2013-2014
Undergraduate Research Award
Scholars and Abstracts

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Brewster, Matthew Mathematics

Campbell, Susanna Biological Sciences

Costinas, Sergiu Biological Sciences

Cruz, Christine History and Political Science

Dakermanji, Steven Chemistry

Davis, Beshaun Psychology

DiBenedetto, Stephen Computer Engineering

Eisen, David Computer Engineering

Fomundam, Mabelle Theatre

Forsythe, Ian Anthropology and Applied Linguistics

Gensheimer, Zoe Visual Arts

Ghosh, Sanchari Biological Sciences

Golden, Kaitlyn Psychology

Hawkins, Samantha Anthropology and Interdisciplinary Studies

Heroux, Nicholas Psychology

Hester, Mary Dance and Interdisciplinary Studies

Hinz, Emily Music

Hughes, Dalton Chemical Engineering

Hussein, Aymen Biological Sciences

Jones, Hannah History

Jung, Ki Biological Sciences

Jurney, Caroline Theatre

Kott, Sam Psychology

Kulandaivel, Sekar Computer Engineering

Lee, Robbin Media and Communications

Majd, Behnam Biological Sciences

Makarevich, Oleg Biological Sciences

Mishra, Rajashree Bioinformatics

Moodie, Fiona Political Science

Mullen, Chris Chemical Engineering

Okoro, Uchenna Biochemistry

Oyeleke, Tosin Chemical Engineering

Papanikos, John Biological Sciences

Pereira, Talmo Biochemistry

Pillsbury, Timothy Physics and Mathematics

Potteiger, Bradley Computer Engineering

Pulianas, Alec Computer Engineering

Quackenbush, Valerie Interdisciplinary Studies

Ramsey, Rosalind Chemical Engineering

Rivas, David Physics

Rogers, Nicholas Chemical Engineering

Snowberger, Sebastian Chemical Engineering

Tran, Thanhlong Biological Sciences

Tsoi, Phoebe Biochemistry

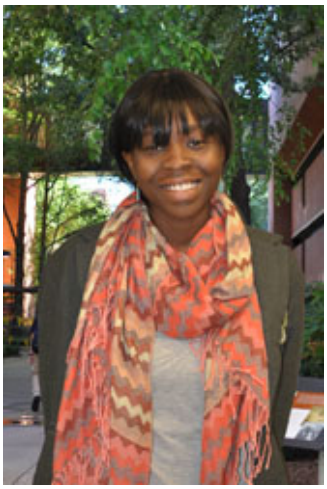
Vu, Kathy Psychology

Weisko, Paul Political Science and History

White, Charles Biological Sciences

Williams, Jennie American Studies

Zhang, Kevin Computer Engineering



Fadaka Adebayo
Health Administration and Public Policy
"Use of Social Marketing Principles to Promote Positive Diabetes Care Practices in Older Minorities"
Faculty Mentor: Angelica Herrera
Expected Graduation Date: Spring 2015

In the state of Maryland, older ethnic minorities have been diagnosed with Type 2 Diabetes Mellitus (T2DM) at alarming rates. Minimizing T2DM complications through self-management can be even more difficult when linguistically and culturally appropriate media is not available. I aim to conduct a systematic review of the literature and qualitative interviews with older Hispanics and African Americans (50 and over) with Type 2 Diabetes Mellitus (T2DM) in Baltimore. I hope to identify the relationship between locus of control and self-management practices, such as glucose monitoring and diet, and to identify members of their immediate social support network involved in their diabetes care. Moreover, I will explore the scientific literature and social marketing campaigns geared towards chronic diseases to identify best practices for applying social marketing to increase self-management practices. Finally, I will design a social marketing toolkit targeted towards older ethnic minorities' diabetes self-management that can be reproducible by community based organizations and local health departments. Creating linguistically and culturally appropriate social marketing tools helps foster an environment suitable for positive changes.

Michael Berlin
Computer Science
"Using Machine Learning to Classify Trouble Tickets"
Faculty Mentor: Tim Finin
Expected Graduation: Fall 2014

The IT help ticket queue for the UMBC Department of Information Technology uses keywords to sort help tickets into more manageable categories, so that the tickets can be directed to people who specialize in that sort of problem. During the course of a ticket's lifetime, a typical trouble ticket gets reclassified several times, adding significantly to the time it takes to respond to it. In order to proper classify future tickets, it was decided that some sort of AI approach could be used, which would provide much better accuracy. This kind of category choosing is common to machine learning, and is called a Classification problem. A lot of very high quality data was given to me, so I first ran Naive Bayes, a very common machine learning algorithm, on the set in order to establish a baseline accuracy. The next step is to try at least two other algorithms on the data, probably multivariate logistic regression and a Support Vector Machine, in order to see which handles this kind of data best. I'd also like to try to use WEKA's feature selection algorithms, and see if I can

improve upon all three approaches, or just find a best approach outright. In addition, the original comparison was only done on a small subset of the data, so I'd like to re-run it on a larger portion, maybe all of it, which the team has provided me with. Finally, there is the matter of when to update the model and how to limit the the problem of too little data in a category, which gives poor accuracy, or too much data overall, which leads to a very long re-build time for the model. One proposal for dealing with the problem of too many features overall is to use faceted browsing, which classifies along several explicit dimensions instead of single, unique ordering. In order to deal with small amounts of data in certain categories, sampling (cloning) the small number of instances may be the way to go.

Shayna Blank
Interdisciplinary Studies
"Aesthetic Autonomy in Feminist Creative Publications"
Faculty Mentor: Amy Bhatt
Expected Graduation Date: Fall 2013

Creative writing is an imaginative space where the practical and the political coalesce. Understanding the gendered, sociocultural significance of literary media is an important step towards being able to create these works myself. I will engage in a combination of interdisciplinary research and creative production where I will produce and publish an independent literary magazine, document the process on a multimedia blog. I will also generate an essay which explores and integrates creative technique, feminist theory, and graphic design. This research will attempt to gain an understanding of how writers can construct literary media in a socially conscientious way, which generates a positive influence on consumers' self-image, cultural identity, and gender identity, while still preserving creative autonomy. I will also examine what effective techniques and methods creative writers can use so that I can apply the theoretical concerns of my research to the tangible craft of writing.

Matthew Brewster
Mathematics
"The Influence of Stochastic Parameters on Calcium Waves in a Heart Cell"
Faculty Mentor: Dr. Matthias Gobbert
Expected Graduation Date: Spring 2014

Calcium is a critical component in many cellular functions. It serves many important functions such as signal transduction, contraction of muscles, enzyme function, and maintaining potential difference across excitable membranes. In this study we examine calcium waves in heart cells and how they diffuse. Calcium sparks are intracellular release events which are

important in converting electrical stimuli into mechanical responses. We investigate the effects of a stochastic spatially uniform flux density term as well as of a stochastic spatially varying flux density term. We hypothesize that having a stochastic flux density term is more physiologically accurate. We use an array of statistical techniques as well as parallel computing to facilitate the large number of simulation runs.

Susanna Campbell
Biological Sciences
"Exploring Female Song in Newly Recognized Species: Puerto Rican Oriole"
Faculty Mentor: Dr. Kevin Omland
Expected Graduation Date: Spring 2015

My project explores male and female song in the Puerto Rican Oriole (Icterus portoricensis) in its natural environment, the dense tropical forests and adjacent edge habitats located at Cabo Rojo, Puerto Rico. In temperate-zone oriole species, song is mostly a male trait; however, song is often a male and female trait in tropical oriole species. Evolutionary reconstruction shows that temperate species have tropical ancestors. Thus, our analysis of the Puerto Rican oriole and other tropical species will indicate ancestral state of the common ancestor of orioles. Comparisons to extant species to the common ancestor will indicate if female song has been lost in the northern species. Our study will clarify how natural selection is causing evolutionary changes in song. We expect that the males and females of the Puerto Rican oriole are both singing. By observing and recording the orioles in their natural forest habitats, we will be able to determine the role female song plays in mate selection and how this affects the observed evolutionary shift to male-only song.

Sergiu Costinas
Biological Sciences
"Determining Song Choice in Song Birds"
Faculty Mentor: Bernard Lohr
Expected Graduation Date: Spring, 2014

A number of song characteristics may be subject to sexual selection in territorial songbirds. In preparation for conducting tests to study song choice in the context of sexual selection, a software algorithm for performing choice tests with female birds using a modified operant conditioning chamber and procedure was developed. Such chambers can vary in design, but share similar features. At its core, this type of operant chamber presents two alternative choices for the subject and allows for the subject to differentiate between those two choices. The circuits we designed facilitate operant conditioning of the subject by providing auditory "rewards" for the subject after a selection. Once the subject is trained to

respond in the operant chamber, choice testing can commence. The choice test circuit measures the type and number of selections made to activate the playback of specific songs, and uses these results to determine song preference. The initial choice test will focus on the two song types produced by grasshopper sparrows, "buzzes" and "warbles," and preferences of the female for the two song types under different conditions.

Christine Cruz
History and Political Science
"The Dare Stones: Finding Eleanor"
Faculty Mentor: Terry Bouton
Expected Graduation Date: Spring 2015

This research examines the Lost Colony of Roanoke as an historical and cultural phenomenon, specifically looking into the origin of the Dare Stones in order to define the root of the Lost Colony's appeal to Americans and as a part of North Carolinian folklore. Many know the tale of Walter Ralegh's failed colony as a bedtime story or a popular legend due to the colonists' mysterious disappearance and their subsequent failure to reappear in history. However, despite on-going research, nobody definitively knows what happened to the colony, thus laying the basis for many myths that surround the colonists today. My goal in this research is to discover how the legends began, and why people are so captivated by them. Why does the disappearance of 118 colonists five hundred years ago still matter? Why do people claim to be descended from Virginia Dare, the first English child born in America? This work is inspired by my fascination with the ways in which the Lost Colony is painted along the background of many of the legends and folklore of North Carolina, defining the way these people live and relate to one another. To achieve my goals, I will be specifically examining what are known as the Dare Stones and researching their history and continued influence upon the story of the Lost Colony. The stones are large rocks upon which Eleanor Dare, one of the colonists and the mother of Virginia Dare, supposedly carved their story following their disappearance from Roanoke. By interviewing historians previously and currently involved with Lost Colony research as well as locals of Manteo, North Carolina – modern-day Roanoke – I will piece together a picture of the Lost Colony's past, present, and future. I hope to reveal the root of the legacy left to us by the first English settlers in North America.

Steven Dakermanji
Chemistry
"The Study of Charged Nanoparticles of Crotamine and Plasmid DNA"
Faculty Mentor: Richard Karpel
Expected Graduation Date: Spring 2014

Crotamine can kill you, but in the future it might save you. At millimolar levels, the chemical is toxic. However at micromolar levels, the 42-residue polypeptide from the South American rattle snake has been shown to be able to penetrate rapidly dividing cells. If expressible DNA molecules could be attach, such as genes with anticancer properties to it, the protein might be a high level of medicinal use. But for now, it is a necessity to understand more about the charges of the protein. Crotamine has a high net positive charge (8+) which allows it to attach to the net negatively charged DNA very easily. But rather attach to one DNA strand, there is evidence of aggregation of many strands of DNA and crotamine. These formed nanoparticles that can be tested using Dynamic Light Scattering (DLS). What is trying to be determined now through testing with the DLS is the charge of the combination of crotamine and plasmid DNA, the ability to combine at different conditions, and how the charge affects the ability of the nanoparticles to be transported into cells.

Beshaun Davis
Psychology
"Practitioner Preferences Regarding Psychosis Risk Screening"
Faculty Mentor: Jason Schiffman
Expected Graduation Date: Spring 2014

Early intervention in the course of psychosis can improve treatment outcomes for individuals with schizophrenia. Identifying high-risk patients before they develop schizophrenia may be possible with recent advances in the conceptualization of an "Attenuated Psychosis Syndrome" (APS) characterized by functional decline and sub-threshold positive symptoms such as unusual thought content, perceptual distortions, delusions, or suspiciousness that occur with distress and/or disability. Researchers estimate that 70-90 percent of people who develop schizophrenia will experience attenuated psychosis symptoms prior to diagnosable psychotic illness. Recently, three brief questionnaires (Prime Screen, Prodromal Questionnaire-Brief, and Youth Psychosis At-Risk Questionnaire-Brief) have been validated as viable tools for assessing APS, but little is known about practitioner preferences with regard to these three inventories. The current research seeks to examine practitioner preferences with regard to these questionnaires in an effort to help to establish a standard for assessing psychosis risk in young patients. We will also evaluate how comfortable clinicians who specialize in adolescent care are with treating psychosis and using standardized instruments to assess psychotic symptoms.

Stephen DiBenedetto
Computer Engineering
"Underwater Node Localization Scheme"
Faculty Mentor: Mohamed Younis
Expected Graduation Date: Spring 2014

Traditional underwater localization relies on line-of-sight (LOS) links to properly utilize ranging information. Unfortunately, the accuracy of the ranging techniques such as time of arrival (TOA), time difference of arrival (TDOA) and angle of arrival (AOA) can be significantly degraded by LOS instabilities in the underwater medium due to increased multipath effects. This project proposes a novel underwater signal reflection-enabled acoustic-based localization scheme (UNREAL) that employs both LOS and surface-reflected non-line-of-sight (NLOS) ranging information to locate a node that has drifted away. The LOS and NLOS links are classified by incorporating a surface-based recovery mechanism, which recovers the channel impulse response information through homomorphic deconvolution. A closed-form least square method is developed to use such classification to locate the node by either using the LOS AOA measurements or the NLOS AOA from the estimated water surface reflection point. Every node in the network can be used as a reference point to locate the lost node when LOS AOAs are available. The AOAs are a collection of elevation and azimuth angles for each reference nodes in the 3D underwater environment. Simulation results are carried out by using a 3D camera to measure the water surface in a controlled tank, the measured water surface was then used in a simulated environment to validate the approach.

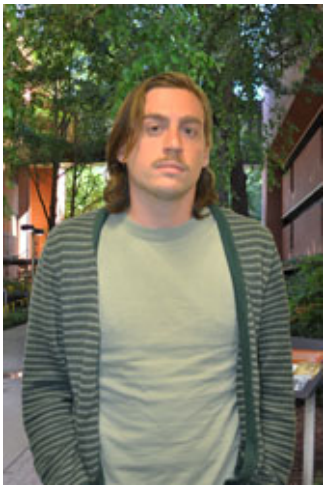
David Eisen
Computer Engineering
Faculty Mentor: Fow-Sen Choa
Expected Graduation Date: Spring 2015

We plan to explore the use of high-frequency ultrasound coupled with near-infrared (NIR) two-photon absorption in order to provide a non-surgical method of deep cell penetration for neural stimulation studies. Our previous URA work investigated mid-infrared (MIR) stimulation techniques in plant and cultured neuron studies which showed difficulty delivering deep cell penetration as light is absorbed by the surrounding tissues before excitation can be achieved. Ultrasound can stimulate electrical activity in neurons by activating voltage-gated sodium and calcium channels. It has also shown the ability to noninvasively propagate through bone and other tissues in a focused manner. These qualities will allow us to demonstrate penetration beyond a millimeter deep excitation depth and generate action potentials. This work can help to build a tool for the

exploration of brain circuitry and can lead to the development of improved diagnostic instrumentation, neural-based prosthesis and sensation inputs or interfaces with motor neuron controls. We plan to explore tuning the ultrasound in the 10MHz range to achieve a focusing size of less than 100μm. The rate of neuron firing is expected be proportional to the applied ultrasonic intensity. We then can study the stimulation and damage thresholds in order to determine a safe range of operations.

Mabelle Fomundam
Theatre
"An Evolving Theatre of Social Change"
Faculty Mentor: Alan Kreizenbeck
Expected Graduation Date: Spring 2014

In my research, I will investigate the techniques and processes that theaters for social change currently use to develop solutions to community problems. The techniques that are identified through the research will be compared to the techniques developed by Augusto Boal. Augusto Boal was a modern advocate of the idea that theater could be used as a motor for change. He spent his life developing techniques for using theater to promote social change. In his book The Rainbow of Desire, Boal says, " we taught the peasants how to fight for their lands... taught the blacks how to combat racial prejudice... taught women how to struggle against oppressors." Before he died in 2009, Boal shared the work he had done and the discoveries he had made through his books and workshops. His books provide a good foundation for prospective practitioners of theater for social change. However, his life's work was developmental. It consisted of making modification to old practices so as to produce better results. Consequently, the purpose of this investigation is to document any current adaptations, modifications, and variations being made by practitioners of theater for social change to Boal's techniques. This research therefore aims to record the development of theater for social change. This research will be conducted both in the United States and Switzerland.



Ian Forsythe
Anthropology and Applied Linguistics
"Recording an Experience of Literacy: A Person-Centered Approach"
Faculty Mentor: Bambi Chapin
Expected Graduation Date: Fall 2013

Through conversation and open-ended interviews, I will explore the experiences and perceptions of a person living in the Baltimore area who believes they can not read or write. I will consider the linguistic levels of literacy and how certain literacies become more valued within a cultural context. I hope to develop a

way of portraying how this individual's literacy has affected their perceptions and how societal valuing of written-word literacy has affected their life economically, emotionally and socially. Using methods and theoretical paradigms from sub-disciplines of anthropology such as sensory ethnography and person-centered ethnography, I will also address issues concerning the incorporation of subjectivity and humanities in the social sciences. I also hope to develop a public anthropology piece collaboratively with this individual and present it in a venue where the individual feels comfortable sharing these personal experiences.

Zoe Gensheimer
Visual Arts
"Photography Workshops in San Miguel de Allende, Mexico"
Faculty Mentor: Mark Durant
Expected Graduation Dates: Spring 2014

I am traveling to Mexico for two weeks this summer to take photography courses and explore the culture and landscapes of the town of San Miguel de Allende. There are many perceived cultural barriers between Mexico and the United States that prevent communication and create rifts between our cultures. These barriers prevent populations from responding to the plights of others and leave us isolated. What relationship does the U.S. have with the country that is geologically so close? How can we break these self-perpetuating barriers and misunderstandings between the Northern and Southern Hemisphere, and between first and third world countries? Photography is said to be the universal language, and is therefore an effective medium with which to build communication between these disparate groups. While in San Miguel, I hope to use my images to open paths of understanding. I will work to increase my Spanish language fluency and expand my familiarity and comfort level with Mexican culture. Under the guidance of a local photographer who is knowledgeable of the community and culture, I will learn to tell others' stories through photo essays. I hope to come back to the U.S. with a deeper knowledge of Mexico's culture and with a group of images that represents or reveals some of the people who live there. In the fall of 2013, I plan to return to Mexico to study abroad through the Mexican Solidarity Network. This program focuses on community-based organizing and the theory and practice of social movements. Hopefully, my work in Latin American can eventually lead to an acceptance to the Fulbright Program or the Peace Corps.

Sanchari Ghosh
Biochemistry and Molecular Biology
"Cell Surface Receptors Involved in T-Cell Activation are Down-Regulated in Presence of Tumor in Mice"
Faculty Mentor: Dr. Suzanne Ostrand-Rosenberg
Expected Graduation Date: Spring 2015

The cell surface molecules Major Histocompatibility Complex (MHC) and Intercellular Adhesion Molecule 1 (ICAM1) on Antigen Presenting Cells (APCs), and T cell receptor (TCR) and lymphocyte function-associated antigen 1 (LFA1) on T-Cells are required for efficient activation of T-Cells. This activation is stimulated through the formation of the immunological synapse, the interface between an APC and T-Cell. Since there is an accumulation of Myeloid-derived suppressor cells (MDSCs) in tumor bearing patients, in this study, we want to see whether MDSCs alter the immunological synapse formation, leading to inefficient activation of T-Cells. To address this, we collected macrophages and T-Cells from the blood and spleen of tumor-free and 4T1 mammary carcinoma-bearing BALB/c mice. After staining ICAM1, MHC II, and LFA1 and using flow cytometric analysis, we found that ICAM1 is down-regulated in macrophages in both blood and spleen, and LFA1 is down-regulated in T-Cells from the blood of tumor-bearing mice compared to that of tumor-free mice. These results suggest that the function of the immunological synapse is reduced in the presence of cancer. Our future goal is to figure out how the presence of MDSCs may affect synapse formation and restrain the body from producing a normal immune response.

Kaitlyn Golden
Psychology
"The Role of Family Network and Psychological Sense of Community in Immigration"
Faculty Mentor: Anne Brodsky
Expected Graduation Date: Spring, 2014

When a Latin American immigrant makes the life-changing decision to move to the United States, he or she may encounter psychological challenges while adjusting to a new way of life, in addition to the social and political ramifications of being an immigrant in the United States. Two pillars of support for Latino immigrants as they acculturate to life in the U.S. are their family systems and their psychological sense of community (PSOC) with regard to the Latin American population. Drawing from the qualitative semi-structured interviews of first-generation Latino immigrants conducted by myself and team members of the Making Words Count lab, I will evaluate the elements of the family system and psychological sense

of community in order to understand how each entity offers unique support during an immigrant's adjustment to life in the United States. I will use the results of my research to identify how psychological and physical resources can be allocated to Latino immigrant communities and immigrant family systems respectively to ease the acculturation process.

Samantha Hawkins
Anthropology and INDS
"Baltimore Voices: Creating a Comprehensive Sense of Place and Identity"
Faculty Mentor: Sarah Chard
Expected Graduation Date: Spring 2014

When many people think of Baltimore, images from the television drama, The Wire, come to mind. But, Baltimore has so much more to offer than an infamous reputation of drugs and poverty. It's the city where the Hon was created, Berger Cookies were born, and manufacturing jobs provided thousands of residents with work. There is no quality typical of a Baltimorean other than the fact that most city residents have a created strong sense of place in Baltimore and Baltimore's neighborhoods. The climate of Baltimore, however, is rapidly developing with the increase in modernization, globalization, and, in general, local transformation. Many Baltimoreans are facing drastic changes in their communities and occupations. Previously significant jobs to the Baltimore economy, such as steel production, are quickly becoming obsolete and Baltimore identities are beginning to change. This research will begin the process of documenting the memories of those living in Baltimore so that aspects of Baltimore's history may be preserved. I will explore Baltimore identity through approximately 20 in-depth oral history interviews with Baltimore residents and capture visual documentation of their lives in the form of photography. I will include Baltimoreans from vastly different geographic, occupational, ethnic, and economic backgrounds. Through these diverse narratives I hope to increase understanding of the complex interactions between place and identity in the modern urban context. I believe that researching the many facets of Baltimore's identity (both positive and negative) through the stories of real people will fill a void in the public's perception of this city.

Nicholas Heroux
Psychology
"Cognitive Effects of Proton Irradiation at Differing Energy Levels"
Faculty Mentor: Bernard Rabin
Expected Graduation Date: Spring 2014

During exploratory class missions outside the magnetic field of the Earth, astronauts will be exposed to various forms of radiation including solar particle events (SPE) which are

predominantly composed of protons. As such it is important to characterize the effects of exposure to proton radiation on cognitive performance. Previous research indicates that exposure to high energy protons (1000 MeV/n) may disrupt cognitive performance. Research also suggests that the relative biological effectiveness (RBE) of the different components of space radiation may vary as a function of particle energy. Since the majority of proton radiation emitted from SPEs is low energy it is necessary to determine whether there are similar differences in effectiveness as a function of proton energy. A series of behavioral studies were conducted to characterize the role of particle energy in the disruptions of cognitive performance seen in proton irradiation. In the initial experiments male Sprague-Dawley rats were exposed to 1000 MeV/n protons at the NASA Space Radiation Laboratory (NSRL) at Brookhaven National Laboratory (BNL). After irradiation the rats were shipped to UMBC and tested on a series of behavioral tests: novel object recognition, spatial recognition memory, elevated plus maze, and operant responding on an ascending fixed-ratio schedule. Cognitive performance on the behavioral tasks was variably disrupted in the experiments using rats exposed to 1000 MeV/n protons at the NSRL. The final study in the series compared the effects of different particle energies (1000 MeV/n and 150 MeV/n) on cognitive performance. Although the results of this experiment were not consistent with previous findings, there were no differences in performance as function of proton particle energy. As such, the possible risk of a performance deficit resulting from exposure to protons cannot be reliably estimated.

Acknowledgements: NASA Grants NNJ06HD93G, NNX08AM66G, NNX13AB73G.

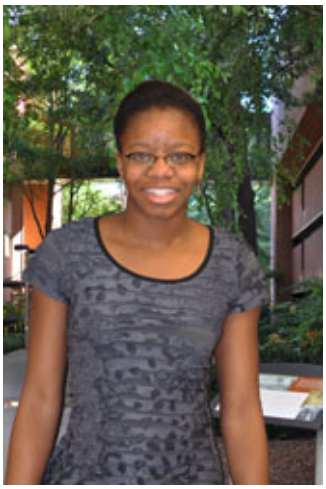
Mary Hester
Dance and Interdisciplinary Studies
"Arts Advocacy: How to Inspire Policy Change by Measuring and Communicating the Benefits of Arts Education"
Faculty Mentor: Carolyn Forestiere

While the Arts are formally recognized as a core learning subject, they do not receive the same support in the education system as other academic subjects, and inequitable access to Arts programs across the country is a significant issue. Research suggests that there is a correlation between children who participate in the Arts and academic performance, development of confidence, creativity in problem solving, and motivation, as well as many other variables. This multifaceted research aims to build upon the existing literature through primary and secondary analysis and investigation of the current state of Arts Education programs in the country. This past summer, I volunteered to teach dance lessons to a group of 22 children enrolled in the Easton YMCA and Elementary School Summer Learning Program. I observed changes in the students' behavior, motivation, and happiness and integrated this information with examples in the literature and research on current Arts initiatives, policies, and programs. The results of this study bring to light the importance of Arts Education and the potential benefits of learning in the Arts.

Emily Hinz
Music
"The Kincaid Legacy"
Faculty Mentor: Lisa Cella
Expected Graduation Date: Spring 2016

Historically, the primary school of flute playing throughout the world was the French School, founded at the Paris Conservatory by Professor Paul Taffanel in the late nineteenth century. The first to break from this prominent school was the American flutist, William Kincaid. Kincaid's influence rapidly spread throughout the United States through his students, who, at one point, held almost all the principal flute positions in the prominent orchestras in America. His revolutionary style evolved into the American school flute tradition and earned him the title of the father of American flute playing. The goal of this research is to investigate the role of William Kincaid in the establishment of the American flute school in the twentieth century and his impact upon today's finest flute instructors through his teaching methods. My approach to understanding Kincaid's influence principally entails experiencing, observing, and interviewing professional flutists who have studied with Kincaid's students. Since Julius Baker is the most highly distinguished student of Kincaid, I plan to interview and study with a number of Baker's students to learn what aspects of their flute training can be traced to Kincaid, acquiring knowledge passed down to them through this rich oral tradition. I will study Kincaid's musical perspectives by reading and dissecting the prevalent analysis of his playing, Kincaidiana, and his books, Art and Practice of Modern Flute Technique and The Advanced Flutist. The culmination of my research will be a written essay analyzing my findings about the extent of Kincaid's influence in the American school of flute playing as displayed through prominent Baker students. Additionally, I will give a presentation of my findings to the flute studio at UMBC, providing all the students with a booklet summarizing my results and outlining the history of the American flute school. This research will provide a detailed analysis of his musical contributions to American flute school and how this is displayed in the teaching of today's finest flutists, a necessary resource for any flutist entering the education field.


Dalton Hughes,
Hollie Adejumo,
Madison Bondoc, and
Chris Mullen
Chemical Engineering
"Development of a Low-Tech Process for Treating Bacterial Contaminants in an Unprotected Spring in Isongo, Kenya"
Faculty Mentors: Lee Blaney
Expected Graduation Date: Spring 2014

Approximately 760 million people do not have access to clean drinking water; a disproportionate amount of those people are located in Sub-Sahara Africa. High chemical and bacterial contaminant levels in drinking water may cause a myriad of health complications. The small community of Isongo, Kenya lacks clean drinking water for its 500 residents. The residents currently retrieve water from an unprotected spring located roughly 20 minutes away. In January 2013, the UMBC Chapter of Engineers Without Borders (EWB-UMBC) travelled to Isongo to assess the current water quality and interview community members that use this water source. Results from the water quality tests reveal high levels of nitrogen and phosphorus. The stream is also contaminated with high levels of indicator organisms and tested positive for fecal and rapid coliforms. Interviews indicated that most children suffer from dysentery and a high prevalence of other waterborne diseases. Residents also expressed an interest in receiving information on topics of sanitation and hygiene. We are currently developing an inexpensive and low-tech method for the removal of these contaminants from the water source. The results of these studies will result in a treatment system that will help to improve the overall health of the Isongo population.

Aymen Hussein
Biological Sciences
“A Comparison of Songs in the Critically Endangered Florida Grasshopper Sparrow (Ammodramus savannarum floridanus) and the Eastern Grasshopper Sparrow (A.s. pratensis)”
Faculty Mentor: Bernard Lohr
Expected Graduation Date: Spring 2014

The Florida subspecies of the Grasshopper Sparrow is the most critically endangered of the subspecies in North America. There is a need to be able to discriminate birds of the morphologically similar Florida and eastern subspecies residing in the same habitat until early May. In the past two years, our laboratory has investigated whether these subspecies might be distinguishable based on song. Male grasshopper sparrows sing two distinct types of song: the buzz, and the warble. Buzz song consists of four short notes followed by a longer, rapidly amplitude modulated (“RAM”) sequence, in turn followed by a final note. We measured the frequency and duration of several components of the buzz song, as the principal advertisement song. We compared these measurements across other North American subspecies. We found significant subspecies-level variation as well as population-level variation within the Florida subspecies songs, suggesting that acoustic characters may be useful in distinguishing among populations as well as subspecies. Our current focus is to investigate further differences in song by including additional recordings from other populations. Additionally, the warble songs will be assessed qualitatively through spectrogram sorting by population and/or subspecies. This analysis will provide better insights into our current understanding of the Grasshopper Sparrow vocalization, and enhance our ability to distinguish subspecies based on song.

Hannah Jones
History
"Profit and Philanthropy: Baltimore through the Eyes of Joseph Townsend"
Faculty Mentor: Marjoleine Kars
Expected Graduation Date: Spring 2015

My research will study the relationship between public philanthropy and private financial success in early national Baltimore, as manifested in the particular case of Joseph Townsend (1756-1841), a prominent Quaker businessman. From his arrival in the city in 1783 until his death in 1841, Townsend was involved in several business endeavors, such as the foundation and management of the Baltimore Equitable Society (the city’s oldest insurance

company). At the same time, he was involved in various charitable, philanthropic, and municipal institutions, such as the Board of Special Commissioners (who laid out and maintained the city's roads and bridges), the Maryland Society for Promoting the Abolition of Slavery (the oldest anti-slavery society in Maryland), and the Board of Health (which dealt with the devastating yellow fever epidemics of 1794, 1797, and 1800). I intend to study Townsend's life as a way of examining how civic service coexisted with, facilitated, or was supported by financial enterprise in the particularly dynamic and ever-changing landscape of early Baltimore. The study of men such as Joseph Townsend is crucial to understanding the nature of early Baltimore society, as men such as he had their hands in nearly every corner of Baltimorean life; yet, such study must combine recognition of their truly history-making contributions with a willingness to consider the possibility of the self-serving motives behind them. By conducting my research, I hope to produce a more scholarly, more in-depth, and likely more gritty and critical study of early Baltimore and the men who helped create it.

Ki Jung
Biological Sciences
"Song Type Patterning and Song Output in Grasshopper Sparrows (Ammodramus Savannarum)"
Faculty Mentor: Bernard Lohr
Expected Graduation Date: Spring 2014

Grasshopper Sparrows (Ammodramus savannarum) produce two classes of song; buzz song, and warble song. We have found differences in patterns of song type use, as well as overall song output in Grasshopper Sparrows throughout the breeding cycle. This result suggests that song feature might be available for females to use in selecting either pair mates or extra-pair mates. Long-term autonomous recording units (ARUs) will be deployed in order to record the songs of males in a restored population at the Chester River Field Research Station during the summer of 2013. Digitized sound files will be analyzed using the Syrinx sound analysis software and mapped onto specific periods of the female breeding cycle (egg-laying phase, hatching, etc.). We predict that differences found previously in song feature will be in sync with different phases of female breeding cycle. The result of this research will provide a better understanding of the process and traits that affect the sexual selection of Grasshopper Sparrows.

Caroline Jurney
Theatre
“Marketing for a Younger Audience in Live Theatre”
Faculty Mentor: Susan McCully
Expected Graduation Date: Fall 2014

In order for live theatre to survive as an art form, we need to diversify our audiences, specifically by focusing on the group that patronizes theatre the least - people ages18-30. I plan to test the effectiveness of certain marketing techniques on attracting this age group to live theatre. My basic tenants in choosing or creating specific marketing techniques to test will be to share much more content, to have the content created by people in the targeted age range, and to place the content where people 18-30 years of age will likely encounter it. I will implement these marketing techniques halfway through the first show’s run in the 2013-2014 theatrical season at Fells Point Corner Theatre, and test their effectiveness through audience surveys. At the end of the season, I will present Fells Point Corner Theatre with a report of all of my results, as well as a new proposed marketing plan for their future seasons, based on my findings.

Sam Kott
Psychology
"Self-Partner Agreement for Disengaged and Engaged Behavior During Couples’ Communication”
Faculty Mentor: Robin Barry
Expected Graduation Date: Spring 2014

Research has shown that disengaged and avoidant behavior between romantic partners can have a negative effect on the quality of couples’ communication and, in turn, the relationship as a whole (Bowman, 1990; Smith, Vivian & O’Leary, 1990). Despite the critical role of disengaged behavior in romantic relationships little, if any, research has been conducted to assess agreement between romantic partners and outside observers regarding each partner’s level of disengagement. Studies of disengagement that include outside observers are needed because previous research suggests that romantic partners often have biased perceptions of each other (e.g., Jacobson & Moore, 1981); if partners are misinterpreting one another’s behavior, it will be much harder for couple therapists to effectively treat couples. The present study will examine the extent to which individuals, their romantic partner, and outside observers agree about each partner’s level of disengagement during a specific instance of conflict communication. This research will advance the understanding of how couples experience disengaged behavior during conflict communication and may inform couple therapists’ efforts to improve couples’ communication.

Sekar Kulandaivel
Computer Engineering
"Alternative Control Paradigms for Remote-Controlled Helicopters"
Faculty Mentor: John Park
Expected Graduation Date: Spring 2016

Safety and stability in flying helicopters has been a major concern for the aeronautics industry since pilots demand for a vehicle that can perform advanced maneuvers, such as flips and sharp turns. In order to maximize the stability of the helicopter, its computer system must utilize data input, such as altitude, tilt, and speed, to determine the power and direction of its main and tail rotors. By combining the power controls and sensors inputs from an Arduino microcontroller with the input analysis capability of a Raspberry Pi Linux box, a "smart" model helicopter would be able to perform more advanced maneuvers without much effort from the pilot. The use of an Arduino microcontroller will allow the Raspberry Pi to obtain input from gyroscopes and accelerometers and compute the proper power and direction for the rotors. Since the amount of data that the Arduino receives from its sensors will be too great for the Arduino to process, the Raspberry Pi will handle the data analysis with its SDRAM capacity of 512 MB. The focus of the project will be reducing the amount of effort needed by the pilot to maneuver the helicopter while increasing the stability of the helicopter during its flight. By developing a "smart" helicopter that will maximize stability during turns, flips, and other maneuvers, a similar system may be useful in large-scale helicopters for military and civilian use and would be a great advancement into the next generation of helicopter safety.

Robbin Lee
Media and Communications
"A New Direction for Chinese Society: Chinese Millennial Engagement with Art and Social Media"
Faculty Mentor: Fan Yang
Expected Graduation Date: Fall 2013

For the Post-1980s generation of Chinese youth Cultural Revolution is no longer part of their personal historical memory, whereas, for previous generations of Chinese of the post 1945 era, the Cultural Revolution was a defining moment. The Chinese Millennials, as they are referred to in the media, those who are currently between the ages of 18 and 30, struggle with finding their identity while feeling separated from the historical trajectory of the Chinese people. This generation must contend other societal demands as well, most notably, China's One-Child Policy, which has shaped a very isolated, pressured, and introspective environment for young individuals. I wish to gain insight on how urban young adults in China today engage in various forms of personal and artistic expression to reflect on their unique upbringing in a rapidly changing and globalizing society. I plan to travel to China to study

the Chinese Millennials' engagement with artistic practices [and social media] with the intention of developing an understanding of the stimulus behind the artistic energy of a social group who is considered the product and agent of social change. By engaging with young Chinese peers on a local level and then adding to my preliminary study of Contemporary Chinese art by interviewing up-incoming artists and experiencing their artwork first-hand, I will be able to generate a socio-historical analysis of their creative practices and place them within the context of a globalizing world atmosphere.

Behnam Majd
Biological Sciences
"Influence of Bur Treatment on the Fatigue Strength of Dentin"
Faculty Mentor: Dwayne Arola
Expected Graduation Date: Spring 2015

Oral health is one of the most expensive health care services in the United States. Every year many patients suffer tooth fractures because of dentist procedures that require cutting of the tooth structure. These procedures, such as the removal of caries and preparation for bridges, remove some section of tooth, however analyzing the damage to the healthy tissue of tooth is significantly important. Several studies have evaluated the instruments and material removal processes used in cavity preparations and no flaws were generally detected in dentin. However, a recent study has shown that cutting using carbide burs, a common method in clinical practices, can result in the introduction of flaws to the restored tissue and degrade its durability. An introduction of defects could diminish the structural integrity of the tissues, thereby reducing the durability of the restoration and increasing the likelihood of tooth fracture. The main purpose of this study is to evaluate the influence of commonly used burs for cutting cavity preparations on the mechanical behavior of coronal dentin, which is the major hard tissue of human teeth. This work will be a part of the research on the fatigue, fatigue resistance and fracture analysis of human dentin. The null hypothesis is that this method of cutting, reduce the strength of dentin evaluated by cyclic loading.

Oleg Makarevich
Biological Sciences
"An Analysis of the Function of L24 in the Ribosomal Complex"
Faculty Mentor: Lasse Lindahl
Expected Graduation Date: Spring 2015

Catalysis of protein formation is performed by rRNA. However, ribosomes also contain a number of proteins, and, for most of them, their exact function in the ribosomal complex is unknown. It is possible that they assist in the assembly of the ribosomal complex or that they help change the rRNA's conformation during

translation. I will approach this question by examining a non-essential ribosomal protein (L24). L24 deletion mutants can grow, but the lack of L24 has an effect on ribosome efficiency. The aim of this project is to grow cells without L24, then turn on the production of L24 (using a bacterial plasmid), and follow the synthesis of the protein, its incorporation into the ribosome, the effect it has on growth rate and/or ribosome sedimentation rate, and the change in translation accuracy.

Rajashree Mishra
Bioinformatics
" Extracting Interacting Orthologs from Literature"
Faculty Mentor: Maricel Kann
Expected Graduation Date: Spring 2014

Information about protein-protein interaction is essential to understand function within cells, pathways and relationship to diseases. Most interactions are not available in the databases. We hypothesize that protein interaction evidence conserved across species (interologs) can be used to uncover positive interactions. A novel methodology, LIGER, was developed to retrieve interologs from the literature. LIGER retrieved mouse interactions using the human orthologs to direct the extraction from literature. A set of human protein interactions built from the STRING database was used as a starting point (seed) to identify putative mouse interactions (target). We used HomoloGene to retrieve all mouse orthologs to human, to build a database of putative mouse protein-protein interactions. Our methodology performs a search for mouse interactions in PubMed defined by their orthology to human. LIGER retrieved 2846 unique mouse protein-protein interactions, 2103 were true positives after manual curation, corresponding to 21% of known mouse interactions. LIGER retrieved 1774 interactions missing in the protein interaction mouse database. The high precision reflects that interologs are more likely to be positive interactions than just any two genes co-occurring in the literature. We are currently implementing a version that uses multiple organisms as seed to increase the sensitivity of the method.

Fiona Moodie
Political Science
“Partisan Attitudes of the Latino Community”
Faculty Mentor: Carolyn Forestiere
Expected Graduation Date: Fall, 2013

The goal of this research is to understand the various driving factors behind the Latino community’s vote in Presidential elections. In 2012 Latinos voted overwhelmingly for the Democratic candidate – Barack Obama – even though their Catholic background of social conservative values align them

more strongly with Republican candidates. Does this demonstrate that the Democratic Party has been responsive to them or does it show that the economic interests of the Latino population outweigh their social and religious beliefs? It is believed that in order to better target this voting bloc, the Republican Party must work to modernize its approach, without moderating or compromising on its core principles. In order to answer the various questions surrounding this topic, focus groups will be preformed both within and outside of the state of Maryland, in person and via teleconference. By conducting these focus groups it is the hope of the researcher that the motivations behind the Latino community's support of Democratic candidates can be revealed. The research understands that the goal of the political process is not to simply win a voting bloc and pay lip-service to a community, but to actually provide that community with substantive solutions to the problems the face. It is the hope that by answering the questions presented here, that the Latino community can be better served by political parties, both Republican and Democrat, because the issues they face transcend party labels and stigmas.

Uchenna Okoro
Biochemistry
"Flexible Purine Inhibitors of the HIV-1 Nucleocapsid Protein NCp7"
Faculty Mentor: Katherine Seeley-Radtke
Expected Graduation Date: Fall 2014

One of the most common antiviral treatments today employs the use of nucleoside analogues. Nucleosides can act as enzyme inhibitors in viruses by competing with DNA or RNA for the active sites of important nucleic acid binding proteins. However, one of the most considerable obstacles these drugs must overcome is the development of resistance. Human immunodeficiency virus type 1 (HIV-1) is one of such viruses that has proven to be very resistant to therapeutic treatment because of its constant tendency to mutate. The HIV-1 nucleocapsid protein (NCp7) is a protein of interest because it has been shown to be an essential enzyme in numerous processes of viral replication. This makes NCp7 a less likely candidate for mutation and thus, an important target for therapeutic design. NMR spectroscopic studies have revealed the structures of complexes between NCp7 and nucleic acids, and shown the importance of specific guanosine nucleosides in the binding process. This project specifically aims to synthesize flexible nucleobase analogues that can inhibit viral replication by binding to the active site of NCp7 thus preventing it from binding DNA or RNA. Introducing flexibility into these nucleobases can increase their efficacy as therapeutic agents and against HIV-1, even in the event of mutation.

Tosin Oyeleke
Chemical Engineering
"Kinetic Space Modeling"
Faculty Mentor: Mariajose Castellanos
Expected Graduation Date: Fall 2013

The fungal pathogen Fusarium graminearum is the most common causal agent of Fusarium Head Blight, (FHB). This destructive disease affects wheat, barley and other small grains both in temperate and in semitropical areas. The disease has the capacity to destroy a potentially high-yielding crop within a few weeks of harvest. In the past decade, economic losses due to FHB for all crops in the Northern Great Plains and Central United States were estimated to be $2.7 million dollars. We believe it is of importance to understand the pathogenesis of F. graminearum by studying the components involved in the pathogenic procedure, i.e. pathogenic gene regulation, thereby preventing the invasion of this destructive fungus into crops. Over the past decade, there has been a push toward better understanding how to generate meaningful kinetic models in light of the gaps in enzymatic characterization. The aim is to fill in gaps by deriving unknown parameters based on the better understood pieces of the cellular system, and utilize sampling methods to generate potential model parameters. I will be applying kinetic space modeling, a mathematical modeling technique that have been developed by the Castellanos laboratory, to study F. graminearium and its specific pathways in relation to virulence.

John Papanikos
Biological Sciences
“Synthesis of a New Potential Inhibitor of the HCV Helicase”
Faculty Mentor: Paul Smith
Expected Graduation Date: Spring 2015
The hepatitis C virus affects approximately two percent of the population worldwide, with some countries such as Egypt showing as high as a 24 percent infection rate. Complications of HCV include cirrhosis of the liver, hepatocellular carcinoma, and fibrosis. While there are current therapies for HCV, a combination of ribavirin and interferon, they produce harsh side effects and are very expensive ($30,000-$40,000 US per person). 35 percent of patients receiving therapy discontinue treatment. New treatments for HCV are desperately needed and will tremendously benefit the millions of individuals infected worldwide who would otherwise go untreated. Dr. Smith’s lab has identified several compounds that inhibit replication of the hepatitis C virus (HCV) at low to sub-micromolar concentrations. Two of these compounds have been shown to specifically target the HCV helicase enzyme. The objective of the present research project is to synthesize a new chemical compound based on these lead structures that has the potential to show activity at nanomolar concentrations.

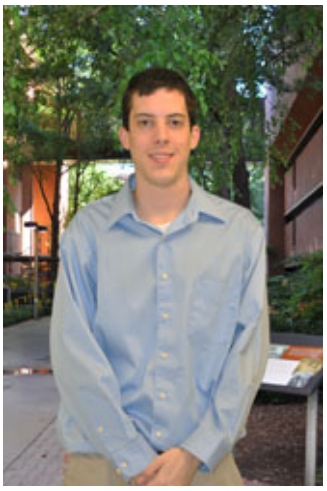
Talmo Pereira
Biochemistry
"Self-Consistency of Starting Motif in Sequence Scoring Motif Searching"
Faculty Mentor: Ivan Erill
Expected Graduation Date: Spring 2015

Transcriptional regulation is one of the primary methods through which organisms regulate protein synthesis. Transcription factors (TFs) carry out this regulation by binding to DNA, thereby enhancing (activators) or blocking (repressors) binding of RNA polymerase to gene promoter regions. DNA-binding proteins may bind to DNA nonspecifically or in a sequence and position-specific manner, but all transcription factors are unique in that they bind to a wide variety of specific sequences, collectively known as a binding motif. Computational methods allow us to calculate the probability distribution for TF binding over the entire genome of an organism. By utilizing different sequence scoring methods and biophysical models of binding, we extend this technique in order to assess the "self-consistency" of a binding motif. Starting with experimentally determined TF binding sites, we compute the binding probability distribution for the TF, and use this distribution to derive a new motif. We then iterate this expectation maximization process until convergence. Our results reveal that most TF-binding motifs are, to some degree, self-consistent. This finding provides a novel tool for analyzing TF-binding motifs, and a natural means for defining the essential components of a TF regulatory network, bringing us closer to understanding their roles in cellular decision-making.

Timothy Pillsbury
Physics and Mathematics
"Quasi-Phase Matching for Enhanced Terahertz Generation"
Faculty Mentor: Dr. L. Michael Hayden
Expected Graduation Date: Spring 2014

A current, popular method for creating terahertz (THz) frequency light uses difference frequency generation (DFG) to mix the broad band of frequencies that exist within an ultra-short pulse (~ 10-15 sec) of longer wavelength (infrared) light, in a non-linear optical material. Thin films of electro-optic (EO) polymers, an important class of non-linear optical materials, have been shown to be efficient emitters of THz radiation. However, thicker versions of these polymers are needed to generate enough THz light for most applications. Unfortunately, when thicker materials are used, the different indices of refraction between the input infrared light wave and the emitted THz light wave, cause a phase mismatch between THz light generated at one spot in the polymer and THz light generated at a spot in the polymer after the input and THz waves have propagated to the second spot. This

phase mismatch causes an interference in the emitted THz waves resulting in an oscillation of the emitted THz amplitude and a limiting of the maximum emitted amplitude. It has been theoretically shown in the literature that inserting an inert layer of material with different indices of refraction between each of the THz generating layers can erase the phase mismatch, allowing more THz light to be created. The goal of this research is to create and analyze a layered system as described using EO polymers as the nonlinear optical material. Ultimately, this system should allow for more efficient creation of THz frequency light for applications in sensing, communications, and imaging.



Bradley Potteiger
Computer Engineering
"Underwater Node Localization Scheme"
Faculty Mentor: Mohamed Younis
Expected Graduation Date: Spring 2014

Traditional underwater localization relies on line-of-sight (LOS) links to properly utilize ranging information. Unfortunately, the accuracy of the ranging techniques such as time of arrival (TOA), time difference of arrival (TDOA) and angle of arrival (AOA) can be significantly degraded by LOS instabilities in the underwater medium due to increased multipath effects. This project proposes a novel underwater signal reflection-enabled acoustic-based localization scheme (UNREAL) that employs both LOS and surface-reflected non-line-of-sight (NLOS) ranging information to locate a node that has drifted away. The LOS and NLOS links are classified by incorporating a surface-based recovery mechanism, which recovers the channel impulse response information through homomorphic deconvolution. A closed-form least square method is developed to use such classification to locate the node by either using the LOS AOA measurements or the NLOS AOA from the estimated water surface reflection point. Every node in the network can be used as a reference point to locate the lost node when LOS AOAs are available. The AOAs are a collection of elevation and azimuth angles for each reference nodes in the 3D underwater environment. Simulation results are carried out by using a 3D camera to measure the water surface in a controlled tank, the measured water surface was then used in a simulated environment to validate the approach.

Alec Pulianas
Computer Engineering
"A Low Power FPGA Hardware Implementation of a Tongue Computer Interface System"
Faculty Mentor: Tinoosh Mohsenin
Expected Graduation Date: Spring 2014

Dr. Mohsenin's Energy Efficient High Performance Computing (EEHPC) Lab focuses on the design and implementation of specialized high-speed, high performance, and energy-efficient digital systems. Personal health care systems can offer a cost effective solution for human healthcare. Progress towards implementing efficient biomedical and smart health care devices has potential for far-reaching impact in a wide range of areas including reducing sudden death and healthcare cost. Assistive technologies (AT) are intended to enhance the independence of individuals with disabilities. Most ATs for people with physical disabilities try to focus on utilizing any remaining abilities of their users in the most efficient way to help them with activities of daily living. Dr. Mohsenin has already initiated a collaboration with GeorgiaTech University who have a similar working wireless tongue assistive device but with very high power consumption. The goal for my FPGA hardware implementation is to replace their high power microcontroller-based circuit with a FPGA. I am going to first implement the machine learning algorithms used in the application in MATLAB, then I will use the results from patients to train the machine learning algorithm. I will implement the algorithm on a FPGA and test on the board.

Valerie Quackenbush
INDS
"From Khatami to Ahmadinejad: Iran's Foreign Policy"
Faculty Mentor: Meredith Oyen
Expected Graduation Date: Fall 2013

An understanding of the political and cultural dynamics of Iran since its 1979 revolution is essential to understanding the dynamics of the contemporary Middle East. To better grasp how Iran interacts with the outside world, one must work to understand the history, culture and politics of this unique country evolved out of the ancient culture and a broad sweeping empire. In my research paper, I will seek to understand Iran's foreign relations posturing by looking to the internal, state to society dynamics to explain the external, state-to-state dynamics. I will use a historical sociological method that takes into account such domestic factors as nationalism, religious fundamentalism, the foreign policy ramifications of "post-client" identity, and the importance of legitimation as a major preoccupation of states in regards to balancing domestic and foreign policy positions. Analysis of Iranian foreign policy and its dynamics will focus on two successive presidents of the Islamic Republic -- the reformist President Khatami (1997-2005) as compared to the

more conservative and most recent president, Mahmoud Ahmadinejad (2005-2013). The paper will explore how historical-sociological themes play out in Iranian foreign relations. It will seek to understand continuities and discontinuities in presidential foreign policy-making in Iran through this approach. Data will be generated from textual analysis of major speeches given by each president during his term. This paper will seek to answer the question, are key societal-level sources of foreign policy, present in a mix unique to Iran (i.e. Shi'ite Islam and Persian, nationalism), driving Iranian foreign policy? Are they identifiable in the foreign policies of two very different, successive leaders? The paper will then draw conclusions for what this means for US-Iranian relations in the future.

Rosalind Ramsey
Chemical Engineering
"The Effects of pH on Atmospheric Reactions"
Faculty Mentor: Christopher Hennigan
Expected Graduation Date: Spring 2015

When reactive organic emissions (Volatile Organic Compounds, VOCs) enter the atmosphere they can become oxidized and form particulate matter (aerosols). These particles are water-soluble and will exist in the aerosol aqueous phase if water is present. Something is causing these water-soluble particles to react and stay in the aqueous phase in the atmosphere. This effect causes more gas to change to the aqueous state thus feeding the reaction further. No one really knows why this effect is happening; currently there is a debate as to whether or not pH has an effect on organic reactions within particles. This project will test to see whether or not pH catalyses this reaction. Tests in laboratory conditions prove that pH does have an effect on these reactions, yet when tests are done in the atmosphere the results obtained point to the contrary. This research has to do with chemical reactions in the atmosphere that affect human health. This project will try to determine whether or not there is a connection between pH and aerosol reactions within particles. By using a thermodynamic equilibrium modelling approach that has not been used previously, I will be analysing data obtained from the atmosphere and drawing conclusions from it to determine whether or not pH causes this phenomenon.

David Rivas
Physics
"Determining the Multiwavelength Emission from Extragalactic Relativistic Jets in the Early Stages of the Universe"
Faculty Mentor: Markos Georganopoulos
Expected Graduation Date: Spring 2014

The goal of this research is to calculate the multiwavelength, radio to Gamma-ray, emission of relativistic jets emanating from the supermassive black holes found at the center of active galaxies

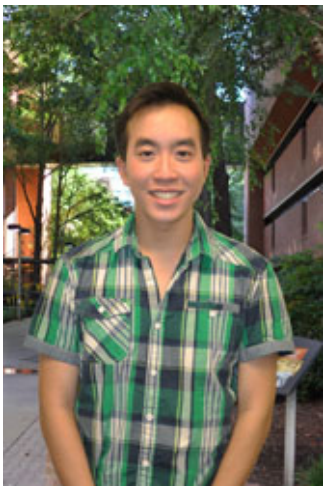
(quasars), at the early stages of the Universe. According to recent X-ray observations of nearby large scale extragalactic radio jets (lengths of up to a hundred times the size of the host galaxy), the speed of the flow of these jets is relativistic, reaching more than 99 percent the speed of light. Recent theoretical work by the group of Dr. Georganopoulos shows that such jets in the early stages of our Universe decelerate due to their interaction with the, previously much denser, cosmic microwave background radiation. To understand the physical conditions of these jets, it is necessary to determine the muliwavelength radiation such decelerating jets produce. The focus of this research is to calculate, both analytically and numerically, the emission anticipated from the relevant radiation processes of these jets such as synchrotron and inverse-Compton emission. This will provide the tools for a comparison of the calculated to the observed spectra and will help us obtain a greater understanding of the physical conditions in these jets.

Nicholas Rogers
Chemical Engineering
"Production and Characterization of Aspergillus nidulans Mutants for Increased Protein Secretion"
Faculty Mentor: Dr. Mark Marten
Expected Graduation Date: Spring 2015

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's 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, I will identify mutant fungal strains that produce and secrete protein at high levels. We hypothesize a relationship between abhorrent morphology (i.e., highly-branched) and increased protein secretion. To test this hypothesis, highly branched, Temperature-sensitive (Ts) mutants of the model fungus Aspergillus nidulans will be generated and screened for increased amylase and protease secretion. These will be quantified by plating mutants on agar containing either starch or protein. Large, clear halos surrounding fungal colonies will represent increased secretion of amylase or protease, which have hydrolysed the starch or protein in the agar. The immediate goal of this project is to generate a library of 500 secretion mutants. A subset of these will eventually be sequenced to better understand the genomic causes for the resultant high secretion phenotype.

Sebastian Snowberger
Chemical Engineering
"Wastewater Treatment of Fluoroquinolene Antibiotics Using UV-Based Processes"
Faculty Mentor: Lee Blaney
Expected Graduation Date: Spring, 2014

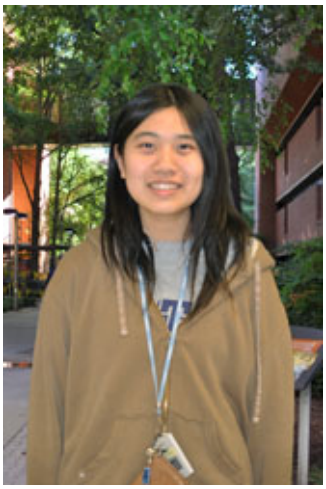
With recent advancements in medicine, consumption of pharmaceuticals is steadily increasing and unprecedented amounts of pharmaceuticals are entering wastewater streams. Currently, wastewater treatment plants do not specifically treat for pharmaceuticals, and concentrations of pharmaceuticals are discharged to the environment and drinking water supplies. Health concerns of ingestion of pharmaceuticals through drinking water are widespread, and numerous studies have identified ecological impacts associated with pharmaceutical contamination. Fluoroquinolone (FQ) antibiotics are among the most frequently detected classes of pharmaceuticals in wastewater and surface water. As more wastewater treatment plants implement ultraviolet (UV)-based disinfection processes, we posit that there is potential for transformation of FQs into benign derivative compounds. To test this hypothesis, we will study the transformation of fluoroquinolone-class pharmaceuticals under UV irradiation and the UV-hydrogen peroxide (UV-H2O2) advanced oxidation process. For direct photolysis (UV only) testing, experimental solutions will be prepared by spiking FQs into buffered deionized water with varying concentration of tertiary effluent (partially treated wastewater); hydrogen peroxide will be added during UV-H2O2 testing. Fluoroquinolone concentrations will be measured using high performance liquid chromatography. Current analysis of the results from both methods, varying pH and concentration tertiary effluent, showed a superior transformation rate using UV-H2O2, which demonstrates the effectiveness of the process for water and wastewater treatment of pharmaceutical contaminants. We hope that continuing this research using different compounds will continue to show these trends.



Thanhlong Tran
Biological Sciences
"Life Span and the Influence of Diet on the Effects of Genes in Drosophila Melanogaster"
Faculty Mentor: Jeff Leips
Expected Graduation Date: Fall 2014

In natural populations, the average life span varies a great deal among individuals. This variation results from genetic differences among individuals as well as the environments that they are exposed to. While studies using artificially induced mutations have identified many genes affecting life span, the genes that are responsible for producing variation in life span in natural populations are largely unknown. There is also an incomplete understanding of how

specific environmental influences (e.g., diet) combine with the genetics of individuals to affect life span. The specific purpose of this research is to use the fruit fly, Drosophila melanogaster, to identify genes contributing to natural variation in life span. Specifically, I will validate the effects of candidate genes on life span and the influence of diet on the effects of these genes on life span that were identified as contributing to natural genetic variation in life span (Durham and Leips in prep) and resting metabolic rate (De Luca and Leips in prep) in genome wide association studies. Polymorphisms affecting these traits were primarily in non-coding regions (5' upstream region, introns or 3'UTR), suggesting that the genetic effects of these polymorphisms may be due to their influence on the expression of these genes. These studies also provide evidence that the effects of these genes on life span are modified when the flies are reared on different levels of yeast in the diet (the primary source of protein).



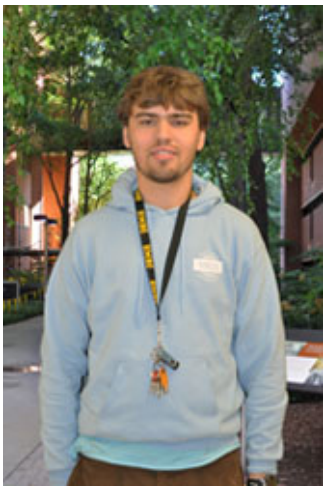
Phoebe Tsoi
Biochemistry
"New Dendritic System for the Delivery of Chemotherapeutic Agents"
Faculty Mentor: Marie-Christine Daniel
Expected Graduation Date: Spring 2015

Ideal drug treatment combines accurate targeting with high efficiency. While chemotherapy has been used to treat cancer, the treatment is far from ideal. Many healthy cells are affected by the chemotherapeutic agent, leading to severe side effects. These side effects limit the dosage of treatment that can be given to the patients. The amount of drug that reaches the tumour site is further decreased when the body quickly clears the foreign substances from its system. Drug delivery systems, in particular nanocarriers, offer advantages which make them ideal candidates for optimizing chemotherapy. The main objective of this project is the design, construction and evaluation of new dendritic drug delivery systems for pancreatic cancer chemotherapy; these systems will afford higher payloads of chemotherapeutic drugs.

Kathy Vu
Psychology
"Chinese Immigrant and European American Mothers' Parenting Beliefs and Styles: A Cultural Understanding of Parental Control"
Faculty Mentor: Charissa Cheah
Expected Graduation Date: Spring 2014

Individuals of Chinese descent compose the largest Asian group in the U.S. However, there has been relatively little research focusing on immigrant Chinese parents of young children, particularly with regard to these children's social and emotional development and the factors that contribute to it. This study will provide greater

understanding of parenting among Chinese immigrants and European American families using a mix-method approach. Specifically, this study aims to: (1) compare immigrant Chinese and European-American mothers' conceptualizations of the ways in which they engage in control through interviews; (2) compare Chinese and European-American mothers' reported engagement in authoritarian and authoritative parenting styles; (3) examine the associations between mothers' conceptualization of their methods of control and their levels of authoritative and authoritarian parenting styles between the two groups; and (4) examine the relations between mothers' cultural values and their parenting conceptualizations of control and parenting styles across the two groups. The findings from this study will reveal how we can support effective parenting and optimize the positive development of children of immigrant families residing in a bi-cultural environment.



Paul Weisko
Political Science, History
"Russian Civil War Propaganda Posters and their Effects on Cold War and Post-Cold War History"
Faculty Mentor: Kate Brown
Expected Graduation Date: Spring 2014

The purpose of my project is to trace the ideas espoused by Red and White Russian Civil War leaders in their memoirs and political tracts to White and Red Russian Civil War propaganda posters. I am interested in seeing how the ideas of xenophobia and anti-Communism, which are two of the two main ideologies of the twentieth century, crystallized during the Russian Civil War. To do this, this project will use the writings of important leaders on both s ides of the Russian Civil War in an attempt to measure how consistent the propaganda posters from both sides are with the writings of each sides respective leaders.

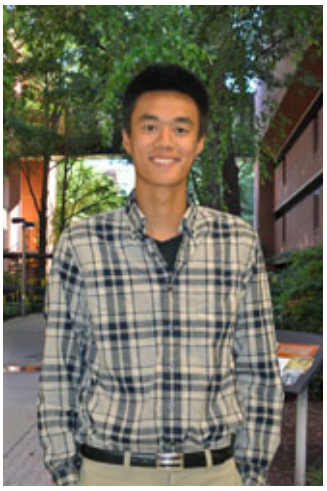
Charles White
Biological Sciences
"Determining Song Output in Song Birds"
Faculty Mentor: Bernard Lohr
Expected Graduation Date: Spring 2014

In territorial songbirds, such as grasshopper sparrows, a number of song characteristics may be subject to sexual selection. In preparation for conducting tests to study song choice in this context, we will use a software algorithm we designed for performing choice tests with female birds using a modified operant conditioning chamber and procedure. The circuits we designed facilitate operant conditioning of the subject by providing auditory "rewards" for the subject after a selection. Once the subject is trained to respond in the operant chamber, choice testing can commence. The choice test circuit

measures the type and number of selections made to activate the playback of specific songs, and uses these results to determine song preference. The initial choice test will focus on how the song output of male grasshopper sparrows is selected for by the female grasshopper sparrows. By using song rate as a laboratory proxy for song output, I will measure female preference for varying song outputs; a higher song rate will serve as a proxy for higher song output while a lower song rate will serve as a proxy for lower song output.

Jennie Williams
American Studies
"A Regular Gig: Understanding the Benefits of Open Mic Performance"
Faculty Mentor: Michelle Stefano
Expected Graduation: Spring 2014

The voluntary actions and collaborations of a community contribute to the definition of its culture, particularly in a folk music setting. A musical open mic is known as a scheduled weekly activity at a nightspot where musicians or bands walk in, sign up, and play without a formal booking. Through my research, I seek to understand what the benefits are of producing and participating regularly in open mic events. I will conduct participant observation at a sampling of open mic events in the Baltimore area in order to identify the two sites where further in-depth research will be undertaken. I will then distribute a survey at my chosen sites to potential respondents, who include business owners, emcees and musicians. In general, the survey seeks to determine the frequency respondents attend the open mic nights, and for how long they have been participating. For business owners, the survey would reflect on more about the economic benefits of hosting an open mic night. I will then conduct in-depth, semi-structured interviews with informants from each site to compare and analyze their personal experiences and their individually insightful responses. These quantitative and qualitative approaches provide a wide range of data with which to gain a deeper understanding of why people habitually participate in open mic nights and how the events are beneficial to a community.



Kevin Zhang
Computer Engineering
Faculty Mentor: Fow-Sen Choa
Expected Graduation: Spring 2015

It has been recently discovered that mature cells have the ability to be reprogrammed to become pluripotent. With this discovery, neuron cells are potentially much more obtainable as mature cells can be converted to induced pluripotent stem (iPS) cells followed by further differentiation to turn them into neuron cells. When studying the firing signals of neuron cells, the electrode picked signal level is at a microvolt range, which is below ambient noise level. By developing a multi-electrode measurement system with impedance matched multi-channel signal amplification capability, the very weak electrical signals generated from firing signals of networked neuron cells picked up by NxN electrodes can be enhanced. This will be done by Interfacing a 64 indium-tin-oxide electrode glass plate with impedance matched 64-channel amplifier-and-A-to-D system. A Faraday Cage and electronic filters will be used in order to maximize the signal while reducing the noises and to achieve the best signal-to-noise ratio (SNR). By using cultured mouse neurons, we can will be able to measure and test the firing signals of these neuron cells. We hope to be able to interface current and voltage amplifiers with an array of electrodes, and also to identify electrical noises and develop methods to reduce them.