2014-2015
Undergraduate Research Award
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Hanzigiannis, Nickolette Psychology

Hong, Donald Biochemistry and Molecular Biology

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Link, Lucas Music

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Loy, James Physics

Mackey, Daniel Ancient Studies

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Malloy, John Biological Sciences

Mattison, Jeremy Biological Sciences

McCauley, Clare Geography and Environmental Systems

Nimarko, Akua Biological Sciences and Psychology

Ortiz, Elelbin Biochemistry and Molecular Biology

Patterson, Erin Theatre

Perry, Samantha Biological Sciences

Raja, Nishay Mechanical Engineering

Ravichandran, Vani Biochemistry and Molecular Biology

Taylor, Victoria Chemical, Biochemical and Environmental Engineering

Sepehri, Amir Salar Biological Sciences

Shin, Matthew Chemistry and Biochemistry

Silver, Deborah Physics

Smith, Jazmin Visual Arts

Strack, Gregory Philosophy

Tran, Ngochan Biological Sciences

Tran, Queenie Psychology

Tsoi, Phoebe Chemistry and Biochemistry

Wachtel, Jennifer History

White, Mark Visual Arts

Xu, Pauline Chemistry and Biochemistry

Yates, Saiah Biological Sciences

Hollie Adejumo
Chemical, Biochemical and Environmental Engineering
"Occurrence and Distribution of Quinolone Resistance Genes in Baltimore Wastewater"
Faculty Mentor: Lee Blaney
Expected Graduation Date: Spring 2016

Wastewater often contains contaminants hazardous to both human and ecological health. Fluoroquinolone antibiotics, which have been recently detected in wastewater, are powerful drugs that are well-known for inhibiting bacterial growth. The presence of these antibiotics in wastewater may contribute to antimicrobial resistance in bacteria. If antibiotics are not removed during wastewater treatment, then antibiotic resistant bacteria are able to dominate, causing serious infections that are not treatable by conventional medicines. The purpose of this work is to understand and track antimicrobial-resistant bacteria in local wastewater. Fluoroquinolones (e.g., ciprofloxacin, ofloxacin, and fleroxacin) that are detected at high concentrations in the wastewater will be investigated in this study. I will test the hypothesis that the concentration of fluoroquinolone antibiotics found in wastewater correlates with the amount of antibiotic resistance. Fluoroquinolone-resistant Escherichia coli will be isolated on agar plates through the Extended Spectrum β-lactamase (ESBL) method. Antibiotic-resistant E. coli will survive, and the isolate will be extracted and evaluated using the Epsilometer test method. The Polymerase Chain Reaction (PCR) procedure will then be used to purify and amplify the fluoroquinolone-resistance genes. Gel electrophoresis and western blotting techniques will be used to separate the PCR product, and ultimately verify the presence of the resistance gene. These results will be compared to a control E. coli standard (ATCC 25922) cultured in lab. The results will be evaluated by determining the relationship between the concentration of the fluoroquinolone detected and the frequency of detection for the fluoroquinolone-resistance genes. These distributions will be created for various wastewater sources to understand if correlations are generally valid for wastewater treatment plants.

William Angel
Biological Sciences
"Investigate Reciprocal Regulation of the Circardian Clock by Plant Innate Immunity"
Faculty Mentor: Hua Lu
Expected Graduation Date: Fall 2014

A thorough understanding of plant defense mechanisms is critical to the success of enhancing plant disease resistance against devastating pathogens. Recent studies have shown that the circadian clock, the internal time measuring machinery, regulates plant innate immunity. Data from Dr. Lu's laboratory further indicate that flg22, a 22-amino-acid peptide of the N-terminus of

bacterial flagellin that is considered as a type of Pathogen Associated Molecular Patterns (PAMPs), both activates basal defense and influences the circadian clock activity. This leads us to hypothesize that components of PAMP signaling triggered by flg22 could regulate the circadian clock. To test the hypothesis, we will determine whether Arabidopsis mutants with impaired flg22-triggered signaling also show altered clock activity. Specifically, we will cross flg22 signaling mutants to a wild-type plant expressing luciferase (LUC), an enzyme that produces light when given its substrate, under the control of the clock promoter CCA1. We will identify plants carrying a homozygous mutation disrupting a flg22 signaling component and the CCA1:LUC reporter in the F2 generation by PCR and harvest these plants for seeds. Seedlings of such a genotype will be monitored for luciferase activity with an instrument detecting luminescence every hour for seven days in the constant light condition. Any change in the phase, period, or amplitude of luciferase activity would indicate the disruption of the clock activity, which is likely due to the signaling mutation disrupting circadian clock regulation.

Sara Arussy
Chemical, Biochemical and Environmental Engineering
"Determining the Effects of Rapamycin on Morphology of Aspergillus nidulans Autophagy Mutants"
Faculty Mentor: Mark Marten
Expected Graduation: Spring 2016

Due to their tremendous ability to produce enzymes and therapeutics at relatively high concentration, filamentous fungi play an important role in the biotechnology industry. When fungi experience nutrient limitations in large-scale bioreactors, which occurs often due to poor mixing or slow feeding of nutrients, they experience autophagy. Autophagy is an important cellular-level process that allows species from yeast to man to survive under nutrient limitation. In this study, autophagy will be induced by growth in the presence of the drug rapamycin. The effect of rapamycin on the parent strain is analyzed by observing a key autophagy protein—Atg8—that is tagged with the green fluorescent protein (GFP). This GFP-tagged Atg8 protein is visualized via confocal microscopy, by overlaying fluorescent and differential interference contrast imaging. These images serve as a control to confirm rapamycin's ability to induce autophagy in fungi. Preliminary data from autophagy deletion mutants implies autophagy, unexpectedly, plays a role in morphogenesis impacting cellular ability to regulate specific branching rate. We hypothesize that higher branching rates correlate with higher protein secretion rates. To test this hypothesis, this study compares the growth and branching rates (i.e., morphology) of an autophagy deficient deletion strain (Δatg13) to its isogenic parent strain (TN02A3). Atg13 is known to be a key autophagy protein. Microscopy and digital image analysis are used to quantify the branching and growth rates for each strain, with and without rapamycin treatment, while extracellular protein assays will provide data on secreted protein.

Christine Au
Modern Languages, Linguistics, and Intercultural Communication
"Conflict of Confucian Ideals and Pragmatic Battle Strategies in Romance of The Three Kingdoms"
Faculty Mentor: William Brown
Expected Graduation Date: Fall 2014

This research will study the Chinese novel Romance of the Three Kingdoms written by a Confucian scholar, Luo Guanzhong in the Ming Dynasty (1368-1644). Among the classic Chinese novels, Romance of the Three Kingdoms is the most popular and has had a profound impact on Chinese literature, society, and culture from the Ming Dynasty until today. Through this historical narrative, the author successfully incorporates his Neo-Confucian ideals, military tactics, and schemes through the many different characters portrayed in his novel. Many Americans are familiar with the main characters such as Cao Cao, Liu Pei, and Zhu-ge Liang through the 2008 Chinese epic war film, Red Cliff, which depicted major battle tactics during the Three Kingdoms Period (AD 220-280). It is well known that Confucian ideals are the foundation of Chinese tradition and ethical values which focus primarily in the cultivation and conduct of proper social relationships. As a Neo-Confucian scholar, Luo Guanzhong purposely depicted Cao Cao as a villain and Liu Pei as the legitimate heir of Han and proper king of Shu, according to the "Mandate of Heaven." Zhuge Liang, on the other hand, is labeled as a "superior man" and all his cunning tactics and military strategies are justified as skillful, sage wisdom and righteousness regardless of their violation of the perspectives of Confucianism. I will use many examples of how the main characters in the novel executed certain military strategies with a purpose to show that the details of these strategies reflect the conflict between Confucian ideals and pragmatic behavior. Finally, by conducting this research, I hope to produce a more scholarly, more in-depth understanding of Luo Guanzhong's moral ambiguities and conflicting application of Confucianism through his depiction of characters and battle strategies.

Amber Barnett
Ancient Studies
"Depictions of Female Killers in Classical Athenian Literature and Visual Art"
Faculty Mentor: David Rosenbloom
Expected Graduation Date: Spring 2015

This research studies the depictions of female killers, in particular Clytemnestra and Hecuba, in Athenian literature and visual art during the classical period (490-322 BCE). Clytemnestra murdered her husband Agamemnon as he returned from Troy, and Hecuba killed the sons of her enemy Polymestor and blinded him. A majority of scholars have seen these two figures in Aeschylus' Oresteia and Euripides' Hecuba as examples of Athenian misogyny:

transgressive women who are punished for their acts (Clytemnestra is killed; Hecuba turns into a dog and drowns). However, this conclusion overlooks elements in each respective play—Clytemnestra's strong rationale for vengeance against the crimes of Agamemnon and Hecuba's punishment of Polymestor's sheer villainy. The conclusion that they are only transgressive women who are punished overlooks elements of the visual record, such as Clytemnestra's typically violent portrayal (very abnormal for women on Athenian pottery) and Hecuba's usual role as a victim. These elements suggest that there is more to the depiction of these women as killers than the need for reasserted male domination of women—affecting the accepted view of Athenian "misogyny." Are these women actually justified in their acts, by policing boundaries that cannot be transgressed? I plan to use literary and visual evidence—the plays themselves and vase paintings from 490-322 BCE—to interpret the portrayals of these women. By combining these two approaches, I hope to gain new insight into the depiction of violent women in Athenian tragedy and pottery.

Lucinda Bennett
Visual Arts
"A Study in the Visual Culture of Cosplay"
Faculty Mentor: Preminda Jacob
Expected Graduation Date: Spring 2015

When most people think of the word convention the images that come to mind are not the most flattering. There are a fair amount of stereotypes that accompany these gatherings and those who avidly attend them, many association with the pastime of cosplay. This pastime, a shortened term for costume role play, is when a fan recreates the look of a character and attends an event dressed accordingly. This research will examine that the industrious fans of the phenomena known as Japanese animation are in fact artists in their own right. Through in-depth interviews with these fans, known among the subculture as cosplayers, I will accumulate date on their age, how long they have been in the hobby, the time it takes to construct their costumes and the process of bringing a two-dimensional image to life. These surveys, and the photography of each participating individual that will accompany them, will be the tools of evaluation. The success of this research project will be measured through the artistic expression of the subjects involved as well as creating a broader understanding of this medium by those who had previously been unfamiliar with it. While other studies have no clear conclusion about cosplay, I aim to define the practice as not simply a hobby of the convention going crowd but as a legitimate form of visual art.

Nina Beri
Biological Sciences
"Overproduction of Fatty Acids in Cellvibrio japonicus"
Faculty Mentor: Jeffrey Gardner
Expected Graduation Date: Spring 2015

Current concerns about the environmental impact and increasing cost of petroleum-based fuels has led to an increased interest in fuels produced from renewable technology. A promising approach is that of the consolidated bioprocessor (CBP), a biofuel-producing microorganism that uses plant biomass as a feedstock. To create a CBP, one must find an organism that can natively perform one of the two essential functions of a CBP: degradation of plant biomass or production of biofuels. This project will utilize the saprophytic soil bacterium Cellvibrio japonicus, which has the robust ability to completely depolymerize plant cell wall polysaccharides, making it an ideal platform for the production of valuable chemicals including biofuels. Using synthetic biology, this project aims to create a consolidated bioprocessing form of C. japonicus that will make fatty acid derived biofuels. Capitalizing on this lab's knowledge of genetic manipulation of C. japonicus, this project aims to eliminate the bottlenecks and competing pathways in C. japonicus in the process of fatty acid production. Using a combination of gene deletions and heterologous gene expression, we will create C. japonicus strains that overproduce fatty acids. Via biochemical and cell growth assays, we will evaluate fatty acid production and compare the success of C. japonicus as a CBP against other fatty acid overproduction strains from the literature.

Susanna Campbell
Biological Sciences
"Testing for Female Song in Newly-Recognized Species: The Puerto Rican Oriole"
Faculty Mentor: Kevin Omland

Evolutionary biologists often assume that elaborate traits that cause sexual dimorphism evolve through male competition for females. However, recent work from our lab showed that the males and females of the common ancestor of all song birds both sang. Therefore, the dimorphism that is observed in many temperate breeding songbird species is due to loss of female song and not the gain of song by males (Odom et. al 2014, Nature Communications). We investigated whether Puerto Rican Orioles (Icterus portoricensis), a tropical songbird, exhibits both male and female song. For this project we marked individuals with sex specific color bands and collected DNA samples. We successfully isolated CHD, a gene that is present in different lengths on either of the sex chromosomes in birds and determined the sex of our banded individuals. In March 2014, we repeatedly observed and recorded female song as well as male song of the Puerto Rican Oriole. Our findings show that both male and female Puerto Rican Orioles sing. This information helps

show that the common ancestor to the oriole genus had both male and female song and that dimorphism has evolved due to loss of female song.

Stephanie Castner
Dance
"Close and Far"
Faculty Mentor: Doug Hamby
Expected Graduation Date: Spring 2016

Dance is a competitive field. Over the past few years, I have seen that the dancers who are most successful in their work are those who have a wide array of dance training and who have worked closely with professionals in the field. Studying under professionals is one of the best ways to improve as a dancer and choreographer. I will attend the Broadway Dance Center (BDC) Summer Professional Semester, an eight-week program based in the heart of New York City. While here, I will improve my technique and learn and master new styles of dance from the variety of world-renowned professional dance instructors that BDC has to offer. While at the program, my concentration will be in Jazz dance, but I will also be taking classes in other styles of dance including but not limited to partnering, contemporary, hip hop, and tap. I will use my knowledge of modern dance that I have gained while studying at UMBC, along with what I will learn while at BDC, and research the contrast between partnering in modern and jazz dance. I will also research a variety of new choreographic methods. Following the completion of my research, I will return to UMBC and use the new choreographic methods I have learned to create a dance performance piece on UMBC dancers that investigates partnering and explores the contrast between jazz and modern dance. Through rehearsing, creating, and performing my dance, I will be able to disseminate wonderful new information to the UMBC dance community and provoke the performers and viewers of my work to consider dance in a new way. My piece will be entitled, "Close and Far", and will be performed in the "Fall 2014 First Words Dance Showcase".

Tobias Clevinger
Chemistry and Biochemistry
"Glucokinase-Based Glucose Sensor: Proof of Concept and Economic Analysis"
Faculty Mentor: Elsa Garcin
Expected Graduation Date: Spring 2015

Human glucokinase is an enzyme with a significant role in glycolysis: the enzyme phosphorylates glucose to form glucose-6-phosphate, the rate-limiting step in the glycolysis pathway. To accomplish this, the enzyme first binds glucose and adenosine tri-phosphate. Then, the enzyme undergoes a conformational change,

allowing for the reaction to occur. This enzyme's affinity increases with an increasing concentration of glucose, making glucokinase an endogenous glucose sensor. The conformational change associated with glucose binding causes a notable decrease in the intrinsic tryptophan fluorescence of the enzyme, allowing for the concentration of glucose to be measured with fluorescence detection. I will test a rudimentary fluorescence-based glucose detector constructed using a sol-gel with encapsulated human glucokinase. By exposing this sol-gel to various concentrations of dissolved glucose, the change in the enzyme's fluorescent properties can be used to determine the concentration of glucose in the solution. This method could, if proven effective, act as an alternative to current amperometric blood-glucose detectors, which rely on glucose oxidase. Since detection by fluorescence does not require physical contact with the sample, this alternative method could result in a blood-glucose detector with no requirement for blood to be drawn.

Eileen Connell
Geography and Environmental Systems
"Population Genetics of the American Redstart: Locating the Winter Sites"
Faculty Mentor: Colin Studds
Expected Graduation Date: Spring 2015

There are distinct populations of the American Redstart, a migratory bird, in Nova Scotia and New Brunswick. The populations are genetically distinct from each other and the differences between the populations will be examined through their mitochondrial DNA. The methods to be employed are DNA restriction, ligation, and the computer programs PAUP and STRUCTURE. The results will show the level of relatedness between the populations in order to determine when the populations diverged. The unique migration pattern of the American Redstart could result in gene flow that would produce a homogenous population. The populations of the American Redstart breed separately during the summer in North America, but spend the winter in the Caribbean Basin during which it is possible for the individuals to mix. However, it is predicted that these populations remain separate from one another during the winter migration, allowing genetic distinctions to remain.

Melissa Crowhurst
Music
Faculty Mentors: Joseph Morin and Janice Jackson
Expected Graduation Date: Spring 2015

This research seeks to study Old Italian Singing (OIS) and its pedagogy in order to explore the use of natural voice as a teaching method for choral students. Originating in Italy during the 19th century and spreading throughout Europe, OIS is the method in which one is able to sing and explore repertoire with a natural and most efficient vocal sound featuring the inherent qualities that are unique to an individual voice. Focusing on qualities such as vocal color, texture, and emotion, this vocal method is best understood in comparison to modern vocal pedagogy. Modern vocal instruction tends to 'sculpt' the voice into a preconceived category, producing a "corporate voice." As a method of vocal instruction, OIS is not an established vocal pedagogy practiced in the United States. As such, this work will take place in Florence, Italy, where I will take daily private voice lessons at Florence University of the Arts with Ms. Eva Mabellini, who is both a product of the Old Italian Singing School and a specialist in its instruction. Being able to witness her teaching methods will provide a further vantage point in knowing how to teach my own students the OIS method. I plan to become proficient in OIS in order to have another pedagogy method in my repertoire as a youth choral teacher. I will also create an information session for UMBC vocalists that demonstrate the difference between various vocal methods.

William Dean
Chemistry and Biochemistry
"Lithium Nickel Borate as a Cathode Material for Lithium-Ion Batteries"
Faculty Mentor: Mark A. Allen
Expected Graduation Date: Spring 2016

Lithium-ion batteries have been made using a variety of cathode materials, optimized for their ability to reliably intercalate and deintercalate lithium ions during the battery's charge and discharge cycles. One emerging family of battery materials is the metal borates, which have the general formula $LiMBO_3$. They are mainly notable for the lightness of their borate polyanion group, which gives these compounds a higher theoretical energy density than other materials. In prior research, the choice of transition metal has been restricted to iron, manganese, or cobalt. The goal of this research is to investigate the novel cathode material lithium nickel borate (LNB), which has the formula $LiNiBO_3$, with an aim towards characterizing and subsequently improving on its electrochemical properties. No published research has been conducted on LNB, so this project will form the foundation for our knowledge of the advantages and limitations of this material. I will review synthesis techniques used for

other borate compounds, customize them to LNB, and seek to improve on them. The resulting materials will be analyzed using electron diffraction imaging and mass spectrometry and will then be used to create battery electrodes for potentiometric testing. The results of multiple charge/discharge cycles as well as impedance spectroscopy will give information about the cell's cyclability, power performance, internal resistance, and capacity, and will inform new synthesis strategies to address problems.

Kelsey Donnellan
Interdisciplinary Studies
"The Garden Nutritional Guide"
Faculty Mentor: Jill Wrigley
Expected Graduation Date: Spring 2015

The college years are critical for the formation of dietary patterns that will persist through an individual's lifetime (Dour, Horacek, et.al, 2013). It is an opportune time then to develop healthy eating habits. Unfortunately, evidence suggests college students' dietary patterns are not optimal. "The typical college student's diet is high in fat, sugar, and sodium and lacking in valuable nutrients," (Kelly, 2013). In a systematic review of nutrition and dietary interventions of college students, Lin (2012), found that interventions did help improve nutrition and dietary patterns. Ha and Caine-Bish completed a series of research projects focusing on nutrition in college students, including whole grain, low-fat dairy, and vegetable and fruit consumption. Their study of vegetable and fruit intake used in-class lectures as the intervention and three-day diet records to gauge effectiveness of the intervention (Ha, 2009). I aim to produce a four-week nutrition and garden guide to help college-aged students at the University of Maryland, Baltimore County (UMBC) increase their basic gardening skills and food sovereignty self-efficacy. To test the effectiveness of the nutrition guide and interventions supported by social cognitive theory, I will instruct student study participants in how to record a three-day food journal, which I will then review for a pre-assessment and post-assessment comparison. For each of the three days, the participant will total their intake of all major food groups as set by the USDA: fruits, vegetables, grains, protein foods, and dairy. Three groups will be analyzed: Garden 1, Garden 2 and Non-Garden participants will receive a written guide and participate in interactions that are supported by social cognitive theory. Garden 2 will not receive a written guide, but will also experience those interactions supported by social cognitive theory. The Non-Garden group will just have the nutrition guide. The more effective intervention will result in a higher vegetable and fruit intake in the post-assessment food journal.

Alex Eftimiades
Physics and Mathematics
"Quantum Mechanics in Curved Spacetime"
Faculty Mentor: James Franson
Expected Graduation Dates: Spring 2015

The equivalence principle is a basic postulate of Einstein's theory of general relativity. It states that gravity causes all (small) free-falling objects to accelerate at the same rate, regardless of their constitution. Electrons are known to have a property called spin that causes them to behave as though they precess either clockwise or counterclockwise with respect to their direction of motion. Recent publications suggest that gravity causes electrons with different spins to fall at different rates. This would contradict Einstein's equivalence principle. The main goal of this project is to investigate whether electrons with different spins fall at different rates in the presence of a gravitational field. I will work with Dr. Franson to develop a model of electrons falling in the presence of a gravitational field. This is relatively well-established. Then, I will numerically simulate electrons with different spins falling in a gravitational field. I am currently looking into using propagators to do this.

Nickolette Hanzigiannis
Psychology
"A Comparison of Mothers' Expressions of Warmth Towards their Young Children: Does Culture Matter?"
Faculty Mentor: Charissa Cheah
Expected Graduation Date: Spring 2015

The Asian immigrant population in the United States is growing rapidly. Despite this growth, and the significant role of parents in their children's adjustment, little research has examined Chinese and Korean immigrant parenting of young children. This study will examine and compare the ways in which warmth is conceptualized and expressed among Korean immigrant, Chinese immigrant, and European American mothers of pre-schoolers through a semi-structured interview. Specifically, the research proposes to examine and compare the three groups of mothers on: (1) their rating of the importance of expressing love and warmth towards their children; (2) their reasons for expressing love and warmth towards their children; and (3) their specific practices of love and warmth towards their children. The project will be the first to use an emic, qualitative approach to capture parental warmth expressions in three different cultures.

Donald Hong
Biochemistry and Molecular Biology
"Synthesis of Allenes for Photochemical Devices"
Faculty Mentor: Paul Smith
Expected Graduation Date: Spring 2016

Hundreds of commercially available products utilize semiconductors called light-emitting diodes, or LEDs. These range from flat screen TVs to basic LED lamps. Technology has advanced even further into the creation of organic light-emitting diodes (OLEDs). However, these organic semiconductors use heavy metals, like platinum, in order to generate efficient electroluminescence. This and manufacturing limitations drive up the costs of OLEDs. We propose the use of allenes, compounds with one carbon atom double bonded to two adjacent carbon atoms, in OLEDs as a more cost effective way to fabricate a wider array of devices than current structures used. Allenes are unique in that the two adjacent double-bonded carbons are held orthogonal together. We propose to synthesize allenes that have an electron donor group and an electron acceptor group held orthogonal to each other, thus maximizing the efficiency of its electroluminescence. This allows an electron to be photochemically excited from the donor group to the acceptor group in order to produce light. We plan to synthesize three different allenes and evaluate them through data collected from IR, Mass, and NMR spectroscopy. We will then study them photochemically with emission spectra (fluorescence, phosphorescence) and quantum yield determination.

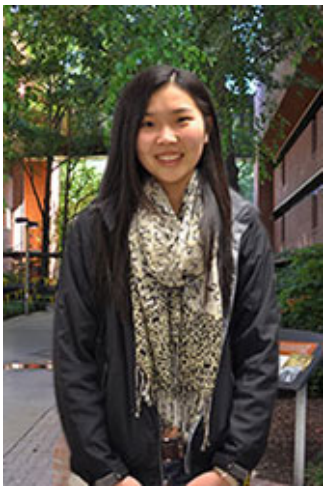
Jin Ah Kim
Biological Sciences
"Using Geolocators to Track Migratory Pathways in Baltimore Orioles"
Faculty Mentor: Kevin Omland
Expected Graduation Date: Spring 2016

Migration is the regular seasonal movement of individuals, usually between breeding and non-breeding grounds. This phenomenon is observed across a wide range of animal groups, from fish and insects to mammals and birds. Due to their large scale journey and size, it has been difficult to track individual populations of small song birds. However with the innovation of light-weight tracking devices, it is possible to track the routes as well as the wintering locations of individual birds. These tracking devices, known as geolocators, use light levels and sunrise/sunset times to determine the location of the bird; the length of daylight corresponds to latitude whereas specific dawn/dusk times correspond to longitude. Using decoy models and recorded male songs, we mimicked a territorial intrusion to lure birds into our nets. We used a harness to attach the geolocators onto six Baltimore Orioles in various parks in Maryland from April-July 2013. The geolocators will constantly store data

points until we recapture the returning birds in the following spring to remove geolocators, download and analyze the data. New geolocators will be placed on eight Baltimore Oriole males and females in late April to June 2014. This information will be essential in studying patterns in migrational movement and timing which is important for both basic understanding of animal behavior and the conservation of our state bird and other orioles.

Hannah Korangkool
Visual Arts
"Arroy: The Thai Food Court"
Faculty Mentor: Stephen Bradley
Expected Graduation Date: Spring 2015

My goal is to introduce Thai culture through the cuisines of street vendors, which demonstrate the impact of food beyond the purpose of simple consumption, but show the underlying socioeconomic and cultural significance of such establishments. While abroad, I will be filming and shooting photography of this community. I will also be employed as an intern at a film studio that will guide me through the process of preproduction and documentation for this project. When I return to the US, I will use my captured visuals to create a book filled with my photography and a short film. This is an artistic exposé that believes to successfully learn about another culture, one must observe how they treat and eat their food.



Ashley Nunghee Kwon
Biological Sciences
"Analyze Cell Fate Determination in Arabidopsis with Erwinia Amylovora Infection"
Faculty Mentor: Hua Lu
Expected Graduation Date: Spring 2015

Erwinia amylovora is the pathogenic agent responsible for fire blight disease, the major disease affecting plant in Rosaceae family that causes billions of dollars of losses every year. Aradidopsis is a non-host to E. amylovora and shows resistance to the pathogen. Interestingly, previous studies from Dr. Lu's laboratory also showed that besides inducing cell death, wild type E. amylovora induces tumor-like growths on infected Arabidopsis leaves. The abnormal growths contain enlarged mesophyll cell with higher ploidy. These results suggest that E. amylovoa could usurp host cell cycle machinery to affect its cell ploidy and subsequently the fate of the cell. Therefore, the goal of my study is to investigate what factors from the pathogen cause the host cell fate change. To achieve my goal of this study, I will investigate what factors from E. amylovora cause cell fate to change in Arabidopsis by infecting the plant with different strains of E. amylovora followed by testing the infected plants for cell

fate change. The E. amylovora dspE and E. amylovora hrpN strains are defective in different effectors. I will infect the fifth, sixth, and seventh leaves of Arabidopsis with these two strains, using a needless syringe to infiltrate the bacterial solutions into the leaves. I will use wild-type E. amylovora and a mock solution as the control in the infiltration

Jessica Lee
Chemical, Biochemical and Environmental Engineering
"Mapping the UV Absorbance of Organoarsenicals During Direct Photolysis as a Function of Fluence, pH, and Wavelength"
Faculty Mentor: Lee Blaney
Expected Graduation Date: Spring 2015

Organoarsenicals, namely roxarsone, nitarsone, carbarsone, and arsanilic acid, are arsenic-containing feed additives used in poultry industries worldwide. Previous literature has reported that the high excretion factors of these compounds in poultry as well as the land application of the contaminated manure lead to increased arsenic contamination in soil, groundwater, and surface water systems. Arsenic, in its organic and inorganic forms, is toxic to most life forms in acute as well as chronic doses. For this reason, treatment of organoarsenical-containing waste is important. Ultraviolet (UV) radiation is being increasingly used as a tertiary treatment process in water and wastewater treatment. In this study, the UV absorbance signature (200-600 nm) of solutions containing organoarsenicals will be monitored as those solutions undergo degradation under UV 254 nm; the solution pH will be varied from 2 to 12. The resulting data will be compiled into four-dimensional (absorbance vs. wavelength vs. pH vs. treatment level) plots. Preliminary results suggest that different functional groups on organoarsenicals give rise to distinct absorbance bands at certain wavelengths across the pH scale. We expect to see these bands markedly shifting as the organoarsenicals approach mineralization. Direct photolysis of roxarsone and nitarsone will be studied with a batch-recycle reactor system with a net photon flux of 1.14×10-5 Einstein/L-s. Carbarsone and arsanilic acid, both of which have greater photolytic rate constants, will be treated in a separate batch reactor system with a net photon flux of 3.33×10-6 Einstein/L-s. Both UV reactors emit at 254 nm. The absorbance of the organoarsenical solutions at various intervals during UV exposure will be measured with a UV-Vis spectrophotometer, and the resulting data will be analyzed, graphed, and animated using Excel and MATLAB.

Lucas Link
Music
“Research in String Trio and Acappella Forms”
Faculty Mentors: Linda Dusman
Expected Graduation Date: Spring 2015

The serious musical composition is not simply a product of pen, paper, and inspiration. Instead, extensive research of forms and their histories must precede a piece. In my Freshmen year I participated in a human rights campaign that sought to raise awareness on the UMBC campus of human trafficking. I was shocked by the stories that I heard, and in response, began to sketch a piece. It was prepared as a string trio (violin, viola, cello), and I spent many hours analyzing the trios of Schubert, Sibelius, Reger, etc to prepare. This project aims for the ultimate realization of that ongoing research in performance, for it is only through this performance and hearing that the relationship between composer, performer, and listener is made, and the quality of the piece tested. To prepare for this, I will be researching the string trio manuscripts and facsimiles of the Great's to trace their development from inception to completion. In addition, this research will drive toward an intimate knowledge of the a Cappella choral form, for it is not dissimilar from the string trio. A Cappella music is composed of a number of lines, unaccompanied. In the context of this aspect of my research, I will focus on the relationship between the instruments.

Michael Lopresti
Biological Sciences
"Estimating the Timing of a Major Geological Event Using Sequence Divergence of Freshwater Fishes"
Faculty Mentor: Tamra Mandelson
Expected Graduation Date: Spring 2015

The Hangay Plateau is a mountain range in Western Mongolia. The timing of the plateau’s uplift is currently being investigated with an interdisciplinary approach, using geological and biological data to estimate the timing. As the Hangay Plateau rose, it separated the rivers and the fish populations in them. As a result, we may be able to use the genetic relationships of the fish species across the Hangay range to determine the time of their most recent common ancestor, who would have lived before the plateau had risen. We collected samples of Barbatula, a genus of freshwater fish, from both sides of the plateau, and we will sequence the cytochrome b gene and compare the sequences using the BEAST program. The BEAST program compares gene sequences to estimate how long ago, in real time, populations on either side of the plateau diverged from each other. Using these techniques, we will be able to estimate the uplift of the Hangay Plateau based on biological data. Ultimately, these biological data will be compared with geological data to determine if the two sources are comparable.

James Loy
Physics
"Computer Interface for Optical Studies of Single Nanoparticles"
Faculty Mentor: Matthew Pelton
Expected Graduation Date: Spring 2016

My research project involves the study of optical properties of metals on the nano-scale. When light is incident on an atom or structure of atoms, its electric field drives the particles' electrons to oscillate about the positive nucleus, causing them to emit light. This process is referred to as scattering (if the light is reflected from the particle with no energy loss) or fluorescence (if the energy of the light is absorbed, some is lost as heat, and then re-emitted as light of a lower frequency). The effect is most pronounced in metals and semiconductors, where the valence electrons are not as tightly bound to a nucleus as in nonmetals. Different factors can alter the particle's response to this process, such as environment, structure, and shape. Progress in this field can help expand our understanding of how light interacts with materials on the scale of nanometers, which will have applications in sensor and communications technology. To study these effects, spectrometers, lasers, microscopes, and single-photon detectors must be coordinated to stimulate and observe the nano-particles. My project will create a computer interface that connects and controls all of these laboratory instruments at once to allow the user to study scattering from individual particles. I will build this interface using LabView software which allows me to interact with each instrument through a serial port. By working on connecting an older style spectrometer, I will gain experience with the software, as well as how to manage any errors between the software, system, and instrument. As other devices for the system arrive, I will work on additional communication between instruments and organizing the data connections to reach the systems monitoring the samples. When the microscopy unit is set up by fellow graduate students in the lab, my program will not only need to control but also give real-time feedback within the interface for the user to manage the sample positioning and the lasers used to scatter light off the particles. Finally, I will culminate different subprograms that control each device into a main interface that will also contain protocols that should help protect the system from damage, such as delaying commands to different instruments until a process is finished. Initial samples will be tested to verify the effectiveness of the overall system. The resulting interface will allow me to efficiently study different effects, such as intensity and orientation of output light, imposed on the light scattered from different particles. Such variables to be studied include particle environment, geometry, and identity. Thus, this research offers a valuable opportunity for advancement in future projects.

Daniel Mackey
Ancient Studies
"Reconstructing Music for the Ancient Greek Tortoise-Shell Lyre"
Faculty Mentor: David Rosenbloom
Expected Graduation Date: Spring 2015

This project is an exercise in experimental archaeology; specifically, the reconstruction of the ancient Greek lyre and a selected piece of ancient Greek lyric poetry. After I have a lyre made to the specifications of the ancient Greek lyre, I will learn to play it. In my research, I will ensure that the replica lyre I have acquired has been made accurately, to the specifications of the ancient Greeks. I will then conduct the research and spend the time needed to learn to play the instrument in the way the ancient Greeks would have done. This will include immersing myself in ancient Greek musical theory and learning to read ancient Greek musical notation. I will then learn to play a selection of existing Greek lyre music. Once this has been accomplished, I will attempt to accurately reconstruct the music for selected Greek lyric poems dating from the 7th- 5th centuries BCE. Finally, I will either perform my own reconstruction of a selected lyric poem or set of poems in front of a live audience, or I will present a poster detailing my research findings as well as put the instrument on display, at URCAD in 2015.

Vanessa Mackley
Chemical, Biochemical and Environmental Engineering
"Cell Adhesion to Microelectrode Arrays Designed to Investigate Alzheimer's Disease Mechanisms"
Faculty Mentor: Jennie Leach
Expected Graduation Date: Fall 2015

Alzheimer's disease is the sixth leading cause of death in the United States; however, with more research this statistic could be drastically changed. If neural cells affected by Alzheimer's could be researched, specifically pertaining to their ability to fire action potentials, significant progress could be made. Microelectrode Arrays (MEAs) have been previously used to study the electrical excitability of neural cells and are an excellent medium for studying action potentials. Beta Amyloid is found in patients who have Alzheimer's and can be used to simulate cells affected by the disease. Our work focuses on optimizing the cell-to-surface interaction of the MEA plate and the neural cells. We hypothesize that given the correct conditions, the MEA plate will provide the means necessary to study the action potential of neural cells affected by Alzheimer's disease. PC12 cells can be grown in the presence of NGF to develop ion channels and the ability to produce action potentials. These cells will be tested with different plate coatings to determine the best cell to surface interaction for the MEA plate, and imaged using DAPI to ensure the presence of ion channels in the PC12 cells. These results will allow the research to proceed to the next phase where the action potentials of

neural cells affected by Alzheimer's disease can be studied and compared to normal neural cells.

Oleg Makarevich
Biological Sciences
"How do ΔL24 Ribosomes Differ from Wild Type?"
Faculty Mentor: Lasse Lindahl
Expected Graduation Date: Spring 2015

The components of eukaryotic ribosomes (4 rRNA molecules and ~80 ribosomal proteins) are well conserved between yeast and humans. However, ribosomal protein L24 in Saccharomyces cerevisiae is dispensable for growth and strains lacking L24 grow only 30 per cent slower than wild type. This raises the question of how ribosomes lacking L24 differ structurally from wild-type ribosomes. The goal of this project will be to investigate how the loss of non-essential ribosomal protein L24 affects the structure of the yeast ribosome. I am currently in the process of creating a strain of yeast in which the chromosomal gene for the L24 protein has been replaced with an HA-tagged version of the same gene under the control of an inducible promoter. This strain will be used in my next project to provide a source of ribosomes with and without L24. These ribosomes will be compared by (i) by sucrose gradient centrifugation to determine if the loss of L24 affects the assembly pathway and accumulation of ribosome precursor particles, (ii) sedimentation velocity to determine if the ribosomes differ greatly in shape, (iii) by two-dimensional gel electrophoresis to determine if the loss of L24 leads to loss or change of additional ribosomal proteins, and (iv) mapping of the ends of the rRNA. These experiments will constitute the first comparison of eukaryotic ribosomes with different protein composition.

John Malloy
Biological Sciences
"Using Nuclear Introns to Infer the Evolutionary History of a Vulnerable Australian Songbird, the Norfolk Island Robin"
Faculty Mentor: Kevin Omland
Expected Graduation Date: Spring 2015

The Australasian robin genus Petroica is commonly used as a textbook example of island speciation due to the radiation of the species outward from the Australian mainland (Mayr, Animal Species and Evolution, 1950). Although their common name sounds familiar, the Australian Robins are a distinct group not closely related to our American Robin. Recently, based on evolutionary analyses, a previous subspecies in the Petroica genus, the Australian mainland Scarlet Robin, was raised to a full species while the closely related Norfolk Island Robin remains a subspecies. The Norfolk Island Robin is considered vulnerable (Norfolk Island

Robin Recovery Plan, 2004) and conservation efforts are therefore critical. However, the evolutionary analyses of this group that resulted in this new taxonomy were performed solely with mitochondrial DNA. Previous work done by the Omland Laboratory at UMBC has shown mitochondrial analyses to potentially be misleading. This project uses nuclear intron DNA (noncoding nuclear DNA) from a wide sampling of Australian Robins. These DNA samples will be analyzed using various evolutionary programs, such as mrBayes and *BEAST, in order to infer a more conclusive and thorough evolutionary history of the genus as a whole, as well as to determine whether the Norfolk Island Robin should be considered a distinct species.

Jeremy Mattison
Chemistry and Biochemistry
"Fluorescence Resonance Energy Transfer between Naphthalimdes and Benzoperylene Monoimides in Polyacrylamide Nanogels"
Faculty Mentor: Lisa Kelly
Expected Graduation Date: Spring 2016

A two-color, fluorescence temperature sensor will be constructed from a temperature-responsive polyacrylamide nanogel (pNIPAM), doped with naphthalimide (NI) and benzoperylene monoimide (BPI) fluorophore dyes. We propose that when NI and BPI are both incorporated in the molecular scaffolding of the pNIPAM nanogels, and irradiated with ultraviolet light, the two fluorophores will engage in fluorescence resonance energy transfer (FRET). FRET is a transfer of energy between two nearby (10-100 Å) electron cloud systems of acceptor and donor molecules. FRET efficiency is directly related to the distance between the two fluorophores in the pNIPAM nanogels; pNIPAM nanogel is temperature-responsive, and we propose that the collapse of the nanogels above lower critical solution temperature will bring the NI and BPI closer together, thereby increasing the FRET efficiency. The collapse state of the pNIPAM nanogel will be measured via a quantitative analysis of the FRET efficiency between the two fluorophores, and the FRET efficiency will be indicative of the system temperature. Once temperature-dependent FRET efficiency is observed in the pNIPAM doped with NI and BPI, we will manipulate the photochemical environment. The fluorophores' concentrations and structures, as well as the acrylamide monomers used in the molecular scaffolding will be modified in order to derive a fluorescence temperature sensor with optimum versatility and sensitivity.

Clare McCauley
Geography and Environmental Systems
"Motivations and Commitments of Participants in UMBC Community Garden"
Faculty Mentor: Jill Wrigley and Margaret Buck Holland
Expected Graduation Date: Spring 2016

The Garden is an interdisciplinary, collaborative endeavor seeking to build both social cohesion and environmental engagement through an organic community garden on campus. This project is an exploratory study aimed at understanding participation in the student-initiated community garden at UMBC based on self-proclaimed motivations for doing so. Participants' stated reasons for joining The Garden project, their plans to return to The Garden the following season, and their reasons for continued commitment will be surveyed and assessed. My goal is to share all knowledge gained from this process as a resource to assist in improving the recruitment, management, and education methods of community gardens in order to increase their long term success. This project will enhance our understanding of why individuals engage in community gardening and make these findings directly useful to The Garden at UMBC, towards making this a self-perpetuating organization that can cater to the specific needs and interests of a university community.

Akua Nimarko
Biological Sciences and Psychology
"Expression Profile of Putative Receptors Involved in Xenobiotics Detection in Mouse Olfactory Epithelium"
Faculty Mentor: Weihong Lin
Expected Graduation Date: Spring 2015

The main olfactory epithelium (MOE) detects environmental odors that are important for survival and transmits this information to the brain. To protect the MOE from environmental toxicants and pathogenic bacteria, cellular mechanisms to detect these xenobiotics are critical. However, data regarding such cellular mechanisms and the receptors involved is sparse. We have previously reported that bacterial lysate and chemical irritants stimulate populations of non-neuronal cells that reside in the MOE (Ogura et al. J. Neurophysiology, 2011). The main objective of this research project is to characterize the expression profile of potential receptors involved in xenobiotics detection through the use of real time quantitative polymerase chain reactions (RT-qPCR) and RNA in situ hybridization experiments in order to elucidate different biological pathways important to MOE protection and function.

Elelbin Ortiz
Biochemistry and Molecular Biology
"Determining the Role of Melanopsin C-tail in Deactivation and Trafficking Using Chimeric Constructs"
Faculty Mentor: Phyllis Robinson
Expected Graduation Date: Spring 2015

Melanopsin is a unique visual pigment expressed in intrinsically photosensitive retinal ganglion cells (ipRGCs) in the vertebrate retina. These cells are involved in many non-image forming functions such as the photoentrainment of circadian rhythm and the pupillary light reflex. During deactivation, melanopsin is deactivated through the phosphorylation of the C-tail followed by the binding of a β-arrestin molecule. β-arrestin contains a signal on its C-terminus that allows for internalization of G-protein coupled receptors (GPCRs) after inactivation. However, it is unknown whether melanopsin becomes internalized. We hypothesize that the C-tail of melanopsin plays an essential role in the efficiency of β-arrestin binding and its trafficking. To study the role of the C-tail in melanopsin deactivation and trafficking, the C-tail of melanopsin is replaced with the C-tail of different GPCRs that are known to become internalized by β-arrestin. Through the use of DNA sequencing, we have confirmed that several chimeric constructs have been created. Our next step is to introduce our plasmids into Human Embryonic Kidney (HEK) cells to assess the localization and signaling of the constructs. These results will help determine the role of the melanopsin C-tail in its deactivation and trafficking.

Erin Patterson
Theatre
"Five Weeks. 10 Minutes"
Faculty Mentor: Eve Muson
Expected Graduation Date: Spring 2016

Artists are compelled to go to places they know will spark creativity and inspire them to work. I have discovered that in addition to training my acting, vocal, and movement technique to become a professional actor and work in others' shows, I must also learn to create my own opportunities. This June, I will attend the Saratoga International Theater Institute's intensive summer workshop. SITI Company is an ensemble- based theater company, focusing heavily on the creation of new work, the training of young theater artists, and international collaboration. I will be studying two noted techniques of acting, Viewpoints and Suzuki, under Anne Bogart, the founder of the company. These are techniques of composition that provide a vocabulary for thinking about and acting upon movement and gesture in order to tell a story. These approaches represent not only a physical technique but also a philosophical, spiritual, and aesthetic approach to many aspects of theatrical work. Together with 29 other accepted applicants, I will attempt to continue Bogart's effort

to redefine and revitalize contemporary American theater. We will collaborate in order to create new theater by drawing upon inspiration from our surroundings and learning new techniques of expression in performance. I will create my own 10- 15 minute one- woman piece that will be presented at the end of the workshop, as well as at UMBC through the Theater Department and the URCAD.

Samantha Perry
Biological Sciences
"Vocal Development in Grasshopper Sparrow (Ammodramus savannarum pratensis) Nestlings from Hatching to Fledging"
Faculty Mentor: Bernard Lohr
Expected Graduation Date: Spring 2015

The complex adult song of many songbirds, such as the Grasshopper Sparrow, as well as the development of the final crystallized song has been studied intensively, but little attention has been paid to the early vocalizations that are obviously critical to the survival of the helpless hatchlings. Analysis of recorded vocalizations of Grasshopper Sparrow nestlings from hatching (day 0) until fledging (about day 9) will help determine how the early, innate vocalizations change as the nestling grows into a self-sufficient full-sized juvenile. Additionally, these wild-born nestling vocalizations will be compared with captive-born nestlings to determine any effects of the difference in rearing habitat on the early vocalizations. Because early vocalizations are innate, we expect there should be no difference. Selective recordings of captive-born nestlings, paired with a sex determination blood test, will allow us to compare the vocal development between male and female hatchlings. We expect initial vocalizations to be the same but predict that vocalizations of male nestlings to continue to become more complex, as only males sing in this species. The results of this research will provide better understanding of how innate vocalizations compare between male and female nestlings as well as how these vocalizations change as their vocal system develops.

Nishay Raja
Mechanical Engineering
"Improving Spatial Visualization Skills of Engineering Majors at UMBC"
Faculty Mentor: Anne Spence
Expected Graduation Date: Spring 2015

Engineering is a challenging discipline with many high performing students struggling at some point leading to lowered retention rates. Underrepresented minorities and women in particular have lower retention rates. A recently researched cognitive skill, spatial visualization, has been linked to success in science, technology, engineering, and mathematics (STEM) fields. Data shows that

more time in developing this skill in students can result in better retention rates of women in engineering fields (Spatial Visualization Skills). The purpose of this research is to assist with a pilot project, which is underway by Dr. Anne Spence, that will implement and evaluate a one-credit, fifteen-hour curriculum module in fall 2014, aimed at improving the spatial visualization skills of UMBC engineering students. I will be working closely with Dr. Anne Spence as my primary advisor and mentor and Ms. Jamie Gurganus in developing the pilot program over the summer of 2014 and with the implementation and evaluation of the course through the fall semester. We will administer a validated pre-test, the Perdue Spatial Visualization Test (PSVT), a 30 item instrument administered through BlackBoard to all students and offer the curriculum to students enrolled in one discussion section. After these students complete the curriculum they will complete a post-test of their skills. The post-test will also be administered to all of the other students in ENES101 as well. I will analyze the data collected in the pre- and post tests and run descriptive and inferential statistics of the scores of students who completed the curriculum and a randomly chosen control group of other new engineering students who did not complete the 15-hour curriculum. The research will be successful if the pre-and post-course data are collected and analyzed to answer the overarching question, "Does completion of the spatial visualization curriculum increase these skills for new undergraduate engineering majors, especially women?"

Vani Ravichandran
Biochemistry and Molecular Biology
"Use of Microelectrode Arrays to Study Action Potentials in Neurons Affected by Alzheimer's Disease"
Faculty Mentor: Jennie Leach
Expected Graduation Date: Spring 2016

Imagine being able to counteract the effects of Alzheimer's disease, simply by pointing a laser at neurons in the brain. The fundamental principle underlying this neurodegenerative disease is the attack on synapses that connect nerve cells to one another, and thus the inhibition of action potentials in neurons. Lining the nerve cell membrane, there exists an amyloid precursor protein that can release an amyloid beta (AB) protein. When the AB protein accumulates, it physically obstructs neuronal transmission in the brain. The ability to drive action potentials in Alzheimers' patients could greatly improve health outcomes. Our team will attempt to drive spiking in neurons of PC12 cells (a line of rat cancer cells) through optical stimulation and induced electrical current. We will use a Micro Electrode Array (MEA) plate that can induce and record action potentials, to see if we can mitigate the detrimental effects of the AB protein on neurotransmission. The electrodes on the MEA plate will record voltage changes in the nerve membrane in order to determine how the AB protein affects cells' action potentials. First, we will attempt to adhere PC12 cells to the MEA plate so that we can then induce action potentials by optical stimulation. For two weeks, we will grow the cells in the presence of a nerve growth factor to accelerate cell division. We will expose these cells to a selection of MEA plates coated with different proteins; one plate will

have collagen, one plate will have Poly-L-Lysine, and the third plate will be a control plate with no protein coating. After two weeks, if we find that the PC12 cells are effectively adhering to the plate in one environment, we will use that protein coating for our experiments. Future implications of our study could allow us to target methods of managing Alzheimer's disease.

Victoria Taylor
Chemical, Biochemical and Environmental Engineering
"Characterization of High-Secretion A. nidulans Mutants through Chemical Genetic Profiling"
Faculty Mentor: Mark Marten
Expected Graduation Date: Spring 2016

Filamentous fungi are widely used in the world of biotechnology. They are essential for the production of therapeutics, commodity chemicals and enzymes whose combined value is over $10 billion annually. One of the challenges related to fungal production of recombinant protein has been inconsistent protein secretion. For some products, expression and secretion can be as high as 100 g/L, yet for others these values are much lower. It is not clear why these differences exist. The overarching goal of this project is to gain insight regarding these differences in protein secretion. As an initial step toward this goal, we have generated 700 highly branched, Temperature-sensitive (Ts) mutants of the model fungus Aspergillus nidulans. The next stage of our project involves screening these mutants for increased protein secretion. Our team has determined that 125 mutants show increased protein secretion capacity. Using these high-secreting mutants, we will develop a phenotypic profile for each strain through chemical genetic profiling. After analyzing the results of this profiling protocol, we will select 25 of the most phenotypically diverse mutants for genomic sequencing. These mutants will help us to definitively understand the genomic causes for the aberrant phenotype and resultant high protein secretion.

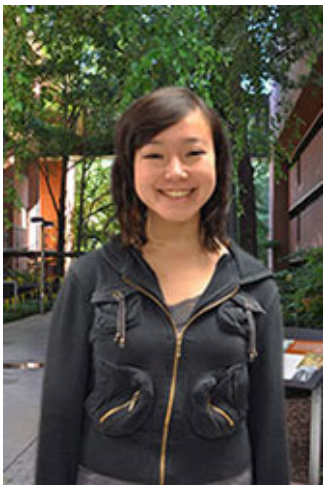
Amir Salar Sepehri
Biological Sciences
"The Study of Chemical Modification of Crotamine and its Interaction with DNA"
Faculty Mentor: Richard Karpel
Expected Graduation Date: Spring 2015

Crotamine is a highly basic polypeptide from the venom of the South American rattlesnake, and it could serve to selectively target malignant cell, either by itself or as a carrier of nucleic acids. The long term goal of studying crotamine is to produce potential anti-cancer and anti-microbial drugs. This project will determine the nucleic acid binding site(s) on the protein by

observing the effects of interacting DNA on chemical modification reactions of crotamine amino acid residues. My specific goal is to find where the DNA interacts with this protein, while at the same time displaying significantly lower toxicity and/ or higher selectivity for actively proliferating cells that are relative to the native protein. There are 42 amino acid residues in crotamine, and an aromatic segment of five amino acids, (31-35: Arg-Trp-Arg-Trp-Lys) on the surface. This protein is an excellent candidate for the DNA interactive sequence. Based on the previous work done in my mentor's laboratory and our general information, it is known that there is a charge dependence of crotamine-DNA binding, which indicates the involvement of Lysine and/or Arginine residues. By using chemical modification, I intend to discover whether modification of Arginine and Tryptophan, which are only found in this region of crotamine, and Lysine will alter the DNA binding, cellular uptake, and toxicity properties of crotamine.

Matthew Shin
Chemistry and Biochemistry
"Synthesis of Potential Anticancer Agents"
Faculty Mentor: Katherine Seley-Radtke
Expected Graduation Date: Spring 2016

As incidence of cancer cases have steadily increased for the last 10 years, there is an ever-increasing need for newer and more effective therapeutics. Existing studies have shown that by introducing small molecules into cancer cells, competition occurs between the natural bases and modified base analogues for DNA-synthesizing enzymes, thus disrupting the normal synthesis of DNA. Halogens are of particular interest due to their intrinsic levels of high electronegativity. Therefore, this class of halogenated nucleotide analogues offers a new and exciting approach to drug design and may successfully address an important unmet medical need for cancer patients. The aim of this project is to synthesize and test a dihalogenated modified analogue of pyrimidine as a potential anticancer agent. We will test the hypothesis that these analogues will be more efficacious than existing analogues, which already show a higher efficacy of 6-10 times the current standard treatment. We believe that these analogues will produce a compound that that exhibits stronger, more favorable bonds in active binding sites than previously reported analogues due to the halogen's greater electronegativity. If patients can take more efficacious dosages of potentially cytotoxic drugs to achieve the same results, then the quality of life for cancer patients will be improved through a safer and more tolerable treatment regimen.



Deborah Silver
Physics
"Study of the Energy Density Ratio of Galaxy Lobes through Simulation of Radio Galaxy Populations"
Mentor: Markos Georganopoulos
Expected Graduation Date: Spring 2016

Astronomers usually assume that the magnetic field and relativistic electrons in the lobes of powerful radio galaxies observed by radio telescopes are in energy equipartition. However, there is no physical argument to support or refute this distribution and no observational test that can be applied to an individual radio galaxy to evaluate it. Therefore, we will create simulated radio galaxy populations with physically plausible distributions of electron and magnetic field densities using Monte-Carlo techniques and use them to find how close the sources are to equipartition for a radio telescope of a given sensitivity. The goal of this research will be to determine under what conditions the assumption of equipartition holds. Evaluating this assumption will allow the energy content of the radio lobes to be more accurately constrained in the studies of evolution of galaxies and galaxy clusters.

Jazmin Smith
Visual Arts
"Afrofuturism in Visual Culture"
Faculty Mentor: Preminda Jacob
Expected Graduation Date: Fall 2014

Afrofuturism is a genre based on the idea that science fiction and fantasy can be used to describe the black experience. Parallels between science fiction and the black experience of the past, present, and future include existing as an Other, unable to assimilate; the ordeal of abduction while being the subject of experimentation; and creating a new societal normal after a forced interaction with an unknown. At present, Afrofuturism is primarily expressed through literary work and music. This project will introduce the concept of Afrofuturism to visual artists in the UMBC community through a web-based exhibition (http://visualizingafrofuturism.tumblr.com/) of a few existing Afrofuturistic works. After presenting this website to UMBC visual artists, I will challenge them to explore ideas of Afrofuturism in their own work. The project will culminate in a juried art exhibition.

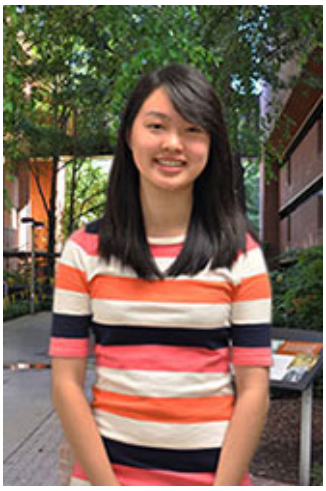
Gregory Strack
Philosophy
"Temporal Logic and Possible Worlds Semantics"
Faculty Mentor: Jessica Pfeifer
Expected Graduation Date: Spring 2015

An adequate understanding of the sort of logical structures that underly everyday talk about time and necessity is required to formally evaluate positions in philosophical debates regarding both the structure of time and the analysis of modal language. I will be studying a number of approaches to formalizing talk about time, in particular examining those fundamental ontological disputes discussed in the classic temporal logic literature and possible applications of some of these concepts to current debates in the metaphysics of modality more generally. Specifically my research will focus on the unique (and fairly radical) temporal logic systems invented and advocated for by Arthur Prior, the metaphysical commitments presupposed in adopting this sort of tensed language, and parallels we may be able to draw to the arguments of those "actualists" in contemporary metaphysical debates regarding the interpretation of possible worlds semantics.

Ngochan Grace Tran
Biological Sciences
"The Genetic Basis of Host Defense Traits in the Drosophila Host-Parasitoid System"
Faculty Mentor: Jeff Leips

Many studies have been dedicated to understand the relationship between molecular genetic variation and phenotypic variation (variation at the DNA sequence level and variation in the observable traits of an organism's phenotypes). By understanding the relationship between these two factors, scientists can better understand how genetic variation contributes to phenotypic variation as well as how natural selection influences the evolution of species and gives rise to the diverse features of organisms. Studies have identified functions of many genes in Drosophila, however, have not obtained a complete understanding of which specific gene affects the phenotypic traits as well as influences the fitness of Drosophila in natural populations. The specific purpose of my research is to use the host-parastiod relationship between Drosophila melanogaster and their parasitic wasp, Leptopilina boulardi-parastoid wasp, to identify specific genes contributing to the host defense traits of Drosophila. RNA interference techniques, such as the GAL4/UAS system in Drosophila, will be used to knock down the expression of target genes and measure their effects on larval behavior and immune defense responses. Target genes, identified as candidate genes influencing larval host defense, were chosen from a previous genome wide association study in the Leip's Lab. The first candidate gene is called "Sh", a protein coding gene that affects Drosophila larval neurophysiological and behavioral functions. By

knocking down the expression of this gene in targeted tissue, I can observe how this specific gene affects Drosophila larval behavior and how this, in turn, affects the non-immunological defense of the fly larvae against Leptopilina boulardi. Since the fitness of larval Drosophila is highly dependent on parastoid wasp, understanding the genetic basis of Drosophila larval host defense traits will help identify genes critical to Drosophila fitness. Because parasitoid wasps also evolve traits to overcome the host defense, these genes identified will also be a first step toward understanding genes involved in the co-evolution of host and parasitoid.



Queenie Tran
Psychology
"The Role of Peer Social Network and Parental Involvement in Predicting Chinese Immigrant Children's Socioemotional Adjustment"
Faculty Mentor: Charissa Cheah
Expected Graduation Date: Spring 2016

Chinese immigrants must raise their children in a host culture with priorities and values that heavily contrast with their native culture. Moreover, Chinese immigrant parents may be less familiar with American culture and the social norms for initiating opportunities for their children's social interaction with others. These challenges might be reflected in the degree to which parents initiate or monitor social interaction opportunities for their children, as well as what kinds of interactions they promote, which could have detrimental effects on their children's social and emotional development. Better understanding of the social networks of Chinese immigrant children and the role that parents play can optimize such parenting practices and consequently children's socioemotional development. This study will examine the social relationship networks of three to six year-old Chinese immigrant children in Maryland. Specifically, this research will examine: (1) the characteristics of Chinese immigrant pre-schoolers' social networks outside of the school setting (e.g., size, demographic composition), (2) how involved parents are in initiating and monitoring their children's play dates with peers, and (3) the associations between (a) the characteristics of children's social networks and (b) their parents' involvement in their social networks with (c) children's socioemotional adjustment at school.

Phoebe Tsoi
Chemistry and Biochemistry
"Synthesis of Dendronized Nanoparticles for Intracellular Trafficking Studies"
Faculty Mentor: Marie-Christine Daniel
Expected Graduation Date: Spring 2015

Drug delivery systems are being studied to improve the effect of therapeutic agents. Drug nanocarriers can increase the payload of drugs delivered to a single cell while decreasing the severity of side effects, leading to a possibility for higher drug dosages during treatment. There are many classes of drug delivery systems with different sizes, charges, and composition which in turn affect their interactions with cells and intercellular trafficking. It is essential to understand the cellular fate of the drug delivery system in order to translate these systems into clinical applications. Thus, a new nanoparticle-cored dendritic system will be synthesized to aid in intercellular and intracellular studies.

Jennifer Wachtel
History
"An Unlikely Refuge: The Shanghai Jewish Ghetto During the Holocaust"
Faculty Mentor: Meredith Oyen
Expected Graduation Date: Spring 2015

This research will focus on the role of a one square mile area in the Hongkou District of Shanghai known as the Shanghai Ghetto (or formerly, the Restricted Sector for Stateless Refugees) within the larger context of Holocaust history. Between 1933 and 1941, when most Western nations closed their doors to European refugees, over twenty thousand German, Austrian, and Polish Jews survived the Holocaust by escaping to Japanese-occupied Shanghai. Over the last five years, scholarly and popular interest in Shanghai as an unlikely but welcome refuge for Jews in the aftermath of Kristallnacht and the Anschluss has surged. I intend to examine the experience of survivors in Shanghai as well as the Shanghai Ghetto's significance in Holocaust history by studying oral histories, written testimony, and scholarly publications in both German and English.

Mark White
Visual Arts
"Infrascapes: A Study of the Invisible"
Faculty Mentor: Calla Thompson
Expected Graduation Date:

It has been said that the wilderness is the ultimate equalizer: it mitigates rank, caste, and inheritance. In today's society, do we still see the wilderness, and the landscapes derived from them, in the same light that we did centuries, or even decades ago? This project will present the landscape in a way that will not only make us question everything we know about landscape in the past, but also how we will decide to think about it moving forward. I will travel throughout the country to capture the landscapes it offers in a way that no one has done before. I will use a modified, infrared-only camera to capture photographs depicting landscape scenes that, if photographed using the visible light spectrum, most viewers would readily identify. Capturing the landscapes in the infrared (invisible) light spectrum will force viewers to confront and question their familiarity with the subject of landscape. By offering a new way of seeing the landscape, this project is meant to conjure in us some sense of awe reserved for the wild, while simultaneously reminding us of the ubiquitous control that ensures the absence of such territory. This work is motivated by my concern that, as a society, we are increasingly disconnected from natural landscape and wilderness. I believe that photography is the right medium to encourage a critical dialogue on the subject of the contemporary landscape.

Pauline Xu
Chemistry and Biochemistry
"Qualitative and Quantitative Analysis of the ACS-1 Modification of GAPDH using Tandem Mass Spectrometry"
Faculty Mentor: Elsa Garcin
Expected Graduation Date: Spring 2015
This project focuses on elucidating the mechanism by which the dithiolethione compound ACS-1 interacts with and affects the activity of the glycolytic enzyme, glyceraldehyde 3-phosphate dehydrogenase (GAPDH). Together with our collaborators, our lab has shown that the chemopreventive actions of ACS-1 are in part due to inhibition of glycolysis via inhibition of GAPDH (manuscript in preparation). Using tandem mass spectrometry, I will test the hypothesis that ACS-1 inhibits GAPDH via covalent modification of its cysteine residues and disulfide bond formation. As inhibition of glycolysis has emerged as a new therapeutic avenue for cancer treatment, our results will provide information to elucidate the mechanism of ACS-1 inhibition of GAPDH. Ultimately, these studies will be critical to translating this discovery into new therapies.

Saiah Yates
Biological Sciences
"The Great Escape: The Effects of Medication and Age on Drosophila Strength"
Faculty Mentor: Jeff Leips
Expected Graduation: Spring 2015

This research focuses on two medications and their effects on weakness in Drosophila. Frailty is a condition in which particular physical abilities deteriorate with age. There are a number of factors that indicate frailty, but the factor the current experiments will focus on is strength which will be assessed in a Drosophila model. We will look at the independent effects of age and the combined effects of age and medication in order to determine the age at onset of weakness and if the medications delay this age at onset, using virgin male Drosophila. The medications used have been known to increase lifespan in mammals and therefore may directly influence strength. Strength will be assessed at ages one, three, five, seven, and nine weeks. Strength decline is assessed by timing Drosophila escape from a sticky substance. This will enable us to measure the effect of the drug on strength in age-matched flies at several time points during the life span of the fly. In advancing this study, males will be tested to determine if the drugs have sex-specific effects on weakness.