2011-2012
Undergraduate Research Award
Scholars and Abstracts

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William Johnson, Ancient Studies Major, Modern Language, Linguistics, and Intercultural Communications minor

Sheriff Jolaoso, Computer Engineering

Jacob Keener, Political Science

Hamed Kharazi, Political Science

Paige Khoury, Dance

Morgan Madeira, Computer Science and Mathematics

Asif Majid, Interdisciplinary Studies

Charles Mason III, Graphic Design and Philosophy

Jamie Nguyen, Biochemistry and Molecular Biology

Ugonna Ohiri, Computer Engineering

Chikezie Okoro, Chemistry

Catherine Pasqualoni, Ancient Studies

Linh Pham, Computer Engineering

Jessie Poole, Theatre

Mercedes Randall, Psychology

Matthew Rapp, Biochemistry and Molecular Biology

Eric Reitz, Political Science

Reema Sharma, Biochemistry and Molecular Biology

Jinal Sheth, Biological Sciences

Hannah Skolnick, Graphic Design

David Sweigart, Physics and Mathematics

Robby Tietz, Chemical Engineering

Kevin Truitt, Dance

Ajay Vaghasia, Biochemistry and Molecular Biology; Biological Sciences

Laura Meg Viar, Psychology

Sharon Wall, Physics

Ryan Wentworth, Financial Economics

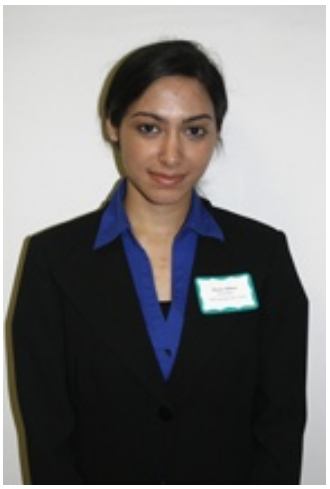
Isleen Wride, Biochemistry

Chris Yankaskas, Chemical Engineering

Brandon Young, Biological Sciences

Rachel Younghans, Geography and Environmental Systems

Weipeng Zhuo, Chemical Engineering



Aleeza Abbasi
Biological Sciences
"Genetic Analysis of Translational Accuracy Using the LacZ Reporter System in HeLa Cells"
Faculty Mentor: Dr. Philip J. Farabaugh
Expected Graduation Date: Spring 2012

The central dogma of molecular biology states that DNA is transcribed into RNA, which is then translated into protein. Transfer RNA (tRNA), a small RNA molecule, is responsible for decoding the RNA during translation to link together units called amino acids to make proteins. However, tRNAs can erroneously interpret the RNA transcript, a process called misreading, which is our laboratory's main interest. In order to study misreading, an enzyme-based reporter system has been used to measure misreading rates. In this positive-reporter system, the lacZ gene encoding the enzyme beta-galactosidase in E. coli was mutated to produce an enzyme lacking significant activity. Misreading of the mutant gene can restore activity at the rate of 10-3 to 10-4 in bacteria. The rate of misreading is measured as a function of the ratio of the mutant enzyme activity to wild-type activity. This research seeks to determine the error rate in human cells using the same reporter system. We propose to insert the lacZ gene from bacterial plasmids into plasmids that can be used in HeLa cells, which are cells of the first continuously cultured strain from human cervical carcinoma. A similar method of misreading analysis will be applied to the human cells' beta-galactosidase activity in order to understand errors in cell machinery during the process of protein production.

Jessica Ruth Baker
Theatre
"Designing and Performing a Solo Show"
Mentor: Ms. Lynn Watson
Expected Graduation Date: Spring 2012

Within the last half-century, well-known actresses such as Anna Devere Smith and Lily Tomlin pioneered the genre of the one-woman show. However, it is still uncommon for actors to ever undertake such a show, and these plays have taken the backseat to more elaborate and populous productions. To understand this world of solo shows, I will design and perform a previously published one-woman show. In producing this show, I will showcase the skills and talents that I have learned in the Department of Theatre in both my acting work and my set and costume design. Additionally, I want to explore the challenge of performing a solo show and understand the difference between that and working with a group. A historical aspect I want to research as well is the history of the one-woman show, and the reason that it has risen in the theatrical realm as a form of performance in the last twenty years.

Nayaba Bawa
Political Science
"Investigating Human Rights Abuses of Children: Comparing the Records of Democratic and Non- Democratic States"
Faculty Mentor: Dr. Cynthia Hody
Expected Graduation Date: Spring 2012

Child labor is one of the many international problems which have deprived countless children in Africa the rights to education, freedom, and childhood. Understanding the phenomenon of child labor sheds light on the impact of globalization in Africa. This research focuses on political questions about the phenomenon of child labor. Specifically, do democracies have more stringent child labor policies than authoritarian regimes? By comparing non-democratic countries and democratic countries in Africa this research aims to ascertain whether regime types matter when it comes to child labor practices. This research is important because often it is assumed that by virtue of being a "democracy" civil liberties regarding children are automatically respected. My research will determine whether this is the case or not. In addition, my research will consider potential influences of child labor practices, such as, the presence of multinational corporations, the role of foreign direct investment, and the elite perceptions of national interests.

"Macy" Mysoon Bokhari
Political Science and International Affairs
"Liberalization Reform of February 2011's Effects on the Saudi Arabian Regime"
Faculty Mentor: Dr. Carolyn Forestiere
Expected Graduation Date: Spring 2012

Recent uprisings in several countries in the Middle East, such as Tunisia, Egypt, Libya, and Syria, have significantly changed the face of politics in these countries. But are these outcomes predestined in a increasingly democratized and liberalized world? To answer this question, this research will assess the recent economic and social liberalization program initiated by the Saudi Arabian government in February 2011 and how such programs possibly placate popular demands for change. To do this, I will first conduct a media-based analysis to track public uprisings in the period after the program was passed. The second phase of this research will be interviews conducted with women in Saudi Arabia. The questions will use women as a lens through which to gauge the general population's desire and opinion towards political liberalization. Currently, women in Saudi Arabia are not allowed to drive or travel without a male guardian's approval and presence. They are required by law to wear the abaya and tarha in public. The former covers their bodies down to their ankles and wrists and the latter their hair. The first and only female minister was appointed in 2009: Norah

Al-Faiz, Deputy Minister of Women's Education. Asking women their opinion about potential liberalization attempts sheds light on what the opposition desires in Saudi Arabia and how the government may resist pressure to make political changes if particular social and economic changes are implemented. This research will seek to generalize upon its findings and find applicability towards non-democratic regimes such as Saudi Arabia's and their futures should they continue to not undergo political liberalization while only pursuing economic and social liberalization reform.

Kelin Brace
Biochemistry and Molecular Biology
"Synthesis of C-nucleosides and Their Biological Implications"
Faculty Mentor: Dr. Katherine Seley-Radtke
Expected Graduation Date: Spring 2013

Modified nucleosides have been intensely studied for their ability to alter normal biological functioning, and are increasingly being considered as important medicinal candidates. In particular, the deazapurines have been investigated because of their antimicrobial, antiviral, and anticancer potential. These particular analogues show promise because their structure is similar to that of the natural nucleosides, and their carbon-carbon glycosidic bond is impervious to hydrolytic and enzymatic cleavage, which is a serious problem for many nucleoside drugs. A number of C-7 substituted pyrrolo[3,2-d]pyrimidines (also known as 9-deazapurines) have also shown inhibitory activity against purine nucleoside phosphorylase (PNP), an enzyme that is known to destroy many nucleoside drugs before they can reach their target. This finding is significant because this suggests these compounds could then be co-administered with nucleoside drugs, thereby blocking PNP and allowing the drug to carry out its therapeutic duties. The focus of this investigation will be to synthesize several 9-deazapurine analogues as potential inhibitors of PNP. Their synthesis will be accomplished through the use of various carbon-carbon organometallic coupling reactions and other functional group transformations. Once the compounds are synthesized and characterized, their medicinal properties will be assessed through the use of biological screening to be carried out by our research group's collaborators. The results of this study will provide new insight into the biological importance for the 9-deazapurine scaffold as potential drug candidates.

Brian Brown
Biochemistry and Molecular Biology
"Synthesis of a Novel Set of Flexible Expanded Nucleoside Reverse Transcriptase Inhibitors"
Faculty Mentor: Dr. Katherine L. Seley-Radtke
Expected Graduation: Spring 2013

Human Immunodeficiency Virus (HIV), Hepatitis C Virus (HCV), and other RNA viruses pose a great danger to human health on both an individual and global level. Several current treatment options on the market have been designed to inhibit the polymerases these viruses use for replication, such as HIV's reverse transcriptase (RT). By inhibiting the replication of the virus, the viral lifecycle is halted. However, many of these drugs have begun to fail due to the viruses developing drug resistance. The type of resistance focused on here is the development of point mutations in the active site of these target polymerases. These mutations introduce steric and electronic hindrance, reducing the binding affinity, and subsequently the efficacy, of previously developed reverse transcriptase inhibitors. This allows the virus to overcome drug therapy and successfully transcribe its genome for viral replication. As a result, new compounds are desperately needed that can overcome resistance in viral polymerases with greater efficacy. It is our hypothesis that by combining the already known activity of previously established antivirals, such as 2'-methyl modified guanosine, with structural alterations found to be advantageous by our laboratory in the past we will be able to design, synthesize and characterize a series of nucleosides that will maintain activity against resistant viral strains.

Clayton Conn
Modern Languages, Linguistics, and Intercultural Communications and Anthropology
"Movement for Community: Immigration, Autonomy, and Remittances in Tlaxcala Mexico"
Faculty Mentor: Dr. John Stolle-McAllister
Expected Graduation Date: Spring 2012

Immigration is a controversial and complicated topic not only here in the US but also in Mexico. Since debates in the US all too often focus on just one side of the problem, my research and investigation will analyze the impacts of immigration on one of the other 'sides' - among Mexican communities. I will examine the dynamics and relationships between immigration and democratic political participation within several communities in the rural state of Tlaxcala, which has high emmigration rates and an economy that depends heavily upon remittances. It is this dependency that has been producing local socio-political transformations. On the one hand emmigration and remittances are fragmenting the make up of communities as people migrate northward, but on the other hand it is galvanizing local activism for greater self-sufficiency and autonomy,

therefore greater political participation and reinforcement of community identity. I will be conducting my research alongside individuals and organizations in Tlaxcala that are specifically engaging with the issues mentioned above. I will be doing this through participant observation, interviews, and collaborative multi-media documentation that will then culminate into digital storytelling pieces that will be utilized by those individuals and organizations in Tlaxcala, so as to further facilitate dialogue on the issues.

Colleen Courtney
Chemical Engineering
"Studying the Aspergillus nidulans Cell Wall Using AFM"
Faculty Mentor: Dr. Mark Marten
Expected Graduation Date: May 2012

The Marten lab works with mutant strains of the filamentous fungi, Aspergillus nidulans. My URA project last year was to develop a published protocol that would qualitatively analyse the stability of the autophagy mutants currently used in the lab. This URA proposal is to further study the cell wall of one of the mutants that was studied in the plate assay. The ΔracA mutation strain is of particular importance because it is hypothesized to have an extremely weakened cell wall and understanding this phenotype is important to understanding fungal fragmentation. In bioprocesses fragmentation is important to understand the lifespan of the fungus and the production capacity of the culture. This project uses atomic force microscopy (AFM) to measure the elastic modulus of the fungal cell wall. The measurements will be taken along the length of a hyphae and around the spore body. The mutant elastic modulus measurements will then be compared to those of the parent strain and conclusions will be made about the rigidity of the cell wall of the ΔracA mutant.

Teklu Dawit
Biological Sciences
"Genetic Analysis of the Role of PHT4;6 in Regulating Innate Immunity of Arabidopsis"
Faculty Mentor: Dr. Hua Lu
Expected Graduation Date: Spring 2013

Successful control of plant diseases depends on a thorough understanding of the mechanisms of plant disease resistance. Previous studies by Dr. Lu's laboratory determined that the loss of function mutant pht4;6-2 enhances plant disease resistance, indicating that PHT4;6 may be a negative regulator of plant defense. To further investigate the role of PHT4;6, we took advantage of a unique Arabidopsis mutant, acd6-1, whose small size is inversely correlated

with the plant's defense level. We constructed a binary vector containing cloned PHT4;6 genomic DNA and transformed the acd6 plants in order to increase PHT4;6 expression. Seeds from the transformed acd6 plants will be placed on a 1/2 MS+Kanamycin selection plate in order to select the homozygous transgenic plants. In the future, after we obtain 10 different homozygous lines, we will infect these transgenic plants with Pseudomonas syringae, test these transgenic plants for their suppression of acd6 conferred phenotypes, including plant size, and determine these plants' levels of defense gene expression. If extra copies of PHT4;6 suppress acd6 phenotypes , it can be determined that PHT4;6 is a negative regulator of plant defense.

Amy Fowler
Interdisciplinary Studies and History
"Analysis of the Hukou System in China"
Faculty Mentor: Dr. Ka-Che Yip
Expected Graduation Date: Spring 2012

The hukou system is the household registration system in China that limits internal migration and determines how social services are allotted. Generally, citizens have either a rural or urban hukou which is passed down from their parents, and household registration is difficult to change. China has experienced a dramatic economic and social transformation since hukou was adopted in the 1950s. It has allowed selective migration to meet the demands of a growing economy in the last 20 to 30 years. Hukou plays a significant role in determining the rights and benefits available to Chinese citizens and has effectively made those who migrate into second class citizens, denying them the best jobs, education for their children, medical care, housing and other benefits. The public's growing dissatisfaction with the hukou system could threaten social stability in China. As China's economy grows, the trend is likely to continue. My research will take me to Beijing, China, where I will be conducting interviews and using other resources such as newspapers, periodicals, and archival materials. The scope of research will explore the origins of the hukou system, its evolution, and impact on society. Further study will include the government's role and the future of the system.

Manroop Gill
Biochemistry and Molecular Biology
"Investigate Cell Fate Determination in Arabidopsis during Erwinia amylovora Infection"
Faculty Mentor: Dr. Hua Lu
Expected Graduation Date: Spring 2013

The bacterial pathogen E. amylovora can cause the fire blight disease in plants belonging to the Rosaceae family, such as apple and pear. The fire blight is a devastating disease that causes the loss of billions of dollars each year in agriculture. Previous studies have shown that Arabidopsis thaliana is a non-host to E. amylovora and is naturally resistant to this pathogen. The resistance is often associated with programmed cell death in the infected region. During the course of my research in Dr. Lu's laboratory, I have observed a surprising tumor-like cell growth in Arabidopsis leaves that are infected with E. amylovora; it is a phenotype that has never been reported before. To investigate this phenotype, I plan on using cell biological approaches to study how the cell fate is altered in Arabidopsis during E. amylovora infection. I will infect Arabidopsis leaves with E. amylovora, using a needleless syringe, and then visualize the cell death and tumor-like cell growth two to three days after the infection. The cell death phenotype can be confirmed with trypan blue staining, and to see the cell growth, I will fix the region and embed the tissue in resin. These fixed regions of the leaf will be cut using a microtome, mounted on a glass slide, and then observed with a light microscope. If more cells are observed in the growth region, compared to a similar area from non-infected leaves, it would indicate that E. amylovora infection induced more cell division to contribute to the cell growth. In addition, I will also investigate how the change in salicylic acid (SA) levels, a key defense signaling molecule, affects the cell fate determination. This work will indicate if SA signaling is required for the tumor induced by E. amylovora, and will provide information to understand cell fate change in Arabidopsis induced by E. amylovora infection.

Daniel Graham
History and Philosophy
"The Rising Tides: A Comparative Study of the Circumstances and Outcomes of the North Sea Floods of 1953 and the Hurricane Katrina Disaster of 2005"
Faculty Mentor: Dr. Terry Bouton
Expected Graduation Date: May 2012

In early 1953, the North Sea was experiencing uncommonly high tides for the season. On the evening of January 31, this high tide combined with a tidal surge and a fierce windstorm to inundate over 1,000 square miles of the Netherlands, and over 350 square miles along the coast of England. Within six hours, the flooding claimed the lives of nearly 2,000 people in the Netherlands (primarily in the provinces of

Zeeland and South Holland), and over 500 British people drowned in the flood waters. The circumstances of the North Sea flood of 1953 shares a number of important similarities with the flooding of New Orleans in 2005 arising from Hurricane Katrina. My study will consist of a comparison of the North Sea disaster of 1953 and the Hurricane Katrina catastrophe of 2005. I will consider water-management efforts in the Netherlands, Great Britain, and the United States, and will analyze the events of each flood in light of these efforts. I will further investigate and compare flood responses in each country.

Dalton Hughes
Chemical Engineering
"Signaling Response of Neuronal Cells to 3D Tissue Scaffolds"
Faculty Mentor: Dr. Jennie Leach
Expected Graduation Date: Spring 2013

Neurons grow and develop in the three-dimensional (3D) environment of the developing embryo. Previous work from our group has demonstrated that culturing embryonic neurons in 3D matrices allows the cells to respond in a way that more closely resembles natural development than traditional 2D culture. Cells interact with their extracellular matrix and sense the dimensionality of their surroundings via integrin receptors on the cell surface that bind to matrix molecules, initiate intracellular signaling cascades and affect changes in cell shape and function. My work focuses on elucidating the signaling events that regulate these changes in cell response. We hypothesize that 3D environments impose changes in matrix-ligand organization and alter neuronal behavior by modulating β1-integrin cytoskeleton signaling. To test this hypothesis we culture PC12 cells, a neuronal cell model, on 2D and within 3D collagen substrates and probe the signaling response by inhibiting several key signaling molecules involved in regulating neuron morphology: β1-integrin, Focal Adhesion Kinase (FAK), and an activated form of FAK that is phosphorylated at tyrosine 397. Immunocytochemistry techniques and fluorescent microscopy will be used to analyze the effect of inhibiting these signalingN molecules on neuronal behavior. The results of this experiment will identify the key signaling mechanisms in 3D neuronal culture and provide a biological basis for testing new biomaterial-based therapeutics.

Shadab Hussain
Psychology
"The Role of Religious Involvement on Parenting Styles of Korean and Chinese Immigrant Mothers"
Faculty Mentor: Dr. Charissa Cheah
Expected Graduation Date: Spring 2012

Koreans and Chinese are two of the fastest growing Asian ethnic groups in the United States. Between 1990 and 2000, there has been a 20 percent increase in the number of Korean and Chinese individuals. These two groups, in particular, suffer high amounts of immigration stress leading to depression and high levels of stress which can in turn negatively affect the individual's mental-health and parenting style. Religious involvement can affect individuals by lowering stress and positively impacting their parenting style and values. The majority of existing studies examining the effect of religious involvement on these two ethnic groups were conducted in urban areas such as California and New York, but few studies were done in smaller, suburban communities such as Maryland. Immigrants in suburban areas such as Maryland may see the church community as a source of social support, which may serve to lower their stress levels and positively affect their parenting. The current study will (1) examine whether the level of religious involvement vary across Korean and Chinese immigrant families, (2) examine the associations between religious involvement and authoritative parenting in Korean and Chinese immigrant mothers, and (3) examine the mediating role of parenting stress (i.e., intensity and frequency) in the association between immigrant mothers' religious involvement and their parenting.

Eva Jannotta
Gender and Women's Studies and English
"What is Chick-lit? Gender and Genre in Contemporary Popular Fiction"
Faculty Mentor: Dr. Jessica Berman
Expected Graduation Date: Spring 2012

This research will examine "chick-lit," a contemporary popular fiction genre, from a Gender and Women's Studies and literary criticism perspective. Ten chick-lit novels written by women in the United States will form the basis of my analysis. I will first examine the way in which chick-lit novels imagine and represent contemporary professional white women, paying particular attention to portrayals of female relationships, feminism, careers, and the perpetuation of whiteness as an invisible racial category. I am also interested in how traditional gender roles and norms may be reified or undermined in these novels through the ways in which female characters negotiate their careers, families, and romantic partnerships. I will then analyze chick-lit novels as part of a supposed genre, using genre theory to determine if and how chick-lit novels comprise their own genre. Novels

considered chick-lit are many and varied, with roots in romance novels, novels of manners and epistolary and diary writing. I will examine these and other influences and analyze the components of chick-lit novels to determine if they merit categorization as one cohesive genre.

William Johnson
Ancient Studies Major, Modern Language, Linguistics, and Intercultural Communictions Minor
"Effects of the Latin Deponents on the Early Sardinian Analytic Perfect"
Faculty Mentor: Dr. Thomas Field
Expected Graduation Date: Fall 2011

This research will determine whether there is a direct relationship between the perfect constructions of the deponent and semi-deponent verbs in Vulgar Latin and the formation of the newer analytical present perfect constructions using the auxiliary essere 'to be' in early Sardinian. In many variations of the Romance languages the periphrastic perfect with either the auxiliary 'be' or 'have' in the present tense has arisen to supplement the more complex synthetic forms derived from Latin. For example, instead of a lone form evolved from the Lat. advenerunt (they [have] arrived) we also find examples such as Sard. sun arrivatos (they have arrived, lit. they are arrived). The latter Romance form is constructed and translated in exactly the same way as the perfects of the deponent and semi-deponent verbs in Latin. This cannot be coincidence. My hypothesis proposes that the connection between the two forms outlined above is due mostly to internal development rather than to outside influences. I will travel to Cagliari, Sardinia and make use of the resources of the libraries and archives there to comb over Latin texts from up to 1700 years ago and the earliest Sardinian texts to investigate the relationship between the deponent verbs and some of the first manifestations of the Romance present perfect taking the auxiliary 'to be.'

Sheriff Jolaoso
Computer Engineering
"A Real-Time Electroencephalogram System for Prosthetic Applications"
Faculty Mentor: Dr. Fow-Sen Choa
Expected Graduation Date: May 2012

In this proposed research, we will first build a real time electroencephalogram (EEG) measurement tool. With this we will be able to obtain brain wave signals as well as analyze them in real time. This recording and analysis program will facilitate us to establish basic signal-pattern library produced by specific limb and body parts movement. We will further identify brainwave

patterns and signatures produced by “intention of motion” for various limb/body movements at different location in the brain map. An algorithm will be developed to improve the interpretation of neuronal signaling and enhance our neuronal-reading capabilities. When brainwave analysis is not performed in real time, and brain waves are not reproducible, it is very difficult to analyze information until we artificially recreated other synchronization signals in the EEG recording process. In this work, we will resolve all issues by making brainwave analysis real time. This will help to synchronize external stimuli with brain responses and also link “intentions of motion” together with their corresponding brainwave signatures. These studies hold the keys lead to the doors of future brainwave controlled prosthetic body/ limb systems.

Jacob Keener
Political Science
"Rethinking the Liberal Democratic Peace Hypothesis"
Faculty Mentor: Dr. Cynthia Hody
Expected Graduation Date: Spring 2012

The purpose of this research is to inquire into the various meanings of the word democracy and to use the knowledge from that inquiry to investigate the democratic peace theory, which holds that states with democratic forms of government tend to be more peaceful than non-democracies. A substantial amount of research has been done about democracies and war, including the democratic peace theory by international relations scholars, but much of this research has taken the meaning of democracy for granted. At the same time, political philosophers have written at length about the meaning of democracy, but both groups do so in their separate spheres. The nexus of international relations and political philosophy is a sparsely-researched area and both fields would be better served by research that takes into account both theoretical philosophy and empirical research. Through this research I will investigate the different meanings and variants of democracy and classify various democratic states according to these definitions. The research will then investigate the political and military actions of each state in its foreign affairs in light of democratic peace theory in order to come to a conclusion about the accuracy and relevance of the theory to differing democratic states.

Hamed Kharazi
Political Science
"The Role of Historical and Rational Choice Institutionalism in Egypt's Current Political Phenomenon"
Faculty mentor: Dr. Carolyn Forestiere
Expected graduation date: Spring 2012

Institutions are the rules that shape our behavior. Neo-institutionalism in political science attempts to address how we explain the choices people make through two dominant paradigms: historical institutionalism and rational choice institutionalism (Hall 1996). Historical institutionalism argues that in order to make a decision, "the path dependency" of the issue at hand should be scrutinized and that historical context matters a great deal in how elites steer countries. In contrast, the focus of rational choice institutionalism is on individuals and how they maximize their utility. While rational choice institutionalism has been accused of not seeing the whole picture and narrowing its attention to just a single issue, historical institutionalism is often too broad in its application. This research will investigate the current political context of Egypt to see how these theoretical approaches explain Egypt's recent political turmoil. The current crisis (the new momentum for regime change) indicates Egypt's vulnerability to instability and having the potential for transition to democracy. In this project I examine Egypt's historical background and its current crisis to demonstrate how both institutional perspectives can be applied. Ultimately, I hope to conclude that both rational choice and historical institutionalism are equally useful and should be treated as complimentary perspectives for any political phenomenon.

Paige Khoury
Dance
"Developing Technique Through Professional Studies"
Faculty Mentor: Mr. Doug Hamby
Expected Graduation Date: Spring 2012

The professional world of dance is highly competitive. Professional dancers are expected to be well versed in many techniques, creative in developing choreography and understand professional etiquette as it relates to dance companies and the audition process. The most successful dancers are ones who have received a variety of dance training and who have worked closely under professional dancers, choreographers and teachers. Being a successful dancer means having a variety of different experiences on your resume. My research will involve studying under a variety of dance professionals at one of the world's most renowned summer dance intensives, American Dance Festival (ADF). The six weeks that I will spend at ADF, will expose me to a variety of different dance techniques, choreographic devices and professional etiquette. The six weeks will continually challenge

my work as a dance in accordance to my technical skills and artistic development. Completing this research will greatly expand my personal ideas about dance and dance performance which will help me develop my capstone project in the course DANC 475. The presentation of my capstone project will allow me to expose fellow dancers at UMBC to work of many professionals.

Morgan Madeira
Computer Science and Mathematics
"Finding Communities of Close Friends in Social Media"
Faculty Mentor: Dr. Anupam Joshi
Expected Graduation Date: Spring 2013

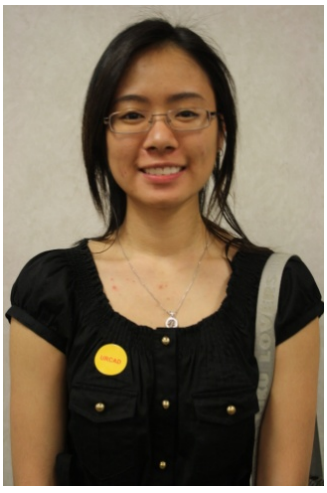
The popularity of social media sites has increased exponentially in recent years. I am investigating the potential value of collecting and analyzing data from these sites, particularly Facebook. Users of social networking sites often associate with many people. Some of these people are strangers to the user, and some of them are in the user's core group of friends. I will be developing an algorithm to accurately identify communities of close friends. I will first write a Facebook application to gather the data. Then, I will analyze the data and use machine-learning techniques to have the computer identify these communities automatically. One application of this procedure is effective search-ad targeting based on data collected from networking sites.

Asif Majid
Interdisciplinary Studies
"The Moroccan Diaspora: An Identity Struggle"
Faculty Mentor: Dr. Brigid Starkey
Expected Graduation Date: May 2013

Members of the Moroccan diaspora who live in the "global north" undergo a unique identity struggle when returning home. This identity struggle is deepened by the complex nature of Moroccan society. The influences of Berber, Arab, African and European traditions are all a part of the Moroccan multicultural environment and vary from north to south. This research project seeks to examine the challenges that diaspora Moroccans experience in cultural, political, social, geographic, and economic terms. Using an interdisciplinary methodology, I plan on exploring how this identity struggle manifests itself and I hope to draw lessons that can be more broadly applied to diaspora community challenges across the Global North-Global South divide. This is an important aspect of peace building in our contemporary global society. The main product of my research will be a video documentary on multicultural identity in Morocco.

Charles Mason III
Graphic Design and Philosophy
"Lead by Example"
Faculty Mentor: Vin Grabill
Expected Graduation Date: Fall 2012

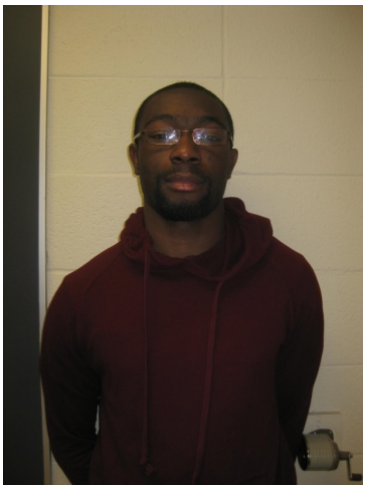
I will address the problems facing some city and county high school students in obtaining an education of value. Through the creation of six posters, I will try to express some of the challenges faced by youth as they pursue their education. These include, but are not limited to, stereotypical attitudes, peer pressure and lack of a support system. By speaking with teachers, students and administrators from several schools, I will investigate what conditions might encourage students to stay focused, to increase their productivity and to heighten their success rate in school. I will display the six posters in cinematic form, that is, as six individual frames in a strip of film. At the conclusion of this research, I will display the posters in some of the schools I approached. Students will then have a visual reference that will reflect the issues many of us have at one time encountered throughout our educational journeys. This research is important for its ability to reach across multiple ethnicities, because students of all races have experienced these forms of hindrance to gaining a quality education at one time or another.



Jamie Nguyen
Biochemistry and Molecular Biology
"Design and Synthesis of Chlorin Arrays for Two-Photon Excited Fluorescence"
Faculty Mentor: Dr. Marcin Ptaszek
Expected Graduation Date: Spring 2012

Fluorophores exhibiting high two-photon absorption cross-sections are significantly advantageous for 3-D fluorescent microscopy and in vivo fluorescent imaging. Chlorins (synthetic analogues of naturally occurring chlorophylls) provide promising building blocks for constructing high two-photon absorbing fluorophores because they are large, highly conjugated, planar macrocyclic compounds with unusually narrow emission bands from 650-700 nm. This project will focus on synthesizing linear arrays containing three chlorin subunits connected by acetylene linkers. Chlorin subunits will be designed to enhance two-photon cross-section absorption by displaying electron-withdrawing chlorin subunits flanked on each side by electron-donating chlorin subunits. For the duration of this project I will prepare arrays of chlorins containing electron-donating groups linked to a central chlorin containing electron-withdrawing groups. For the construction of such chlorin arrays I will use a palladium-catalyzed, Sonogashira coupling reaction. The chlorin subunits will be synthesized using a well-established zinc-mediated synthesis. Then, I will confirm the identities of resulting arrays and determine their fluorescent efficiency. Compounds with

absorption and emission wavelengths above 700 nm and high fluorescent quantum yields (i.e., >0.30) will be sent to collaborators for two-photon absorption cross-section measurements. Further analysis of the multi-chlorin fluorophores will provide information about the link between structural composition and two-photon absorption cross-section.



Ugonna Ohiri
Computer Engineering
"Standoff Chemical Detections using Quantum-Cascade Lasers and Microphone Arrays"
Faculty Mentor: Dr. Fow-Sen Choa
Expected Graduation Date: Spring 2012

In this research we propose an innovative method for standoff chemical detection, using the techniques of photo-acoustic sensing and high sensitivity microphone arrays for acoustic beam-forming and noise rejection. Acoustic beam-forming is a technique used to detect signals along the formed beam while rejecting and filtering surrounding noise outside the regions covered by the beam. Similar to phase array antenna characteristics, we can form receiving beams using a 2D microphone array. The more microphone elements in the array, the narrower the receiving beam becomes (higher directivity). Our plan will be to use an array of 4 microphones and collect their signals simultaneously using a multi-channel A-to-D unit. The collected signals will be processed in real time with a delay time constant training section and will also achieve ambient noise cancellation and signal enhancement.

Chikezie Okoro
Chemistry
"Reverse" Carbocyclic Fleximers as a Means of Overcoming Drug Resistance"
Faculty Mentor: Katherine L. Seley-Radtke
Expected Graduation Date: Spring 2012

Drug resistance is a common problem occurring in monotherapies for many diseases, often caused by point mutations in the active site of the target enzyme. This resistance, which can render potent drugs completely ineffective, has become one of the major focal points in pharmaceutical companies to date. To try to overcome this form of resistance, our lab has synthesized a series of carbocyclic flexible inhibitors, "fleximers," by splitting the nucleoside's purine heterocyclic ring into its respective imidazole and pyrimidine components. Previous studies have shown that this flexibility allows the nucleoside analogue to interact with residual amino acids in the enzyme's active site, while maintaining the necessary components needed for enzyme specificity. This project is investigating flexibility as well as the reverse connectivity of purines, by studying "reverse fleximers", in which the

carbocyclic sugar moiety is connected to the N1 position of uracil, with the C5 position being substituted with five membered heterocycles. Initial analogues of these compounds have shown interesting activity against adenosine deaminase (ADA). ADA is a critical enzyme in purine metabolism, and is overproduced in certain cancers and autoimmune diseases. The synthesis, characterization, and biological data will be presented herein.

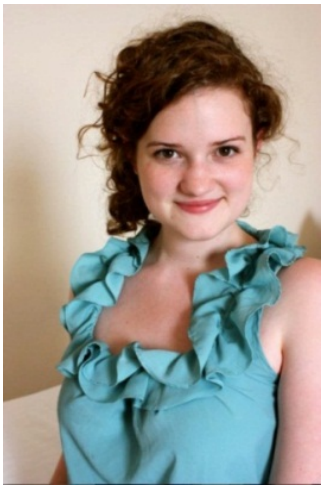
Catherine Pasqualoni
Ancient Studies (Archaeology)
Faculty Mentor: Dr. Marilyn Goldberg
Expected Graduation: May 2012

In general, the elite Etruscan women of the 6th century BCE held important and elevated positions in society, specifically when compared with low the social positions held by their Greek and Eastern Mediterranean counterparts. Following a long period of reduced intercultural trade and contact, and of general economic strife, in the Mediterranean world during the 10th and 9th centuries BCE, Greeks, Phoenicians, and other peoples began to make a reappearance on the Tyrrhenian coast of Etruria (which consisted mostly of modern-day Tuscany) in the 8th and 7th centuries BCE. In this period of renewed contact, Greek and Eastern Mediterranean art had a great stylistic impact on Etruscan artwork. This research will explore whether or not these influences had an effect on the public representations of elite Etruscan women in the 7th and 6th centuries, and whether they resulted in regional differences in public representations of elite women. I will examine images of women from sites such as Fiesole, Bologna, Murlo and Chiusi in the interior of Etruria and compare these images with those from coastal sites, including Tarquinia, Cerveteri, Populonia, and Vetulonia. The majority of the images I will be examining come from a funerary context.

Linh Pham
Computer Engineering
"Investigating the Properties of Optical Excitation of Nerve Cells"
Faculty Mentor: Dr Fow-Sen Choa
Expected Graduation Date: Spring 2012

Electrical excitations are typically used in clinical applications like heart pacemakers. The problem with electrical excitation and other excitation methods is the need for direct contact with the cells. Electrodes will gradually age or become corrupted due to their contacts with chemicals. The cells can also be damaged by the electrodes. Optical excitation is a new alternative that can provide noncontact stimulus delivery. Furthermore optical stimulations provide improved spatial selectivity and reduced stimulation artifacts. Mid-IR

light sources are able to excite neurons effectively without causing damage over a long period of operation. In this work, we plan to use near- and mid-IR sources to study photon-neuron interactions. Rat neurons will be cultivated by other local labs on electrical circuit boards. Electrical excitations will be used to measure signal propagation through neurons. After mastering this, optical signals will be used to test excitation and inhibition. The final product of this project is improving current works involving optical excitation or neurons. This could lead to better pacemakers and hearing aids.



Jessica Poole
Theatre
"The Body as a Vehicle for Performance"
Faculty Mentor: Lynn Watson
Expected Graduation Date: May 2013

In the acting program at UMBC, we are taught not only movement and voice work but also how to connect to an active inner emotional life. When combined, skills in these disciplines contribute to vulnerable and compelling performance. I would like to further bring together body and inner emotional life through the study of physical theatre, specifically through work with "neutral mask." Neutral mask, as developed by theatre luminary Jacques Lecoq, helps the actor achieve greater expressiveness by developing movement and gesture that is free of mundane, pedestrian patterns. This work is important because performers share traits with athletes. We must have strong, present, and enlivened bodies because our bodies are the vehicles for performance. My own experience has shown me that I have access to more compelling performance choices as I study and practice various movement disciplines. I plan to pursue my research at a workshop at the Center for Movement Theatre called the "Neutral Mask Comprehensive Summer Intensive" at the Academy for Classical Acting in Washington, DC. The workshop is taught by Dody DiSanto, a teaching protégé of Jacques Lecoq. I plan to hold workshops with my peers culminating in a performance at URCAD, which will incorporate and demonstrate my research. My overall long-term goal is to create new performance pieces focused on movement in connection with human emotion and experience.

Mercedes Randall
Psychology
"The Effects of Meditation on Reading Comprehension and Attention"
Faculty Mentor: Dr. Shawn Bediako
Expected Graduation Date: Spring 2012

The effects of meditation on the mind and body have been the topic of numerous research studies. Many of these studies have examined the physical and psychological effects of meditation and have found that meditation can increase one's ability to relax, may improve mood, and most importantly increase one's ability to concentrate. This special ability to concentrate is known as mindfulness and is the desired outcome of the steady practice of mindfulness meditation. Although previous research has supported all of these effects of meditation, none of them have offered ideas as to the practical implications of this knowledge. This study aims to examine the effects of mindfulness meditation in an academic context. Using a sample of students, I hope to demonstrate the effects of meditation on reading comprehension and attention. My aim is to show that practicing mindfulness meditation can be of practical use to students in an academic setting.

Matthew Rapp
Biochemistry and Molecular Biology
"Opsin Adaptation to High Pressure in the Deep-sea Fish Gonostoma elongatum"
Faculty Mentor: Dr. Phyllis Robinson
Expected Graduation Date: Spring 2012

In the eye, photoreceptor cells contain visual pigments, which consist of a vitamin-A-derived chromophore bound to an opsin protein. When the visual pigments absorb photons, a signalling cascade is activated, which allows light energy entering the eye to be transformed into an electrical signal that the brain can interpret. Studying opsins from species that live in different habitats provides insight into how the protein has evolved and adapted to different environmental pressures. By comparing many fish opsin protein sequences, members of the Robinson lab have identified three amino acid sites that are under selection in species living in the deep-sea. Based on a homology structural model of a deep-sea fish opsin protein, the three different amino acids are located at the interface between two opsin proteins forming a dimer. Our hypothesis is that these three sites are structurally important to how the opsin protein evolved to adapt to the significant pressure of the deep sea. The goal of this project is to test this hypothesis by performing a functional analysis of the rod opsin protein from the deep-sea fish Gonostoma elongatum Gunther 1878 (the elongated bristlemouth fish). The first specific aim of the project is to construct mutants in the wildtype G. elongatum opsin gene. Then, we will express, reconstitute, and purify the

visual pigments in order to perform assays to test whether the mutations have affected the function of the protein.

Eric Reitz
Political Science
"The Effects of International Law on Civilian Populations"
Faculty Mentor: Dr. Jeffrey Davis
Expected Graduation Date: Spring 2012

Internal conflict and instability are constant threats to world peace. Civilians have always suffered greatly during wartime, and in modern internal conflicts, combatants are using deadlier tactics, and they are doing so in urban settings. Consequently, civilians continue to suffer tremendously in these armed conflicts. This research will examine the legal protections afforded to civilians in internal conflicts and argue that while the international community has made progress in prosecuting war crimes, they have not done enough. The international community has enacted protections, such as the Geneva Convention and the Rome Statute of the International Criminal Court to protect civilians in armed conflict. However, these international conventions are not effectively enforced, leading to situations where war crimes are committed against civilians without accountability. This research will seek to apply the international standards outlined in legal documents and treaties to current cases, specifically occurring in the Middle East.

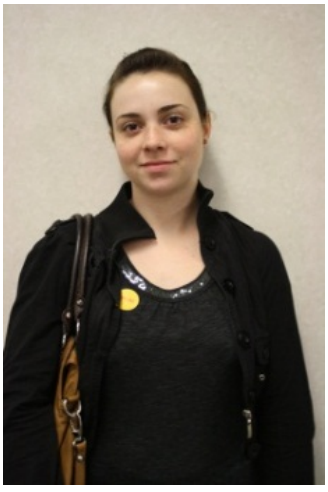
Reema Sharma and
Anthony Kronfli
Biochemistry and Molecular Biology
"Incorporation of Tagged and Untagged L4 Ribosomal Protein into Ribosomes"
Faculty Mentor: Dr. Lasse Lindahl
Expected Graduation Date: Spring 2013

Ribosomes are responsible for the synthesis of protein in every living organism. They contain a large number of protein subunits (50-75 depending on the organism), and the functions of these proteins are not clear. Ribosomal protein L4 (RPL4) is an evolutionarily conserved protein present in ribosomes from bacteria to humans. My lab uses a "tag" in mutated versions of the RPL4 to observe the role of its various features in yeast ribosomes. This tag consists of six histidine amino acids added onto the N-terminal end of the RPL4 amino acid chain, which makes it possible to observe the relative amounts of mutant and wild type RPL4 protein accumulating in the cell. This in turn should make it possible to determine the function of mutant versions of RPL4 in ribosome assembly. However, the histidine tag may

affect the overall structure of RPL4 and result in the tagged protein being less compatible with the ribosome than the un-tagged protein. My project is to determine if the tagged version is as effectively incorporated into the ribosome as the wildtype protein. The results of this project will be used to better plan and conduct other projects involving the N-terminal histidine tag on the L4 protein.

Jinal Sheth
Biological Sciences
"Regulation of Collagen During Cell Migration in Drosophila melanogaster"
Faculty Mentor: Dr. Michelle Starz-Gaiano
Expected Graduation Date: Spring 2013

During animal development, cells detach and migrate in order to fulfill their destiny. One example is the migration of the border cells in the Drosophila melanogaster ovary. Previous experiments have identified specific genes that are essential for cell migration; however, it has not yet been determined how Collagen IV, component of extracellular matrix, affects the cell migration. This project will investigate how the differences in the expression or regulation of Collagen IV affect the ability for the border cells to detach and migrate to the oocyte. It will also test the hypothesis that regulatory gene, PH4alpha, affects the cell migration, and determine how their functions are coordinated. To address these goals, several different lines of mutant flies that disrupt the Collagen gene or its putative regulator will be studied. Some of these lines contain a transposable element (P-element) that is predicted to create a loss of function mutation. Using technique of fluorescence microscopy, cell migration will be assessed by comparing the difference and degree of cell migration in egg-chambers for each individual in mutant and normal flies. The success of this project will contribute to a better understanding on border cell migration and may provide insight into tumor metastasis.



Hannah Skolnick
Graphic Design
"A Digital Renaissance Experience"
Faculty Mentor: Bodil Otteson
Expected Graduation Date: Spring 2012

My research seeks to recreate the experience of Italian Renaissance art for an average viewer. I will create an interactive web page using motion graphics, maps, and images to explore specific works, artists and cities. The importance of the Renaissance is widely recognized, however, many people outside of the art community don't have a comprehensive understanding of the period – its seminal works, defining artists, and

foundational cities. An engaging and aesthetically appealing way to learn about these important characteristics of the Renaissance will involve the viewer more than any textbook or simple static image of the work can. Italy is central to both fine art and contemporary design. My website will use the stylistic techniques of Italian graphic design to communicate the concepts and experience of the country's Renaissance art.

David Sweigart
Physics and Mathematics
"Field Assisted Charge Dynamics in P3HT and P3HT/PCBM"
Faculty Mentor: Dr. L. Michael Hayden
Expected Graduation Date: Spring 2013

Semiconducting polymers have been shown to be promising materials for a wide range of organic opto-electronic devices including organic solar cells and organic field-effect transistors. In fact, the highest efficiencies achieved in organic solar cells have been obtained using regioregular poly(3-hexylthiophene-2,5-diyl) (P3HT)/[6,6]-phenyl-C61-butyric acid methyl ester (PCBM). Currently, high carrier yields of ≥60 percent for such devices have been reported. However, the carrier yield obtained using optical-pump terahertz-probe (OPTP) spectroscopy is ≤1.5 percent. This discrepancy may be due to the fact that real world organic solar cells have an electric field present throughout the material. Therefore, I will be investigating the charge carrier dynamics in photoexcited solid films of P3HT and P3HT/PCBM using OPTP spectroscopy in the presence of an electric field. To do this, I will first use 400 nm light from an amplified Ti:Sapphire laser to create photocharge generated electron-hole pairs in the samples. I will then use a sub-picosecond THz pulse to monitor the dynamics of the electron-hole pairs and their subsequent evolution into either free or bound charges. This research is designed to better connect our OPTP laboratory experiments with device measurements in real solar cells. This will allow us to better predict the real world and to have a broader impact.

Robby Tietz
Chemical Engineering
"Investigation of Poly(N-Isopropylmethacrylamide) Hydrogels"
Faculty Mentor: Dr. Lisa Kelly
Expected Graduation Date: Spring 2012

The development of molecular thermometers is important in applications such as microfluidics, thermal therapy, and smart packaging where traditional temperature measurement is impractical or impossible. Hydrogels possess the unique physical property of being stimuli-responsive to numerous environmental variables including temperature and pH. When

labeled with a fluorescent dye, the hydrogels report an alteration in these variables via change in color and intensity of fluorescence. Hydrogel synthesis yields cross-linked spheres of uniform diameter. Preliminary data show Poly(N-Isopropylmethacrylamide) (PNIPMAm) exhibits a lower critical solution temperature (LCST) near 44°C. Heating through the LCST causes a fully reversible coil to globule transition upon which the spheres collapse to nearly half of their original size. The purpose of this research is to synthesize, via free-radical polymerization, a pure batch of PNIPMAm, as well as mixed-monomer hydrogels. The temperature-dependent size of the hydrogels will be measured using dynamic light scattering. Finally, PNIPMAm will be copolymerized with fluorescent dyes. Fluorescence spectroscopy will be used to investigate their viability as potential temperature-specific molecular thermometers.

Kevin Truitt
Dance
"Discovering New Dance and Choreographic Techniques"
Faculty Mentor: Mr. Doug Hamby
Expected Graduation Date: Spring 2012

Dance is an ever changing art. New movement ideas and techniques are constantly being introduced into the world. The only way to improve as a dancer and choreographer is to study under the professionals in the field. I will intensely study for three weeks under the guidance of numerous choreographers, teachers, and other students. I will study different dance techniques as well as broaden my knowledge in dance composition. I will also learn how the body moves and its functions. My research will include personal study in how I move and what I need to understand about my body. I will also learn new choreographic techniques to enhance my knowledge and capability in creation. In the end, I will create a work on fellow dancers using my new awareness and choreographic and technical dance methods. The dance will incorporate the new movement and choreographic techniques that I learned in the research.

Ajay Vaghasia
Biochemistry and Molecular Biology; Biological Sciences
"The Binding Studies of Gene32P with dsDNA and Sliding Model"
Faculty Mentor: Dr. Richard Karpel
Expected Graduation Date: December 2011

Gene32 protein (g32p) is a classical single stranded DNA (ssDNA) binding protein in T4 bacteriophage. The g32p is involved in DNA replication, repair and recombination. In most genomes, the single stranded regions exist in patches flanked by vast double stranded regions. It is improbable that

a collision of g32p to DNA would result in binding to ssDNA patches. Thus, three-dimensional diffusion alone will not result in the timely binding of single stranded regions by the protein. Therefore, it can be hypothesized that g32p binds to double stranded DNA (dsDNA) and slides along dsDNA until it encounters the ssDNA patch. Recent experiments in Dr.Karpel's laboratory have shown that g32p has weak affinity for dsDNA. The goal of this study is to further investigate the thermodynamics and kinetics of g32p and dsDNA complex formation. The binding constant will be determined by measuring changes in absorbance in g32p and dsDNA titration by using the DNA binding cationic dye, Azure A, as spectrophotometric probe. Using Azure A and a stopped-flow instrument, the rate of dissociation of dye-dsDNA and the rate of complex formation of dsDNA-g32p will be measured. The resulting information about the g32p binding site size, binding constant and kinetic rate constant will further help us understand the sliding model which allows SSBs like g32p to find ssDNA patches in genome.

Laura Meg Viar
Psychology
"The Effects of Anger and Happiness on Preschoolers Compliance to Peer Requests"
Faculty Mentor: Dr. David Schultz
Expected Graduation Date: Fall 2011

Researchers have discovered that a child's affect and emotion are responsible for influencing a number of behaviors. The development of prosocial behaviors is particularly important for preschool-aged children. Future social success is determined greatly by a child's ability to successfully navigate interactions with their peers. Prior research has found angry children less likely to exhibit prosocial behavior than happy children, who tend to be more generous and less aggressive. This study will examine the effects of anger and happiness on a child's willingness to comply with tasks administered by their peers. Forty preschool-aged children will participate in this study. After undergoing mood induction procedures, each child will receive requests from their peers. This study will test how the subject complies to requests from a peer who contributed to the subject's angry or happy state, as well as compliance to requests from an unrelated peer. The results of this study could illuminate relationships between emotional states and prosocial behavior, as well as how peer interactions are influenced by prior emotion eliciting exchanges. These findings could aid in the development of best teaching practices in the preschool setting, and aid teachers in maintaining a positive educational environment.

Sharon Wall
Physics
"Interferometric Autocorrelation of Femtosecond Pulses Emitted from a Widely Tunable Optical Parametric Amplifier"
Faculty Mentor: Dr. Michael Hayden
Expected Graduation Date: Spring, 2012

Terahertz radiation is becoming increasingly important in many fields, with particular application in the field of medical imaging, due to its ability to penetrate deep into organic materials without the damaging effects of X-rays. In Dr. Michael Hayden's research laboratory, the generation and detection of terahertz radiation using nonlinear optical materials is studied. Recently, the lab acquired an Optical Parametric Amplifier (OPA) for use in terahertz experiments, which emits ultrashort laser pulses on the order of 10-15 seconds in duration over a wide range of frequencies. In order to correctly interpret the results of their experiments, Dr. Hayden and his colleagues must be able to accurately measure the pulse duration. As the pulse duration is too small to measure by conventional methods, it must be measured using the interference between the pulse and a copy of itself. The goal of my research is to design and build a small-scale, portable Michelson interferometer to take Interferometric Autocorrelations of ultrashort pulses. As the interferometer must be effective over a wide range of wavelengths, I will construct two different types of detectors: a two-photon detector for use in the 1000nm – 2600nm range, and a detector that uses second harmonic generation in a nonlinear optical crystal for use in the 400nm – 1000nm range. I will also write the programs necessary to operate the interferometer and analyse the resulting data, providing accurate and easily accessible measurement of femtosecond laser pulses.

Ryan Wentworth
Financial Economics
"The Effects of Rebalancing Frequency on Portfolio Performance"
Faculty Mentor: Dr. Douglas Lamdin
Expected Graduation Date: Spring 2012

This research investigates how the frequency of portfolio rebalancing affects the risk and return of an investor's portfolio. Portfolio rebalancing refers to reallocation between asset classes to match the targeted portfolio allocations. Increases or decreases in asset values over time will cause actual asset holdings to differ from targeted allocations. Popular portfolio allocations will be simulated using U.S. data on asset class returns, such as stocks and bonds, over the time period from 1926-2009. For each portfolio, a sensitivity analysis will be conducted to determine how risk and return are affected by different rebalancing frequencies. One, two, three, four and five year rebalancing frequencies will be used. For each portfolio and rebalancing period, the average return, standard deviation of return (which measures risk) and Sharpe Ratio (the standard risk-return statistic) will be

calculated. The optimal rebalancing period will be the one that maximizes the Sharpe Ratio. Additionally, these portfolios and sensitivity analyses will be constructed for multiple time frames within the range of 1926-2009. Using information from multiple time frames can help assess whether the optimal rebalancing period is consistent, and account for differences in returns on different assets during different time periods. Knowing whether there is an optimal time frame to rebalance a portfolio is important for portfolio management decisions because it is a variable that managers of portfolios must consider.

Isleen Wride
Biochemistry
"The Relationship between Age-specific Expression of Antimicrobial Peptides and Age-specific Immune Function in Drosophila melanogaster"
Faculty Mentor: Dr. Jeff Leips
Expected Graduation Date: Spring 2012

Age-related decline in the ability of organisms to mount an immune response appears to be a universal consequence of aging and mounting an immune response is energetically costly. Life history theory predicts a trade-off between the immune system and somatic maintenance. There is also evidence that age-related changes in the immune response have a genetic basis but the genes responsible are unknown. To examine these relationships I will monitor bacterial infection levels together with gene expression levels of diptericin, an AMP whose production is triggered by infection with gram negative bacteria, comparing these traits using individuals from a paired selection-control population. The differences in the expression levels of antimicrobial peptides between individual Drosophila melanogaster can reveal the influence of age-specific immunity.

Chris Yankaskas
Chemical Engineering
"Determining Growth and Morphological Rates of Autophagy Mutants in Aspergillus nidulans"
Faculty Mentor: Dr. Mark Marten
Expected Graduation Date: Spring 2013

Marten Lab research focuses on the life process, autophagy, and how it functions within the model fungus, Aspergillus nidulans. Autophagy is induced by environmental stress, such as nutrient starvation or the drug, rapamycin. The autophagy pathway allows a filamentous fungus to break down cellular components in its senescence (aged and inactive) zone and transport these materials in vacuoles to the apical tip of a hyphae, where the materials are used for continued hyphal extension in the absence of exogenous nutrients. This study will compare

the growth and branching rates (i.e. morphology) of wild type A. nidulans with two autophagy mutant strains, Δatg8 and Δatg13. We hypothesize that the mutant strains will have growth and branching rates similar to that of the parent strain in conditions that do not induce autophagy, and reduced growth and branching rates when subjected to nutrient starvation and/or the drug rapamycin. Optical microscopy and digital image analysis will allow quantification of the growth and branching rates for each strain in both autophagy-inducing and non-autophagy-inducing growth conditions. Comparison of these rates will implicate the effects of the deleted genes on the autophagy pathway and the life of the fungi.

Jojo Yeboa
Chemical Engineering
"Increasing the Chronological Lifespan of Aspergillus nidulans via Induced Autophagy"
Faculty Mentor: Dr. Mark Marten

Filamentous fungi represent an extremely important class of organisms. As human and plant pathogens, they are responsible for excessive morbidity and mortality as well as billions of dollars in crop losses annually. In contrast, fungi have a tremendous beneficial impact and are used for the annual production of billions of dollars of pharmaceuticals and foodstuffs. Recently, augmentation of autophagy (a cellular recycling mechanism) has been implicated in extending the chronological life span (CLS) of several organisms. This phenomenon is yet unstudied in filamentous fungi. Therefore, we determined if induction of autophagy through rapamycin exposure increased CLS of A. nidulans. To accomplish this, we utilized the metabolically sensitive XTT tetrazolium salt to colormetrically monitor the overall metabolic activity of rapamycin treated cells. We hypothesized that cells with augmented autophagy will remain metabolically active longer than the controls when they are both deprived of a carbon nutrient source. Preliminary results suggested that wild type A. nidulans exposed to rapamycin have an increased CLS compared to controls without rapamycin. The next step in this project is to test an autophagy null mutant (Δatg13), in order to determine the dependence of CLS changes on a functioning autophagy pathway.

Brandon Young
Biological Sciences
"The Functional Analyses of a Mutated Tentacle within the L4 Protein"
Faculty Mentor: Dr. Janice Zengel
Expected Graduation Date: Spring 2013

The 50S subunit of bacterial ribosomes, which conducts peptide bond formation at its peptidyl transferase center, contains an exit tunnel which nascent proteins must traverse to reach the cytoplasm to become functional proteins. The tentacle of the L4 ribosomal protein contributes to the structure of this exit tunnel. It has been shown that mutations within the tentacle of Escherichia coli L4 cause detrimental effects to the 50S subunit. In my research project, bioinformatic analyses were used to delineate the L4 tentacle in the following three microorganisms whose L4 proteins are orthologous to E. coli L4: Haemophilus influenzae, Bacillus subtilis, and Vibrio cholerae. This analysis resulted in identification of amino acid differences in organisms that are genetically similar to E. coli. Polymerase chain reactions (PCR) and site-directed mutagenesis have been used to introduce changes into the E. coli L4 protein. Then the function of ribosomes carrying this mutated L4 protein will be analyzed. Most of these mutations are expected to show little or no detrimental effects on ribosome assembly or function. However, mutations causing harmful effects will shed light on the role of specific amino acids in the L4 tentacle.

Rachel Younghans
Geography and Environmental Systems
"WHERE MATTERS"
Faculty Mentor: Mr. Fred Worden
Expected Graduation Date: Fall 2012

This will be a video about the end of geography and the beginning of whatever takes its place. As the Internet connects all of the world's geographic places, what was once the prime identifier for humans, physical location, becomes inferior to other grouping methods (age, interests, beliefs, etc.). The Internet can be thought of as one single place, binding all of the world's places into one. Distance is eliminated. With this new singularity of place, it can be difficult to know or even care where one's physical location is. This work will investigate this transition, and the agony and delight of existing in a new "place", with a radically new and different definition.

Albert Zhou
Biochemistry and Molecular Biology
"Combining Oncogene Activation and Tumor Suppressor Loss: Developing a New Combinatorial Mouse Model of Prostate Cancer"
Faculty Mentor: Dr. Charles Bieberich
Expected Graduation Date: Spring 2012

The prostate is a male accessory sex gland that stores and secretes proteins into the seminal fluid during ejaculation. Prostate cancer accounts for approximately 30,000 deaths annually in the United States alone. A number of genes have been implicated in the origin and progression of prostate cancer. One possible mechanism in human prostate cancer involves both the activation of an oncogene (MYC) and the loss of function of a tumor suppressor gene (PTEN). Mouse models based only on the overexpression of MYC or the loss of function of Pten have been derived. However, no mouse model exists in which both these events are replicated. The aim of this study was to generate prostate-specific activation of MYC and the loss of Pten in a single mouse model. To achieve this goal, we have taken advantage of a prostate-specific Hoxb13 promoter to drive the MYC oncogene (Hoxb13/MYC) and Cre recombinase (Hoxb13/Cre) with a floxed Pten mouse. Mice carrying these modifications were interbred and their progeny analyzed by Southern blot and PCR techniques for inheritance of all three transgenes. To date, we have identified mice that carry all three alleles. We are waiting for phenotypic analysis of these mice in terms of development of prostate cancer.

Weipeng Zhuo
Chemical Engineering
"Optimizing Magnetic Separator System Used for the Removal of Nanoparticles from Flowing Fluid"
Faculty Mentor: Dr. Jennie Leach
Expected Graduation Date: Spring 2012

In the field of biomedical engineering, nanoparticles are an extremely versatile and novel delivery system. As nanoparticle-based technologies are becoming increasingly popular, we lack an efficient way to remove these particles after use, which is potentially problematic due to issues relating to long-term toxicity and physical blockage of these nanoparticles. Our lab proposed a solution through the use of magnetic nanospheres that can be removed from continuous flow using a strong magnetic field and a well-designed separator system. With every cycle through the separator system, a percentage of the nanoparticle concentration in fluid is removed. The percent removed per cycle and the number of cycles through the separator system are inversely related but both depend only on the flow rate of the fluid. My project focuses on determining the flow rate responsible for the highest nanoparticle removal efficiency by quantifying the concentration of nanoparticles at various times

throughout each flow rate, and at various flow rates. We plan to quantify nanoparticle concentration through a method that involves chemically conjugating our nanospheres to a catalyst, horseradish peroxide (HRP). HRP catalyses the conversion of reduced ABTS [2,2'-azino-bis(3-ethylbenzthiazoline-6-sulphonic acid)] to oxidized ABST. Oxidized ABTS may be quantified by absorbance measurements with a spectrophotometer. Assuming the concentration of catalyst present in the reaction is proportional to the formation of products from the reaction, we can calculate the relative HRP-nanoparticle concentration of our samples by determining the concentration of oxidized ABST formed from reacting the sample for a set amount of time.