis of the observed CD exciton couplet and molecular modeling of interporphyrin twist, the absolute configuration of various chiral guests can be determined. Several diamine derivatives were studied in the Spring-Summer semesters of 2010. Spectroscopic data and computational results were obtained from the analysis of benzyl amine and methyl amine. The negative interporphyrin helicity of methyl amine was confirmed by computational studies after the circular dichroic signal of this molecule yielded a negative intensity. Currently, several alcohol derivatives are being prepared for spectroscopic analysis. The analysis of alcohols will bring a different approach to the insertion of the molecule into the tweezer due to the fact that it does not contain the necessary structure to anchor it to the tweezer; therefore, the substrate needs to be derivatized with a carrier molecule that contains the anchoring residues.



## NATASHA DALTON

After I spent two semesters in a program called Queens Bridge to Medicine Program with emphasized studies on Chemistry, Calculus and English, I realized that my main interest has always been science-based subjects. I also remembered doing in depth studies with my Chemistry teacher, who devoted her time every Saturday morning to make sure we did well on the Science Regents. As a result, I knew that I would not enjoy having a career any other field but the science field. This is one of the best opportunities that I have been given to do research and to practically apply all that I have learned.

### Absolute Configurational Assignment of a Self-Assembling Light-Harvesting Porphyrin using the Tweezer Approach (Dr. Proni)

In order to trap the energy from sunlight, antenna plants construct chlorophyll derivatives from chemical self-assembly in a highly ordered manner. 10,20-bis(3,5-di-tert-butyl-phenyl-15-acetyl-5-(hydroxyethyl)-porphyrin 1 is a "synthesized" compound that will be tested for harvesting solar energy as an alternative to silicon-based photovoltaic devices<sup>1</sup>. The determination of its absolute configuration is of academic and practical importance in order to understand the chemical properties of this molecule. The absolute configuration determination will be achieved by means of a supramolecular approach developed in the last decade<sup>2</sup>. The protocol relies on a host-guest complexation mechanism between an opportunely derivatized chiral substrate ("guest") and a dimeric zinc porphyrin host that acts as a "receptor". The two porphyrins in the complex adopt a pre-

ferred helicity related to the substrate's absolute configuration. The relation between the absolute configuration of the substrate and the inter-porphyrin helicity will be predicted by molecular modeling studies.

Specifically, porphyrin derivative 1, needs to be coupled with a bidentate carrier to form the bifunctional amide conjugate. Once the conjugate molecule is complexed with the achiral CD sensitive host, the Zn porphyrin tweezer, it yields a host-guest complex that exhibits intense negative or positive exciton-coupled CD in accordance to the absolute configuration of the substrate. The carrier chosen in this proposal is protected at the amines functionalities with groups that could be removed in light basic conditions. This is done because acidic condition have been proven to interfere with the chemical structure of the substrate.

Dr. Angelique Corthals



## JAMES FIELD

Like most students in the major I breezed through high school with straight A's without any effort being put in. The classes that were supposed to be "challenging" ended up being just another boring class that was just there to take up time between lunch and study hall. When I reached my final year I took a class that actually held my interest, which was both fun and interesting. The class was Forensic Science. This class was not exactly science based, but it was a very broad class studying drugs, fingerprints and DNA. This is what really got me into the course, and the teacher pointed me in John Jay's direction. When I took the freshmen orientation I was told that the challenge that I desired could be found in the Forensic Science major. It was through this major where I met my mentor and my enrollment in PRISM began.



### Determination of the Freshness of Fish via HPLC Determination of ATP and Amines Derivatives (Dr. Proni)

The objective of the study is to determine the freshness of the sushi and sashimi sold in the New York markets. Recently there have been a number of published newspaper articles that have publicized studies on raw fish sold in New York City. One study tested the levels of mercury in sushi and found that they were alarmingly high (Burros 2008). The study revealed that 5 out of 20 restaurants had mercury levels so high that the FDA could use legal force to remove the fish. Another study analyzed the genetic profile of fish samples sold in markets around the city (Schwartz 2008). It was shown that one quarter of the fish was improperly labeled and was not species advertised. The quality of the fish, and more precisely its freshness, is of paramount importance due to bacterial pathogens and parasites that may

cause food poisoning. Due to the potential dangers associated with the consumption of raw fish, the freshness of the raw tuna in the form of sushi and sashimi from 12 restaurants in New York metropolitan area will be investigated. The determination of the index of freshness (K coefficient) and consequently the biochemical age of several fish samples will be achieved by using a technique that extracts and quantifies the products of the ATP breakdown and the formation of biogenic amines during fish aging. The biochemical ages of the samples obtained by the restaurants, determined through a comparison with opportunely prepared calibration curves of aged tuna samples, will provide an idea regarding the fish spoilage.

In addition to gaining valuable research experience in the laboratory, many PRISM students have the opportunity to spend time out in the field. From measuring mercury emissions in Cornwall, New York, to visiting archeological excavations in Egypt, PRISM's mentors work hard to give students as much experience as possible within the focus of their research.



## EUGENE GONZALEZ-LOPEZ

I have always been fascinated by the complexities that surround me. This fascination led me to the sciences. I couldn't believe how it branches off into an interconnected web of different specialties. Chemistry is by far my favorite. I love synthesizing reactions and figuring out how other molecules came to be. Chemistry is everywhere from the Haloform reaction that purifies our water to the way we analyze blood at a crime scene. I want to improve old techniques and create new ideas for research. A place where anything is possible and thinking outside the box is the only prerequisite.

### The Role of Microtubule on Dithiocarbamate Cytotoxicity (Dr. Cheng)

Environmental factors have been associated with the pathogenesis of neurodegeneration. Manganese ethylene-bis-dithiocarbamate compounds, [Maneb (MB) and Mancozeb (MZ)] are fungicides which have been widely used in United States. These compounds can potentiate the effects of the dopaminergic neurotoxin 1-methyl-4-phenyl-1,2,3,6-tetrahydropyridine (MPTP) *in vitro* and *in vivo*. However, the mechanisms for these effects are not so clear.

Exposure to MB has been related with sporadic case reports of parkinsonism. MB is able to enhance the damage created by

oxidative stressor for dopaminergic systems. The aim of this study is to elucidate the role of microtubule in this toxic effect. This study may lead us to a better understanding on how these toxic compounds prompt Parkinson's disease. Therefore, unraveling the interaction between dopamine transporter and other proteins may help us to rethink the roles of the process of dopamine transport mechanism play in the pathogenesis of neurodegenerative diseases. Such knowledge may ultimately open the possibility to design a new class of drugs that directly or indirectly modulate these interactions, thereby counteracting detrimental influences on normal transport function.



Eugene Gonzalez-Lopez

## CHRISTINA HUI

I recently graduated from John Jay with a degree in Forensic Science (specialization in Criminalistics). While going through the Forensic Science program, I realized that I was interested in the chemistry behind the methodology and, thus, this is what I plan to study in the future in graduate school. Asking questions and finding out the “why” of how things work has always intrigued me. This, of course, applies to my research in Dr. Carpi’s lab studying mercury emissions from soil surfaces in response to artificial precipitation events.



### Mercury Emissions from Soil Samples in Response to Simulated Precipitation Events (Dr. Carpi)

Mercury emissions from soil have been shown to increase as a result of both artificial irrigation and natural precipitation. Mechanisms proposed in the past to explain the observed increases in mercury emissions have included the desorption of Hg<sup>2+</sup> by infiltrating water followed by transport to the air surface interface (with subsequent reduction), soil gas displacement by percolating water, enhanced redox reactions involving Hg<sup>2+</sup> in the aqueous phase, and addition of mercury through precipitation (Lindberg et al., 1999; Song & Heyst, 2005; Dustin & Stamenkovic, 2005; Gillis & Miller, 2000). The numerous proposed mechanisms demonstrate the uncertainty of the actual mechanism(s) actually contributing to the observed phenomenon. To investigate mercury emissions following soil irrigation,

various volumes of water were applied to soil samples under both light and dark conditions. Mercury emissions were monitored using dynamic flux chambers (Carpi et al., 2007) which were connected to a Tekran Mercury Vapor Analyzer 2537A. Based on the data collected, it was seen that soil emissions from irrigated soil under light conditions was greater than that in the dark. When the broad mercury emission profile that formed in the dark following soil irrigation was compared to the larger peak that formed under light conditions, it was seen that light combined with an increase in soil moisture resulted in a synergistic rather than additive increase in mercury emissions. This would suggest a chemical rather than physical mechanism is present.



## KARRY JOHNSTON

I transferred to John Jay in January of 2009 and it wasn’t until the summer of 2010 that I began performing research for Professor Korobkova. Since then, I have had the chance to experiment with various instruments and data analysis techniques. As a Forensics major with a Criminalistics focus, this has been very beneficial as many of these procedures I will have to perform daily in my desired profession. After graduation, I intend to pursue my Master’s degree and eventually my PhD. Research will be a critical part in this path that I have picked and the work I have been undertaking since the summer has helped me to grow and develop my skills as a scientist. Eventually, I wish to work in a lab that is entirely devoted to wildlife forensics and the prosecution of those that commit crimes against nature.

### Antidepressant and Dye Effects on DNA (Dr. Korobkova)

Antidepressants are used to treat depression; however it is believed that they can cause more damage than benefits to the body. Through extensive research, it has been seen that certain tricyclic antidepressants cause the destruction of DNA. Gel electrophoresis has observed this phenomenon when oxidizers such as horseradish peroxidase and hydrogen peroxide are present. Fluorescence was being used to observe the DNA in the presence of different drugs and how strongly they bonded. HPLC has been used to observe the retention times of the individual nucleotides and with the drugs present. Continuing research will show if there are other possible combinations that can cause DNA to be destroyed or mutated.



**WON SANDY KONG**

My father passed away due to liver cancer when I was 12 years old. My grandparents also passed away because of cancer. So cancer became my enemy since I was little because it took away three of my loved ones. I met Dr. Champeil in Organic Chemistry I. Some of my friends had already begun researching with professors and I asked Dr. Champeil if she wanted to be my mentor for research. It turned out that she was working with an anti-cancerous drug called mitomycin C which triggered my interest immediately. This project allowed me to learn about lots of techniques and knowledge which could not be taught in a regular science class. This research project also allows me to understand how unpredictable and complex chemistry is. The PRISM program allowed me to attend an ACS conference in California last year and it was a very valuable experience. After graduation, I would like to go to graduate school to receive further education in molecular biology.

### Synthesis of the Alpha MC Adduct (Dr. Champeil)

This research project protocol is based on the previous project's procedure of coupling the amino-mitosene to the oligonucleoside (guanosine). This research project consists of the coupling of the amino mitosene to the guanosine oligonucleotide. The deprotection at the O6 position by acetylation and de-salt by lyophilizing the samples was not as successful as expected. The samples were analyzed by HPLC then put through Sephadex for purification and identification of products with a fraction collector and an UV detector. The samples then would be lyophilized and sent for Mass Spect for further analysis.

### Effects of Antioxidants on the Cytotoxicity of Dithiocarbamates (Dr. Cheng)

Parkinson's disease is a neurological disease that results in the degeneration or death of dopamine cells. This will affect our movement muscle and our balance. It is believed that pesticides in our agricultural industry can implicate neurodegenerative disease such as Parkinson's disease. The aim of our experiment is to test the cytotoxicity of different dithiocarbamate compounds such as Maneb, Mancoeb, Ziram and Zineb on PC12 cells using MTT Assay. We also want to elucidate if there is a synergic effect on the cytotoxicity when these dithiocarbamate compounds are combined with MPP+. We've chosen these compounds because they are common pesticides used in many agricultural industries. In conclusion, we found out that MPP+ does have a synergic with some of the dithiocarbamate compounds.



**YING LIN**

I'm studying to become a forensic toxicologist at John Jay. I first became interested in forensics during my senior year in high school, when I took an elective class in which it gave me a brief introduction – and it was a class that changed my life. That was when I decided to join John Jay to pursue a career in forensic science. During my senior year at John Jay, I got the opportunity to work on a research project with Dr. Shu-Yuan Cheng. I worked on different dithiocarbamates compounds to see if they have a synergistic effect on MPP+ cytotoxicity which leads to the Parkinson's disease.



## LIDISSY LIRIANO

I've always had an utter respect for science. I loved the fact that I was able to understand things by breaking it down to what was taught in class. This was what drove me to enter the medical science program in high school and to continue studying in the science field in John Jay. I became interested in Forensic Science during my sophomore year of high school. I was very happy to know that John Jay offered this program at an affordable cost, increasing my enthusiasm to pursue this field. I love to learn something new every day and be able to apply and connect with that information in my daily life. My goal is to continue my education in this field after graduating from John Jay.

### Isolating DNA from Bone Samples for Forensic Analysis (Dr. Li)

Bone tissue is often used for recovering DNA samples for the purpose of human identification. However, the initial cleaning and sampling of the bone specimen is a labor-intensive and time-consuming step, which must be completed prior to isolating DNA. To address this issue, an enzymatic approach using trypsin is used; producing a proteolytic reaction by breaking down the protein collagen. The use of the trypsin procedure reduces the amount of labor required by physical method, thus reducing possibility of cross contamination and safety concerns due to the exposing bone powder of the sanding method.

PRISM students often have the opportunity to speak about their research in depth at events, such as the annual CSTEP conference. For many students, the experience of discussing their work in this environment provides invaluable training for communicating science, attending scientific conferences and interviewing for graduate programs. It also lets them gain feedback from peers and faculty.



Irving Campoverde speaking with Alicia Williams



**MELINDA AMY LIU**

I am currently a senior at John Jay College of Criminal Justice where I am enrolled in the Criminalistics track in the Forensic Science program. I am an intern at the NYPD Forensic Investigations Laboratory where I have the privilege of shadowing analysts in various criminalistic disciplines. I would like to begin my career as a criminalist at the NYPD or LAPD crime laboratories. I am also looking forward in furthering my education in the near future by attending graduate school at California State University of Los Angeles at the Hertzberg-Davis Forensic Science Center.

### **Mechanisms of DNA Binding to Tricyclic Antidepressants (Dr. Korobkova)**

Studies indicate that tricyclic antidepressants interfere with the integrity of DNA ultimately resulting in DNA fragmentation. The mechanisms of DNA binding to tricyclic antidepressants are studied utilizing fluorescence spectroscopy to monitor the behavior and interaction of dyes. These dyes are DNA specific probes which form fluorescent complexes by attaching to the minor or major grooves of double stranded DNA. Displacement of the fluorescent dye with antidepressant is observed by fluorescence signal quenching where data obtained for the dyes will be compared to one another to gain on the binding specificities of the antidepressants and binding modes of DNA.

### **Synthesis of the Alpha MC Adduct (Dr. Champeil)**

Our goal was to synthesize the amino mitosene derivatives and to synthesize the alpha (1a) MC adduct. There are trans alpha ( $\alpha$ ) and cis beta ( $\beta$ ) stereoisomers of the MC adduct. We set up the reaction for the coupling of the alpha ( $\alpha$ ) amino mitosene with the fluorinosine derivative of the following oligonucleotide (5'- TTAC (2- FTMSE- dI) TATCT - 3'). We employed various analytical methods to analyze the products.



**ELAAN LUKASIEWICZ**

My curiosity for the sciences started at age 7 when my grandmother bought me a toy microscope. The microscope came with blank slides which I used to examine blood and carpet fibers. Without even knowing it I was examining trace evidence and I enjoyed it. As I continue my education at John Jay my knowledge and love for the sciences grow. For the past two years I have been doing cancer research with Dr. Champeil. I am also a laboratory technician for Instrumental Analysis and Quantitative Analysis. I recently started another research project with Dr. Kocak which is more geared towards forensic science. I am looking forward to graduating John Jay College May 2011. After graduation I plan on working as an Adjunct for Quantitative Analysis this summer and attending John Jay College for graduate school Spring 2012.



### AMORA MAYO-PEREZ

I am a senior in the Forensic Science program hoping to attend a PhD program in Biomedical Sciences this upcoming Fall. I am a double major in Molecular Biology and Toxicology. The next phase of my life involves incorporating my love of teaching with skills I learned through my research at John Jay and hopefully during my upcoming summer research experience. Although, I have learned many laboratory techniques through my projects, I have also realized that not only does research require independent work and creative thinking, it reinforces the multi-disciplinary aspect of forensic science by fusing of disciplines. For me that is what makes forensic research so dynamic. I want to use my research interest not only to answer questions in drug effects on the human body but also as a tool to not only mentor undergraduates and graduate students but to teach them techniques to develop their own passions.

#### **The Potential Role of Silicon Dioxide as an Oxidizing Surface in Strong Sunlight: Studies on Mercury Behavior (Dr. Carpi)**

As part of an ongoing multi-year study at the Blackrock Research Forest in Cornwall, NY we have identified an atypical response of mercury deposited to pure silicon dioxide sand surfaces in strong sunlight. Pure laboratory sand was pre-cleaned by baking the surface to 300°C and then placed outdoors under a transparent Teflon roof to study the dry deposition of mercury to this surface. Typically, mercury from natural surfaces demonstrates increased emission to the atmosphere in strong sunlight, with the response trending toward deposition after sunset (Carpi & Lindberg, 1998). Over a thirty-day period during March and April 2007, our sand surface displayed ten days of irregular flux patterns. These irregular patterns are not repeated during sub-

sequent years. The study shows consistent negative fluxes until mid afternoon and positive fluxes from approximately sundown until midnight. The process is not fully understood. Negative fluxes are attributed to greater mercury concentrations in the environment compared to the surface of the sand. Positive fluxes are representative of mercury emissions from the surface of the sand compared to the surrounding mercury concentrations. The irregular flux patterns occur on ten separate days with corresponding trends at the same times-of-day. This study aims to determine the association between ozone, strong sunlight and uncharacteristic mercury fluxes.



## DOMINIKA MUCHA

I am a Forensic Science Toxicology/Molecular Biology student at John Jay College. After obtaining my Forensic Science degree, I intend to pursue a PhD in pharmacology. I inherited my fascination with science from my mom, an inorganic chemist, when I was only 5 years old and living in Poland. Throughout my undergraduate career, I have worked towards nourishing my understanding of science as demonstrated by my academic accomplishments. In order to advance my studies, under Dr. He's supervision, I began a research project of my own. I am currently conducting research on the determination of trace level residues in natural water samples. My academic and research experiences have allowed me to pursue numerous educational pathways on my road to personal fulfillment.

### Determination of Trace Level Residue in Natural Water Samples (Dr. He)

Pharmaceuticals are designed to minimize harmful effects on humans once consumed; however, when released into the ecosystem, these pharmaceuticals have an increasing affect on the metabolism of non-target organisms. Acidic drugs are a major category of drug residues found in sewage treatment plants (STP). A procedure based on microextraction was proposed to analyze trace level acidic over-the-counter drugs found in natural water samples. The six pharmaceuticals were: ibuprofen, naproxen, salicylic acid, omeprazole, clotrimazole, and lorata-

dine. Their UV absorption characteristics were investigated by a UV-VIS spectrophotometer. A method based on hollow fiber, supported by three phase liquid-liquid-liquid microextraction, is proposed for HPLC separation and UV detection. Factors that affect extraction efficiency such as the pH of a sample solution, type of extraction solvent, aqueous acceptor phase, and extraction time will be investigated and optimized. This method will be evaluated by analyzing aqueous environmental water samples.

## WILLIAM NG

I am an undergraduate upper senior pursuing my Forensic Science degree in Criminalistics. My collegiate career has been an interesting and long journey. After attending Clarkson University and Kingsborough Community College, I took a break from school to figure out what I really want to do with my life, professionally. However, the short break became a five year hiatus from school. With the decision that the field of forensic science is the right path for me, John Jay became my third college. After graduation, I hope to obtain a position in the crime lab of the NYPD or FBI and eventually earn my Master's degree in Criminalistics.

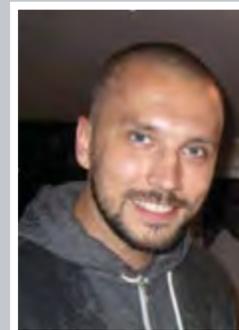


### Development of a Fingerprint Scanner Device for the Detection of Metabolites from Unlawful Substances (Dr. Roberts)

The struggle for homeland security to stop the influx of illegal drugs and to counteract the war on terrorism has resulted in the application of various analytical chemical techniques. However, some of the methods lack the convenience and practicality to be used as tools for border patrol and airport screenings either due to cost effectiveness, time consumption and intrusiveness. The development of a fingerprint scanner able to detect metabolites in a person's body via sweat from specific prohibited materials is an innovative concept which incorporates spectroscopic, electrochemical and immunological concepts. The device is made feasible for its affordability, portability and rapid presumptive analysis for field usage.

## KONRAD ORNATOWSKI

In 2006, after my commitment to the United States Marine Corps was completed, getting a college education became a priority. I enrolled into the Forensic Science program at John Jay College with the hope of further developing my love and curiosity for the sciences. The program itself has exceeded my expectations and my time spent at the college has been very positive. In the spring of 2011, I will be graduating with a degree in Forensic Science with an emphasis on Molecular Biology. I am proud to say that this program has unquestionably prepared me for the employment aspirations that I have within the federal government. It has provided me with the skills and knowledge necessary to supplement my military experience in becoming an effective investigator.



### Binding and Depurination Studies of PAP on Ribosomes Isolated from Yeast (*Saccharomyces cerevisiae*) Cells (Dr. Cheng)

Pokeweed Antiviral Protein (PAP) is a Ribosome Inactivating Protein (RIP). RIPs are able to inhibit protein synthesis by depurinating the conserved sarcin/ricin loop of the large subunit of ribosomal RNA (rRNA), thereby rendering the ribosome inactive. It is hypothesized that when a cell is infected by a virus, the integrity of the cell membrane is compromised, allowing for PAP to permeate from the cell wall matrix into the cell and block pro-

tein synthesis at the translocation step. In this study, ribosomes will be isolated from yeast (*Saccharomyces cerevisiae*) cells utilizing various extraction buffers and an ultracentrifuge. The pure and active ribosomal subunits will then be exposed to PAP in an established depurination assay to determine the effects of PAP on the eukaryotic ribosomes' ability for protein synthesis.

## LATOYIA PATRICK-SAUNDERS

I was always interested in science and law enforcement as a child because I always found science to be fascinating. I love the combination of science and criminal justice because I can utilize my scientific knowledge to uphold the law and protect people in my community in various ways. There are so many different fields within science that I can participate in while holding a science degree; however, biology is specifically my passion. Combining biology with law, as is done with my degree at John Jay, is exactly what I want to do. Particularly, I absolutely love being able to help individuals using DNA amplification methods to help identify a criminal suspect as well as exonerate the innocent. In addition, toxicology in conjunction with biology allows me to help individuals even more because I can specifically pin-point how toxins, substances, stimulants, narcotics and poisons absorb and travel through the blood stream and/or bind to receptors, and in turn, predict and test the affect of these items on organs, organ malfunction and death to the individual. Motivation is an essential requirement to be successful in this competitive major, and in my opinion, the drive to learn about science and the law from my early childhood has only been further satisfied by both tracks. In the future, I wish to continue my education in by earning a Doctorate degree in Biology.



### Microwave Assisted Reactions of Deoxyguanosine at Position C-6 and C-2 (Dr. Champeil)

This project intends to investigate microwave assisted methods for the introduction of various substituents at the C-6 and C-2 positions of 2'-deoxyguanosine. The following substitution reactions are being investigated: (1) substitution at the 6 position of the O6-(benzyl-triazol-1-yl) guanosine derivative by a range of nucleophiles; and (2) substitution at the C2 position of the fluorinosine (X) by a range of hindered amines. Our goal is to compare the reaction times and yields of various substitution reactions with and without microwave assistance. The development of new methods for substitutions at position 2 will be applied to the reaction of fluorinosine with hindered amines mitosenes.



## RICHARD PISZCZATOWSKI

I began my undergraduate studies at John Jay College in 2007, pursuing a degree in Forensic Science with a focus on Molecular Biology and a minor in Anthropology. Towards the end of my first year, it became evident to me that my place in life was as a physician, helping those in need. Participating in numerous extra-curricular activities throughout my undergraduate career has exposed me to many people, places and points of view. Volunteering at my local hospital, serving on the John Jay Pre-Medical society, and shadowing physicians has given me a first hand experience and newfound respect for the medical field. Partaking in undergraduate research through PRISM, mentored by Dr. Nathan Lents, has taken my passion for the sciences to a new level. Undergraduate research, with the supervision of my mentor and the funding through PRISM, has helped sharpen my scientific mind as well as shape me into a well rounded individual, interested in applying science to help others. All of these activities along with my studies have helped me develop into a dedicated student with an aspiration to pursue a degree in medicine.

### Characterizing the Role of Myeloid Zinc Finger-1 (MZF-1) as a Transcription Factor in the Regulation of Connective Tissue Growth Factor (CTGF) (Dr. Lents)

Connective Tissue Growth Factor (CTGF) is a protein encoded by the CTGF gene. CTGF plays a critical role in cell adhesion and proliferation, which explains its abundance in thrombocytes, also known as blood platelets. Blood platelets are created by megakaryocytes located in the bone marrow, and have been found to contain abundant amounts of CTGF while in the blood. However, current research shows that when blood platelets are created by megakaryocytes, they do not initially contain CTGF, nor do the megakaryocytic cells produce CTGF. Thus, blood platelets must acquire CTGF from an external source via endocytosis, and the megakaryocytes must provide some sort of signaling mechanism to initiate the production and excretion of CTGF by nearby cells.

This research project will attempt to show that MZF-1 (myeloid zinc finger-1), a protein made abundantly in the bone marrow, acts as a transcription factor to affect the fabrication of CTGF of cells in the vicinity of megakaryocytes. MZF-1 may be a possible contributor to the communication between megakaryocytes and other bone marrow cells to produce and provide the CTGF protein to thrombocytes. Identification and confirmation of MZF-1 as a transcription factor of the CTGF gene may open the door to a new look at the development of blood platelets, as well as entire blood clotting cascade. Results from this research project may have clinical implications as well, as MZF-1 may provide a new outlook on how to approach poorly acting blood platelets as well as a possible factor in the maintenance of proper hemostasis.



## ELLIOT QUINTEROS

One of my favorite questions to ask people is: "Why?" I have always been very curious about many aspects of life. To me, the only way to figure out the answers was to look for them myself. Of course the only way to go about finding answers was to use science. As I learned about the different areas of science I was always drawn to the area of forensics. In the Forensic Science program, I was and still am being given the tools and knowledge to answer my own questions. As I progress towards my Bachelor's degree, I find that my interests are in biology and toxicology. I see myself expanding my knowledge of both subjects, and pursuing graduate school for one of the two. My ultimate goal is to earn a PhD and be able to pursue my passion in science.



### Surface Modification for the Development of a Novel Drug Detection and Fingerprint Scanner (Dr. Roberts)

Advances in the detection of illicit drugs now potentially allow for the use of an individual's sweat to determine if that person has had any contact with drugs. The way this is determined is through the use of metabolites produced in the liver, such as the metabolite benzoylecgonine, an indicator for the presence and use of cocaine. We propose to use immunogenic binding to determine the presence of the biomarker. Initially the principle for the modification of the surface and the detection of benzoylecgonine will be proven. This will be executed using spectroscopic methods such as ultraviolet light and surface plasmon resonance, as well as electrochemical methods. The overall goal will be to create a fingerprint scanner which will be able to use the same principles.

## ANDREA SEANZ

I entered John Jay College in 2007, enrolled in the Criminology major. I have always been interested in why crime occurs and I thought following a career that specializes in the study of crime would be just what I was aiming for. After my first year I realized that I was not being challenged enough and sought a new path. I decided to change my major to Forensic Science–Toxicology track. In all my science courses I found myself at the edge of my seat amazed at what I have not known and excited to learn and expand my knowledge in these different areas. I am currently doing research with Dr. Proni and work as a math and science tutor at John Jay. After graduation I plan on continuing my education in graduate school in order to specialize in pharmaceutical chemistry.



### Supramolecular Properties of Porphyrin-Guanosine Conjugates (Dr. Proni)

Suitable arrangement of multiple chromophores is one of the most important issues in material sciences, since the self-assembled multi-chromophoric system may show completely different physical, photochemical and electrochemical properties compared to the forming unit. Porphyrins have been widely investigated because of their H- and J-aggregates formation under specific conditions (Endo 2008) while guanine-rich oligomers have shown the possibility of forming G-quartets and, if further self-assembled, liquid crystal phases of different nature

(Lena 2008). We plan to synthesize deoxyguanosine-porphyrin conjugates soluble both in organic and aqueous environments and explore their aggregation processes. The hope is to be able to modulate the aggregation of the two different parts of the molecules: it would be of great interest and highly innovative to have the porphyrin side of the conjugate aggregating at conditions that are different from the ones used to self-assemble the guanosine side.



James Field



### EV A MARIA SANTOS TEJADA

Ever since I was a little girl, I have felt drawn to science. My favorite program was “Unsolved Forensic Cases by the FBI”. However, the thought of studying forensic science was only a dream! After having been awarded with a government funded scholarship by the Dominican Republic in 2006, the journey started at Queensborough Community College (QCC). The original goal was to pursue a degree in Chemical Engineering, which was the major in which I was already enrolled in the Dominican Republic at the Atunoma University of Santo Domingo (UASD). However, a deep passion for forensics grew after listening to Dr. Carpi speak about the forensics program at John Jay College at one of the ACS regional meetings. After graduating from QCC with an Associate’s degree in Science, the dream of becoming a scientist began at John Jay. The first two semesters were very challenging because of the class load and difficulty of each one. As an international student, I had to maintain a minimum of 12 credits (four science classes!). I thank God for Professor Carpi, who kindly and unconditionally dedicated his time helping me to get back on track. His encouraging words and patience helped me not to give up. My passion for forensics was further stimulated after a summer internship at the national forensic lab in the Dominican Republic, the Instituto Nacional de Ciencias Forences (INACIF). Thanks to Dr. Kobilinsky and the D.R. government, my confidence and passion for the field has come back. My research experience, as well as the internship, provided me the confidence and discipline to work in a professional lab. The support and encouragement from my mentors and research partners have eased and enhanced this wonderful experience in this demanding field.

### Effects of Flushing Flow Rate in Mercury Flux (Dr. Carpi)

Mercury has a complex biogeochemistry in which different species of the metal participate in different transport processes depending on the chemical properties of the constituent in question. Several environmental reactions influence this process by driving the reduction or oxidation of mercury, and inter-conversion between mercury complexes. While the reduction of  $\text{HgCl}_2$ ,  $\text{HgO}$  and  $\text{HgS}$  play important roles on land surfaces,  $\text{Hg}^{+2}$  salts hydrolyze in water to form  $\text{HgClOH}$  (in the case of mercuric chloride),  $\text{Hg(OH)}_2$ ,  $\text{Hg(OH)}_3^-$ , or even  $\text{Hg(OH)}_4^{2-}$ . Mercury hydroxide compounds exhibit different reduction/oxidation potentials than other salts. The goal of this work is to examine the pathways and kinetics of the formation of mercury hydroxide complexes in water, and the subsequent reduction/oxidation chemistry of these constituents.

## CHRISTOPHER SHAW

Before John Jay College, I worked in the music and finance fields. About four years ago as the stock trading desk I worked for was about to be closed down, I read an article in a prestigious journal (*The New York Post*) that mentioned forensic science as a promising job path. This caught my imagination and I enrolled in the Forensic Science program at John Jay. My other alternative was business graduate school but the world of “CSI” and hard-core math and science was where my heart pointed. I am happy with my choice. Despite my long break from school and homework, I was still able to survive. I was very thrilled to encounter such inspiring teachers as Professors Lents, Proni, Petraco, and Rauceo, among others. I eventually started with PRISM and research with Dr. Friedland. It was a bit of a slow process for me as I was someone who to be honest always excelled more in the classroom than the lab. But after some invaluable lab experience with Dr. Friedland and Kana Noro, my lab “chops” markedly improved. I have recently finished a series of crossover experiments pitting the Friedland lab’s Pokeweed Antiviral Protein versus Dr. Rauceo’s fungus of choice, *C. albicans*. I am currently a full-time member of the Rauceo lab team.



### Synthesis of *Candida albicans* ALS1 Mutant Vectors (Dr. Rauceo)

Adhesion to biological surfaces and subsequent yeast cellular aggregation are the initial critical steps in *Candida albicans* pathogenicity, the major human fungal pathogen. The *Candida albicans* ALS gene family mediates adhesion and aggregation to biological surfaces through formation of amyloid domains. Here, I propose to study one member of this gene family, ALS1, and its proposed genetic sequence responsible for amyloid formation. I will utilize a site-directed mutagenesis strategy to switch a critical amino acid in the amyloid-forming region of the ALS1 protein from the wild-type hydrophobic valine to the hydrophilic asparagine. This change will be effected by site-directed mutagenesis of a recombinant plasmid containing the ALS1 gene fragment. The mutant plasmids will then be transformed into bacteria in order to be amplified. This resulting DNA will be sequenced to verify that the first stage of this experiment has succeeded in the creation of mutant ALS1-fragment vectors. In following experiments, the plasmid vectors will then be transformed into yeast cells to produce the mutant glycoprotein. It is hypothesized that the mutant gene fragments of ALS1 will code for protein that suffers from loss of aggregation function and amyloid formation.





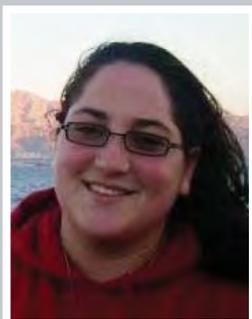
### LAURA SINGH

Thinking back, I remember that it was the museum that piqued my interest in science. I was always interested in how modern day methods could help uncover the mysteries of the past. Using bones to identify evolutionary changes as well as using DNA to trace disease and ancestry seemed very interesting to me. I readily began to work with Dr. Corthals after hearing of her international experience and involvement in forensic and biological anthropology. I joined PRISM shortly after and have begun work on the genetic and environmental causes of the onset of Multiple Sclerosis (MS). Working with Dr. Corthals on the various causes of MS has opened my eyes to the complexities of this evolutionary disease and has furthered my interest in the field of population genetics in anthropology. Because of the opportunities provided to me by both Dr. Corthals and PRISM, I am ready to apply my knowledge in the field of biological anthropology at graduate school.

### Tracing the Epidemiology of Multiple Sclerosis Based on Genes and the Environment (Dr. Corthals)

Multiple Sclerosis (MS) is an autoimmune disease that affects many people, particularly Northern Europeans, and causes the function of their motile faculties to deteriorate. MS is the self degradation of the myelin sheath on the neuron, which causes the synapses necessary for senses and movement in the body to fail. Dr. Angelique Corthals and I are working to understand the epigenesis of this disease by studying the pathways in the body that relate to its environmental and genetic causes. Based on our research, we are pursuing this problem based on genes that influence autoimmune responses, their passing on to offspring via mitochondrial DNA and its effect on populations, antigen presentation to the self by Major Histocompatibility Complexes, and the evolution of diet that has effected change in the pathways related to the onset of MS. Laboratory methods employed for research are DNA electrophoresis, GC/MS analysis of proteins, data mining, GenBank, and proteomic databases to determine the genes involved in the development of MS. We have found that the exposure to sunlight affects conversion of cholesterol to vitamin D and triggers the onset of MS when paired with a genetic susceptibility. Our future work will be based on locating the "Viking gene," or genes passed on from the Scandinavians which are believed to be the genetic source of MS susceptibility.





### ANNA STOLL

Edwin Hubble said, “Equipped with his five senses, man explores the universe around him and calls the adventure Science.” Every part of science has its mysteries and I desired to be a part of it all. I began my studies at John Jay in 2008 as a Forensic Science major. After many courses I became more interested in applying what I was learning to real life. Research with Dr. Cheng has allowed me to apply my classroom knowledge to real life as well as concentrate my interest on how the human body works. My research, which hopes to contribute to what is known about Parkinson’s disease, has introduced me to human biology and toxicology and has inspired me to pursue the Molecular Biology and Toxicology tracks of the Forensic Science major. I hope to use my experiences at John Jay to contribute to the further understanding of human biology.

### **Role of Alpha-Synuclein in the Potentiated Effects of Dithiocarbamates on MPP+ Cytotoxicity (Dr. Cheng)**

Maneb (MB) and Mancozeb (MZ), and Diethyldithiocarbamate (DDC), usually used as fungicides in the agricultural industry, are Mn containing ethylene-bis-dithiocarbamates and have been known to increase the effect that the neurotoxin MPTP has on dopaminergic neurons which can lead to cell death and Parkinson-like symptoms. (Bachurin et al., 1996; McGrew et al., 2000; Domico et al., 2006). The Dopamine Transporter (DAT) is a protein which is known to play a role in MPTP’s toxicity by transporting MPP+ into dopaminergic neurons. Alpha-synuclein, a protein that interacts with the Dopamine Transports, can regulate the cell surface expression of DAT. Increasing the concentration of DAT on the cell membrane leads to higher uptake of MPTP (Lee et al., (2001). Previous research in the Lab (by Carlos Cuellar) concluded that DDC, MB, and MZ treatment increased alpha-synuclein and DAT interaction.

This research will look at the role of the alpha-synuclein in potentiated effects of mancozeb, maneb, and DDC on MPP+-triggered cytotoxicity. By mutating the alpha-synuclein the interaction between the DAT and the alpha-synuclein will be able to be observed when treated with the fungicides. HEK 293 cells (Human Embryonic Kidney cells), stably expressed human Dopamine Transporter (HEK-DAT), were used. After treating the HEK-DAT cells with the mutated DNA and fungicides the cells underwent co-immunoprecipitation using an anti-DAT antibody. The proteins were then separated using a SDS-PAGE then transferred to a nitrocellulose membrane for Western Blot analysis. The images that will then be taken of the protein bands on the membrane will allow for the amount of each protein in the different conditions to be known.



## LEONID SUKALA

I'm a junior at John Jay College of Criminal Justice following the Molecular Biology track for the forensic science major. I've been involved with the PRISM program for over a year. The constant challenge and excitement of working in a microbiology laboratory with my mentor has been rewarding in so many different ways. Academically, the theories and concepts I learn in class are brought to life during my experiments. This helps me develop a working knowledge of science that interweaves many different aspects of what I learn in school (and helps me remember stuff). Professionally, I feel more and more comfortable working in a laboratory setting. I'm learning and practicing techniques that improve my organization, my familiarity with various instruments, trouble-shooting and developing experimental outlines. As a result, my interests are more focused which will help me greatly in graduate school. And personally, I'm gaining confidence in my pursuit for a career in science. This, along with the refinement of my interests has given me a stimulating, positive outlook towards my future. Overall, the PRISM experience has been like a powerful multi-vitamin for my goals in science. I feel so grateful and lucky to have this opportunity, and I implore students to take advantage and become active in this amazing program.

### Development of Mutant Strains Expressing Different Domains of the *C. Albicans* ALS1p Adhesin (Dr. Rauceo)

Many immuno-compromised patients are susceptible to life-threatening systemic infections by the pathogen *Candida albicans*, a normally commensal yeast organism that resides in healthy people. Environmental cues within the patient trigger a morphogenic shift in *C. albicans*, increasing its virulence by initiating hyphae filamentation, biofilm formation and amyloid structural motifs. A critical component that mediates these and other important functions is the cell wall. The cell wall is responsible for the cell's interactions with its environment and protects *C. albicans* from environmental stresses like antifungal drugs, osmotic pressure, changes in pH and host immune defenses. Such behavior is in part mediated by cell-wall bound adhesion proteins that selectively interact with a host of mammalian substrates, such as those found in human gastro-intestinal tracks or urogenital systems. These crucial proteins are themselves composed of various domains, each of which contributes a specific function that, when taken together, confer the effective binding profiles that enable the yeast to be a successful pathogen. One of our research aims is to develop various mutant strains that express different domains of the *C. albicans* ALS1p adhesin. These truncated proteins will be functionally compared and be used to elucidate particular domain contributions to the overall adhesion process. Because these adhesins are unique to the yeast, such mechanistic information could be used to generate safe and effective therapeutics.



### JENNIFER TEUBL

I am enrolled in John Jay's Forensic Science major with a concentration in molecular biology. I'm interested in cellular biology and genetics, specifically as they apply to human disease, and am currently studying under the tutelage of Dr. Rauceo researching novel cellular pathways in the pathogenic yeast *Candida albicans*. I am immensely enjoying the intellectually stimulating environment which both the lab and the classroom provide, and hope to continue to pursue my academic endeavors in graduate school.

#### ***Candida albicans* sko1 $\Delta$ / $\Delta$ and hog1 $\Delta$ / $\Delta$ mutant phenotype under osmotic stress and functional conservation of *Candida albicans* SKO1p in *Saccharomyces cerevisiae* (Dr. Rauceo)**

The ability of an organism to respond to stress in its environment is critical to its survival. The focus of the following months will be to confirm the importance of stress signaling pathways in the pathogenic yeast, *Candida albicans*. The HOG1- SKO1 pathway has been shown in previous studies to respond to osmotic shock in the bakers yeast *Saccharomyces cerevisiae* and recently in *C. albicans*. Here, we will determine the cellular phenotype for sko1 $\Delta$ /  $\Delta$  and hog1  $\Delta$ /  $\Delta$  mutant strains following osmotic stress. Growth rate kinetics will be determined in the presence or absence of Sodium Chloride ( NaCl) for sko1 $\Delta$ /  $\Delta$  and hog1  $\Delta$ /  $\Delta$  mutant strains and will be compared to a wild type strain. We will determine whether salt treatment causes aberrant cell morphology by observing the mutant strains under light microscopy. By using these mutant strains, we hope to illustrate the importance of the HOG1-SKO1 pathway under osmotic stress in *C. albicans*. In addition, we will introduce the Ca SKO1 into a *S. cerevisiae* sko1 $\Delta$  mutant and test for functional conservation.

### MICHAEL TSAMIS

I am an undergraduate student at CUNY John Jay College of Criminal Justice where I am concluding my senior year, earning a Bachelor of Science in Computer Information Systems with an applied specialization in Criminal Justice and minor in English. Based on my academic performance, I was accepted into my college's Department of Homeland Security Undergraduate Career Development Program which provided me with opportunities to do research and work in fields related to homeland security. Upon graduation in June 2011, I hope to have a career related to cyber security or computer forensics. In my free time, I enjoy reading classical literature, playing guitar and swimming.

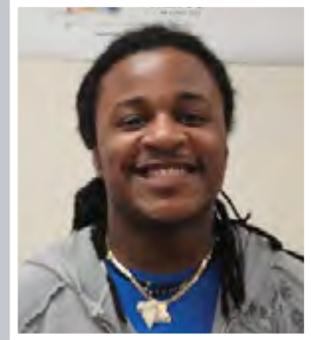


#### **Sonification of Network Traffic (Dr. Khan)**

The ability to monitor normal and abnormal network traffic in real time is vital, since a network attack can occur and be completed in seconds. One novel way to render network traffic is through its acoustic representation. The Centaur project (Centralized Auralization) explores dynamic sonic interpretation of live TCP/IP network packets as musical notes of varying pitch, volume, duration and instrumentation. Centaur renders a stream of TCP packets in a manner that reflects the system's continuously updated beliefs concerning the network state, e.g. whether a "port scan" or "distributed denial of service attack" (DDoS) is taking place. Additionally, the system is capable of mapping normal web traffic contents into musical notes. Multiple Centaur sensors can be deployed to monitor machines across the wide area Internet; a central Centaur server receives musical note commands over the network from deployed sensors. The advantage of this architecture is that the guarded machines need not cohabit the same local area network (LAN). Future work will evaluate the extent to which such acoustic renderings enable administrators to more effectively (and viscerally) sense shifts in patterns of network utilization.

## JUSTIN WALTERS

I was influenced in science early on by learning about Ancient Egypt in elementary school. During my years at Martin Van Buren High School, I began volunteering at Bellevue Hospital, working with patients with TB. The reason I began to volunteer is because I had a lot of free time after classes. This volunteering experience drove me to want to go to medical school, but I didn't have an idea of what kind of doctor I wanted to be. At the time I loved the show *Forensic Files* so I took up a major in Forensic Science at John Jay College of Criminal Justice. Along the way I realized I didn't like Forensics but I liked the science, so I concentrated in Molecular Biology. Beginning my research with Dr. Diana Friedland, I was sent out to Colorado to gather information which till this day drives me to want to learn more.



## The Toxic Mechanism of Manganese Nanoparticles in PC-12 Cells (Dr. Cheng)

Nanotechnology has been used to create many new materials with a broad range of applications, in medicine, electronics, biomaterials and energy production. However, nanotechnology also raises concerns about the toxicity and environmental impact of nanomaterials. *In vitro* study showed (Hussain et al., 2006) manganese (Mn) nanoparticles induce dopamine depletion and increase reactive oxygen species (ROS) which will trigger apoptosis. Mn is an essential element necessary for brain development, formation of bone and connective tissue, lipid metabolism and reproductive function. However, at high concentrations or after prolonged exposures of Mn, this element can accumulate in the brain and induce tremors, rigidity and psychosis. This condition, known as Manganism, is a progressive disorder similar to Parkinson's disease (Cai et al., 2007). The preliminary data from Dr. Cheng's lab show manganese-containing pesticides enhance MPP+, the active metabolite of parkinsonian toxin MPTP (1-methyl-1,2,3,6-tetrahydropyridine), cytotoxicity in PC12 cells. The potential toxic mechanism of these manganese-containing pesticides could be due to increase the cell surface expression of dopamine transporter (DAT) which is required for MPP+ toxicity. The aims of this study are (1) to evaluate the effect of Mn nanoparticles on MPP+ induced cytotoxicity and (2) to elucidate the role of DAT in the toxic mechanism of Mn nanoparticle.

Dopamine crystals viewed with polarized light





### STEPHANIE WATSON

As my undergraduate academic career winds down, I find myself reflecting on the past year and some of the lessons learned. One of which is that all the setbacks in my life have been blessings in disguise. When I wasn't able to graduate in 2010 with my friends I was extremely devastated. Though I was ecstatic for their achievements, I felt defeated within myself and doubted my own abilities. At that time I wasn't able to truly appreciate it when my Aunt said "the race is not for the swift, but those who can endure." Looking back now it's clear how that instance enabled me to enhance academic career further. Since then I've been fortunate enough to participate in two research projects, one within the field of Microbiology at Brooklyn College and the second in Organic Chemistry at John Jay. In addition I was able to complete the Molecular Biology and Toxicology tracks, an elective Human Physiology class and a Toxicology internship. All of those instances in combination have enhanced my desire to become a physician scientist who studies chronic diseases, their treatment methods and the enhancement of the patient care experience.

#### Investigating the Reactivity of Aziridinomitosenes Towards Various Nucleophiles (Dr. Champeil)

This project is part of an ongoing investigation of the local structures of DNA adducts of decarbamoyl mitomycin C (DMC) and mitomycin C (MC) believed to be responsible for the different biochemical responses produced by the two compounds. The overall focus is on assessing the reactivity of the leucoaziridinomitosene toward various nucleophiles. If the leucoaziridinomitosene is reactive toward azide anions for instance, this will provide a quick way to amino mitosenes, which are key intermediates in the synthesis of DMC and MC-DNA adducts. The research plan is to reductively activate MC with various thiols and characterize all adducts formed in the presence of sodium azide ( $\text{NaN}_3$ ). Thus far the hydrolysis of Mitomycin C was achieved. The hydrolysis product was protected at the 2 position with the teoc group. At that stage, both the cis- and trans- hydroxy mitosenes were isolated through column chromatography ( $\text{SiO}_2$ , 3% MeOH in  $\text{CH}_2\text{Cl}_2$ ). The cis- and trans- compounds obtained weighed about 73 and 20 mg and had yields of 36% and 10% respectively. The products were then mesylated at the 1 position and azide displacement using  $\text{NaN}_3$  followed. Future steps for this project include the isolation and analysis of the product(s) formed during the latter reactions, deprotection of the teoc group, further investigation of the leucoaziridinomitosene reactivity towards the azide ion used and if successful, the characterization of all adducts formed in the presence of sodium azide.



### **ALICIA WILLIAMS**

My name is Alicia Kwang Williams. I was born in South America, Suriname. I am currently a senior at John Jay College of Criminal Justice studying Forensics Science with a concentration in Criminalistics. The reason I chose to study Forensic Science was because of my interest in chemistry, and since the Forensic Science program builds a solid foundation in the sciences especially chemistry the program was ideal for me. In Fall 2009 I began doing a research project with Professor Korobkova at John Jay College. I currently am continuing my research and plan to do so until I graduate. The research topic that I am working on is based on studies of antidepressant and antitumor drugs that cause DNA damage and other side effects. My plans after I graduate is to attend graduate school and obtain my Masters in Forensic Science, and in the future obtain my PhD.

### **Interactions of Tricyclic Antidepressants with DNA: A Role of Peroxidase Catalysis and Intercalation (Dr. Korobkova)**

Tricyclic antidepressants were discovered in the 1950s and were used for many years in the treatment of mood disorders. The antidepressants and their metabolites can be very genotoxic in living cells. The planar structures of the drugs can insert between DNA bases forming stacking complexes. The metabolism of antidepressants may lead to the DNA bases modifications or DNA strand breaks. We studied the effect on DNA of three tricyclic antidepressants, imipramine, amitriptyline, and opipramol. We focused on the drug-DNA binding and DNA damage aided by peroxidase catalysis. As a model of peroxidase we used HRP (Horseradish peroxidase). We performed ethidium bromide fluorescence quenching experiments and determined drug concentrations at 50% fluorescence quenching, C<sub>50</sub>. The value of C<sub>50</sub> ranged from 1 mM for opipramol to 5 mM for imipramine and amitriptyline. Agarose gel electrophoresis studies showed that DNA disappears in the reaction mixtures containing imipramine and HRP/H<sub>2</sub>O<sub>2</sub>. Phenol:chloroform:iso-amyl alcohol extraction from the mixtures containing DNA and imipramine in the presence of HRP/H<sub>2</sub>O<sub>2</sub> indicated that DNA degrades in the reaction. UV-vis studies showed that both imipramine and opipramol are the substrates for HRP. At pH 7, reaction between HRP and excess of H<sub>2</sub>O<sub>2</sub> and imipramine led to the formation of a broad spectrum with a peak at 522 nm. The intensity of the spectrum increased with time. The position of the maximum shifted to the longer wavelengths as the pH decreased reaching 650 nm at pH 2. These spectra are associated with imipramine radical. GC-MS analysis of the brown precipitate produced in the mixture of imipramine and HRP/H<sub>2</sub>O<sub>2</sub> indicated the dealkylation process and the formation of iminodibenzyl. Thus all three antidepressants bind DNA possibly by intercalation, opipramol exhibiting a greater affinity compared to imipramine and amitriptyline. DNA degrades in the presence of imipramine and HRP/H<sub>2</sub>O<sub>2</sub> at the drug concentration of 2 μM. The damage to DNA is caused by imipramine reactive intermediate.

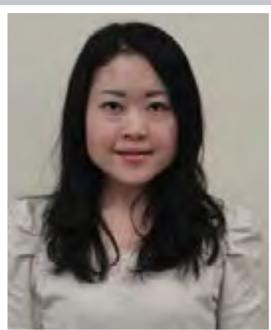
## CINDI-ANN WILLIAMS

I was born and raised on the Southern Caribbean island of Grenada where science was always a major part of my life. As a result, I moved to New York in search of higher education and greater opportunities within the field. John Jay was my first choice because of my interest in Forensic Science. Through PRISM at John Jay, I have come to understand what it truly means to be a scientist. As part of an expanding group of undergraduate researchers, I have had the chance to work closely with professors, learn some of the most current scientific techniques and explore research topics in a variety of fields. My current research project merges Toxicology and Molecular Biology and through it I have found a strong interest in the biological sciences emerging. I hope to turn this interest into a research career in the biological sciences or a career in the clinical sciences.



### Maneb and Mancozeb Enhance MPP+ Toxicity Through Activation of NF-kappa B Signaling Pathway (Dr. Cheng)

The pesticides Diethyldithiocarbamate (DDC), Maneb(MB) and Mancozeb(MZ) have been implicated in the development of Parkinsonian-like symptoms in agricultural workers. Such symptoms are associated with neurotoxicity as a result of the toxic effect of the compound MPP+ on dopaminergic cells. The enhancement of MPP+ toxicity by the pesticides DDC, MB and MZ via a mechanism involving the activation of the NF-kappa B signaling pathway was investigated. Cells treated with DDC, MB and MZ were expected to show an increase in nuclear NF-kappa B activity. The chemical treatment of PC 12 cells was followed by incubation for 12, 18 and 36 hours. An assay for Luciferase activity was used to assess nuclear NF-kappa B activity relative to a PBS control group. Data analysis revealed no change in nuclear NF-kappa B activity at 12 hours, sustained increase at 18 hours and increase at 36 hours. For MB and MZ, the sustained increase in NF-kappa B activity was found only at 18 hours. The confirmation of NF-kappa activation represents the first stages in isolating a complete mechanism associated with neurotoxicity with potential application to the determination of strategies for treatment of neurodegenerative diseases such as Parkinson's disease linked to MPP+ toxicity.



## AYAKA YAMADA

After I graduated from the State University of New York, Mohawk Valley Community College, I transferred to the City University of New York, John Jay College of Criminal Justice for Forensic Science in Fall 2009. Soon after, I started working in the Friedland laboratory. The main topic of our lab is Pokeweed Antiviral Protein (PAP), which depurinates the large ribosomal RNA and prevents protein synthesis by stopping translation. So far, I have learned basic techniques that are essential in the lab and been involved in three projects. As an undergraduate research student, I will continue to devote myself to further analysis of PAP.

### Equilibrium Binding Properties of Pokeweed Antiviral Protein to the Cap Analog m7GTP under Varying Chemical and Physical Conditions (Dr. Cheng)

Pokeweed Antiviral Protein (PAP) extracted from Pokeweed is one of the Ribosome Inactivating Proteins (RIPs) that depurinates the large ribosomal RNA and prevents protein synthesis by stopping translation. It is a protecting system in the plant against a variety of insect, fungi, and viruses. Equilibrium binding properties of PAP to the cap analog m7GTP were analyzed in buffers of different pHs and different salt concentrations by measuring the native protein fluorescence at the emission maximum wavelength of 347nm. It had been hypothesized that the smallest dissociation constant of PAP would be observed in the buffer with pH 6.5 and the salt concentration of 100mM. The results showed that the cap bound to PAP most strongly in the buffer with pH 3.0 and the salt concentration of 150mM. In this spring, the same experiments will be performed again to examine the causes of the inaccurate results.

# 2011 PRISM Symposium

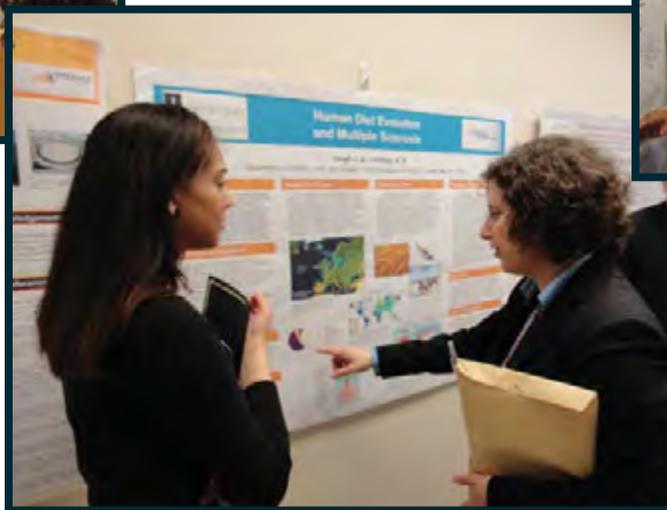
2011 marks PRISM's 5th Year Anniversary, and we took the opportunity to celebrate all that has been accomplished at the PRISM Undergraduate Research Symposium. This year's Outstanding Undergraduate Researcher, Richard Piszczatowski, discussed the gene transcription research he has been conducting under the guidance of Dr. Lents, and the implications this



President **Jeremy Travis** learns about the research **Christopher Shaw** has been conducting in **Dr. Rauceo's** lab.



**Alicia Williams** with **Drs. He and Cheng**.



**Laura Singh** discusses her poster on epidemiology with her mentor, **Dr. Angelique Corthals**.

## PRISM Symposium Speakers and Awards

### 2010

Speaker: Julie Layshock, PhD (Oregon State University)

*John Jay: Graduating Class of 2005.*

Award Recipient: Jason Quiñones

### 2009

Speaker: Bladimir Ovando, PhD (State University of New York – Buffalo)

*John Jay: Graduating Class of 2002.*

Award Recipient: Kana Noro

### 2008

Speaker: Marcel Roberts, PhD (Boston College)

*John Jay: Graduating Class of 2002*

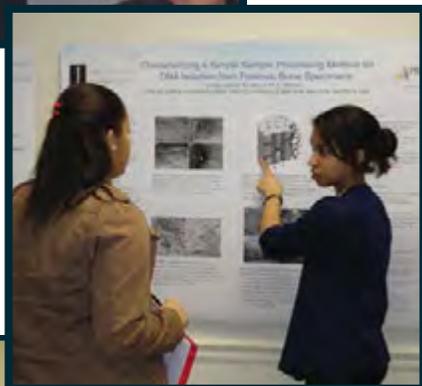
Award Recipient: Nicole DeLuca



**Dr. Kobilisky** offers a rousing speech to remind students of John Jay's significance in the Forensic community, and to take pride in all that they have accomplished.

work could have for the approximately 15% of Americans struggling with blood disorders. Key-note Speaker, and John Jay graduate, Dr. Kimberly Papadantonakis followed with guidance on choosing an appropriate graduate school, and shared some of the challenges students might face as they transition into the next phase of their career. She credited the instrumental and lab training she received at John Jay as a contributing factor to her success at CalTech.

**Richard Piszczatowski** (center), the 2011 Outstanding Undergraduate Researcher, along with Honorable Mention awardees **Roselynn Cordero** and **Leonid Sukala**.



Above, **Lidissy Liriano** with a fellow undergraduate science student.

Left, **Drs. Kobilisky** and **Carpi** cut the cake, celebrating 5 years of successful undergraduate research and mentorship at the College.



**Dr. Kimberly Papadantonakis**  
2011 Keynote Speaker

*Dr. Papadantonakis completed her Ph.D in Chemistry at the California Institute of Technology in 2008 where she conducted research under the advisement of Nathan S. Lewis. She received her Bachelor of Science in Forensic Science from John Jay College of Criminal Justice in 2002 after completing both the toxicology and criminalistics tracks. While at John Jay she conducted research under the advisement of Robert M. Rothchild. She graduated *summa cum laude* and was the class salutatorian. She is currently a Research Staff Member at the Institute for Defense Analyses in Alexandria, Virginia.*

Dr. Papadantonakis gave a presentation entitled *Self-Assembled Monolayers for Surface Patterning*, in which she discussed the results from studies of mixed monolayers that led to an original approach to pattern control, and progress toward a patterning method which employs the monolayers as surface masks for permanent pattern transfer. As she explained, simple straight-chain hydrocarbons and many other small molecules spontaneously assemble into highly ordered monolayers at solid-liquid interfaces. These monolayers are composed of molecules that lie flat at the interface without forming chemical bonds to the surface of the solid. These two-dimensional monolayer structures form surface patterns that possess feature separations that are on the scale of just a single nanometer in length. The molecules and surface patterns can be fully resolved and imaged in real time using scanning tunneling microscopy. Despite the ongoing race towards device miniaturization, self-assembled monolayers have not yet been exploited for either research or technological applications. Her presentation addressed some of her work in this area.

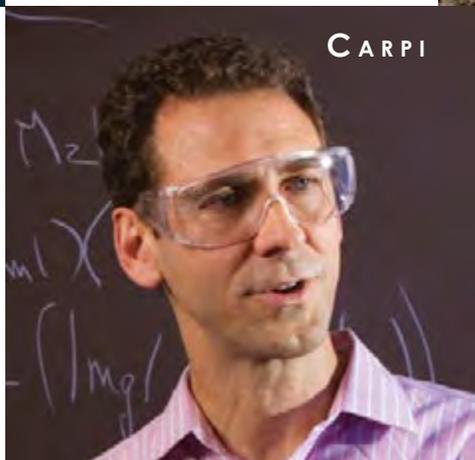
# Research Mentors

PRISM is about more than simply teaching students how to conduct research. The faculty mentors supervising student projects are invested in each student's progress and act as important role models, representing the diverse paths down which a degree in science can lead. Our students and mentors form important personal and professional relationships that carry well on after graduation.

Research training experiences go beyond the traditional training students receive in the classroom, helping to demonstrate that science is not exact, but an iterative process of questioning the world around us. Research experiences provide students with the skills necessary to succeed in science beyond the classroom and join in the community of researchers across the globe.



Dr. Lents working with students in his lab



**Anthony Carpi, PhD** (Cornell University)

**Professor of Environmental Chemistry and Toxicology**

Areas of Expertise: Environmental and forensic toxicology

My research interests broadly fall into two categories: 1) the chemistry and transport of heavy metals, and especially mercury, in the environment; and 2) the teaching of scientific reasoning skills. Regarding 1, mercury has a complex environmental chemistry that, in part, accounts for its status as the leading cause of pollution advisories on fishing resources in the United States. My laboratory studies the mechanisms of reduction, and subsequent emission of mercury from environmental surfaces such as soils. Specifically, we have demonstrated that mercury reduction and transport is associated with incident light, and especially ultraviolet radiation; and inversely correlated with the humic concentration of soils. We are currently using a combination of laboratory and field studies to further investigate these processes toward understanding the potential effects of global climate change on the environmental mercury cycle. Regarding 2, we are currently developing resources for teaching science as a process of investigation instead of a collection of known facts, and we are studying the impact of these resources on student understanding of science.

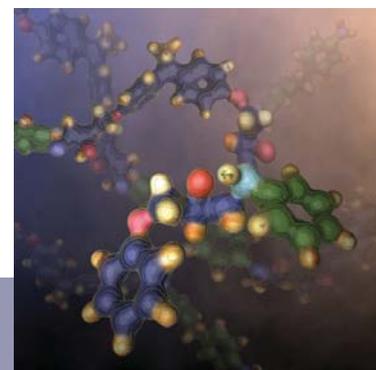
**Elise Champeil, PhD** (Univ. of Ireland, Trinity College)

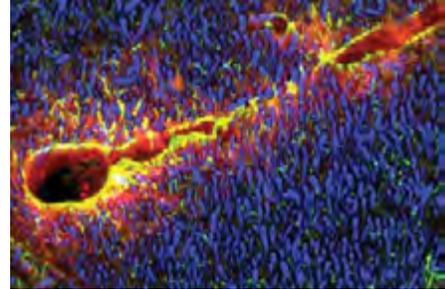
**Associate Professor of Chemistry**

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 which 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 is an anti-cancer agent. We are interested in synthesizing various DNA adducts of mitomycin C, particularly the beta cross-link adduct. This adduct has been shown to trigger cell death via a different pathway than traditional chemotherapeutic agents; 2) Analysis of drugs of abuse by NMR spectroscopy. We are interested in using 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- $\pi$ -acceptor kind which can be used to detect the presence of fluoride anions and glow in the dark at the same time!





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

***Assistant Professor of Toxicology***

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

Dr. Cheng's research interests include: 1) Studying the roles environmental toxins (dithiocarbamate compounds) play in neurodegenerative diseases, such as Parkinson's disease, eg. altering protein-protein interaction ( $\alpha$ -synuclein, dopamine transporter, and others); 2) Identifying the target genes and proteins which are affected by these environmental toxins; 3) Elucidating the possible signaling transduction pathways (such as NF-kappa B and Akt/mTOR) which are regulated by these environmental toxins; 4) Elucidating whether antioxidants (such as green tea extracts) can reverse this toxic effect; 5) Studying the effects of psychostimulants (such as cocaine and amphetamine) on the dopamine transporter expression.

**Angelique Corthals, PhD (University of Oxford)**

***Assistant Professor of Chemistry and Biochemistry***

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

I'm a biological/forensic anthropologist and earned my DPhil (PhD) at the University of Oxford. I have 10+ years of scientific research and teaching experience in the fields of forensic anthropology, wildlife forensics, wildlife conservation, phylogenetics and evolutionary biology, genetic resources and epidemiology. My foci of research are the historical ecology of infectious diseases, the history of autoimmune diseases, and protocols of recovery of genetic information for ancient or damaged specimens.

In addition to teaching at John Jay, I am currently the forensic anthropologist-in-residence on the University of Brussels' TT29 excavation in the Valley of the Nobles (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.

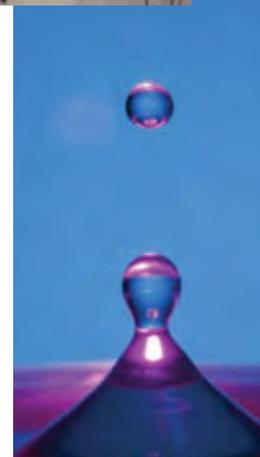
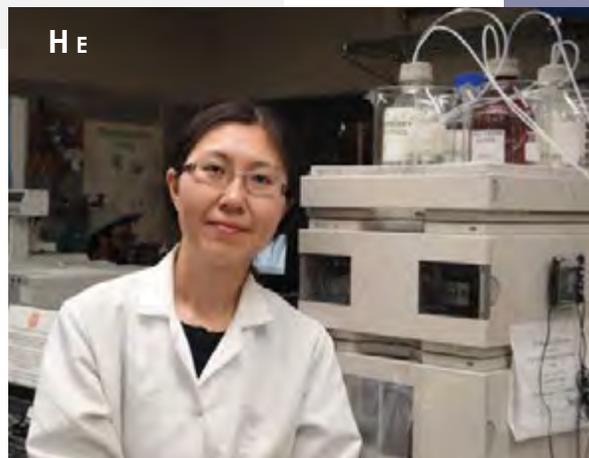


**Yi He, PhD** (City University of New York)

**Associate Professor of Chemistry**

Areas of Expertise: Analytical chemistry and environmental forensic toxicology.

Dr. Yi He studied applied chemistry and environmental chemical engineering at Shanghai Jiao Tong University in China and analytical chemistry in National University of Singapore before completing her PhD in analytical chemistry in 2004 at the Graduate Center of the City University of New York (CUNY), USA. She joined the Science Department at John Jay College of Criminal Justice of CUNY in Fall 2004, and the chemistry doctoral program at the Graduate Center of CUNY in 2007. Her 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. The major instruments involved in her research include GC, GC-MS, HPLC and ICP-MS.

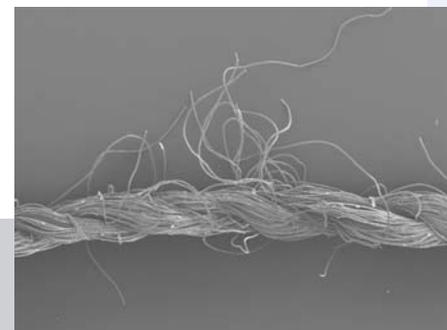


**Ali Kocak, PhD** (City University of New York)

**Associate Professor of Analytical and Physical Biochemistry**

Areas of Expertise: Analytical chemistry specializing in infrared and Raman spectroscopy techniques.

Dr. Kocak's research interests focus on the use of Attenuated Total Reflectance infrared and Raman (FT-Raman and Confocal Raman microscopy) spectroscopy techniques to study the structure of fibers, hair and other forensic evidence. He is also interested in forensic evidence analysis developing more sensitive sampling techniques such as Transflectance infrared spectroscopy to study of minerals and plant matter.

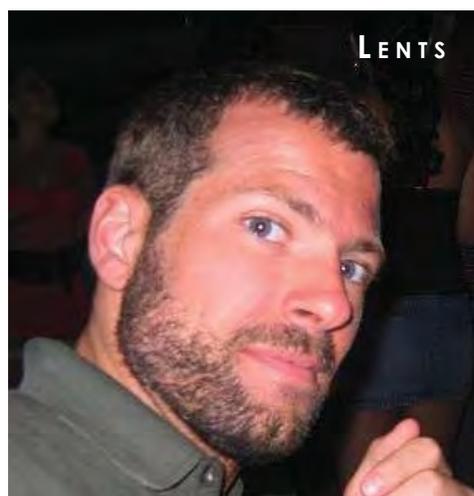




**Ekaterina Korobkova, PhD** (University of Chicago)  
**Assistant Professor of Chemistry**

Areas of Expertise: biochemistry, biophysics, physical chemistry

My current project of interest focuses on the side effects of psychiatric agents. I am particularly interested in the DNA damage produced by these drugs. Psychiatric drugs are prescribed for the treatment of depression, migraines, and insomnia. However, studies show that many of these drugs are potentially very reactive to cellular macromolecules, including proteins, lipids, RNA, and DNA. The drug molecules with their aromatic structures can bind DNA in various ways. Their metabolism can produce reactive intermediates that destroy DNA. Covalent modification on DNA produced by certain reactions with the drugs can be used as markers of the medicines and employed in forensic studies.



**Nathan Lents, PhD** (St. Louis University Medical School)  
**Associate Professor of Molecular Biology**

Areas of Expertise: Cell biology, forensic biology, genetics, and molecular anthropology

My research lab studies gene expression control and cellular signaling. Specifically, we combine bioinformatics and computational biology with standard bench molecular biology techniques in order to reveal new regulatory networks of gene regulation. We also frequently work on side projects in the larger field of forensic biology. Beginning in Summer 2011, I am also preparing to take the lab in a new direction – forensic anthropology. Specifically, I plan to use DNA analysis to trace the shared ancestry of indigenous populations of Central America and how these populations are related to pre-Columbian populations of the region.

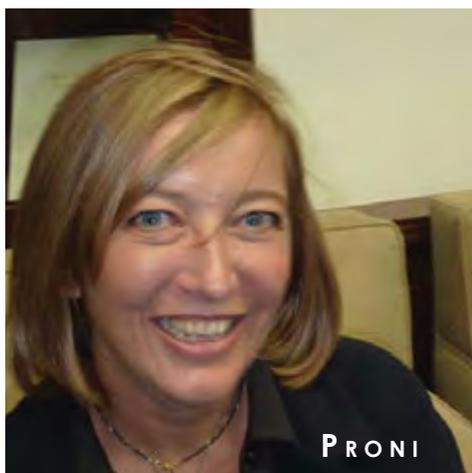


**Richard Li, PhD** (University of Wisconsin–Madison)

**Associate Professor of Forensic Biology**

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

My laboratory studies the forensic analysis of biological evidence. The research includes two aspects. The first aspect, a 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, the study is working on the extraction methods of controlled substances from complex matrices, including biological fluids and solid tissue samples.



**Gloria Proni, PhD** (University of Bologna)

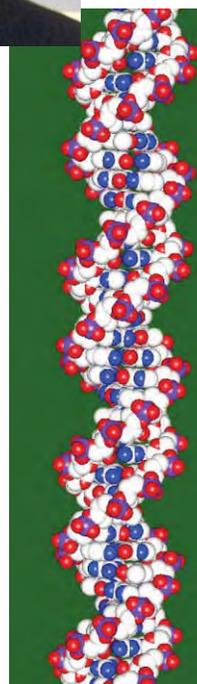
**Associate Professor of Organic Chemistry**

Areas of Expertise: Organic chemistry, spectroscopy, supramolecular chemistry

I received both my “Laurea” (*cum Laude*) in Pharmaceutical Chemistry and Technologies in 1995, and PhD in Molecular and Cellular Biotechnologies in 2000, from the University of Bologna under the supervision of Prof. G. Gottarelli. I joined Dr. K. Nakanishi’s and Dr. N. Berova’s group, at Columbia University, in 2001, and was awarded a National Institute of Health postdoctoral fellowship in 2002. In 2003, I started my independent career in the Science Department at John Jay College of Criminal Justice. My research interests span from optical spectroscopy to organic chemistry applied to forensic science. Currently I am involved in four main projects:

- 1) Development of new reagents for latent fingerprint detection derived from lawsone, responsible of the staining properties of henna;
- 2) Use of NMR spectroscopy and other spectroscopic techniques for detection of drugs of abuse in biological fluids such as urine, blood, etc;
- 3) Stereochemical determination of organophosphorus pesticides by means of electronic and vibration circular dichroism and optical microscopy in polarized light;
- 4) Determination of the absolute configuration of diamines and aminoalcohols via host-guest complexation of dimeric porphyrin tweezers and the chiral substrates.

In my spare time I love outdoor activities, travelling, and Harry Potter.





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

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

I pursued a scientific career mainly to understand the mechanisms underlying clinically relevant diseases. Fungi have served as a model organism in which extraordinary biological processes were elucidated. Thus, mycology lies at the core of my biomedical research career. I earned my doctorate degree from The Graduate Center of The City University of New York, specializing in molecular biology and fungal pathogenesis. I continued to explore fungal pathogenesis and molecular genetics during my post-doctoral appointment at Columbia University.

Our current research focus is the major fungal pathogen, *Candida albicans*, which infects over 60,000 people per year in the US alone. Our research goals explore two critical aspects of *C. albicans* pathogenesis. The first is to understand stress response signaling mechanisms in *C. albicans* that promote its survival in the presence of antifungal drugs and contribute to drug resistance. Second, we seek to determine the molecular mechanism of *C. albicans* adhesin proteins that mediate attachment to host surfaces and cellular aggregation. To meet our research goals, we routinely utilize current molecular biology, molecular genetic, and microbiological techniques.



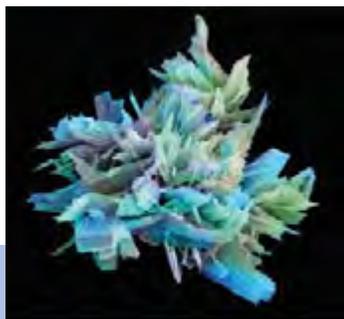
**Marcel Roberts, PhD** (Boston College)

**Assistant Professor of Biomedical Engineering**

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.



*One looks back with appreciation to the brilliant teachers, but with gratitude to those who touched our human feelings. The curriculum is so much necessary raw material, but warmth is the vital element for the growing plant and for the soul of the child.*

~Carl Jung



## **In Memoriam**

On January 21, 2011, PRISM lost a special member of our program with the death of Dr. Diana Friedland. Diana became a full-time member of the Department of Sciences in September of 2004, and quickly became an active and invaluable member of our community. She assisted with the development of PRISM's undergraduate research training course, mentored dozens of undergraduates in her laboratory, and helped facilitate seminars, presentations and other key events within PRISM. She was a significant champion of our undergraduate research efforts, always willing to lend advice and counseling to students, and contributing to the growth and development of research throughout our Department. Diana's work has touched the lives of many of our current and former students, and through her efforts, many of these students have gone on to become respected scientists in their own right. Her humor, wit, and mentorship will be sorely missed.



# Program Information & Staff

PRISM, the Program for Research Initiatives for Science Majors, 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 of Criminal Justice. 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 U.S. Department of Education and National Science Foundation are critical support mechanisms contributing to the growth of this initiative. As PRISM has expanded, the number of students served by it has grown commensurately. In its first year of operation, PRISM realized an expansion of student participation from a handful of students a year to 13 students who actively participated in mentored research and several dozen additional students who participated in program seminars and training activities. In its most recent year of operation, 30 students have participated in mentored research and receive research stipends, an additional 32 students have participated in research training activities, and well over 100 students have participated in program seminars and training activities. PRISM has been highly successful in increasing the number of students moving on to post-graduate education and successful careers in science. For more information, contact us at [PRISM@jjay.cuny.edu](mailto:PRISM@jjay.cuny.edu), visit our website [www.prismatjjay.org](http://www.prismatjjay.org) or 'like' our PRISM group on Facebook®.



**Anthony Carpi, PhD**  
*PRISM Director*



**Lawrence Kobilinsky, PhD**  
*PRISM Co-Director*



**Ron Pilette, PhD**  
*PRISM Coordinator*



# Acknowledgements

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

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- A Collegiate Science and Technology Entrance Program grant from the New York State Education Department;
- A U.S. Department of Education CCRAA Cooperative grant;
- A grant from the U.S. Department of Education's Minority Science and Engineering Improvement Program;
- Additional funding for student stipends was supplied through the Louis Stokes Alliance for Minority Participation grant from the National Science Foundation.

Thanks also go to Heather Falconer and Teeshavi Narayne for the design and production of this Chronicle.

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