URCAD 2012 Student Abstracts

In Alphabetical Order by Presenting Author

How to read the abstracts

Title of Presentation

Name of Student Author, *Co-Investigator, Co-Investigator*
Name of mentor, rank of mentor, department of mentor

Student presenter names are in bold. Non-presenting co-investigators are not in bold
All investigators are assumed to be from UMBC unless otherwise noted.
Mentor information is shown below author information, in roman type. If the mentor is not from UMBC, an institution name is given.

The body of the abstract provides information about the student's research.

Funding information is provided in italics below the body of the abstract.

We encourage you to visit the students' presentations throughout the day. Presentation times and locations begin on page five of this booklet.

Genetic Analysis of Translational Accuracy Using the Dual Luciferase Reporter System in *E. coli* and HeLa Cells

Aleeza H. Abbasi, *Nandini Manickam*
Philip J. Farabaugh, Professor, Department of Biological Sciences

Proteins are synthesized by linking together a series of amino acids, and transfer RNA is responsible for decoding the messenger RNA. This process is prone to errors when the information in the RNA is misinterpreted and may lead to the incorporation of the wrong amino acid. This phenomenon, termed "misreading" is our laboratory's main interest. A previously created plasmid construct (Kramer, 2006) with the fusion of firefly luciferase (F-luc) and *Renilla* luciferase (R-luc) and mutations that altered an essential amino acid of the enzyme was inserted into both *E. coli* and immortal human tissue culture cells called HeLa cells. This dual luciferase reporter system was used to measure mutant protein activity, indicating misreading rates. The cells were exposed to normal growth conditions as well as heat shock conditions to test the possible varying effects on misreading rates. The misreading rate is the ratio of the activity of the mutant F-luc/R-luc enzyme to the activity of wild type F-luc/R-luc. Misreading rates in HeLa cells and *E. coli* cells were similar, and heat shock increased misreading in both types of cells.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and through Research Project Grant 1R01GM029480-25 from the National Institute for General Medical Sciences of the National Institutes of Health, and Special Research Assistantship/Initiative Support at UMBC.

Increasing the Safety and Supportiveness in a High School

Meghan R. Alokonis
Carol Hess, Professor, Department of Dance; Linda Oliva, Assistant Professor, Department of Education

An extremely popular question among many school improvement teams is how to increase the safety and supportiveness of the school community. Research states that feeling safe and supportive not only increases one's ability to learn but are also essential factors to human needs. Based on my observations as a student intern, I strongly believed that the safety and supportiveness of the school community could be improved. The negative attitudes and petty arguments among students in the dance classes demonstrated that the students needed to develop respect for diversity which could lead to greater understanding and acceptance of their classmates. I developed a five-week program based on the popular "Challenge Day Program" which has been aired many times on MTV. Five bonding and acceptance activities were implemented in the dance classes at Southern High School. These activities allowed students to learn about one another, find similarities between themselves and their classmates, and to be more open-minded and accepting of others. Through daily written observations, note taking, and weekly interviews with students and my mentor teacher, I was able to collect data that showed whether or not this five-week program increased the safety and supportiveness of the school community at Southern High School.

Improving Augmented and Alternative Communication (AAC) Software via Context-Aware Computing

Kyle Althoff, *Barbara Linam-Church*
Advisor: Shaun K. Kane, Assistant Professor, Information Systems

Augmented and Alternative Communication (AAC) devices use synthesized speech to enable people who are unable to speak to communicate with others. Our research explores how context-aware computing and human-computer interaction techniques can improve the usability of AAC software. We use three techniques to improve the usability of AAC software: using location tracking to display words and phrases that would be useful to the user in that specific situation; allowing the user to take photos and automatically speak the words in the photos using object recognition; and to recognize another person using the device's video camera to display words and phrases that the user may talk with the other person about. We will evaluate our prototype with current AAC users.

Using the *BRCA1* Mutant Mouse Model to Understand How Changes in Mammary Adipose Can Promote Tumor Growth

Chinwendu L. Amazu, Kwadwo E. Owusu-Boaitey
Laundette P. Jones, Assistant Professor, Department of Pharmacology and Experimental Therapeutics, University of Maryland School of Medicine

Identifying distortions in mammary gland architecture is pivotal to understanding breast cancer progression. Previous studies in our lab have shown that *Breast Cancer Susceptibility gene 1 (Brca1)* mutant mice display an abnormal brown adipose tissue (BAT) structure in their mammary glands. Yet the mechanisms underlying this phenotype are unknown. LIM-only protein 4 (LMO4) and bone morphogenic protein 7 (BMP7) are two factors known to be up-regulated in breast cancers and also involved with BAT production. Therefore, we hypothesized that the persistence of BAT in the *Brca1* postpubertal mutant mammary gland is correlated with the upregulation of both LMO4 and BMP7. Immunohistochemical analyses revealed that LMO4 and BMP7 expression was higher in postpubertal *Brca1* mice compared to controls. Studies compared mRNA levels and protein levels of LMO4 and BMP7 in both Brca1mutant mice and wildtype mice mammary glands. Similar translational studies were conducted on human tissue samples. The findings of increased LMO4 and BMP7 along with BAT persistence in the model mice suggested that these factors may work together in the early stages of mammary tumor development.

This work was funded by NCI Grant CA062483-28S1 and a grant to UMBC from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education Program.

Comparing Risk and Protective Factors for Smoking between White and other Adolescents

Dana Ansari*, Preston Greene*
Carlo DiClemente, Professor, Department of Psychology

Smoking in adolescence is influenced by risk and protective factors including peer influences, parental influences, media and academic achievement. Studies have shown that white adolescents are at the greatest risk for smoking compared to other ethnic groups and that smoking initiation becomes more prevalent in high school compared to middle school (Landrine et al., 1994; Marshall et al., 2006). The current study addressed the question of whether there were differences in risk and protective factors between smoking and non-smoking middle school and high school white and other ethnic adolescents. We hypothesized that white adolescents will report greater risk and less protective factors compared to other ethnic groups. Logistic regressions will be used to test differences in risk and protective factors between white adolescents and other ethnicity youth above and beyond school level and smoking status using data collected for the 2010 Maryland Youth Tobacco Survey (MYTS), a classroom-based survey of 86,098 public middle and high school students. These results may be used to create more effective prevention programs tailored to adolescents' ethnic-specific risks and protective factors.

Emotional Images and their Effect on Pupil Dilation

Andrea P. Arellano
Diane L. Alonso, Program Director/Senior Lecturer, Department of Psychology

Various stimuli that involve emotions, in particular, visual images that produce an emotional response, can affect pupil dilation. Studies have shown that the amygdala, an area of the brain responsible for emotional processes, affects pupil dilation when impacted by emotional stimuli. This study uses positive, negative and neutral images to serve as emotional stimuli. Thirty adults view a set of fifteen randomized images, in which five are positive, another five are negative, and the remaining five are neutral. The pupils of the participants viewing the images are recorded and measured to see whether highly emotional (positive and negative) images cause the pupils to increase in size. The pupil will be measured while participants are viewing a fixation point before each image, and while viewing the image. When comparing the pupil size during the fixation point and image, the pupils are expected to increase for positive and negative images, but remain constant for neutral images. The expected increase in pupil size for positive and negative images can be influenced by emotional arousal and possible increase of activity in the amygdala.

Time's Up

Melissa August
Frederic Worden, Associate Professor, Department of Visual Arts

This video explores the symbiotic relationships that can exist between animate and inanimate things, specifically humans and the machines we create. By looking at modern machines and the effect they have on human societies, I was trying to determine whether some of the advances in the technological and mechanical spheres are really contributing as much as we like to think. Trains and airplanes, for instance, were created by humans as extensions of the human body's ability to transport itself through space. They have dramatically increased the range and speed at which humans can move across the globe, but do the advantages and efficiencies made possible by machines have some unrecognized downsides? They do contribute to pollution.They also cause us to trump time, schedules, and work agendas over just living and taking a deep breath. It was challenging trying to present these ideas in a theoretical way. This video project examines the machine-human relationships in a very abstract and visual way. No final answers or judgments are offered. I use three characters to explore time while they explore their environments. These basic questions are acted out through the emotional and psychic actions of the characters who are the crux of this experimental narrative.

The Effects of Collagen 2D Substrates and 3D Matrices on Neuronal Precursor Cell Behavior

Natalie A. Austin*, Michelle Previtera[1], Devendra Verma[1], Rene Schloss[1], Noshir A. Langrana[1]*
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Noshir A. Langrana, Professor, Department of Biomedical Engineering, Rutgers the State University of New Jersey

The prevalence of spinal cord injuries have incited research interests in deriving ways to repair and replace damaged neurons. Our novel contribution to this pool was the use of biodegradable and biocompatible collagen hydrogels to influence proliferation and differentiation of neuronal precursor cells (NPCs). Glia and neurons are two main types of cells found in the spinal cord. After injury, the body has a response to proliferate and differentiate glia, creating the glial scar which can hinder neuronal growth. In addition, the growth of neurons is insignificant to repair the damaged site. Dissociated neurospheres were plated to promote NPC proliferation and differentiation. Substrates and matrices formed from collagen hydrogels with various stiffness and concentration were used for NPC plating. Cells were stained with KI-67 to assess NPC proliferation. Cells were also stained with differentiation markers Nestin, MAP2, and DAPI to assess the ratio of NPCs and neurons, to total cells. Biological (concentration) and mechanical (stiffness) conditions were shown to have no influence on the proliferation of NPCs. Additional studies on the influences of hydrogels on the differentiation of NPCs into neurons would lead us a step closer to finding the most effective ways to successfully regenerate neuronal spinal cord cells.

This work was funded in part, by the NSF REU program under grant number EEC-0851831 and NJSCR under grant number 08-3080-SCR-E-0.

Designing and Performing a Solo Show

Jessica Ruth Baker
Lynn Watson, Associate Professor, Department of Theatre

Within the last half-century, well-known actors such as Anna Deavere Smith and Lily Tomlin have advanced the tradition of the one-person theatrical performance. However, solo plays are much less common than larger cast productions. To gain an understanding of the unique demands of solo shows, I designed and performed an excerpt from a previously published one-person play—*I Was Bigfoot's Love Slave: A Multimedia Christian Experience* by Barbara Ulrich. In producing this play, I drew upon the skills and talents that I have learned in the Department of Theatre in both my acting work and my set and costume design. I produced only the first half of the show, which was a manageable amount of material to explore and confidently put onstage. In the professional world, new works typically go through work-in-progress stages of development, and following that model was a valuable learning experience for me as I prepare to embark on a career in the performing arts. This project was a first step in production development, and I plan to continue the work in the summer and fall ahead, after I graduate.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Modeling Optical Stretching of a Malaria Infected Red Blood Cell

Chrysantus Bandon-Bibum II, Joshua J. François
Charles D. Eggleton, Professor, Department of Mechanical Engineering

Studying the elasticity of biological cells can provide insights to the physiological changes they undergo, given the relationship between cell structure and function. Optical stretching is a non-contact method used to measure the elastic properties of cells, inducing less damage compared to other methods. Light rays from a laser interact with cells and transfer momentum. The momentum transferred induces optical forces that stretch the cell without physical contact. Previous analytical models of optically stretched cells neglected the nucleus. Here, we used the dynamic ray tracing method to model the deformation of a malaria-infected red blood cell with a nucleus of variable size. The effect of the presence of the nucleus and its size on the optical force magnitudes and cell deformation, were examined. Our results showed that as the size of the nucleus increased, the net force on the cell's plasma and nuclear membranes increased. This work offers the potential to obtain the exact force and deformation measurements in optical stretching models.

This work was funded, in part, by the NIH Grant No. RO1 AI079347-02.

NMR Detection of Structures in the HIV-1 5'-Leader RNA that Regulate Genomic Packaging Using a Novel Method

Shawn M. Barton*, Bilguujin Dorjsuren, Gowry Kulandaivel, Simmone Jones, Atheeth Hiremath, Sai Sachin Divakaruni, Courtney LaCotti, Daniel Tummillo, Azra Hosic, Kedy Edme, Sara Albrecht, Kun Lu, Xiao Heng, Lianko Garyu, Sarah Monti, Eric Garcia, Siarhei Kharytonchyk, Alice Telesnitsky*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

The Human Immunodeficiency Virus type-1 (HIV-1) RNA genome contains the highly conserved 5′ - untranslated region (5′ - UTR), a 356-nucleotide sequence that has been shown to regulate dimerization prior to packaging and eventual budding of the viral particle. Limited dispersion of NMR signals in RNA spectra make it difficult to assign signals for large molecules, forcing us to employ novel techniques in structural determination of the 5′-UTR. Using a novel method called long-range probing by adenosine interaction detection (lr-AID), a large RNA can be probed for various structural elements. By mutating a short segment of adjacent base pairs to A-U bases, nuclear Overhauser effects (NOEs) can be directly detected upfield (~6.5 parts per million) within a NOESY spectrum. This technique was used to confirm a long-range interaction in the 5'-UTR between the unique 5 (U5) region and the start of the coding region for the Gag polyprotein (AUG) as well as between U5 and the dimerization initiation site (DIS). These two conformations naturally exist in equilibrium in the native 5'-UTR. In vitro and in vivo studies confirmed that the U5:DIS interaction promotes translation of the Gag polyprotein and the U5:AUG interaction promotes dimeraization and eventual packaging of the viral genome.

*This research was supported in part by a grant to UMBC from the HHMI through the Precollege and Undergraduate Science Education Program and by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Awards to UMBC.*

Investigating Human Rights Abuses of Children: Regimes and the Application of Law

Nayaba Bawa
Cynthia Hody, Professor, Department of Political Science

Socio-economic approaches dominate the study of child labor. These studies neglect the important political factors that shape the phenomenon. This research focuses on political questions about the phenomenon of child labor, specifically the variation of the application of child labor laws in different regimes. Child labor is one of the many international problems which has deprived countless children around the world the rights to education, freedom, and the typical protections associated with childhood. In order to examine the evolution of child labor laws and their application within different governments I conducted five case studies. From my case studies certain patterns were identified which illustrate that while the political systems examined all shared the universal definition of child labor, the actual application of law did not reflect international child labor standards. It appears that the level of industrialization in each country is a major influence on the application of laws in each political system. My research concludes with hypotheses for future testing about the relationship between political systems, their laws and the instances of child labor abuses.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

The Earthquake that Shook the World: Cultural Differences in Media Presentation of Japan's Tohoku Disaster

Alyson M. Becker
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In 2011, a 9.0 magnitude earthquake struck Japan, triggering a tsunami and nuclear disaster. The media outlets of Japan and the United States recorded the events and broadcast their own coverage to their own nation. Therefore, American audiences received a different portrayal of the Tohoku events from their Japanese counterparts. The present study aimed to investigate variance between American and Japanese culture and understand how this was manifested in the Tohoku coverage of each. It utilized three methodologies: a literature review focusing on cultural difference, an analysis of television clips from each country, and an ethnography conducted during the disaster's aftermath. The ethnography evaluated the natural reaction of both American and Japanese citizens in areas not immediately affected by the disaster and dependent on media coverage for information. The present study concluded that there is a necessity for the new term "cultural media" in lieu of "global media" due to the differences found in media coverage and reactions of the American and the Japanese populations over the same event. It is imperative to realize that two cultures can interpret the same occurrence differently, and that using an umbrella term like "global media" is not adequate in expressing world events.

Inhibiting Matrix Targeting of the Gag Polyprotein towards the Plasma Membrane in HIV-1 Retrovirus Replication

Pallavi Bhargava, Deborah Girma
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

The Gag polyprotein is necessary for the formation of the mature HIV-1 virion. The N-terminal matrix protein (MA) of the Gag polyprotein in the HIV-1 virus is known to target the polyprotein towards the plasma membrane of the host cell in the late phase of HIV-1 replication. During assembly, Gag binds to phosphatidylinositol (PI) 4,5 biphosphate [PI(4,5)P2], located in the plasma membrane. This binding induces a conformational change of the myristate group of the matrix domain to an exposed state, allowing Gag to further bind to the lipid bilayer. Gag assembly at the plasma membrane is a potential point of intervention in the virus life cycle. Thus, the goal of this project is to inhibit matrix targeting to the plasma membrane. The methods that are used to help achieve this are to express and purify isotopically labeled HIV-1 myr-MA for Nuclear Magnetic Resonance (NMR) experiments. At this stage in the project, we are in the process of using NMR to find an inhibitor that will bind to the matrix protein and change its overall conformation.

This work is funded by NIH/National Institute of Allergy and Infectious Diseases, 4R37AI030917.

The UMBC Biodiesel Project: A Student Club for Exploring Alternative Fuels

Laura Blevins, Anastasia Sarioglou, Scott Forster
Stephen A. Mang, Lecturer, Department of Chemistry and Biochemistry

Long-term reliance on fossil fuels is economically and environmentally unsustainable. Oil and natural gases are finite resources whose extraction, processing and use lead to elevated levels of greenhouse gases and other pollutants. Biofuels present an alternative that has the potential to drastically reduce the environmental impact of transportation. The UMBC Biodiesel Project was founded to give undergraduate chemical engineering and chemistry students the opportunity to learn about the process of making and using biodiesel. We will present results of our experiments in making biodiesel, including our efforts to reduce the need for catalysts and our efforts to switch from an energy- and labor-intensive batch system to a flow system. Metrics such as energy content, gel point (the temperature below which the fuel becomes solid) and purity of the fuel will be used to compare the biodiesel production processes.

This work was funded, in part, by the UMBC Improve-It grant.

Implications of the Arab Spring on Women's Rights

Mysoon "Macy" Bokhari
Carolyn Forestiere, Assistant Professor, Department of Political Science

Uprisings in countries involved in what is now called the "Arab Spring" have changed the face of politics, especially regarding women, across the Middle East (ME) and North Africa (NA). The role of women in the MENA is changing, but how and if women achieve rights is not uniform across these countries. An important factor, which explains how women's rights are addressed, involves the assistance the countries received during uprisings and the subsequent leadership structure that replaced the former authoritarian regimes in cases of capitulation. Additionally, countries without uprisings passed economic and social liberalization reforms affecting women's rights, specifically, the Kingdom of Saudi Arabia (KSA). My research assesses the role women have played in five MENA countries that experienced uprisings: Tunisia, Egypt, Yemen, Libya, and Syria. My research then assesses the role women played in a MENA country with no uprising, the KSA. To do this, I have conducted case studies on each country to analyze the extent women were involved in each of the six countries, if women's rights were a core issue to any of the reforms protestors or petitioners had been seeking, and, whether these findings have further implications for the expansion of women's rights and their participation in civil society.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Synthesis of Pyrrolopyrimidine Nucleosides using Heck Methodology

Kelin Brace, *Kartik Temburnikar*
Katherine L. Seley-Radtke, Professor, Department of Chemistry and Biochemistry

Modified nucleosides have been studied for their ability to disrupt disease replication, thus represent important medicinal candidates. In particular, the deazapurines have been investigated because of their antimicrobial, antiviral and anticancer potential. These analogues show promise because their structure is similar to that of the natural nucleosides, and their C-C glycosidic bond is impervious to hydrolytic and enzymatic cleavage, a serious problem for many nucleoside drugs. The focus of this investigation was to synthesize several 9-deazapurine analogues as potential drug leads. Their synthesis was accomplished through the use of state-of-the-art carbon-carbon coupling Heck reactions and other key synthetic steps. Once the compounds were synthesized and fully characterized to confirm their structure and purity, their biological activity was assessed through the use of biological screening to be carried out by our research group's biological collaborators in Belgium and the USA. The results of this study provide new insight into the biological importance of the 9-deazapurine scaffold as potential drug candidates.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, and in part by NIH grant R01GM073645 to KSR.

Role of *skywalker* in Collective Cell Migration in Drosophila

Niambi S. Brewer*, Michelle Starz-Gaiano*
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences

The focus of our lab is to understand better the process of collective cell migration, that is the coordinated movement of a cluster of cells to change its position in an organism. Understanding collective cell migration in *Drosophila*, can lead to a better understanding of mammalian processes such as wound healing and cancer metastasis. During egg development in *Drosophila*, a group of six to eight epithelial cells on the anterior side of the egg chamber become motile and travel posteriorly to the border of the oocyte. We hypothesize that a mutation in *skywalker* disrupts border cell migration. To identify components in cell migration, we employed a forward genetic screen *(sky)* encodes a regulator of the endocytosis pathway, which is responsible for the uptake of various molecules secreted by surrounding cells. We have identified and confirmed two additional mutant alleles of *sky*, and are characterizing the effects of these mutations on cell movement. To test this hypothesis, we are comparing flies with mutations in *sky* to known endocytosis mutants. Our work will clarify the role of *sky* in border cell migration in *Drosophila*, and potentially will have implications in other types of cell movements.

This work was funded, in part by a grant to UMBC from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education Program.

Technology Integration in the Classroom: Enhancing Student Engagement with the Use of iPods

Hannah Brogi
Linda Oliva, Assistant Professor, Department of Education

From document cameras, laptops, and various educational websites, students constantly interact with a wide array of technology. In my tenth grade seminar class, a double period English class for students reading one to two years below grade level and at risk of failing the Maryland High School State Assessment, I conducted a study on the effect voice recordings of HSA practice drills have on student performance. Students were assigned HSA reading drills in which they read a passage and then answered a series of questions. For half of the reading drills, I recorded myself reading the passage, and then transferred the audio onto a classroom set of iPods. Students were able to listen to the reading and read along. I graded their "talking to the text" and the amount of reading questions answered correctly. I recorded their answers on the reading drills taken with the iPods and then compared them with the reading drills that they read without the iPods. The results showed that when students listened to the iPods, they showed more evidence of talking to the text, however, there was little improvement on the accuracy of their answers.

Screening Coumarate and Functionally Related Compounds for their Effect on Tropodithietic Acid Production in *Silicibacter* sp. TM1040

Alexis T. Brown*; Preeti Sule*
Robert Belas, Professor, Department of Marine Biotechnology

Silicibacter sp. TM1040, hereafter "TM1040," is a member of the *Roseobacter* clade of marine alpha-proteobacteria. *Roseobacters* make up ~25% of all heterotrophic bacteria found in coastal communities. Research concerning the symbiosis of TM1040 with harmful algal blooms (HAB) via physical attachment to the surface of phytoplankton cells has opened avenues of research aiming to achieve ways of controlling HAB, by manipulation of this symbiotic relationship. TM1040 produces tropodithietic acid (TDA), an antibiotic and signaling molecule, by an unknown biochemical reaction from phenylacetate, whose synthesis is initiated under static culture conditions. TDA is the only known inducer of *tda* gene transcription in TM1040. In other roseobacters, coumarate, a breakdown product of lignin, has been shown to induce synthesis of other, non-TDA bioactive molecules. We hypothesize that coumarate and related compounds may also induce TDA biosynthesis. To test this hypothesis, we are using a non-TDA producing strain of TM1040 transformed with a *tdaC*$_P$::*lacZ* reporter plasmid, which has been previously shown to be induced by TDA, to screen coumarate and other structurally and functionally similar chemicals for their ability to induce TDA production. Successful conclusion of these experiments will lead to a better understanding of the molecular mechanisms regulating the production of TDA.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR GM 08663 National Research Service Award to UMBC.*

Synthesis of a Novel Flexible Nucleotide Antiviral Agent

Brian Brown, *Hannah Peters*
Katherine L. Seley-Radtke, Professor, Department of Chemistry and Biochemistry

The goal of this project was to expand upon a set of previously synthesized ribose-modified nucleoside polymerase inhibitors. Polymerases are critical for viral replication. Current chemotherapies against Hepatitis C Virus are succumbing to resistance through escape mutations in viral polymerase binding sites. By introducing nucleobase flexibility previously investigated by the Seley-Radtke laboratory to a series of potent antiviral drugs, a novel class of flexible polymerase inhibitors is being developed. These "fleximers" possess necessary hydrogen bonding elements necessary for recognition by the polymerases. Their inherent flexibility, however facilitates their ability to adopt novel conformations, which enable engagement of alternative amino acid residues in the binding site. This allows them to overcome resistance mechanisms related to point mutations, thereby remaining active. To date a key bicyclic precursor to Flex-GTP has been synthesized and will be further functionalized to produce the target Flex-4'-azido GTP.

This work was funded, in part, by the National Institutes of Health #AI097685 (KSR) and an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Local and Regional Constraints on Diversity of an Experimental Urban Metacommunity

Katherine F. Brundrett*, Christopher M. Swan*
Christopher M. Swan, Associate Professor, Department of Geography and Environmental Systems

Humans create novel landscapes through urbanization. It is hypothesized that complex urban landscapes influence biodiversity at both local and regional scales. However, despite the increasing prominence of urban centers, we know little about the processes that shape urban ecological communities. To understand how urbanization can shape biodiversity, we performed an experiment where we estimated the response of zooplankton diversity to different local (water quality) and regional (source pool composition and dispersal) factors. Pond mesocosms were inoculated with zooplankton from either rural or urban stormwater ponds, and dispersal was maintained in half of the mesocosms. Water quality was degraded by introducing road deicer as sodium chloride, a contaminant of rising concern in urban areas. Our hypotheses were supported overall. Dispersal increased diversity, while chloride reduced diversity. Biodiversity levels were highest when dispersal was allowed and no chloride was present, but lowest when dispersal was inhibited under the same no chloride treatment. This suggests dispersal played a strong role in shaping local diversity patterns. How biodiversity is generated and maintained in the urban environment is understudied, yet important to understand from both local and regional perspectives. This study provides one of the first tests of local versus regional factors shaping urban metacommunities.

This work was funded, in part, by NSF LTER DEB-1027188.

Analysis Identifying the Challenges of Social Networking When Using Screen Readers

Caroline E. Brunschwyler
Ravi Kuber, Assistant Professor, Department of Information Systems

The widespread adoption of social networking mechanisms has had a profound effect on the way in which individuals communicate and collaborate with one another. However, levels of accessibility can be compromised to achieve aesthetically-pleasing interfaces. A study was conducted with 12 blind screen reader users, to identify the barriers faced when interacting with social networking web sites. Results indicate difficulties interacting with graphical objects (e.g., interactive games and verification images), and problems gaining an overview of dynamically-refreshing content. The findings aim to lead towards the creation and implementation of guidelines for interface designers looking to develop inclusive social networking web sites.

The London Foundling Hospital: Social Entrepreneurship Aimed at Unwanted Children in the Eighteenth-Century

Erin Butler
Amy Froide, Associate Professor, Department of History

The eighteenth-century British welfare system had few viable options for unwanted children; they were often left in substandard conditions at parish homes or workhouses, or simply abandoned by their family and left to die. In 1722, Thomas Coram, a successful businessman, began campaigning for a revolutionary institution to care for these children and make them productive working citizens, and in 1739 the London Foundling Hospital was chartered. This was truly a venture in social entrepreneurship by the elite, who utilized new approaches to caring for the children. One was increased press coverage of the Foundling Hospital and its inmates, to garner acceptance and donations to the institution. Two were novel fundraising methods, unheard of in parish care, but characteristic of elite culture. Three, and perhaps the most entrepreneurial aspect of the Hospital, however, was the care of the children. Stringent admissions procedures, novel approaches to nursing and education, and constant oversight of these practices provided an innovative alternative to existing parish institutions. The Foundling Hospital was a foray by London's elite into social entrepreneurship to address the growing problem of unwanted children in Britain, and it became a model for private charity for years to come.

Fine-tuning of Mucosal Barrier Function for Tetanus Vaccine Delivery in Mice Using the Novel Peptide Adjuvant AT1002

***Patricia C. Castillo**, Vincenzo Casolaro, Alessio Fasano, Karen Lammers*
Alessio Fasano, Professor, Dept of Pediatrics, Medicine, and Physiology, University of Maryland School of Medicine; Vincenzo Casolaro, Associate Professor, JHU School of Medicine; Karen Lammers, Research Associate, Dept of Pediatrics, University of Maryland School of Medicine

Mucosal vaccination is a potentially more effective, more practical, less expensive, and safer method of mass immunization. The main limiting factor is the inability of the antigen to cross the mucosal barrier. We tested whether AT1002, a peptide regulator of mucosal barrier function, can act as an adjuvant to elicit protective local and systemic immune responses. We predicted that its ability to reduce intercellular tight junction competence would permit antigen passage through the airway mucosa, hence initiating a greater immune response. Weekly and biweekly over four to six weeks, we intranasally administered tetanus toxoid (tt) antigen with increasing amounts of AT1002 to C57BL/6 mice. To measure the peptide's effect, tt-specific IgG antibodies and cytokines were quantified using ELISA. Results show that exposure to 100 and 300 nmol AT1002 induced increased IgG levels (albeit somewhat inconsistent at highest dose). Slight increases in cytokine levels were measured upon exposure to 300 nmol AT1002 only. Optimizing the conditions of peptide preparation will allow for further testing of its capacity to protect tt-immunized mice challenged with a lethal dose of tetanus toxin. Successful characterization of AT1002 as an adjuvant in this model paves the way for its employment in effective protocols of mucosal vaccination.

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Determination of the Pharmacological Specificity of Sumanirole and its Analogs on Dopamine Receptor Subtypes

***Mayukh Chakrabarti**, Rebecca A. Roof[1], Mu-Fa Zou[2], Amy Hauk-Newman[2], David R. Sibley[1]*
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Dopamine receptors are responsible for mediating the effects of dopamine, a catecholamine neurotransmitter, within the brain and in peripheral organs throughout the body. In the brain, dopamine receptors regulate such activities as locomotion and working memory. Malfunctions in dopaminergic neurons result in the pathogenesis of a number of neuropsychological disorders, including Parkinson's disease and schizophrenia, and are an appealing target for therapeutic drugs. In mammals, five types of dopamine receptors have been identified (D1-D5), and have been classified into D1-like (D1, D5), and D2-like (D2, D3, D4) subgroups. The objective of the study was to classify the pharmacological effects of sumanirole, a putatively selective D2 agonist, and its structural analogs, on receptors of the D2-like dopamine receptor subgroup. Early results show that analog MFZ 11-51 appears to be the most promising D2 – selective compound, exhibiting high agonist activity with very low antagonist activity. Drugs like MFZ 11-45 and MFZ 11-48 exhibit partial agonist activity, while analogs MFZ 13-19 and MFZ 13-16 both appear to exhibit relatively strong antagonist activity in D2. Further studies are being conducted to better understand the selectivity of these drugs for other DA receptor subtypes.

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TIMP-2 Overexpression Alters the Transcriptional Profile of Human Adenocarcinoma A549 Cells

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Tissue Inhibitors of Metalloproteinases (TIMPs) are proteins secreted by all cells. TIMPs are natural inhibitors of Matrix Metalloproteinases (MMPs), proteins that promote the breakdown of the extracellular matrix. Previous studies show that TIMP-2 has additional functions than the inhibition of MMPs. TIMP-2 stunts cancer growth by arresting cells in their G1 state; it also inhibits tumor angiogenesis, and therefore restrains tumor growth *in vivo*. This is achieved via a) TIMP-2 inhibition of MMP-2, and therefore, reduced ability of MMP-2 to degrade the ECM that supports angiogenesis; and b) TIMP-2 inhibition of growth factor-stimulated endothelial cell growth via its binding to integrin α3β1 on the endothelial cells. This occurs independently of its MMP inhibitory activity: a mutant, Ala+TIMP-2, lacking MMP inhibitory activity, is also able to inhibit angiogenesis. TIMP-2 is also thought to promote the apoptosis of tumor cells, while high levels of MMPs are associated with increased cancer cell migration, invasion, and high risk of metastasis. We found that *in vitro*, Timp-2 and Ala+Timp-2 inhibited tumor cell proliferation; in vivo, Timp-2 and Ala+Timp-2 xenografts showed reduced growth rates. Thus, as the MMP/TIMP balance is shifted towards the MMPs proteolytic activities, TIMPs could potentially be used therapeutically against tumor progression.

This work was funded by the National Institutes of Health.

Determining the Effect of Dithiolethione Compounds on the Activity of Human Glyceraldehyde-3-Phosphate Dehydrogenase

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Dithiolethione compounds have chemopreventive, cytoprotective, and antimitogenic effects. We have shown that some of these compounds interact with glyceraldehyde-3-phosphate dehydrogenase (GAPDH). In cells, GAPDH is an abundant and multifaceted protein involved in glycolysis, cell death, DNA repair, regulation of gene expression, tRNA export, membrane fusion and transport. As a result of its plethora of roles, there is an incentive to understanding how dithiolethiones affect GAPDH activity and function. Dithiolethiones can directly or indirectly modify cysteine residues in protein targets. GAPDH contains three cysteine residues that are susceptible to thiol-modifying agents. Therefore, we set out to examine how the dithiolethione, ADT-OH, affects GAPDH activity. Human GAPDH was overexpressed in bacterial cells and purified by ion-exchange and affinity chromatography. We measured the catalytic activity of GAPDH in the absence and the presence of ADT-OH, and in the absence of DTT. Comparison of the kinetics parameters for unmodified GAPDH and GAPDH modified with increasing concentrations of ADT-OH reveals a concentration-dependent decrease of GAPDH catalytic activity. In order to determine the exact mechanism of ADT-OH modification of GAPDH we have performed a site-directed mutagenesis of cysteine residue 156 into a serine. Our next steps will be to perform a kinetic assay and use mass-spectrometry.

This work was funded, in part, by the Howard Hughes Medical Institute's Precollege and Undergraduate Science Education Program (JC) and UMBC DRIF SRAIS (EG).

The Games Children Play: Differences in Math Skills Fostered through Games

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There are measured differences in children's math achievement across ethnic populations which are evident at school entry. On average, African American and Latino children start school with significantly lower math skills than European American children. The skills with which children start school predict their later math development. Thus, what children do at home prior to school entry plays an important role in young children's math development. Differing parental beliefs and the math activities children engage in at home can explain some of the variation in children's math skills. Prior research has shown that playing math board and card games can improve children's math skills. Nevertheless, research on children's math development has not yet adequately considered home-based practices. The present study identified the games African American, European American, Chinese, and Latino parents provided for their children, and the skills fostered through these games. Parents of children from prekindergarten through second grade completed interviews about their beliefs about children's math development and the frequency with which their children participated in activities relevant for math development.

Perceptions of Nationality and Citizenship: a Look at Jordanian Palestinian and Trans-Jordanian identities

Laurentina Cizza
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Identity represents an open question in the Middle East. In Jordan, the 1948 influx of Palestinian refugees rendered Jordanian national identity inextricable from the struggle for a Palestinian homeland. The original inhabitants of the East bank of the Jordan River (Trans-Jordanians) view the loyalty of the descendents of Palestinian refugees to the Jordanian state with suspicion. As long as Trans-Jordanians view Jordanian-Palestinians in this light, Jordan will remain divided. This study focused on the perceptions of Jordanian youth regarding nationality and citizenship and assessed whether these conceptions vary across Palestinian and Trans-Jordanian lines. Data collection for this study took the form of a survey conducted at the University of Jordan and Hashmeieh University in Amman and Zarqa, Jordan. The survey also helped generate interviews with respondents. The researcher used the survey to categorize the responses along pluralist and nationalist lines (Stefanie Nanes 2008). Nationalists ascribe to the "cultural nation," based on cultural origins, not rational choice. Pluralists ascribe to the "contractual nation" based on individual willingness to participate in a community and submit to its laws. Although Palestinians demonstrated slightly stronger pluralist tendencies than Trans-Jordanians, ultimately Jordanian youths' perceptions of nationality and citizenship demonstrated strong pluralist tendencies regardless of Palestinian and Trans-Jordanian origins.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Targeting Bone Metastasis in Hi-Myc Mouse Model to Recapitulate Human Prostate Cancer

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Charles Bieberich, Professor, Department of Biological Sciences

Prostate cancer is the second leading cause of cancer death in men in the United States, and there is a pressing need for an animal model that recapitulates key features of human prostate cancer. The best current model is the Hi-Myc transgenic mouse, based on androgen-driven expression of the human MYC gene, an oncogenic transcription factor that regulates cell growth and apoptosis and is upregulated in prostate cancer. A hallmark feature of human prostate cancer is loss of the prostate-specific tumor suppressor protein *Nkx3.1*, and *Pten,* a phosphatase that also acts as a tumor suppressor. Recently, a triple transgenic mouse model in which the androgen independent *Hoxb13* promoter drives MYC expression concurrent with conditional loss of *Pten* driven by Cre recombinase (*Hoxb13-MYC/Hoxb13-TCre/Pten*$^{Fl/Fl}$*)* was generated. This model faithfully recapitulated human metastatic prostate cancer with 100 percent lymph node metastasis, high levels of liver and lung metastasis, and low levels of bone metastasis. The bone is a common site of metastasis in human prostate cancer. To increase the incidence of bone metastasis, and generate a more aggressive model for further studies, we have attempted to derive a new model that incorporates a greater extent of MYC overexpression and *Pten* loss.

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Deletion of PKA Subunits Induces Novel Packing of Collagen Fibers and Regulates Mineralization in Bone Tumors

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Abnormal activity of Protein Kinase A (PKA) causes fibrous dysplasia and endocrine and bone tumors. PKA is known to regulate bone making cells, but the mechanisms are unclear due to the complexity of its subunits. The R1a, R1b, R2a, and R2b isoforms of regulatory subunits bind cyclic AMP and release and activate catalytic subunits regulating cell proliferation and differentiation. Previous deletion of one R1a allele in mice produced fibrous and bony tumors associated with increased PKA activity, cell proliferation and incomplete differentiation of osteoblasts. We found that further deletions of an R2a or R2b allele in the R1a$^{+/-}$ background resulted in unexpected partial compensation. Although the deletions did not prevent the tumors completely, they restored mineralization and organization of collagen in bone material growing within the tumor, as indicated by polarized microscopy and Raman micro-spectroscopy of caudal verterbrae sections. The tumors also produced novel, well organized and mineralized bony structures. Our results suggest that PKA II isoforms may coordinate collagen organization and mineralization.

This work was made possible through the Summer Internship Program in Biomedical Research at the National Institutes of Health.

Digging Deeper: Sino-Sub-Saharan African Economic Relations

Juan M. Collazos
Tim Gindling, Professor, Department of Economics

In the past decade, China has sought increasingly interdependent economic relations with Sub-Saharan Africa. Although not surprising given the region's abundance of natural resources essential in fuelling China's unparalleled economic growth, these relations distinguish themselves from those of other nations in that they are promoting and achieving greater trade, investment, and aid links region-wide. At the same time, after historically lagging behind other regions of the world in economic indicators, Sub-Saharan Africa became home to six of the world's ten fastest-growing economies. China's involvement in Sub-Saharan Africa is an important factor in these developments, but the overall macroeconomic impact of Chinese investment, trade, and aid in Sub-Saharan Africa is still a source of heated debate in academia, among policy makers, and in the press. This research examines literature on the topic and proposes an alternative, more encompassing econometric model to help determine the economic impact that Chinese trade, investment, and aid has had in the region.

The Expression of Aristotelian Theory in Tolkien's Writings

Rebecca A. Couch
Lisa Vetter, Associate Professor, Department of Political Science

With the popularization of Tolkien's works over the past decade as a result of the release of the "Lord of The Rings" trilogy on film, his ideas now enjoy a prominent role in mainstream American culture. Tolkien conveys complex political and moral messages throughout his works that could be influential for those who are and will be making important decisions in today's world. Current scholarly research on Tolkien's political theory analyzes his most popular works in the larger context of his life and career to understand his positions regarding political life, both domestic and international. Several studies of Tolkien's political theory examine connections with the political and ethical work of Aristotle, one of the most influential political philosophers of all time. Upon closer inspection, it is clear that through story Tolkien is not only able to convey to the public many of the complex concepts in Aristotle's political and ethical work without oversimplifying them, but also in many cases expanding upon those ideas. My research builds on the current research on Tolkien's political theory to gain more insight into how his Aristotelianism can help inform American political culture.

Using a High Throughput Assay to Understand Gene Function Related to Cell Wall Development in *Aspergillus nidulans*

Colleen Courtney, LaTonya Simon
Mark Marten, Professor, Department of Chemical, Biochemical, and Environmental Engineering

There are numerous genes known to contribute to cell-wall synthesis and repair in the model fungus *Aspergillus nidulans*. A number of sophisticated experimental tools (e.g., atomic force microscopy) have been used to determine how various genes impact the cell's shape (i.e., morphology) and cell-wall material properties (i.e., elastic modulus and tensile strength). These tools are both time consuming and expensive. To quickly and inexpensively screen new genes for their impact on cell wall synthesis and repair we have adapted a previously developed, high-throughput plate assay. Each assay consists of various agar plates containing a different compound known to interfere with cell wall development or repair. These plates are then inoculated with a series of concentrations of mutants, to determine if the respective gene impacts cell wall development. We hypothesized that autophagy deletion mutants (Δ*atg8*, Δ*atg13*) are involved in cell wall development and used this assay to test our hypothesis. Each strain, along with their isogenic parent (TN023A, as a control) was grown on Congo Red and Calcofluor White (known to interfere with cell wall development) and rapamycin (induces autophagy). Initial results imply that the *atg8*, *atg13* genes do not play a role in cell wall development.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Backspace/Erase: Delete

Ryan K. Cox
Fred Worden, Associate Professor, Department of Visual Art

Backspace/Erase: DELETE is an experiment in creating a video adaptation of an original comic book story. *Delete* was completed using a computer drawing tablet and three computer software programs: Adobe Photoshop, Adobe After Effects and Adobe Flash. The flexibility and efficiency of using computer software allowed for a more manageable and less time-consuming workflow than with traditional cel animation. This was especially important as, unlike with a Hollywood production, I was the sole animator available to put in the time necessary to achieve the sophisticated graphic and dynamic style I hoped to achieve. I had to find a balance between the visual subtleties of the hand drawn animation technique and the time saving properties of computer frame interpolation animation. One of the creative challenges of Backspace/Erase: DELETE was deciding how to incorporate and adapt the strongest features of the print media, multi-panel comic book version of the story into a smoothly flowing time-based animated film. This required both careful pre-production planning, including using story boards to plan a scene's composition, as well as some trial and error modifications of those plans as I undertook the actual animating.

Decreasing Tardiness in High School Classrooms through Graded Opening Activities

***Cortney Crouse**, **Caitlin Conran,** Brian Alseph, James Thayer*
Dr. Jonathan Singer, Associate Professor, Department of Education

Students arriving late to school and late to individual classes throughout the day are a major problem in local high schools. Students arriving late miss crucial information that is vital to their success in each class and are disrupting class instruction. One strategy to limit tardiness is to use the first ten minutes of class for important and meaningful activities that are worth credit. The purpose of this study was to investigate the effect the grading a variety of activities, including worksheets, quizzes, videos, or extrinsic motivators during the first ten minutes of class time. If students arrive on time, they receive class credit for those activities. Those who come late are required to complete an extra assignment to receive partial credit for the class activities they missed. If these extra class assignments are done correctly, the maximum score a student can receive is 85 percent. Therefore, students are encouraged to come to class on time to have the opportunity to receive full credit for the beginning of class activities. The data were collected from two different content areas and from different time periods during the day. The class attendances for 88 students were logged and the tardiness rates were recorded for a period of eight weeks. Data for this research is currently being collected and analyzed. Final results and conclusion will be reported during the URCAD presentation and the graduate research poster presentation.

Does Web Content Filtering Affect Teachers' Ability to Utilize Multimedia to Provide Meaningful Learning Experiences?

John R. Cservek
Linda Oliva, Assistsant Professor, Department of Education

Nearly synonymous with internet access in our public schools, it is almost a given that while connected to a school network, only a small fraction of the internet is readily accessible. Content filtering software purports to protect our students from the evils of the internet, blocking inappropriate sites before they can deliver unscrupulous messages, but what happens when teachers want to access blocked sites such as YouTube in order to incorporate an engaging multimedia component to their lessons? The purpose of this study is to investigate the following questions: How does content filtering software work? Who determines which sites contain objectionable content? Is it possible in an environment as replete with multimedia as the internet to block only that content which serves no academic purpose? Furthermore, are teachers of specific content areas harmed more or less than others depending upon the type of material blocked? My research seeks to determine, through guided study of content filtering software itself and self-reported information from teachers whether or not content filtering software in fact achieves its intended purpose, and if so, at what cost?

Does Intentional Use of Positive Reinforcement Improve Students' Behavior and Time Spent on Instruction?

Alison A. D'Ottavio
Linda Oliva, Assistant Professor, Department of Education

Positive verbal and written reinforcement is often neglected in the classroom because teachers are more inclined to focus on negative behavior that limits classroom instruction. Often, students who are well behaved and respectful do not get the praise that they deserve because of the distracting negative behavior that occupies the teachers' attention. The purpose of this study was to investigate how positive written and verbal reinforcement affected the behavior of students and classroom instruction time. The methods of verbal and written positive reinforcement included both whole-class-directed affirmations and student-specific affirmations. These interventions were delivered and logged in two Spanish classes. The effects of these interventions were recorded after each class to show the progression of improvement in the incidents of students' on-task behavior and the amount of class time spent on instruction. The results concluded that negative behavior decreased in the classroom as a result of the increased use of positive reinforcement, which also allowed maximum instruction time.

Determine the Mechanism CD80 Uses to Activate T-Cells and Induce Immunity in Individuals with Cancer

Sonia Dalal*, Samuel Haile*
Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

Programmed Death Ligand-1 (PD-L1) is expressed by many tumor cells and increases tumor progression by binding to its receptor PD-1 on T-cells, thereby inhibiting T lymphocyte activation and causing T-cell apoptosis. Cluster of Differentiation 80 (CD80), expressed by antigen presenting cells provides a potent costimulatory signal needed for T-cell activation by binding to T-cell-expressed CD28. We have recently identified another function for CD80 and shown that human cancer cells modified to express CD80 inhibit PD-L1 binding to its receptor, resulting in increased T-cell activation. To distinguish if tumor cell-expressed CD80 promotes T-cell activation by binding to CD28 and/or inhibiting PD-L1 we must construct a mutant CD80 that does not bind to CD28. We are generating a soluble CD80 mutant ($sCD80_{96,97,99}$) because it is not feasible to inject cancer cells expressing CD80 into patients. Previous studies demonstrated that CD80 mutated at amino acids 96. 97, and 99 ($CD80_{96,97,99}$) no longer binds CD28. To generate a mutant soluble molecule the $sCD80_{96,97,99}$ gene was inserted into the pINFUSE-hIgG1-Fc vector. Mammalian cells are being transfected with the $sCD80_{96,97,99}$ construct. $sCD80_{96,97,99}$ will be purified and western blot analyzed and used in functional experiments to determine how CD80 restores T-cell activation.

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Guided Argumentative Writing Action Research

Cristina M. Dalton
Linda Oliva, Assistant Professor, Department of Education

Argumentative writing is a skill area in which most high school students struggle. Students need to have more guided instruction and practice during their academic careers in order to successfully use argumentative writing in their future. My study examined the effect of guided argumentative writing lessons on the skills of the students. The subjects of my study were twenty five students in my Spanish 2 Honors Class. I gave them an argumentative writing sample to use as a reference and dedicated half an hour of one class period to providing instruction on different pieces of the argumentative writing process. I then provided a guided argumentative writing process in which they wrote pieces of the essay each class period for fifteen minutes, until it was finished. I then provided feedback on their writing, and had them write an argumentative essay on their own. The quality of their writing was measured by comparing their first written argumentative writing essay with the second.

Optimization of the Expression of Zebrafish PKR

Erica Dasi, *Eunseok Choi*
Rosemary Jagus, Associate Professor, University of Maryland Center for Environmental Science-Institute of Marine and Environmental Technology (UMCES-IMET)

PKR is a protein kinase that phosphorylates the α-subunit of the eukaryotic translational initiation, eIF2. It plays a significant role in the innate immune response in both fish and tetrapods. Tetrapod PKR contains two double stranded RNA binding domains (dsRBDs). Many fish, including, zebrafish, contain three dsRBDs. Although there have been several theories as to why zebrafish have an extra dsRBD, there is currently no definite answer explaining this difference. Similarly, the relative contributions of the three dsRBDs towards regulating kinase activity have yet to be established. In this investigation, we produced recombinant *Danio rerio* PKR and *Homo sapiens* PKR to phosphorylate eIF2α *in vitro.* In addition, we investigated the effect of the co-expression of lambda phosphatase on the expression level of *D. rerio* PKR (DrPKR) in bacterial cells. We looked at expression using the pTYB4 vector with and without co-expressed phosphatase to produce DrPKR in its non-phosphorylated (inactive) form. To our surprise, co-expression of the phosphatase did not increase DrPKR expression, probably because the intein fusion DrPKR is not active. We plan to measure DrPKR activity in the fusion protein and after removal of the intein by the addition of dithiothreitol (DTT).

This work was funded through the Living Marine Resources Cooperative Science Center (LMRCSC) internship program from the NOAA Educational Partnership Program.

Genetic Analysis of the Role of PHT4;6 in Regulating Innate Immunity of Arabidopsis

***Teklu M. Dawit**, Chong Zhang, Hua Lu*
Hua Lu, Assistant Professor, Department of Biological Sciences

Successful control of plant diseases depends on a thorough understanding of the mechanisms of plant disease resistance. Previous studies by Dr. Lu's laboratory showed that the loss of function mutant of the *PHT4;6* gene, *pht4;6-2,* enhances Arabidopsis disease resistance. Therefore, we hypothesized that *PHT4;6* is a negative regulator of plant defense. In order to further understand the role of *PHT4;6* in defense regulation, we took advantage of the unique Arabidopsis mutant, *acd6-1*, whose small size is inversely correlated with plant defense level. We crossed *pht4;6-2* with *acd6-1* to determine if a loss of function in *PHT4;6* could enhance the defense phenotypes of *acd6-1*. We also crossed a transgenic plant expressing extra copies of the *PHT4;6* gene with *acd6-1* to determine if a gain of function in *PHT4;6* could suppress the defense phenotypes of *acd6-1.* The F2 plants from these crosses will be screened with DNA markers corresponding to *acd6-1* or *pht4;6-2*. Plants will also be selected for Kanamycin resistance conferred by the vector carrying the *PHT4;6* transgene. Once we obtain double homozygous mutant/transgenic plants, we will then phenotype these plants and perform defense assays to assess if misexpression of *PHT4;6* could alter disease resistance in *acd6-1*.

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Does Variation in Feeding Rate Influence Genetic Differences in Lifespan and Fecundity of Drosophila?

***Payal Daya**, Mary F. Durham*
Jeff Leips, Associate Professor, Department of Biological Sciences

Dietary restriction, a decrease in nutrient intake without malnutrition, has been shown to increase life span nearly universally among many species and is highly linked to feeding behavior. Previous experiments in our laboratory found that the effect of dietary restriction on life span and fecundity varied among different natural genotypes of *Drosophila melanogaster.* In order to substantiate if the response of these traits to dietary restriction is influenced by genetically based differences in feeding behavior or the dietary treatment itself, we measured the feeding rates of several *Drosophila* genotypes. Flies were fed radioactively labeled media for 24 hours, and isotope levels in each fly were measured to quantify the total volume of food ingested. The body size of each fly was accounted for as a covariate. Generally, flies reared on a high protein diet ate more food than those reared on a restricted diet, indicating that those reared on a restricted diet do not compensate for the nutrient decrease by eating more. This means that the genotype specific response of life span and fecundity to dietary restriction observed in previous studies is largely an effect of the dietary treatment rather than differences among genotypes in feeding rates.

This work was supported, in part, by Travel Award from the UMBC Office of Undergraduate Education and NIH Grant R01-DK084219.

Arranging for Unconventional Ensembles

Krisztina E. Dér
Joseph Morin, Lecturer, Department of Music; Linda Dusman, Professor, Department of Music

Born of a desire to create repertoire for an unconventional ensemble of UMBC music students, this research project studied musical arrangements created for various unconventional ensembles, ensembles which do not fall into the traditional categories of string quartet, piano trio, etc. These arrangements provided insights into the artistic crafts of arranging, reducing, and transcribing, which are the standard processes for adapting musical literature for such ensembles. Two prominent concerns were addressed in producing and arrangement for the UMBC ensemble: a general understanding pertaining to executing arrangements, and a specific understanding of the essence of the compositions themselves, necessary to the production of a faithful arrangement. Following this research, the final stage of this project produced an arrangement of a movement from Zoltán Kodály's *Háry János Suite*, configuring this work for performance as a chamber ensemble of altogether different instrumentation while preserving the essence of the original work. Given that unconventional ensembles represent a substantial performance mode in today's world of classical musicianship, knowledge and practical application regarding the arrangement, reduction, and transcription of orchestral works are extremely valuable skills for the aspiring professional musician.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

HIV-1 Diploid Genome Selection is Mediated by a Novel Dimerization-Dependent RNA Structural Switch Mechanism

Sai Sachin Divakaruni, *Courtney LaCotti, Atheeth Hiremath, Xiao Heng*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

The Human Immunodeficiency Virus (HIV) is a retrovirus that can cause Acquired Immunodeficiency Syndrome (AIDS), a global epidemic. To understand the mechanism of genome recognition and packaging, the interaction between the HIV-1 5' Untranslated Region (5'-UTR) and the Nucleocapsid (NC) domain of the viral Gag polyprotein was studied. Our lab obtained Nuclear Magnetic Resonance (NMR) data showing that the HIV-1 AUG region exists in equilibrium between a hairpin (HP) monomer and a long-range interaction (LR) dimer structures. We stabilized the RNA into both conformations, incubated them in near-physiological salt conditions, and analyzed the resulting structures via gel electrophoresis. Our results showed that 5'-UTR ^{HP} remained a monomer, whereas 5'-UTR^{LR} formed a dimer. We used Isothermal Titration Calorimetry (ITC) to characterize RNA-NC interactions. Our results indicate that 5'-UTR^{HP} contains 7 ± 1 high–affinity NC binding sites, while 5'-UTR^{LR} contains 16 ± 2 high-affinity NC binding sites. Thus, our results strongly suggest that diploid genome selection by HIV-1 is mediated by a dimerization-dependent RNA structural switch involving the U5-AUG long-range interaction.

This work was funded, in part, by NIH Grant No. 3R37AI30917-I9 and the Howard Hughes Medical Institute.

Improving Literacy Skills in the Art Classroom

Danielle M. Doll
Linda Oliva, Assistant Professor, Department of Education

Literacy has always been a crucial part of the classroom, and with the increasing awareness for involvement in STEM, Howard County Public Schools has adopted a method of including literacy into any course with The Seven Capacities of Literate Individuals. The purpose of this study was to investigate how including all Seven Capacities into the Feldman Theory of Aesthetic Criticism could improve my student's written responses when critiquing their classmates' work, and to survey how in depth they felt they exercised those capacities. I did this by reworking a pre-established and currently used theory of artistic criticism called the Feldman's Theory of Artistic Criticism by changing how it was used to incorporate all Seven Capacities. My first step was to have our students critique artwork using Feldman's Theory and then take a survey asking them how in depth they used each of the Seven Capacities. Then, I had our students use the Feldman's Theory once more, but with changes to incorporate all Seven Capacities, and then take another survey asking them how in depth they used the Capacities. I also compared the written responses before and after the change.

There and Back Again: Analyzing Adventure Cycling in America

Jason Dubbs
Theodore Gonzalves, Associate Professor, Department of American Studies

This study is a textual analysis of the cultural themes of the sport of adventure cycling and the intentions behind cyclists taking on such expeditions. Adventure cycling, or bicycle touring, is a growing trend amongst Americans, but in a culture of luxury automobiles, first class flights, and a hotel in most any town, people still choose to travel by bicycle, a mode of transport that is seldom used for even the smallest of commutes. While these trips are often charity rides across entire states, or from Atlantic to Pacific, more and more people are choosing to travel by bicycle for other reasons. In this study, I examined two first-person narratives: *Off the Map: Bicycling Across Siberia* by Mark Jenkins, and *Be Brave, Be Strong: A Journey Across the Great Divide* by Jill Homer. These two trips, traversing the Rocky Mountains and Siberia, are extremes to the culture, but reflect the trends of many cyclists taking on less daunting pursuits. Key cultural themes of the sport include a sense of wanderlust, a public sentiment of little faith, and an insatiable appetite for the toil of endurance. The growing trend of adventure cycling may be redefining the culture of American travel.

The American Road Trip: A Reading of the Landscape

Jordan Dubbs
Nicole King, Assistant Professor, Department of American Studies

This study analyzes how road narratives present the cultural, human, and physical landscape of America. When traveling on the American road by automobile, travelers learn about the country while speeding by, somehow experiencing the land and the people that inhabit it. In passing, a traveler has a limited opportunity to understand a place and this reconstruction takes many forms. This paper is a textual analysis of four road narratives, *On the Road* (1957) by Jack Kerouac, *Travels with Charley: in Search of America* (1962) by John Steinbeck, *Blue Highways: A Journey Into America* (1982) by William Least Heat-Moon, and *Roads* (2000) by Larry McMurtry, to examine how these male narrators learned about the places along the roads of America. Also, this paper seeks to find how the America portrayed in these narratives changed during the 43-year period between these narratives, and how the speed and method of travel affects the representation of the American landscape. The research presents the cultural importance of traveling the road in American identity, the historical context of these narratives, and the importance of method and personal philosophy in understanding America.

The Effect of Needle Gauge on Ferrofluid Nanoparticle Concentration Patterns in Agarose Gels

Korine A. Duval*, Anil Attaluri, Navid Manuchehrabadi, Liang Zhu*
Liang Zhu, Associate Professor, Department of Mechanical Engineering

The unique ability of ferrofluid nanoparticles to generate thermal energy when the nanoparticles are subject to an alternating magnetic field has made it useful in a variety of heating studies, particularly within biomedical research. In magnetic nanoparticle hypothermia research, these particles are injected into cancerous cells and energized in order to induce apoptosis within malignant cells. This groundbreaking research, however, is currently still in its young stages with much knowledge left to question. Particularly within the scope of this work, the effect of needle gauge on the concentration patterns of ferrofluid injections in agarose gels was studied. In order to determine the concentration patterns of each injection, a Micro-CT imaging system was used to determine 3-D nanoparticle distribution in the gels and how the needle gauge affects the nanoparticle deposition pattern. The gauges explored were 21G, 25G, 23G, and 30G at an injection rate of 5 µL/min and an injection amount of 0.1 cc. Results suggested a pattern of increasing breadth and dispersion of particles with increasing needle gauge. Findings are consistent with earlier calculated theoretical predictions where larger needle gauges yield more backflow while smaller needle gages yield a larger porosity.

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A Novel Mechanism of Resistance to Apoptosis in Immune Suppressive Cells in the Inflammatory Tumor Environment

Christopher Ecker, *Olesya Chornoguz, Suzanne Ostrand-Rosenberg*
Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

Most cancer patients have a weakened immune system due to the accumulation of myeloid-derived suppressor cells (MDSC), which makes them poor candidates for cancer immunotherapies. Because MDSC accumulation and potency are enhanced by inflammation, we are studying the effects of inflammation on MDSC using wild type mouse 4T1 mammary carcinoma cells and 4T1 cells transfected with the pro-inflammatory cytokine Interleukin-1β (IL-1β). Previous studies from our laboratory showed that IL-1β exacerbated tumor progression by increasing MDSC resistance to apoptosis. When activated, p38 mitogen activated a protein kinase (p38 MAPK) confers resistance to apoptosis, suggesting that inflammation caused by IL-1β may increase MDSC resistance to apoptosis through the p38 MAPK pathway. If our hypothesis is correct, then inflammatory MDSC will have higher levels of activated p38 MAPK and be more resistant to apoptosis. Preliminary results show that upon stimulation with the p38 agonist anisomycin, inflammatory MDSC have higher expression of activated p38 MAPK compared to conventional MDSC. Defining the mechanisms responsible for MDSC resistance to apoptosis will facilitate the creation of effective, cancer immunotherapies.

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CollecTF: A Database of Experimentally Verified Prokaryotic Transcription Factor Binding Sites

Chad E. Elkins, *Joseph Cornish, Kathryn Cronise*
Ivan Erill, Assistant Professor, Department of Biological Sciences

As the improvements to high-throughput sequencing technologies continue to grow, so does our need for computational resources that organize and store the vast quantities of data these technologies produce. Of particular need is an extensive database for transcription factor binding sites (TFBS) that allow us to benchmark methods previously applied in TFBS search and modeling. While current databases do exist, they do not always provide the most current data, nor do they provide a measure of data quality. To address these problems, we have begun development of CollecTF, a curated database of experimentally verified prokaryotic TFBS that can supplement current databases and with time, supersede them. The primary focus of CollecTF is for users to assess and rate the soundness of experimental methods used to identify TFBS thereby providing that lacking measure of quality. This assessment is accomplished through the use of a strict rubric that provides consistency in the rating. The CollecTF project strives to offer open submission and to directly submit data from CollecTF to NCBI as Third Party Annotation. This will encourage direct submissions from experimentalists, thus creating self-sustaining incorporation of the most recent data.

This project was funded by the National Science Foundation (DBI–1031420)

Spiritual Music and its Relation to Personality

Cristóbal Fernández
Diane L. Alonso, Senior Lecturer, Department of Psychology

For some time, researchers have been interested in studying the relationship between spirituality and personality traits. Studies have shown that transcendental meditation, a type of spiritual meditation, has yielded positive results in reducing migraine-related problems in individuals who are classified as being "opened to experience," by the "'Big Five" personality traits scale. The current study investigates whether spiritual music can help reduce anxiety for individuals who are "opened to experience." Sixty participants are randomly assigned to one of three groups. An initial blood-pressure reading is taken for all three groups. Then all participants complete a simple task but are given falsified results, showing poor performance, in order to create anxiety. Next, a second blood-pressure measurement is taken, after which participants are asked to wait. Depending on their group assignment, they will hear in the background either Gregorian chants, Pop music, or no music at all. After five minutes, a final blood-pressure reading is obtained in order to be compared to the previous two readings. It is expected in this study that participants who listen to Gregorian chants show a faster return to their original blood pressure levels indicating that spiritual music may be helpful in reducing anxiety.

An Analysis of the Hukou System in China

Amy Fowler
Ka-che Yip, Professor, Department of History

The hukou system is the household registration system in China that limits internal migration and determines how social services are allotted. 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. My research, conducted in Beijing, shows that at a time when China is undergoing a dramatic economic and social transformation, the government's actions to reform the system and assuage social discontent have not resulted in any real practical changes that address the basic problems of the system. An analysis of secondary literature, primary source documents and interviews, find that the hukou system is slowly decaying and is not viable in the twenty first century. The public's growing dissatisfaction with the hukou system could threaten social stability in China. The scope of research explores the origins of the hukou system, its evolution, and impact on society. Further study includes the government's role and the future of the system.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

The Effect of SQ3R on Reading Comprehension in Middle School

Ashley M. Francis
Linda Oliva, Assistant Professor, Department of Education

According to the school improvement plan at my placement school, a primary goal of the school is to boost student reading comprehension. The plan suggested the implementation of SQ3R reading strategies in the classroom to increase comprehension. This study investigated the effect of SQ3R reading strategies on students' reading comprehension. Student grades, performance, and reading comprehension were measured before we began to implement SQ3R strategies. Student reading comprehension was monitored through various types of assessment (both formal and informal). The study focused on students in seventh grade world cultures. Individual student progress was also monitored and analyzed for trends. This information will be able to begin to fill the currently existing gap in SQ3R research since there is limited evidence that SQ3R is an effective tool to increase student reading comprehension.

Creating a Semi-Automatic Pipeline to Incorporate New Species Data into Mirrortree Database

Veer Gariwala
Maricel G. Kann, Assistant Professor, Department of Biological Sciences

Protein-protein interactions are vital for understanding genotype-phenotype relationships. One method created to predict these interactions is the Mirrortree method. Mirrortree predicts protein-protein interactions using concept of co-evolution. One requirement for Mirrortree is to find query proteins from a database of complete genomes. However, queries must meet a specified number of common species from orthologs to be predicted by Mirrortree. Also protein queries from a specific species may need very specific species to assess co-evolution. Both are not possible with a lack of species in the database. We have a created a semi-automatic pipeline to increase number of species with complete genomes in the database. With this pipeline we are also incorporating the ever-growing sequencing data into the Mirrortree method. Prior to this pipeline, there were 186 complete genomes in the database. Now, there are an additional 225 species in the database with 120 pending. With these updated genomes, Mirrortree protein-protein interactions can be tailored to a specific type of interaction, i.e. the orthologs can be restricted based on their sequence similarity to the query proteins depending on type of interaction being studied. The goal is to have all complete genomes or a representative for each phylogenetic group of organisms.

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Characterizing the Cellular Responses to a Molecular Gradient: a Mechanistic Mathematical Model

Xuan Ge, David P. Stonko
Bradford E. Peercy, Assistant Professor, Department of Mathematics and Statistics
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences

Small alterations in biochemical signaling can be transformed into major differences in cellular decisions. Our interdisciplinary project investigated the conserved JAK/STAT signaling pathway, which is essential for cell migration. STAT activation is initiated by diffusible molecules radiating from a localized source. To analyze how cells respond to a gradient of signaling, we examined the ovary of *Drosophila*. High levels of STAT activation causes a cluster of cells to migrate, while nearby cells with lower activity remain stationary. A balance of opposing transcription factors, SLBO and APT, determines the correct number of motile cells. To identify the minimal requirements for how cells can resolve a graded signal into a step-wise activation (bistability), we have developed a mechanistic mathematical model based on known/probable molecular interactions. The model showed that cooperativity of SLBO to repress *apt*, is sufficient to achieve bistability in this system, given certain parameters. Bioinformatic approaches and our model support a potential role for microRNAs in mediating APT/SLBO cross-repression. To investigate this idea, we are cloning two microRNA genes with the goal of expressing them in *Drosophila*. The mathematical model will continue to inform other new testable hypotheses and direct future biological experiments.

This work was funded by a grant from the National Science Foundation for the UBM Undergraduates in Biological and Mathematical Sciences program.

Modeling Oxygen Concentration Profile within a Biofilm Layer

Nikodimos A. Gebreselassie
Julia M. Ross, Professor, Department of Chemical, Biochemical and Environmental Engineering

Biofilm-related infections are very resistant to antimicrobials and host defenses, which makes prevention and treatment difficult. Current prevention and treatment studies have focused on understanding the initial adhesion of bacteria that leads to a biofilm formation and understanding the structure and biokinetics of biofilms. The study of the structure and biokinetics of biofilm mainly relies on how a biofilm obtains nutrients and utilizes them for growth. Oxygen is a curial substrate for staphylococcal biofilm growth. Our lab has previously developed oxygen-sensing microparticles that are specifically designed to characterize oxygen levels within a bacterial biofilm. The particles were used to measure the oxygen concentration profiles within a live *Staphylococcus aureus* biofilm. Our goal is to model the diffusion of oxygen across a biofilm layer and compare the results with measured values. Current models suggest similar patterns in the two results, which would confirm our mathematical understanding of oxygen diffusion and consumption inside the biofilm.

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Synthesis of a Gemcitabine Functionalized Dendron for Improvement of Advanced Pancreatic Cancer Treatment

Phillip A. Geter*, Margaret Grow*
Marie-Christine Daniel, Assistant Professor, Department of Chemistry and Biochemistry

The standard chemotherapeutic treatment for advanced stages of pancreatic cancer is gemcitabine; however it is rapidly metabolized to an inactive form, leading to a therapeutic half-life of less than one hour following standard infusion. The overall objective is the creation of a nanoparticle-cored dendrimer functionalized with gemcitabine, transferrin (targeting protein) and gadolinium-DOTA (MRI imaging agent) in order to prolong the circulation of the active drug in the body as well as target it to the tumor site, thus leading to fewer side effects of chemotherapeutic treatment. This specific project is focused on the linkage of gemcitabine to a poly-propylene imine (PPI) dendron via a pH-sensitive imine bond.
Our lab has been able to synthesize PPI dendrons of different sizes, and is currently working to link gemcitabine to the generation one dendron. Proton NMR, mass spectrometry and elemental analysis data are used for verification purposes; the final compound will be sent to our collaborators for biological assays.

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Investigate Cell Fate Determination in Arabidopsis during *Erwinia amylovora* Infection

Manroop Gill*, Safae Hamdoun*
Hua Lu, Assistant Professor, Department of Biological Sciences

The bacterial pathogen *Erwinia amylovora* causes the fire blight disease in plants belonging to the Rosaceae family. Billions of dollars are lost each year in agriculture due to this disease. Previous studies have shown that *Arabidopsis thaliana* is resistant to this pathogen, and this resistance is associated with programmed cell death in the infected region. However, in Dr. Lu's laboratory, a surprising new tumor-like cell growth was observed in Arabidopsis leaves infected with *E. amylovora*. To begin to understand how this tumor-like growth affects Arabidopsis resistance to *E. amylovora*, cell biological approaches were employed to determine cell fate alteration in the tumor cells. After infecting *Arabidopsis* leaves with *E. amylovora*, cell death and tumor-like growth phenotypes were scored via the naked eye and histology staining. In addition, the infected tissue was fixed, embedded in resin, cut into thin sections, and observed with a light microscope. Compared to the non-infected tissue, the tumor region was observed to have significantly enlarged cells. Future work on this project includes testing the nucleic content of these large cells, and assaying to determine whether cell growth is associated with Arabidopsis resistance to *E. amylovora*.

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Dual Fluorescent Glutamine Sensor based on Glutamine Binding Protein

Hamsa N. Gowda
Leah Tolosa, Research Professor; Hung Lam, Research Assistant Professor; Yordan Kostov, Research Professor, Department of Chemical, Biochemical, and Environmental Engineering

Developing new and more accurate tools of measuring concentration levels of metabolites, such as glutamine and glucose, has been a rapidly growing area within the medical and biotechnological research fields. This project focuses on developing a method for detection sub-millimolar concentrations of glutamine using the glutamine binding protein (QBP). It was labeled with two complementary dyes: Acrylodan. When glutamine is added, conformational changes of QBP causes decrease of fluorescence intensity in Acrylodan. Fluorescence of the Ruthenium complex remains unaffected, thus allowing Ruthenium to act as a reference. Previous studies have showed that both Acrylodan and Ruthenium have been reliable labeling tools. Therefore, labeling method was optimized to achieve high degree of labeling with both dyes. Using the labeled protein together with fluorescence spectroscopy, measurements of glutamine in micromolar range were performed. Labeled QBP will be used with a portable fluorescence sensor, which is under development. The system can be used in point-of-care settings (in a hospital or at home) for long-term glutamine monitoring. The higher sensitivity of the assay allows for the use of smaller sample which translates to less risk for the patient.

This research was supported in part by a grant to UMBC from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education Program.

The Rising Tides: A Comparative Study of the North Sea Floods of 1953 and the Hurricane Katrina Disaster of 2005

Daniel P. Graham
Terry Bouton, Professor, Department of History

The flooding of New Orleans in 2005 was a terrible disaster. However it was not the first catastrophe of its kind, and the loss of life that resulted from the flooding could have been avoided. In 1953, the Netherlands experienced a similar flooding disaster. Poorly maintained infrastructure allowed massive flooding to occur, and ineffective warning systems precluded the evacuation of those people in the floods path. Had the U.S. and Louisiana State Governments heeded the lessons of history, they would have seen the striking similarities between the situation of New Orleans and that of the Netherlands. Realizing these similarities, a stronger push could have been made to repair damaged levees in New Orleans, and a mandatory evacuation could have been ordered. My research shows the similarities between New Orleans and the Netherlands with regard to geography, weather, and water management efforts, and then contrasts the flood responses of the Dutch government in 1953 and the U.S. government in 2005.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Adolescent Mothers' Parenting Perceptions and their Children's Negative Temperament

Courtney B. Green
Charissa S. L. Cheah, Associate Professor; Laura E. Rose, Doctoral Student, Department of Psychology

The present research explored the mediating role of adolescent mothers' perceptions of their child's negativity in the association between mothers' effortful parenting attributions and their child's observed negativity. Seventy-two mothers (16 to 21 years old) with toddlers (17 to 22 months old) completed measures assessing parenting attributions and how negative they perceived their child's temperament to be; children's negative affect was also objectively observed and assessed during a mother-child play session in the home. Mediation regression analyses revealed that adolescent mothers' perceptions of their child's negativity fully mediated the relation between their parenting and their child's observed negativity, Sobel's $\delta = 8.87$, $p = .05$. Mothers who attributed their parenting successes to their own efforts were significantly less likely to perceive their child as being difficult, which in turn significantly predicted less observed child negativity during mother-child interactions, $t(70) = 2.50$, $p < .05$, $f^2 = .09$. Mothers who make effortful parenting attributions may feel more in control of their parenting and child, and thus perceive their child to be less difficult. Such positive perceptions of their child may elicit more positive mother-child interactions contributing to less actual child negativity. Adolescents are less developmentally prepared for parenting, and parenting interventions should target these areas.

The Role of Relationship Quality and Paternal Involvement in Adolescent Parenting

Sarah M. Grimes, Kelly N. Jeon
Charissa S. L. Cheah, Associate Professor; Laura E. Rose, Doctoral Student, Department of Psychology

Paternal involvement in the form of a strong emotional bond and high social engagement between the father and the child is associated with more positive outcomes in children. However, only one in five children of adolescent mothers have regular contact with their non-residential father by five years of age. Research suggests that several factors can impact father involvement, including the relationship between the child's mother and father. Adolescent mothers' relationships with their own parents may also influence paternal involvement by determining the necessity for additional support from the father. Importantly, differences have also been found in the types of behaviors that mothers versus father engage in with their children. The present research aimed to: (1) examine how mothers' relationship quality with her own parents and the child's father are individually related to paternal involvement; and (2) compare the amount of social interaction behaviors that adolescent mothers engage in with their child compared to fathers. The sample included 70 urban adolescent parents and their infants. Our findings can inform parents and practitioners regarding the need to develop strong relationships among key individuals to promote engagement with and the positive development of children of adolescent parents.

Music and Mathematics: Using Connections and Overlapping Concepts to Increase Comprehension in Both Fields

Daniel J. Grippi
Linda Oliva, Assistant Professor, Department of Education

I implemented research to study the effect a mathematical approach would have on the understanding of musical concepts. Specifically, I researched how rhythm relates to fractions, and how musical intervals correspond to ratios. I investigated whether approaching rhythm and intervals from a mathematical viewpoint would increase the percentage of students in the class who successfully demonstrated understanding. Conversely, I was curious to find out if basing these mathematical concepts in musical examples would have a positive effect on mathematical understanding of fractions and ratios. I implemented a series of lessons with a seventh-grade band class that focused on the relationships between rhythm and fractions, and between intervals and ratios. The musical examples were taken directly from the concert music the students were currently performing. Students were given a pre-assessment that focused on fractions, ratios, rhythms, and intervals. Over the course of eight weeks, I initiated the lessons and began a bi-monthly assessment. The results were then analyzed at the end of the eight-week period to determine if a trend existed that suggested a positive correlation between student understanding of the musical and mathematical concepts. This research is important because it investigates the effectiveness of an arts integration approach.

Genetic Manipulation of an Oyster Larvae Probiotic Bacterium to Study Host-Bacterial Interactions

Seghen Haile
Harold J. Schreier, Associate Professor, Department of Biological Sciences, Department of Marine Biotechnology, Institute of Marine and Environmental Technology

A major focus of the aquaculture industry involves the development of strategies for controlling diseases due to bacterial pathogens. One approach utilizes probiotic bacteria that benefit the host and antagonizes harmful competitors. To assist in understanding the mechanisms involved in host/probiotic interactions the introduction of molecular-based tools into probiotic strains are necessary. In the present study we focus on one strain, S1, which has been used as a probiotic in larval culture of the oyster *Crassostrea virginica.* Previous studies have shown that strain S1 is related to *Bacillus cereus*. Like *B. cereus*, we found that S1 produces a "GATC" *Sau*3AI-like restriction/modification system that acts as a barrier to DNA uptake. Using extracts prepared from S1 we were able to modify the Gram-positive chloramphenicol-resistance-conferring plasmid pC194; modified pC194 was successfully introduced into strain S1 by electroporation. A Gram-positive GFP-producing plasmid, pAD43-25, was identified for use in strain S1; experiments using this plasmid are in progress.

This work was supported in part by the Living Marine Resources Cooperative Science Center (LMRCSC) of the NOAA Educational Partnership Program.

Sustainability at UMBC: Mapping Stakeholder Perspectives using Cognitive Mapping Techniques

Madeline Hall
J. Kevin Eckert, Professor, Department of Sociology and Anthropology

Climate change, natural resource depletion, and biodiversity loss are threats to our human and environment systems. Efforts to address such occurrences are described using a singular term: sustainability. Over the last decade, universities, including UMBC, have been highlighted as places to implement sustainability initiatives due to their size, and influence. In order to create real change across university campuses, one needs to acknowledge the different ways that people think about sustainability and allow for their ideas to be developed. This research asked involved students, faculty, and staff what elements they perceived to be important when working towards sustainability at UMBC. Cognitive mapping techniques were used to analyze interviews focusing on stakeholders' perceptions of sustainability at UMBC and beyond. Findings reveal stakeholder insights about actions/inactions at the university, and commonalities/differences among the groups studied. By allowing participants to both verbally and visually express their views, I documented future needs for the university's sustainability initiatives as well as UMBC's current sustainability framework. Given the university's pledge within the American College and University Presidents Climate Commitment, this knowledge will be valuable in moving towards a greener and more sustainable university campus.

Erin L. Hanratty, Brad W. Widener
Alan Kreizenbeck, Associate Professor, Department of Theatre

We conducted research on the playwrights, settings, and given circumstances for our characters in the two scenes and one monologue we prepared for the 2012 Irene Ryan Acting Competition at the Kennedy Center American College Theatre Festival. In order to better inform our character and acting choices we researched different aspects of the environment in which our characters lived. For example, our first scene was from The Cripple of Inishmaan by Martin McDonagh. The scene takes place on the island of Inishmaan off the coast of western Ireland in 1934. We researched historical events, religious culture, education, the state of the economy, and geography for the time and place. We also analyzed the characters' desires, wills, and values that motivated them to pursue their goals despite various obstacles they encountered. By conducting this research, we not only increased our own knowledge and skills, but improved our presentation to the Festival.

This work was funded in part, by a Travel Award from the Office of Undergraduate Education.

Increasing Homework Completion through Student Choice in Incentives

Amanda R. Harris
Linda Oliva, Assistant Professor, Department of Education

Homework is essential in maintaining pace and attaining rigor and mastery in today's math curriculum. Some students may view homework as busy work that is assigned for no other reason than to obtain more grades. This lack of participation in homework affects the retention of material as well as the potential for mastery. This study investigated the effect of student chosen incentives for homework completion for the third quarter in two Algebra 1 classes and two Algebra 2 classes. Each class voted on one of three options: a homework pass for every 10 consecutively completed homework assignments, a chance to win a raffle for a $10 gift card to the store of their choice where a student receives a raffle ticket for every 100% earned on a test or quiz, and a donut party for attaining a class average of at least 85% homework completion for the third quarter. One Algebra 1 class chose the homework pass option while the other three classes chose the donut party option. Data were collected by examining student homework completion for the third quarter. The effects of the incentives were measured through comparisons between the first, second and third quarter grades of the students. Participants included 46 Algebra 1 students and 29 Algebra 2 students in eighth grade at a Baltimore County school.

Sickle Cell Trait and Genetic Testing: Attitudes toward Genetic Testing among African American and Hispanic Women

Danielle L. Harrison
Shawn M. Bediako, Associate Professor, Department of Psychology

Genetic testing is increasing in availability in the United States, but little is known about its use in specific sub-populations. The present study utilized data from the *United States Public Knowledge and Attitudes about Genetic Testing* survey on public knowledge and attitudes about genetic testing (N = 1,824) and examined attitudes toward testing among 182 women of color. Using selected components from the Health Belief Model, we conducted a logistic regression analysis in order to determine demographic and attitudinal factors that predict willingness to undergo testing. Overall, the logistic regression model accurately predicted 80.5 percent of cases. Two variables were significant predictors of willingness for genetic testing: perceived benefits (e.g., whether the respondent would be tested for a treatable disease), and ethnicity. The odds of being willing to undergo genetic testing increased by a factor of .045 for those who perceived the benefits of testing. In addition, Black women were .22 times more likely to be willing to undergo genetic testing for sickle cell anemia compared to Hispanic women. These findings have helped to better understand attitudes toward genetic testing in this group and informed targeted educational interventions.

This work was funding in part by the McNair Summer Research Institute at UMBC.

Revolution

David Harton
Frederic Worden, Associate Professor, Department of Visual Arts

[HH] is an abstract experimental music video investigating the impact of audio-visual imagery on a viewer's psyche. Using sound-picture relationships, the video attempts to evoke an emotional response by contrasting images of natural beauty with man-made objects symbolizing the destructive consequences of industrialization. Some unique processing of the visual images was accomplished using Adobe After Effects, a video processing software program. I also experimented with non-narrative temporal structuring tied to my original music score. Although the film does not tell a conventional "story," it does attempt to follow an arc that progresses from a dark mood and tone to a more harmonious and hopeful section at the end. My ambition is to use video's capacity for audio-visual communication to raise awareness of mankind's impact on the planet's environment.

Iqbal's Vision Realized: **The Youth of the Arab Spring Take Action**

Irma N. Hashmi
Phillip Seng, Visiting Assistant Professor, Department of Philosophy

The project reveals parallels between Muhammad Iqbal's work and the events of the Arab Spring movement. Poems by Iqbal (1877-1938) were collected from primary texts, while information regarding the Arab Spring was drawn from online academic articles, news reports and popular media sources. Muhammad Iqbal's writings urge the Indian Muslim youth to develop their own characters, then demand change for a better future. In the twenty-first century, Iqbal's words manifested in action, as the youth of the Arab Spring traced a revolution trajectory similar to that found in the writings of Iqbal. To begin the process of change, Iqbal highlights the potential of the Muslim youth; this must be realized by the Arab youth also. In the second phase, Iqbal's striking metaphors insist change must come through action; the youth of the Arab spring turned to protests to demand change. Finally, Iqbal imparts hope for a new future; the new countries of the revolution, too, possess optimism and the potential for long-lasting change.

Does Employment Status Influence Partner-Violent Mens' Response to Counseling?

Tehmeena Hassan
Christopher Murphy, Professor, Department of Psychology

The effect of employment status at program intake for an abuser intervention program will be examined to predict program completion and treatment outcome. Previous studies have suggested that unemployment is related to rates of domestic violence in community samples, and may be a risk factor for domestic homicide. However, very little research has examined employment status among men in treatment for perpetration of intimate partner violence (IPV). Employment status will be correlated with the level of physical assault at the time of intake (reported by male client and female victim), number of treatment sessions attended by the client, and level of physical assault six months after treatment as reported by the female victim. Archival data are available on a sample of approximately 140 men who utilized counseling services at the Domestic Violence Center of Howard County, Maryland. Regression analyses will be utilized to predict the outcome and completion of treatment. It is hypothesized that men who are employed at the time of program intake, as compared to those who are unemployed, will have lower rates of pre-treatment physical partner assault, will complete more counseling sessions, and will have lower rates of post-treatment physical partner assault. These results may indicate that employment support should be considered as a component of intervention programs for perpetrators of intimate partner violence.

Anagram

Brieanna K. Helmlinger
Doug Hamby, Professor, Department of Dance

My goal for the creation of *Anagram*, a dance performance work, was to explore the visual aspects of a painting (by Stephanie Seker) through modern dance choreography. Through my choreographic process I explored the dynamics, spacing, colors and textures of the painting and also created dance phrases out of words that appeared on the painting. To illustrate emotions that I saw in the painting I created explosive and contrastingly smooth movement through the use of ripples, repetition and dancers moving in unison. I also collaborated with the dancers to help create new and interesting movement and spacial patterns. Instead of making it obvious to the viewer that my dance was based on a painting, I began by first selecting the costumes. Then I asked the painter to create a painting based on the color and texture of the costumes. In this way, the dance remained abstract and each viewer could discover the dance in her or his own way.

A Heating and Cooling Technology Suitable for Pyroelectric Energy Generation

Joshua S.T. Hooks, *Amir Harandi*
Tony Farquhar, Associate Professor, Department of Mechanical Engineering

The Laboratory for Flexible Structures is developing a new class of heating and cooling devices, which can establish precise variations in temperature along designated path(s). The desired variations in temperature are achieved via differential conduction through a composite heat conductor. In practice, such materials can be fabricated via conventional patterning and laminating of thin comb-like metal structures within layers of insulating material. I have analyzed finite element models created in the computer application COMSOL 4.1 Multiphysics to design an annular heating plate. The current computer model can produce 12 cycles of 48C +/- 20C around a 65 mm diameter path on its upper surface whenever the edges of its inner (54 mm) and outer (76 mm) diameters are in contact with a 100C or 0C heat source, respectively. Informed by this fine-scale simulation, we are preparing to build and test a prototype with multiple layers of copper. In principle, a device of this kind could be used to subject materials to cyclic heating and cooling at a relatively high rate. One application of potential interest is pyroelectric energy generation. Tourmaline is one example of a naturally occurring pyroelectric crystal that can be heated and cooled to generate electricity.

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Signaling Response of Neuronal Cells to 3D Tissue Scaffolds

Dalton N. Hughes*, Andreia Ribeiro, Swarnalatha Balasubramanian*
Jennie B. Leach, Associate Professor, Department of Chemical Engineering

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 two-dimensional (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. Our 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. PC12 cells, a neuronal cell model, were cultured 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. The results of this study will identify the key signaling mechanisms in 3D neuronal culture and provide a biological basis for testing new biomaterial-based therapeutics.

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Ethnic Majority and Minority Emerging Adults' Well-Being: The Roles of Beliefs and Parents

Shadab Hussain
Charissa S.L. Cheah, Associate Professor, Department of Psychology

Emerging adulthood, the period from the ages of 18-25 years, is a critical stage in an individual's life where one explores different possibilities in relationships, work, and worldviews. An emerging adult's subjective well-being, depression, and engagement in risk behaviors can be affected by various factors at the individual, relationship, and cultural level. However, research on this period of development is limited, especially among ethnic minority emerging adults. As emerging adulthood is characterized by independent exploration and increase in autonomy, it may be a particularly challenging period of development for emerging adults of more interdependent-focused minority cultures, such as Hispanics and Asian-Americans. The goal of this project was to identify risk and protective factors among ethnic minority emerging adults that may be associated with their positive and negative outcomes. Specifically, we examined the role of emerging adults' (1) beliefs regarding filial piety, (2) perceptions of their parents' engagement in psychologically controlling practices, and (3) support of their autonomy, in predicting their levels of engagement in risk behaviors, depressive symptoms, and anxiety. An online survey assessing the constructs described above was completed by 237 UMBC students. The associations among these variables were tested. Implications of our findings for emerging adults are discussed.

The Role of Religious Involvement in the Parenting Styles of Korean and Chinese Immigrant Mothers

Shadab Hussain
Charissa S.L. Cheah, Associate Professor, Department of Psychology

Koreans and Chinese are two of the fastest growing Asian ethnic groups in the United States. These immigrant families experience stress due to immigration and acculturation processes, and can be at risk for poor mental-health and maladaptive parenting. Religious may be beneficial for individuals by lowering stress and impacting their parenting style positively. The majority of existing studies examining the effect of religious involvement on these two ethnic groups were conducted in large, urban areas, but few studies were conducted in smaller, suburban communities such as Maryland where immigrants may see the church community as a source of social and functional support. The current study examined (1) whether the level of religious involvement varied across Korean and Chinese immigrant families, (2) the associations between religious involvement and authoritative parenting in Korean and Chinese immigrant mothers, and (3) the mediating role of parenting stress in the association between their religious involvement and their parenting. Mothers completed questionnaires assessing their religious involvement, parenting stress, and engagement in authoritative parenting. Findings of this study can contribute to the existing literature and inform service providers regarding factors that can promote positive adjustment in Korean and Chinese immigrant communities.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, the National Institutes of Health (R03HD052827-02) and the Foundation for Child Development.

Song Characteristics of the Critically Endangered Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*)

***Aymen Hussein**, Brian Rolek*[1]
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Bernard Lohr, Assistant Professor, Department of Biological Sciences

Of the four recognized subspecies of grasshopper sparrow in North America, the resident Florida subspecies is the most critically endangered. There is a need to be able to discriminate birds of the morphologically similar Florida and eastern subspecies that reside in the same habitat until early May. We investigated whether these subspecies might be distinguished at a distance based on song characteristics. Male grasshopper sparrows sing two distinct types of song: the buzz, and the warble. Buzz song consists of four introductory notes followed by a longer, rapidly amplitude-modulated sequence (the "buzz"). We measured frequency and time components of the buzz song, as the principal advertisement song, and compared these with buzz songs from populations of the other North American subspecies. We found that the duration of the introductory portion of the "buzz" section was longer, the frequency of the song's last note and the "buzz" section of song was lower, and the frequency bandwidth of this "buzz" section smaller in birds of the Florida subspecies. These results suggest that certain acoustic characteristics may be useful in distinguishing among subspecies, and warrant further study of differences in song, including in the more complex warble song.

This work was funded, in part, by an Undergraduate Research Assistantship Support award from the UMBC Office of Research Administration, and the UMBC Department of Biological Sciences.

Determining Structural Requirements for Heme Stability in H-NOX Regulatory Domain of Soluble Guanylate Cyclase

***Janelle Ikard,** Elsa Garcin*
Elsa Garcin, Associate Professor, Department of Chemistry and Biochemistry

Soluble guanylate cyclase (sGC) is the sensor of nitric oxide (NO) and produces the secondary messenger cGMP to regulate blood pressure. The sGC enzyme contains two subunits, with a heme nitric oxide/oxygen binding domain (HNOX), a HNOX-associated domain (HNOXA), a coiled-coil domain, and a catalytic domain. Upon NO binding to the sensor HNOX domain, the cGMP output is drastically increased. The mechanism of sGC activation is unknown. Based on crystal structures of bacterial HNOX homologues, it was proposed that NO binding to heme induces conformational changes leading to increased sGC activity. Our goal is to elucidate the structural changes in sGC activation. Previous research on sGC constructs revealed differences between constructs containing only HNOX domain and constructs containing HNOX and HNOXA domains. In the HNOX construct, the heme oxidizes rapidly, while the heme in the HNOX-HNOXA protein behaves like that of full-length sGC and binds NO. We hypothesize that this difference results from conformational changes in the HNOX domain when the HNOXA domain is present. We are currently optimizing the sample purification protocol for future structural characterizations. These results will confirm whether the simpler bacterial HNOX represents a viable model for the mammalian sGC HNOX.

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The Price of Success: Who Pays?

Jovan James
Fred Worden, Associate Professor, Department of Visual Arts

Second Life is a narrative short film that explores the difficulties encountered by two young filmmakers who go to Hollywood to pursue a career in the film industry. The two are best friends as well as business partners. They intend on sticking together both creatively and professionally after getting the attention of a professional Hollywood agent who agrees to represent them. The intention of the film is to use this storyline to explore dramatically the range of choices faced by young adults as they pursue career choices in contemporary society. The story is a familiar one and the challenge faced by the filmmaker was to develop an original and compelling way to reinterpret this archetypal plot in a contemporary setting with characters with whom today's audience can identify. This is the challenge faced by all storytellers working within genre formats. Hollywood is used as a central metaphor for all the difficult questions that are encountered when the values of friendship and personal integrity clash with the requirement to succeed at all costs. The hope is that the film will both entertain as well as raise important thematic questions in the minds of viewers. The success of the film will be best measured by the degree to which audiences see themselves in the main characters and recognize the difficult choices the characters must make as similar to choices they too must face.

Gender and Genre in Contemporary Chick-lit Novels

Eva Jannotta
Jessica Berman, Associate Professor, Department of English

Contemporary popular fiction novels written by and for women, often called "chick-lit" novels, are a genre frequently derided by the media and literary critics. Yet their commercial success and popularity attest to their importance and relevance to contemporary women readers. My research examines chick-lit novels from a Gender and Women's Studies and literary criticism perspective. I first analyze nine novels for the ways in which they imagine and represent contemporary white professional women, paying particular attention to portrayals of female relationships, feminism, careers, and the perpetuation of whiteness as an invisible racial category. I then analyze three chick-lit novels in-depth, exploring them as contemporary revisions of fairy tales. Using folktale and postfeminist theory I explore how chick-lit novels masquerade as verisimilitude and disguise their elements of fantasy, thereby attempting to persuade the reader to believe in the fairy tale and feel reassured by it. My research illuminates the hopes and anxieties of contemporary white professional women as portrayed through the novels they read and write. Understanding the dynamics reflected in chick-lit novels and the fairy tale tropes these novels deploy allows readers and critics to understand the function, appeal and insight of chick-lit novels despite their dubious reputation.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Understanding the Lipid Biosynthetic Pathway in *Chlamydomonas reinhardtii* with Deterministic Kinetic Modeling

Scott L. A. Johnson, *Nicole Carbonaro, Ian Thorpe*
Ian Thorpe, Assistant Professor, Department of Chemistry and Biochemistry

A worldwide effort to find renewable alternatives to fossil fuels is underway. Under certain conditions, algae produce large amounts of lipids that can be converted to biodiesel. However, the lipid biosynthetic pathway of algae is still not well understood. We have chosen *Chlamydomonas reinhardtii* to model algal lipid biosynthesis because this organism has been extensively studied, with large amounts of enzyme activity data available. In addition, *C. reinhardtii* is known to engage in high levels of lipid production under low nitrogen conditions. The goal of this undertaking is to generate a deterministic kinetic model of the lipid biosynthetic pathway in *C. reinhardtii*. This model incorporates the flow of reactants and products for each of the reactions in the pathway, along with concentrations of the substrates and turnover numbers for the enzymes involved. This information is used to construct ordinary differential equations that are solved using MATLAB. We intend to improve overall lipid production by changing the kinetic properties of enzymes present in the model. This information is being used to predict optimal ways in which this biosynthetic pathway can be manipulated to induce higher levels of lipid production *in vivo*.

This research was supported, in part, by a grant to UMBC from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education Program and the mentorship of Dr. Ian Thorpe.

Sardinian Evidence of the Perfect Auxiliary ESSE: A Romance Development

William R. Johnson
Thomas T. Field, Professor, Department of Modern Languages and Linguistics

Many modern Romance languages make use of two auxiliaries to form the present perfect tense, “to have,” and “to be.” The evolution and development of “to have” from Late Latin into Romance is well documented and understood, but a debate currently exists about the origin of the more elusive “to be.” Some believe it came from outside influences, but my research contributed evidence to the opposing theory that “to be” followed a course of development similar to “to have” with its origin also in Late Latin. For two months during the summer of 2011, I traveled to Cagliari, Sardinia to make use of the university libraries there. I combed over Latin texts from up to 1700 years ago and the earliest Sardinian texts to investigate some of the first manifestations of the Romance present perfect taking the auxiliary “to be” and the possible relationship between these and a group called deponent verbs of Latin. I found tantalizing connections between the Late Latin and the Sardinian that suggest “to be” was indeed an internal development.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Spatial and Temporal Analysis of Brain Electrical Activity Mapping

Sheriff Jolaoso
Fow-Sen Choa, Professor, Department of Computer Science and Electrical Engineering; Elliot Hong, Maryland Psychiatric Research Center and Associate Professor, Department of Psychiatry, University of Maryland, School of Medicine

A Brain Electrical-Activity Mapping (BEAM) is a data visualization model that can be used to analyze and possibly extract event related potential signals out of raw brain signals. In this work we examined the spatial and temporal characteristics of the high frequency portion of short time span as well as BEAM characteristics from data obtained from tests of schizophrenia patients and a control group. Since neuron-firing patterns seem to be correlated to the second derivative of EEG signals, we also analyzed the spatial and temporal BEAM characteristics of the second derivatives of our data. We found that the BEAM plots of the control group have a sharper spatial distribution and faster time variation compared with those in our sample of ill patients. The implications are that high-frequency signals are operating in denser patterns and traveling faster in the control group compared with that in the test patients. We are in the process of creating a rating system with scores based on the Fourier domain quantization and analysis. We hope the rating system can help aid in the patient diagnosis process. When the method is verified, it may help to understand patterns of EEG readings in reference to diagnosis illness and possibly other physiology mechanisms correlated to neural degradation disease.

This work was funded, in part, through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Visualizations for Self-Analysis of Performance for Older Adults

Jasmine Jones, Chitra Gadwal, Steven Hall
Amy Hurst, Assistant Professor, Department of Information Systems

As a person ages, they may have difficulty performing unfamiliar tasks which causes them to adopt new ways of working. We studied how to present data to a person about their performance in completing a task. We took an interdisciplinary and user-centered approach to investigate how to provide constructive visual feedback about performance to person, especially when the information may not be positive. Also, we have visualized methods to contextualize and display data of varying importance over time; and emphasized the socio-cultural influences on a user's perceptions and preferences regarding personal information and technology interventions. As a case study, we explored how to use the technique of information visualization to inform older adults about how well they were using the computer. We developed the idea using a previously collected dataset of mouse use metadata representing pointer performance and accuracy over time. We conducted a user study of our visualizations with older adults using real-time collected data. Through this project, we gained a better understanding of how users interact with data about themselves and ways we can help empower them to use this data for their own benefit.

This work is funded through a Collaborative Research Experience for Undergraduates (CREU) from Computer Research Association's Committee on the Status of Women in Computing Research (CRA-W).

Song Patterning, Organization, and Output in the Grasshopper Sparrow (*Ammodramus savannarum*)

Ki Jung, Oliver Muellerklein, Angela Trenkle
Bernard Lohr, Assistant Professor, Department of Biological Sciences

A number of song characteristics may be subject to sexual selection in territorial songbirds. Surprisingly, song output (total amount of song produced) has been relatively under-studied. We used long-term automated recording units as a first approach at evaluating the importance of song output in the grasshopper sparrow (*Ammodramus savannarum*). Eight of these units, operating from 5am – 11am (6 hours/day) were deployed in grasshopper sparrow territories at the Chester River Field Research Center during the summer of 2011. An additional four units were operated in the same habitat from 5am – 11pm (18 hours/day). We found an expected singing peak from 05:00 – 08:00 in the morning, a long period of relatively little singing from 08:00 – 20:00, and a smaller, though substantial singing peak around 20:30 (sunset). Slightly over 50% of each day's song was produced in the first 6 hours of the day. Grasshopper sparrows produce two classes of song; buzz song, and warble song. We counted the number of buzz versus warble songs across the season and, though variable, found gradual transitions between the two song types that may be related to particular aspects of an individual bird's breeding cycle (time of egg laying, egg hatching, etc.)

This work was funded, in part, by the Chester River Field Research Center, and the UMBC Department of Biological Sciences.

The Impact of Climate Change on Air Quality and Respiratory Disease: Maryland/DC Metropolitan Area

Alpana Kaushiva, *Shadrian Strong, Steven Babin, Larry Paxton*
Luis Pinet-Peralta, Associate Director, Health Administration and Policy Program
Shadrian Strong, Research Scientist, Johns Hopkins Applied Physics Laboratory

Ground-level ozone, or tropospheric ozone, forms smog and becomes directly harmful to humans by exacerbating respiratory conditions, primarily asthma (Knowlton et al. 2004). The projected increase in ozone concentration caused by climate induced temperature change is 1-2 ppb in 2020 and 2-7 ppb in 2050, with associated temperature increases of 1-2 degrees Fahrenheit and 2-5.5 degrees Fahrenheit, respectively (UCS, 2011). In Maryland, there would be approximately 68,894 occurrences of acute respiratory symptoms associated with a 2 ppb climate penalty in 2020, and the total costs for health impacts associated with this would be approximately $133,398,027 (UCS, 2011). In their 2011 "State of the Air" report, the American Lung Association rated the Maryland/DC metropolitan region as one of the 25 most ozone polluted regions nationwide (ALA, 2011). We examine acute and chronic asthma prevalence data for adults and children in MD, DC, and VA using the CDC's Behavioral Risk Factor Surveillance System. Additionally, we analyze ozone concentration from the EPA's Air Explorer tool for MD, DC, and VA and determine costs of asthma due to increased ozone emission.
Visualizations from this data can serve as important educational and planning tools for decision makers in the Maryland, DC, and Virginia regions.

This work was supported by the Oak Ridge Institute for Science and Education and by a Travel Award from the Office of Undergraduate Education and completed at the JHU Applied Physics Laboratory.

The Role of Historical and Rational Choice Institutionalism in Egypt's Current Political Phenomenon

Hamed Kharazi
Carolyn Forestiere, Associate Professor, Department of Political Science

The purpose of this research was to determine whether the rational-choice institutionalism could explain Egypt's contemporary political vicissitudes. Institutions are the rules that shape our behavior. Neo-institutionalism in political science attempts to address how we explain the choices important political figures make through two dominant paradigms: historical-institutionalism and rational-choice institutionalism (Hall 1996). Historical-institutionalism argues that when elites make decisions, "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 scrutinized as being too broad in its application.My research investigated the contemporary political context of Egypt to argue that, while flawed, the rational-choice perspective can help explain Egypt's political turmoil. I examined the choices made by three important leaders at different points in Egypt's history over the past 50 years to demonstrate how individual leader choices made at one point in time to maximize a leader's utility can lead to future instability and regime change.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Developing Technique through Professional Studies

Paige S. Khoury
Doug Hamby, Professor, Department of Dance

The professional world of dance is a highly competitive field. The most successful dancers are those who have had a variety of dance training, working closely under professionals in the field. My research has found that dancers grow technically and artistically through continuous exposure to dance along with teaching others. My research involved studying under a variety of dance professionals at one of the world's most renowned dance intensives, American Dance Festival (ADF). At the six week festival, I studied technique, composition, improvisation, and anatomy through a variety of different classes. I also had the opportunity to see twelve professional dance performances that featured renowned companies. It was this research that enabled me to learn a variety of choreographic and artistic tools. These tools have greatly expanded my personal ideas about dance and performance which helped develop my Capstone project in the course DANC 475. My research has contributed to the UMBC dance community through the creation of my project. Through the development of my piece, I educated fellow UMBC dancers on new choreographic techniques, the importance of anatomical awareness and injury prevention. My expanded awareness of the movement aesthetic, thus inspired me to use paint in the final production of my capstone project entitled "Catalyst."

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, the UMBC Dance Department Summer Research Grant, and Student Scholarship provided by American Dance Festival.

The Effect of Erythromycin on Ribosomal Pausing and Activity

Maithri Kondapaka
Janice Zengel, Senior Research Scientist, Department of Biological Sciences

Ribosomes are organelles present in all living cells. They are responsible for synthesizing proteins through a process called translation. SecM, a protein whose gene sequence contains a specialized pause signal, can stop protein synthesis by causing the ribosome to temporarily pause translation. Previous studies have identified mutations in the ribosome and the SecM pause sequence that hinder this function. Here, the goal was to determine whether erythromycin, an antibiotic that interacts with the ribosome in a location similar to the SecM pause sequence, would also inhibit pausing. In this study, the secM gene was paired with the lacZ gene to quantify the amount of pausing in the presence of erythromycin. This was done by measuring the amount of β-galactosidase (product of lacZ) produced when varying concentrations of erythromycin were added to E.coli cultures containing the secM/lacZ construct. It was observed that as erythromycin concentration increased, the frequency of pausing decreased. Erythromycin may inhibit pausing by interacting with ribosomes during translation or by disrupting ribosome assembly either directly or as a result of its co-translational interaction. Gene constructs, for *in vitro* and *in vivo* studies, were designed to elucidate the exact mechanism by which erythromycin alters ribosomal activity, specifically SecM-mediated pausing.

This research was funded by the National Science Foundation Grant MCB0920578.

Can Classroom Learning and Study Habits be Improved in a Single Discipline and Improve Students Overall Performance?

Claudia T. Konkus
Linda Oliva, Assistant Professor, Department of Education

This examination of the study habits of ninth grade students found the students to be ill prepared for the demands and the rigors of high school life. Most did not know or understood how they learned and what method worked well for them. This study hoped to gain insight into their learning preferences. Thirty-five students at the German I level answered a questionnaire. The results showed that most students believed they learned better by drawing, singing, and dancing versus reading and writing. This led to the development of new games with Total Physical Response (TPR) and the integration of more group work with project presentations, such as the creation of advertisements on poster boards. Students also received more time to review previously learned and new material at the beginning and the end of class. In addition, typed grammar note handouts, visual and verbal aids, and music were integrated into the lessons. The end goal was the improvement of study skills in the classroom and providing students with tools to use throughout their high school careers.

Profile of Cognitive Impairments in Schizophrenia

Sandya S. Lakkur
Gregory P. Strauss, Assistant Professor, Department of Psychiatry, Maryland Psychiatric Research Center University of Maryland School of Medicine; Robert P. McMahon, Associate Professor, Department of Psychiatry, Maryland Psychiatric Research Center University of Maryland School of Medicine

Schizophrenia is associated with significant cognitive impairments, and these deficits tend to be associated with negative (or deficit) symptoms of the disorder. Patients are not uniformly impaired across different aspects of cognition and may show selective deficits in areas such as working memory, attention, processing speed, verbal memory, visual memory, motor functioning, and learning. A battery of neuropsychological tests was administered to two subgroups of schizophrenia patients: deficit and nondeficit patients, and a third group, healthy controls. Multivariate Mann Whitney U-statistics was used to estimate how well the neuropsychological tests classified individuals into the three groups. The results indicated that the deficit group showed little overlap in test scores with control subjects and moderate overlap with the nondeficit group, which showed intermediate levels of impairments compared to the controls on most tests. Further analysis of the data will determine the variations among the neuropsychological domains tested in the level of impairment between deficit and nondeficit patients.

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Beyond Barriers: A Comparison of Hadrian's Wall in Britain and the Han Dynasty Wall in China

Jocelyn S. Lee
Carolyn G. Koehler, Associate Professor, Department of Ancient Studies

Throughout human history, fortified walls have had purposes beyond military defense and territorial demarcation. The creation of immensely long fortified walls had other implications and effects on both the empire where the wall was built and surrounding cultures that bordered the wall. Both the Roman Empire and the Chinese Han Dynasty, two of the most prominent cultures in the first century of our era, created such fortifications. By analyzing archaeological remains, ancient texts, and modern scholarly works related to Hadrian's Wall and the Han Dynasty Wall, a greater understanding of social and political situations in the Roman Empire and Han Dynasty is achieved. This study concludes that there are many parallels between the East and the West with regard to the impact of a fortified wall, including the facilitation of population movements and cultural exchanges. In the creation of such frontiers, each empire revealed to the world that it had set limits on its definition of the entire world (*orbis terrarium* for the Romans, *tianxia* for the Chinese). This idea then also became a statement of power.

Image Joins the Written Word: Artists Interpret *Bartleby 2012*

Laura Lefavor, Kayla Smith
Sally Shivnan, Senior Lecturer, Director of Writing and Rhetoric, Department of English
Guenet Abraham, Associate Professor, Department of Visual Arts

This exhibit showcases the collaboration of UMBC's student poets, fiction writers, and essayists with a select group of graphic design students, by displaying the design students' visual interpretations of written works from the 2012 issue of *Bartleby*, UMBC's creative arts journal. Each design student has produced an image for a particular poem, story, or essay, incorporating some or all of the text in the image. To ensure that each image is the artist's own unique and independent interpretation, design students produced their work without the consultation of the authors. Authors were only permitted to see the visual interpretation of their work after it had been completed. The text of each written piece appears beneath its corresponding poster-size image. This project celebrates the release of *Bartleby* 2012 and the work of its staff—an interdisciplinary effort involving students across many majors, who bring together writing and art from students throughout the university community.

This work was funded, in part, by the UMBC Office of Undergraduate Education and the Student Government Association.

To Have and to Withhold: Projections of Thrift on the Modern Consumer

Hillary J. Lennox
Kathy S. Bryan, Lecturer, Department of American Studies

This research investigates the cultural constructions of thrift and frugality presented to the modern woman during a period of economic recession. Though notably absent in the twenty-first century, the virtues of thrift had traditionally been directed towards the woman of the home through outlets such as *Ladies Home Journal* and Child's The American Frugal Housewife. Long associated with those whose daily lives necessitated economizing practices for survival, it has been adapted by the high-minded classes who emphasize social and moral obligations towards simplicity, as well as those who idealize wealth incurred through reduced consumption and increased savings. This study was conducted as a textual analysis of two current lifestyle magazines targeting women: the educated and romantic *Real Simple* and the practical, working-class *Woman's Day*. Research reaffirms the notion that thrift now plays a complex role in shopping trips and savings tips. While it is clear that its appeal is still applied through the negotiation of household economy, its construction tows a fine line between being stigmatized as "cheap" and glorified self-worth.

Development of New Methods for the Estimation of Dissociation Energies between Isoelectronic Pairs

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We suggest that it is necessary to review estimation techniques of dissociation energies between isoelectronic pairs. Isoelectronic pairs are compounds that share the same number of electrons such as BH_4^-/CH_4 and CO_2/NO_2^+. These compounds can be substituted for each other in experiments. We are studying whether there is a better model for the estimation of the dissociation energies than William L. Jolly's method, published in "A New Method for the Estimation of Dissociation Energies and Its Application to the Correlation of Core-Electron Binding Energies Obtained from X-Ray Photoelectron Spectra" Journal of the American Chemical Society (1970), 92(11), 3260-5. Because there are updated techniques for finding experimental values of dissociation energies, Jolly's model may not hold true for the same isoelectronic species he once used. We can evaluate this by assuming that a difference in dissociation energy is equal to the difference in the sum of the ionic contributions to the bonds. At this stage of the research, we are trying to calculate the dissociation energies of each of the bonds to determine which one relates most closely to the actual bonds.

On the History and Ethics of Photomanipulation

Brendan A. Lipton
Rebecca Adelman, Assistant Professor, Department of Media and Communications Studies

The invention of photography was truly a breakthrough; it recorded nature more realistically than any existing medium. People believed the images were accurate, truthful, and without bias. However, even in the early days of photography, photo manipulation did occur for a variety of reasons. The Cottingley Fairy photos of 1917, for example, were created to convince viewers of the reality of other types of worldly beings. The Russian dictatorships manipulated photos to remove political adversaries and individuals who had fallen out of favor. Early photo manipulations were time consuming and cost prohibitive. The advent of digital technologies such as Photoshop and similar photo editing software makes it possible for anyone to create altered, imaginary, or entirely false images, bringing the objectivity of a photograph more publicly in question. "On the History and Ethics of Photo Manipulation" documents the shift from mirroring reality to altered images and outlines the current legal and ethical debates and possible steps to address these concerns. Altered, corrected, manipulated or enhanced images entail a quagmire of ethical and aesthetic concerns. With the right tools, however, viewers may still be able to have some degree of faith in the truthfulness of photographs.

Behind the Apple: The Culting of Macintosh Technologies

Elizabeth H. Locke
Donald I. Snyder, Lecturer, Department of Media and Communication Studies

Impromptu messages of grief and tokens of tribute, closely resembling rites of religious devotion, appeared in public spaces and on the Internet in response to the death of Apple Inc. CEO Steve Jobs in October of 2011. While it is clear that consumers in the twenty-first century place a high value on digital technologies, those loyal to Apple appear to go a step further in supporting, consuming, and connecting to the brand. The enthusiastic brand loyalty that Macintosh enjoys is unique among its competitors. What is it about Apple products that promote such avid faithfulness? Building upon literature that highlights the growing importance of brand identification, I conducted focus group interviews to better understand the fanaticism behind Apple products. In addition to analyzing the way Macintosh brands itself in television advertisements, I examined individuals who are loyal to Apple in order to investigate the relationship between consumption, identity and community. This study helps to explore the importance of branding and the role of new technologies in our global consumer society.

Using Sample Distributions to Accurately Calibrate Model Confidence

Alex MacDonald, *Kevin Winner, Rotem Ganel*
Marie desJardins, Professor, Department of Computer Science and Electrical Engineering

Classification models, which utilize observational data to identify and apply predictive patterns to previously unseen data, often report probability levels that are not adequately correlated with actual predictive accuracy. Our work built on previous methods for rescaling these predicted confidence levels using regression on a calibration set. We expanded these standard one-dimensional regression techniques into two dimensions, incorporating measures of sample density and sample purity of nearby training instances to produce improved confidence predictions. We used two commonly implemented classifiers—Naïve Bayes and J48—as a baseline for unscaled confidence predictions, and produced significant improvement in some domains to the accuracy of these predictions without sacrificing overall model performance. Our work also identified domains in which two-dimensional regression seems to yield poor results. We are currently investigating the possible sources of this drop in performance. The ability to accurately predict probability levels of classified instances has countless applications to such classification problems as medical diagnostics and optical character recognition.

This work was funded by NSF EAGER award #1129683 and an associated Research Experiences for Undergraduates (REU) supplement, NSF #1129683.

We Hold a Banner for a Sword till All Oppression Ceases: The Activism of Lucy Burns and Alice Paul

Lisa M. Macfarlane
Michelle Scott, Associate Professor, Department of History

My research is on Lucy Burns' and Alice Paul's activism in the American women's suffrage movements. Alice Paul and Lucy Burns were members of the National American Woman Suffrage Association (NAWSA), the mainstream American suffrage organization. NAWSA's approach to women's suffrage was to gradually gain women's suffrage on the state level. In 1915 Alice Paul and Lucy Burns broke away from NAWSA and created the National Woman's Party (NWP) to lobby for a congressional suffrage amendment. Current scholarship on women's suffrage states that Alice Paul ran both the Congressional Union, NWP predecessor, and National Woman's Party alone but primary sources demonstrate that Lucy Burns was a co-leader and as important to both organizations as Paul. Through a wide array of primary sources; newspapers, National Woman's Party papers, and public documents, I demonstrate Lucy Burns' and Alice Paul's working relationship in the movement. My project brings forth new information on the structure of the National Woman's Party and Congressional Union, and Lucy Burns contributions to the women's suffrage movement. Without Lucy Burns the National Woman's Party would not have been as instrumental in the passage of the nineteenth amendment, granting women legal suffrage.

Analyzing Social Media Data

Morgan A. Madeira
Anupam Joshi, Professor, Department of Computer Science and Electrical Engineering

Social media has increasingly become an outlet for expression for a large part of our society. Literature suggests that analyzing data from these sites can lead to improvements in areas such as health-care and search-ad targeting. Users of these sites often associate with many other users described as "friends," even if they do not have a strong connection, or what would be described as friendship in daily life. It is valuable to determine the strength of relationships between users and to identify communities within social networks. These communities represent people with similar characteristics, which are used by applications to solve many real-world problems. For instance, it is useful to identify groups that are interested in a specific movie genre. Information about these groups can be used to target movie advertisements towards the people most interested in that genre. These types of problems have similar characteristics to identifying close friends. We have created a system to collect and analyze the data about user characteristics, while being respectful of privacy concerns. The system is composed of a front end Facebook application and a back end machine-learning based tool. The front end component gathers data about a user and their friends. The back end uses the collected data and machine-learning techniques to determine relationships between users.

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Lead by Example

Charles Mason, III
Vin Grabill, Associate Professor, Visual Arts

This research addressed the problems that Baltimore City and County high school students faced when striving to obtain an education of value. The challenging issues investigated included stereotypical attitudes, peer pressure, lack of a support system, self-esteem and mental strength. After speaking with teachers, students and administrators from the schools I visited, I was able to learn what conditions help students to stay focused, to increase their productivity, and to heighten their success rate in school. I then created six posters that expressed the challenges faced by youth as they pursued their education. These images will be displayed at URCAD at the Fine Arts Building Hallway Gallery. Following this exhibition, the posters will be displayed in some of the schools I worked with for the benefit of the students. As a result, students will gain a visual reference that will reflect the issues they encountered at some point during their educational journeys. This research was 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.

This work was funded in part by the UMBC Office of Undergraduate Education through an Undergraduate Research Award.

Fluorescent Glucose Biosensor from a Glucose Binding Protein

Carmen Matos, *Karuna Sri Mupparapu*
Leah Tolosa, Associate Professor, Department of Chemical, Biochemical and Environmental Engineering

Diabetes is a major health concern in many countries, including the United States. It can be monitored and controlled by collecting a drop of blood and detecting the elevation of blood glucose levels (hyperglycemia) with biosensors. The self-blood glucose-monitoring system (SBGMS) has been the standard glucose biosensor for diabetes care. The SBGMS functions by monitoring the amount of oxygen consumed in the enzyme-catalyzed redox reaction with glucose by the glucose-enzyme electrode, glucose oxidase (GOx). However, GOx reacts with other compounds, resulting in incorrect blood glucose readings.We are developing an alternative biosensor using a fluorescently labeled protein found in *E. coli* called glucose binding protein (GBP) that does not have the same problem. Unlike GOx, GBP is not an enzyme, but undergoes a conformational change from “open” to “close” in the presence of glucose, which decreases the fluorescence intensity. A spectrofluorometer is used to measure the changes in fluorescence intensity of GBP due to the conformation change and correlate the readings with blood glucose concentrations. Finally, the GBP biosensor will be compared to the YSI analyzer for standard glucose determination, as well as commercially used glucose meters for diabetics.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC, the HHMI Undergraduate Scholars Program at UMBC, and the Howard Hughes Medical Institute.*

Reclamation and Resistance: Audiovisual Tools in Bolivia

Stefanie M. Mavronis
Jason Loviglio, Associate Professor, Department of Media and Communication Studies

The first years of the twenty-first century have been characterized by globalization, a shrinking of the world through neoliberal economic policies and shared networks of information. In the face of the global export of Western values and the legacy of hundreds of years of colonization, active and creative resistance movements have grown. Developing nations like Bolivia have enjoyed a thriving tradition of community media, and a new consciousness has emerged to organize this popular energy around the process of decolonization. Art and media technologies comprise one set of tools that have been used in Bolivia, a country with a majority indigenous population, in the struggle for freedom and independence from its forced historical legacy. This documentary film tells three stories of this resistance. Starting with the history of indigenous filmmaking, Aymara filmmaker Patricio Luna explains the importance of reclaiming indigenous identity. Then, sociologist Silvia Rivera and her art collective demonstrate the physical realization of decolonization theory through the construction of a community center in La Paz, Bolivia's capital. Finally, a group of young people in nearby El Alto discusses its innovative community television project that seeks to create content that is meaningful and reflective for their own community.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

The Development of Optimized SERS Nanosensors for Intracellular Analyses

Adam S. Mayer*, Charles Klutse*
Brian M. Cullum, Associate Professor, Department of Chemistry and Biochemistry

Surface-Enhanced Raman Scattering (SERS) is a highly sensitive vibrational spectroscopic method that can provide molecular fingerprint data down to the single molecule level. However, the quality of SERS is highly dependent on the SERS substrates on which the measurements are conducted. One major class of SERS substrates are derived from metal films deposited on silica spheres. This research focuses on the optimization of individual isolated SERS-active particles. Using 4-mercaptobenzoic acid as the model analyte, several measurements were made to determine the substrate (based on metal film thickness, etc.) with optimal SERS enhancement. Separate trials have been conducted on the SERS-nanoparticles floating freely in a solution of 4-mercaptobenzoic acid and have shown that the nanoparticles maintain their molecular sensing capabilities in solution, but produce a lower enhancement than when fixed on a planar substrate. Once optimized, these individual sensors were successfully applied to the determination of the relative concentrations of L-phenylalanine and methylphosphonic acid in mixtures. Future work will involve functionalizing the individual nanoparticles and applying this novel technique to in-vivo analyses of phosphorylation events and protein activity involved in the immunological response, specifically of ZAP-70 protein within T-lymphocytes and Interleukin-2 at the cell surface.

This work was funded in part by the UMBC Department of Chemistry and Biochemistry.

The Role of *Syndecan* in Lifespan of *Drosophila melanogaster*

Margaret Mburu, *Maria De Luca*
Jeff Leips, Professor, Department of Biological Sciences

Individuals in natural populations exhibit extensive variation in life span but we know little about the genetic basis of variation in this trait. Previous studies identified the *Syndecan (Sdc)* gene as a candidate gene contributing to variations in metabolic traits in *Drosophila melanogaster.* Follow up studies found that the expression of *Sdc* in different tissues affects fat storage, sleep-wake patterns and immunity. Knock down of *Sdc* in the fat body of females reduced life span while knock down mutations in the brain extended female life span. In this study we are investigating whether *Syndecan* has a similar effect on male lifespan. We use the GAL/UAS system, a powerful tool to alter gene expression in a tissue- specific way in *Drosophila*. We used the enhancer of the *takeout* gene, a gene that is expressed in the fat body to knock down *Sdc* expression in males. Results from these findings will help us better understand the role of *Syndecan* in affecting lifespan. As *Sdc* is also conserved in humans, these results may contribute to understanding the genetic basis of human longevity.

This work was funded by NIH grant R01-DK084219.

qPCR Analysis of G-Protein β and γ Subunits in the Main Olfactory Epithelium of Mice

Saloni T. Mehta*, Aaron Sathyanesan, Weihong Lin*
Weihong Lin, Assistant Professor, Department of Biology

Odorant receptors (ORs) are G-protein coupled receptors (GPCRs) present on the cilia of olfactory sensory neurons in mice. It has been established that the ORs mediate olfactory signal transduction through the α subunit of the olfactory G-protein, Gαolf; however, little is known about its β and γ subunits. In other cellular systems, it has been shown that the Gβγ dimer plays important roles in signal transduction. Previously, we performed RNA in situ hybridization studies to map the locations of different subunits in the main olfactory epithelium (MOE) (Mehta et al., URCAD abstract 2011). We observed differential expression of Gβγ subunits. To further increase our understanding of the expression patterns of β and γ subunits, we performed Real-Time quantitative polymerase chain reaction (RT-qPCR) assays to monitor changes in relative expression levels. In accordance with our previous data, we observed differential expression of subunits B1, B3, and G2, such that the subunits showed a significant difference in fold change between the MOE than the tongue. Furthermore, we conducted double in situ hybridizations to study cellular colocalization of the subunits with standard olfactory markers. We found that G13 is expressed in mature olfactory neurons.

This work was funded by NIH/NIDCD grant DC009269 and ARRA supplement to WL.

A Mathematical Model of the Inactivation of Melanopsin

Jacquelyn S. Meisel, Kimberly M. Daniels, *Kevin Herold, Drew Thatcher, Joseph Blasic, Evan Cameron*
Kathleen Hoffman, Associate Professor, Department of Mathematics and Statistics
Phyllis Robinson, Professor, Department of Biological Sciences

Melanopsin is a photopigment expressed in intrinsically photosensitive ganglion cells in the vertebrate retina. These ganglion cells project to the SCN which regulates circadian rhythms. Light- activated melanopsin activates a second messanger pathway. Data suggests that melanopsin is deactivated by phosphorylation of its carboxy tail and the binding of a beta-arrestin. This deactivation is assayed using a fluorescent calcium imaging. HEK cells expressing wild-type melanopsin show that the fluorescence increases as it is activated by light, and decreases with deactivation. Cells expressing a mutant melanopsin missing all its phosophorylation sites demonstrated no deactivation. Deactivation of mealnopsin is mathematically modeled with a set of differential equations representing the chemical reaction in the phototransduction cascade. Specifically, the model focuses on the phosphorylation of melanopsin's tail and subsequent binding of an arrestin. Comparing experimental and modeling results shows remarkable agreement. Sensitivity analysis of the model indicates that the rate that a kinase binds and unbinds to melanopsin's tail is independent of the number of phosphorylations. The rate of phosphorylation increases with the first three phosphorylations, and decreases with further phosphorylations. This model will help determine the number of phosphorylation sites necessary for deactivation and create hypotheses for current experiments.

This work was funded by NSF through an Interdisciplinary Training for Undergraduates in Biological and Mathematical Sciences.

Perceived Racism in Community Settings, the Media, and Experienced by Family and Friends and Daily Mood among Minority Women

Angela A. Mensah, *Faiza Haq, Antione D. Taylor*
Danielle L. Beatty, Assistant Professor, Department of Psychology,
Elizabeth Brondolo, Department of Psychology, St. John's University

This study examined whether racism experienced in community settings, the media, and as shared by family and friends was related to daily mood among minority women. Black (n = 207) and Latino (n = 193) women (mean age 39 $\pm$ 10.4) residing in New York City completed: a) the Perceived Ethnic Discrimination Questionnaire-Community Version that assessed exposure to racism across different settings (nine items), the media (three items), and shared by family and friends (six items) on a 1-5 point scale and b) a diary measure of mood assessing anger, nervousness, and sadness at 20-minute intervals across one day. Pearson's correlations indicated that perceived racism across settings including work, looking for housing, the court system, and on the street were related to diary mean scores for greater anger (r = .23, p < .0001), nervousness (r = .26, p < .0001), and sadness (r = .15, p = .009). Reports by family and friends were associated with diary mean scores for greater anger (r = .15, p = .006) and nervousness (r = .16, p = .003). The findings suggest that experiences of racism across community settings and shared by family and friends may impact the well-being of minority women.

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The Implications of Static and Dynamic Biopsychosocial Factors in Treatment of Female Juvenile Delinquents

Jennifer A. Mercer
Steven McAlpine, Assistant Director, Department of Interdisciplinary Studies

This literature review addresses the unique perspectives of adolescent girls who are in the custody of the juvenile justice system. Crime is a persistent social issue, with the delinquent actions of juveniles arousing a large amount of public concern. Until recently, juvenile delinquency was considered to be synonymous with wayward boys, resulting in gender-biased research that neglected the perspectives and experiences of girls, and ineffective treatment based on that same flawed research. The review of literature surrounding factors which influence the lives of girls revealed that static, or relatively permanent, and dynamic, or changing, factors carry different (but equally important) implications for criminal justice professionals involved in treating this unique population. Of particular interest were considerations of past abuse, attitudes towards future goals, and the intersections of multiple marginalized statuses. Effective management of these issues requires that criminal justice professionals who work with girls are trained to recognize the importance of these factors, can provide basic intervention when necessary, and can refer individual girls to specialists when necessary.

***The Perfect Bride*: A Study in Antiquated Animation**

Renee Meunier
Frederic Worden, Professor, Department of Visual Arts

As technology has evolved, so has the way animated films are produced. Stop-motion is considered an outdated and laborious animation process in which puppets or other visual elements are moved slightly from one film frame exposure to the next. My research project investigates the use of the traditional stop-motion technique to create a high-quality puppet animation within a fine-arts context. When it comes to animating using the stop-motion method, there are few available sources that teach the techniques required for the construction of sets, the various features of the puppets, and the timing of sequences. In the course of my project, I had to develop original methods in each of these areas. I was especially concerned to find ways to speed up the animation process. I worked hard to eliminate wasted time on unseen elements, such as leg movements on puppets which would only be seen from the waist up. In addition to developing my own techniques for producing a stop-motion animation, I was also interested in striving to create a believable animated world and characters within that world with whom audiences could develop an empathetic identification.

Paradigms in Games and Storytelling

Kenner Miner, Mallorie Ortega, Lorenzo Lalimarmo, Michelle Martir, Iris Kwok, Patrick Sedlander, Kevin Somers, Sarah Yendrey, Megan Masciana
Neal MacDonald, Assistant Professor, Department of Visual Arts

Many newly developed games tend to trod paths well worn by their successful predecessors, mimicking gameplay mechanics and structure and only differing in art, layout, and pacing. In the development of Reverie, a platforming and puzzle-solving game, we aimed to take a standard game structure and modify the player interaction paradigm to create a fresh experience that engaged players. Building the initial game mechanic was relatively straightforward; players would manipulate the world around their character rather than moving the character directly. However, problems arose when our initial choice of physics library began creating unintended bugs when interacting with the world, complicating game mechanics that were meant to be simple. The saving grace, noted by many of Reverie's play-testers, was that the artwork and music provided a unique atmosphere that encouraged continuation of play, even when the game's fundamental mechanics were clunky. All in all, our experiences building new methods of interaction were successful, though unrefined. While gaming is a relatively small part of the computing world, shifts towards new human computer interactions continue to flourish. Encouraging experimentation and creative problem solving will help lead to the discovery of the next ubiquitous human-computer interaction paradigm.

This work was funded, in part, by the IRC Fellows.

A Text Mining Approach to Extract Protein-Protein Interactions of Orthologous Proteins from Literature

Rajashree Mishra*, Emily Doughty*
Maricel G. Kann, Assistant Professor, Department of Biological Sciences

Important molecular data such as protein interactions are essential because their interactions are crucial to understand functions within cells, pathways and their relationships to diseases. However, most of these associations are not available in interaction databases. Using evidence of interacting orthologs (interologs) can help uncover positive interactions. We developed an automatic method to extract protein–protein interactions from the literature using the concept of interologs to transfer interactions between organisms. Interactions in a seed organism are transferred to a target organism using HomoloGene. The method then uncovers protein-protein interactions by searching the STRING database for the interactions in the target organism. If these interactions are not found in STRING, then the method text mines for the interaction in a corpus of organism-related abstracts. To evaluate the text-mining portion of our method, we chose the Seed and Target as *H. sapiens* (human) and *M. musculus* (mouse), respectively. We curated a random set of 250 abstracts from our text-mining method, and found the precision to be nearly 83%. Preliminary results of using our approach to detect interactions in mouse show our interolog-based method has great potential to be used for large scale retrieval of protein interactions from biomedical literature.

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Multiclass Datasets, their Predictions, and their Visualization

Alexander Morrow, Wallace Brown, *Kevin Winner*
Marie desJardins, Professor, Department of Computer Science and Electrical Engineering
Penny Rheingans, Professor, Department of Computer Science and Electrical Engineering

Many datasets contain a wealth of information. For example, a person may be described by their race, age, gender, income, marital status, nationality, level of education, etc. By analyzing this data, we can form educated and accurate predictions about individuals. We can, for instance, determine that a person with a particular race, age, nationality, and income is likely to be a college undergraduate. Our goal is to develop ways to visualize these predictions and the uncertainty associated with the predictions. Displaying data in a scatterplot is a standard means of describing two-dimensional information. However, displaying high-dimensional data (i.e., data that includes many attributes, such as age, race, and income) is significantly more challenging. We present a means of visualizing high-dimensional data sets and the predictive models derived from the data, using existing dimension reduction techniques and novel glyph-based displays.

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Translational Misreading in *rbfA* Compensatory Mutants

Chatura Nagaradona, Chiemeka Onyima, Monika Bhatt
Philip J. Farabaugh, Professor, Department of Biological Sciences

The process of protein synthesis occurs when the ribosomes translate the mRNA of a cell into a string of amino acids, which forms the protein. The prokaryotic ribosome 70S is comprised of a large (50S) and a small subunit (30S). Ribosomes are comprised of many ribosomal RNAs and proteins. Ribosomal binding factor A (*rbfA*) helps the proteins assemble onto the rRNA. Cells without this binding factor exhibit a slow growing phenotype as well as cold sensitivity. *rbfA* mutants grown at low temperatures revert to cold insensitivity due to mutations in the *rpsE* gene. *rpsE* mutations can cause increased inaccuracy in translation. We are interested in determining whether these *rbfA* and *rpsE* mutations cause inaccuracy. Translational misreading results from incorrect base pairing between the mRNA codon and the tRNA anti-codon, which creates incorrect proteins. We will quantify the misreading using a dual luciferase assay. Comparisons will be made between *rpsE* mutants with and without the *rbfA*. If misreading causes the cold sensitivity, we expect that the strains lacking *rbfA* will have higher misreading rate than the wild type strains.

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Design and Synthesis of Chlorin Arrays For Two-Photon Excited Fluorescence

Jamie K. Nguyen
Marcin Ptaszek, Assistant Professor, Department of Chemistry and Biochemistry

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 focused on the synthesis of chlorin dimers connected by acetylene linkers exhibiting strongly expanded conjugation. For the construction of the chlorin dimers, palladium-catalyzed Sonogashira coupling reactions were utilized. Key steps for the construction of novel dimers include preparation of new building blocks for assembling the chlorin macrocycle, novel chlorin derivatives, as well as optimization of conditions for the synthesis of the final dimer. The identities of key intermediates and their spectral properties were determined using ^{1}H NMR, ^{13}C NMR, MS, absorption, and emission spectroscopy. Further analysis of multi-chlorin fluorophores will allow insight to determine the relationship between structure, fluorescence properties, and two-photon absorption cross-section in strongly conjugated chlorin dimers.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Improved Measurement System for Experimental Wounds

Ribe Ninan, *Junkai Du[1], Lixin Liu[1], Frank Lay[1], Sayed Mohammad Hosseini[1], Guy P. Marti[1], John W. Harmon[1]*
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John W Harmon, Professor of Surgery, Department of Surgery, Johns Hopkins Bayview Medical Center

The purpose of this experiment was to design a reliable reproducible wound measurement system, which is examiner independent. Using fluorescein sodium helps avoid wound manipulations by observers, limits the procedural steps, and accurately determines unepithelialized borders. Currently, there are three methods for wound measurements: tracing wounds onto an acetate paper, tracing wound margins from a photographic picture, and measuring dyed surface of the wounds. In these techniques, the wound images are uploaded to a computer and the wound area is measured, counting the pixels of the wound using Photoshop. Fluorescein sodium is a safe dye, used for ophthalmologic examination, which exposes under UV light. Since unepithelialized wound is moist, it uptakes the fluorescein dye. To test the fluorescein sodium method, eight-millimeter wounds were excised to the dorsum of each mouse. Then a photo was taken, with the dye, under a UV lamp that was uploaded and traced in Photoshop for pixel counting. Comparing the data obtained from traditional techniques and fluorescein to a reference, we were able to discover that pixels from the fluorescein technique were the closest to the reference.

This work was funded by John W. Harmon, M.D., FACS.

Effect of Piano Lessons on Primary Instrument Proficiency and Performance in Mathematics

Jason M. Noren, Eric S. Piccirelli
Linda Oliva, Assistant Professor, Department of Education; Cheryl North-Coleman, Assistant Professor, Department of Education

The purpose of this study was to investigate corollaries of piano lessons on proficiency playing one's primary instrument and scores in math class. Middle school students were offered after-school piano lessons free of charge. This piano club was open to all students in the school, although only those who participated in band or orchestra – about twenty students – were used as subjects in this study. Prior to the start of lessons, the instrumental music instructor provided a musical character statement for each participant. This statement included general dispositions as a musician playing their selected band or orchestra instrument, including remarks on embouchure, note and rhythm reading, posture, etc. Additionally, each participant's grade was recorded supplementing qualitative data with quantitative comparisons. This process was repeated for the same number of non-participants, and was completed again after piano club ended. Seven participants were selected at random to have progress measured in mathematics. Mathematical character statements were provided before and after the study, noting student participation, content knowledge, and overall dispositions as a math student. This also was repeated after piano club ended. This study puts forth meaningful data regarding an extra-curricular activity which too commonly gets referred to as irrelevant and insignificant.

Potential Novel Genes involved in Expression of Brown Adipose Tissue in Brca1 Mutant Mice

Felix O. Nwogbo*, Laundette P. Jones*
Laundette P. Jones, Associate Professor, Department of Pharmacology and Experimental Therapeutics, University of Maryland, Baltimore

The goal of the Jones Lab is to identify key biomarkers for early detection of breast cancer using a mouse model analogous to humans with BRCA1 mutations. Prior studies in this model discovered that compared to adult wild-type mice, Brca1 mutant mice display a sustained brown adipose tissue (BAT) phenotype in the mammary glands that is correlated with increased angiogenesis. We hypothesize that this sustained mammary BAT phenotype in Brca1 mutant mice can provide a permissive environment for tumor growth. My role in the lab focused on establishing the cause of the abnormal BAT phenotype. My prior DNA and RNA analysis studies suggested that the BAT phenotype was not specifically due to targeted deletion of Brca1 in cells. Therefore, my current work involved an in-depth literature search to find candidate genes which might be responsible for the BAT phenotype. An existing microarray data set that compared Brca1 and wild-type mammary glands will be utilized to search for each of the candidate genes identified to determine if/how expression was altered. We anticipate that this work will ultimately generate novel hypotheses and identify specific mechanisms that will explain the role of the adipose environment in the early stages of breast tumorigenesis.

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Homework Completion: Increasing the Odds

Sharon O'Neill, *Hyo Cho*
Cheryl North-Coleman, Professor, Department of Education

Less than twenty-five percent of students at Violetville Middle School complete their assigned homework on a regular basis, compared to a forty-seven percent national average. We believe this negatively impacts student achievement. We have implemented a homework intervention program that combines positive incentive for completion of homework, along with mentoring of students in strategies for establishing responsible homework routines. We worked with a select group of students who were identified by teachers as non-compliant in homework completion. We invited them to participate in a program that would reward them for regular homework completion. They were also required to attend lunchtime sessions for mentoring.
We believe this research is important to the general public because homework completion is an ongoing problem across the country. Especially in middle school and high school, when students do not have as much supervision, homework is a low priority. We suggest that intervention and support in the middle school may help to establish habits through the use of extrinsic and intrinsic motivation.

Characterizing the AC1-Exemestane Resistant Cell Line in Estrogen-Dependent Breast Cancer with Aromatase Inhibitors

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Angela Brodie, Professor, Department of Pharmacology and Experimental Therapeutics, University of Maryland School of Medicine

In estrogen-dependent cancers, estrogen relies on the aromatase enzyme for synthesis. Aromatase is an enzyme that mediates the conversion of androgens (i.e., androstenedione) into estrogens. Aromatase inhibitors (AIs) are used to treat estrogen receptor positive (ER+) patients by reducing the levels of estrogen that are produced via the aromatase enzyme. The purpose of these studies is to examine the underlying mechanisms of AI resistance. We treated mice with ER+ tumors with Exemestane. The xenograft tumors initially regressed, but after long-term treatment, they became resistant to treatment and began to grow. We characterized the AC1 Exemestane Resistant (AC1-ExR) cell line by analyzing their drug sensitivity. Aromatase assays were performed to measure the aromatase activity in these cells following treatment with 10^{-6} M of exemestane. The aromatase activity in the AC1-ExR cell line, when treated with exemestane, was higher than that of the parental cell line: average concentration of 19.27 fmol/mg protein compared to the average concentration of 0.88 fmol/mg protein of the parental cell line. We also studied the cancer stem cell properties of AC1-ExR cells, which formed more mammospheres than the AC1 parental cell line. We will perform further experiments to increase the sensitivity of ACR-ExR cells to AIs.

This work was funded by the National Cancer Institute of the National Institutes of Health.

Standoff Chemical Detection using Quantum Cascade Lasers and Microphone Arrays

Ugonna C. Ohiri
Fow-Sen Choa, Professor, Department of Computer Science and Electrical Engineering

This project investigates 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. Parts-per-billion level quantum-cascade laser acoustic sensing has been demonstrated; however most of the methods are localized techniques and require samples to be contained in a photo-acoustic cell. Acoustic beam forming, using an array of microphones and signal processing technique, is used in this project to form a highly directive acoustic detection beam. The acoustic beam can be well aligned with photo-acoustic source, which is generated by the laser beam through a training process of delay adjustment. Noise sources outside the beam-covered region will not be effectively collected by the microphone array due to array phase cancelling. So, equivalently the array is functioning like a spatial filter to select signals coming from a pre-calculated direction. The more microphone elements used in the array, the narrower is the receiving beam and the better is the signal-to-noise ratio (SNR). Using a multi-channel analog-to-digital converter, we simultaneously collect acoustic signals from an array of four microphones and adjust their signal delays to achieve enhanced SNR. We are in the process to achieve real time operations of the system.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Characterization of the Role of the L4 Tentacle in the Process of Translation

Oseogie Okojie, *Brandon Young*
Janice Zengel, Senior Research Scientist, Department of Biological Sciences

Bacterial ribosomes are made up of two separate subunits: the 30S subunit (small subunit) and the 50S subunit (large subunit). This research deals with the 50S subunit, which conducts peptide bond formation at its peptidyl transferase center. Within this subunit is an exit tunnel which nascent proteins traverse to reach the cytoplasm to become functional proteins. The tentacle of the L4 ribosomal protein contributes to the structure and possibly functions of this exit tunnel. It has been shown that mutations within the tentacle of *Escherichia coli* L4 can cause detrimental effects to the 50S subunit. Polymerase chain reactions (PCR) and site-directed mutagenesis have been used to introduce additional changes into the *E. coli* L4 protein. The synthesis and function of ribosomes carrying these mutated L4 proteins will then be analyzed. These studies will help to reveal the role(s) of specific amino acids in the L4 tentacle and the process of translation.

This research was supported by the National Science Foundation Grant MCB 0920578.

Reverse Carbocyclic Fleximers as a Means of Overcoming Drug Resistance

Chikezie Okoro*, Sarah Zimmermann*
Katherine Seley-Radtke, Professor, Department of Chemistry and Biochemistry

Drug resistance is a common problem occurring in monotherapies for many diseases. These mutations are 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, thereby mimicking the purine scaffold. 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.

This work was funded in part by the National Institutes of Health training grant T32GM066706 (KSR and SZ) and through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Flexible Carbocylic Nucleosides as Antiviral Agents

Uchenna C. Okoro*, Hannah L. Peters*
Katherine Seley-Radtke. Professor, Department of Chemistry and Biochemistry

One of the most prominent themes in antiviral treatment today is the use of nucleoside analogs. Nucleosides can act as inhibitors of important cellular enzymes by prematurely terminating the growing viral DNA or RNA strand. One of the largest obstacles these drugs must overcome is the development of resistance. Viral polymerases frequently undergo mutations in the active site by introducing steric or electronic hindrance to prevent the drug from binding properly. As a means to enable them to overcome this resistance, the Seley-Radtke lab has designed a series of flexible nucleotide analogs. The structures of the modified nucleotides retain essential hydrogen bonding motifs so that they are properly recognized by the enzyme, but are flexible enough to interact with secondary amino acids in the active site as a means of overcoming resistance and retaining their biological activity. Through a series of synthetic organic chemical reactions, including the iodination of imidazole, and subsequent Vorbruggen coupling, an important intermediate in the fleximer target synthesis has been realized. This analog will be further functionalized to lead to a key tricyclic intermediate for the synthesis of the flexible nucleotide analog, Flex-2'-fluoro-2'-methyl GTP. Once in hand this novel compound will be tested for antiviral activity against Hepatitis C Virus and studied to explore the capabilities of flexible nucleosides in polymerase binding sites.

This research was supported in part by a grant to UMBC from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education Program and the National Institutes of Health, R21AI097685 (KSR) and T32GM066706 (KSR and HLP).

Life Is Like Basketball

Martin Onuegbu
Frederic Worden, Associate Professor, Department of Visual Arts

Life Is Like Basketball is a narrative film depicting a young man's struggles in his life and makes use of the game of basketball as a metaphorical representation of those struggles. This short movie presents a dazzling array of action shots and makes use of special effects to tell an epic story of a boy named Ron battling a variety of foes. These battles unfold both on a basketball court as well as in an imaginary trial room in his mind. As the story progresses, the protagonist overcomes his foes through his determination as well as his fantastic basketball skills. This film is intended to be both entertaining, as well as an in-depth character study of a man striving to overcome the obstacles in his life. Both the visual imagery and the original musical soundtrack are designed to communicate and articulate the character's struggles. The hope is that the film will both entertain as well as make viewers think about the sources of inspiration that can be called upon to rise above some of life's more challenging obstacles.

Antimicrobial, Non-Contact, Fluorescence-Based Temperature Sensor for Newborns

Royce E. Onyimba
Hung Lam, Assistant Professor, Department of Chemical and Biochemical Engineering

Current body temperature monitoring of neonates in the neonatal-intensive-care unit consists of attaching a wired thermistor to the skin via a strong adhesive. The adhesive has been shown to be a site of bacterial growth and causes dermal wounds upon removal, from stripping of skin. This project helped introduce a specialized hydrogel capable of replacing adhesive based thermistors. For sensing, two dyes were enclosed in an antimicrobial chitosan gel that can be harmlessly applied and removed from skin. To improve the gel's skin compatibility, different molecular weights of chitosan were tested against Escherichia coli and Staphylococcus aureus to determine the most antimicrobial structure. A ratiometric temperature measuring approach was taken with tris(1,10-phenanthroline)ruthenium(II) (Ruphen) as the temperature sensing dye and 8-aminopyrene-1,3,6-trisulfonic acid (APTS) as the temperature-insensitive dye employed as a reference. A charge-coupled device (CCD) camera was used as the fluorescence detector and a light-emitting diode (LED) served as the excitation light source. This temperature sensor had a resolution of 0.1°C and low molecular weight chitosan possessed the greatest antimicrobial activity. With included chitosan, the hydrogel not only measures temperature precisely, but also protects newborns from infection.

This research was supported by General Electric Healthcare and the National Institutes of Health.

Peptide Modification of 3-Dimensional Surfaces to Enhance Cell Adhesion and Differentiation

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Bone Tissue Engineering is an interdisciplinary field that applies the principles of biology and engineering to the development of viable synthetic substitutes that are able to restore and maintain the function of human bone tissues. The problem facing this therapy is that most cells fail to adhere properly to the scaffolds which lead to fibrous tissue formation around the implants. One strategy to solve this issue would be to immobilize a molecule that promotes cell adhesion onto the 3D scaffolds. This would ensure that cells adhere to the scaffolds, and it has the potential to enhance cell proliferation and cell differentiation. In this study, calcium aluminate (CA) was utilized as the scaffold. CA is a non-toxic, bioactive, and non-degradable material. CA also exhibits high mechanical strength and porosity. CA was modified by immobilizing the cell adhesion peptide Lys-Arg-Ser-Arg (KRSR) onto the surface via a novel chemical linker system. Cells of interest were primary human osteoblast and adipose-derived Stem Cells (ASCs). We hypothesized that CA surfaces modified with KRSR would enhance cell adhesion to the scaffolds as compared to unmodified CA. A cytotoxity assay was used to determine cell viability on the scaffolds at day one, four and seven day growth points.

This work was funded by Pittsburgh Tissue Engineering Initiative and NIH.

Projections: the Creation of Moving Images

Mallorie B. Ortega
Fredric Worden, Associate Professor, Department of Visual Arts

The projection of images during stage plays is becoming an increasingly popular design element in live theatre. The UMBC Theatre Department added visual projections to their fall show, *The Laramie Project*, a documentary play that tells the story of Matthew Sheppard;s murder and the impact his death hadon the Laramie community. The technology necessary to successfully project images onto the stage during live theatre was not understood by the faculty and had to be developed during the play's pre-production process. My video, *Projections*, documents the process of working out of the difficulties of implementing the image projections called for by the play's director and the complications of integrating those projections into the play's overall lighting design. In the video, I was exploring how to make an observational documentary that both informs and entertains audiences who have little or no knowledge of what goes into preparing and mounting the lighting design for a contemporary stage play.

Synthesis of a Transferrin Functionalized Dendron for Targeting Advanced Stages of Cancer

Christina L. Parker, *Margaret Grow*
Marie-Christine Daniel, Assistant Professor, Department of Chemistry and Biochemistry

The administration of chemotherapeutic drugs causes many side effects to the patient, as these therapeutics are not directly targeted to the site of the tumor. They are subsequently either rapidly removed from the body or enter into healthy tissues, introducing problems of drug toxicity. To overcome such concerns in therapeutic delivery, the transferrin protein can be used as a natural targeting moiety when linked with a drug. This drug delivery platform is suitable for a number of cancers as transferrin is not only a naturally occurring protein but also because those malignant cells overexpress its corresponding receptor. The goal of this project is to use this protein as an active targeting moiety on a multifunctional gold nanoparticle drug delivery platform for advanced stages of cancer, in particular for those cancers that overexpress the transferrin receptor, such as pancreatic, brain, and breast cancers. Transferrin functionalized poly(propylene imine) (PPI) dendrons of generations one, two, and three will be coupled to gold nanoparticles and evaluated on their ability to effectively and actively target malignant tumors. Generation one and two PPI dendrons have been synthesized and are now ready for coupling with transferrin. The completion of this last step will be verified by ^{1}H NMR, absorption spectroscopy and dynamic light scattering.

Compass

Katrina A. Parker
Fred Worden, Associate Professor, Department of Visual Arts

The film *Compass* combines video images with exaggerated sound and music to give physical and auditory form to the intangible emotions within the human mind. The film combines narrative and experimental styles as it follows a character on a search through his subconscious memories, fears, and desires. All of us, no doubt, have repressed unconscious fears and desires. One of the goals of the film is to bring audiences to an awareness of this fact by immersing them in a dream-like cinematic world, where such unconscious drives and desires are made tangible and visible. If the film succeeds, audiences will be prompted to discover and address the thoughts and emotions hidden in their own minds. The character's ultimate goal in his search is never revealed, allowing the audience to project their own conclusion, and thus their own discoveries, onto the character's journey.

Philistines in the North? An Examination of Mass Migration to the Northern Levant in the Early Iron Age

Catherine Pasqualoni
Laura Wright, Lecturer, Ancient Studies

Early twentieth-century archaeologists argued that the Philistines, a people of Biblical acclaim, migrated from the Aegean to southern Palestine at the end of the Late Bronze Age (ca. 1200). For early archaeologists, the Bible and Egyptian texts offered definitive proof that this migration occurred. Similarities in non-elite material culture supported this conclusion. In recent, influential excavations, Aegean-like material culture has been found in the northern Levant, prompting some scholars to identify a similar migration to this area. Re-evaluation of epigraphic evidence in light of recent linguistic advancements has been cited, which has led some scholars to identify this northern migration specifically with a Philistine population. This project re-evaluates the specific nature of that migration through an exploration of the very concept of migration (and its innumerable iterations) as well as an examination of the epigraphic evidence and material culture of the Northern Levant to determine if, in fact, there were Philistines in northern Syria.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

The Relationship between Maternal Perceived Illness Severity and Child's Peer Interactions

Shyam G. Patel, Samantha M. Braatz, *Amy L. Hahn, Caitlin C. Thompson, Lynnda M. Dahlquist*
Lynnda M. Dahlquist, Professor, Department of Psychology

Past research observing the parent-child relationship in children with chronic illness has demonstrated a relation between ratings of illness severity and parental adjustment. However, little research has been conducted on how parent perceptions of severity affect the social interactions of chronically ill children. The current study seeks to examine the relationship between maternal perceptions of illness severity and child peer interactions in children with food allergy. Data were collected from 31 mother-child dyads (58 percent male, 80.6 percent Caucasian). Children ranged in age from 36.14 to 81.64 months (M = 56.04, SD = 15.74). Mothers were asked to complete questionnaires documenting the history of their child's food allergies and their child's peer interactions. The researchers will examine questionnaires measuring maternal perceived severity of the food allergy and frequency of peer interactions, parental presence during peer interactions, and structure of peer interactions. The researchers hypothesize that higher ratings of severity will correlate with increased parental involvement in peer interactions. Secondly, the researchers hypothesize that higher ratings of perceived severity will correlate with decreased frequency of peer interactions outside of the home. This study aims to provide a better understanding of the relationship between maternal perceptions of food allergy and peer interactions.

This work was funded in part by a grant from the Department of Human Development at Washington State University and grant #R031R21HD058053 from the NICHD, NIH.

The Role of Solitary Chemosensory Cells in Limiting Toxicants to the Vomeronasal Organ and Maintaining Sexual Behaviors

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Tatsuya Ogura, Research Assistant Professor, Department of Biological Sciences
Weihong Lin, Assistant Professor, Department of Biological Sciences

The vomeronasal organ (VNO) detects pheromones, mediating many innate social and sexual behaviors. Pheromone rich urine is deposited in the environment and drawn into the VNO via the anterior entry duct. The VNO entry duct is densely packed with TRPM5-expressing solitary chemosensory cells (SCCs). Since we recently found that bitter compounds are detected by SCCs in the VNO entry duct (Ogura et al. 2010), we hypothesize that SCCs play a role in protection of the VNO from bitter toxins by monitoring them as they travel into the VNO. We tested the role of SCCs in protecting the VNO from toxic damage and maintenance of sexual behaviors. To determine the role of SCCs we compared mice with functional SCCs (WT) to mice with non-functional SCCs (TRPM5KO). These mice were exposed to toxins followed by behavioral tests and examination of neuronal activity in the accessory olfactory bulb, the region of the brain innervated by the VNO. Our results show that in toxin exposed TRPM5KO mice, instances of mating are diminished in comparison to toxin exposed WT mice and control mice. Lastly, we see diminished neuronal activation in the accessory olfactory bulbs of toxin exposed TRPM5KO mice in response to mating stimuli.

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Project 2061: Design for the Future of Aging

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Judah Ronch, Dean, Erickson School of Aging; Amy Hurst, Assistant Professor, Department of Information Systems; Elizabeth Lunt, Lecturer, Erickson School of Aging; Catherine Neylan, Assistant Professor, Department of Visual Arts; Timmie Topoleski, Professor, Dept of Mechanical Engineering

The aging care industry is one of the fastest growing in the United States as the baby boomers begin to represent an increasing segment of the elderly population. Addressing the rapidly growing demand for elderly care, the students and faculty of Project 2061 formed an interdisciplinary collaboration to envision and create an exhibit of technologies that, 50 years from now, might be what nowadays is called nursing home level of care. The problem we focused on was how to incorporate technology into a living environment to enable aging individuals to achieve optimal quality of life. Through independent research on prospective future technologies and guest lectures by industry professionals, we selected some technologies through collaborative discussion and faculty advising. We created a large exhibit to showcase our findings in a design which includes contributions from a variety of disciplines in the form of illustrative panels and posters depicting technologies that represent our vision for the future. We formulated our design using principles of person-centered care; to that end three personas that describe the life of and type of care and support these particular elders might need form the core around which the technologies were selected and the exhibit designed.

This research was supported in part by a grant from LeadingAge and by the Erickson School of Aging.

Photon Excitations and Inhibitions of Cultured Neurons

Linh R. Pham
Fow-Sen Choa, Professor, Department of Computer Science and Electrical Engineering

Neuronal optical excitation can provide non-contacting tools to explore brain circuitry and a durable stimulation interface for cardiac pacing and visual as well as auditory sensory neuronal stimulation. To obtain accurate absorption spectra, we scan the transmission of neurons in cell culture medium, and normalize it by subtracting out the absorption spectrum of the medium alone. The resulting spectra show that the main neuronal absorption peaks are in the 3000-6000nm band, although there is a smaller peak near 1450nm. By coupling the output of a three μm interband cascade laser (ICL) into a mid-IR fluorozirconate fiber, we can effectively deliver more than one J/cm^2 photon intensity to the excitation site for neuronal stimulation. An indium tin oxide based microelectrode arrays was prepared for rat neurons to be cultured on it. Circuit board connecting to an analog to digital converter was designed and fabricated. Neuron firing signals from the microelectrode array can be directly extracted and observed from the control PC. Signal to noise reduction through differential mode operations and frequency filtering is in the process to be optimized for final preparation before starting the cell culture work on the circuits.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Improving Students Test Scores through the Use of Rewriting Opportunities

Ronnie L. Polk
Cheryl North-Coleman, Assistant Professor, Department of Education

Student test scores in the area of writing have become a major issue for schools with tests such as the SATs and other high-stakes testing. In turn, every subject area must make writing a priority in order for students to be successful. This study gives students the opportunity to write essays in several content areas, such as English, Social Studies, and Art. Each time the student had an opportunity to re-write the essay to see if this resulted in improved writing. Each time a student had an opportunity to rewrite the essay which resulted in marked improvement on each essay. The improvement is measured by the student's enhancement of the writing in content as well as grammar.

Lecoq's Neutral Mask: The Readiness is All

Jessie M. Poole
J. Lynn Watson, Associate Professor, Department of Theatre

At Jacques Lecoq's school, L'École Internationale de Théâtre in Paris, student actors spend their first year working with the "neutral mask." The neutral mask is a full-face, seemingly expressionless brown leather mask worn while doing a series of specific exercises. However, the neutral mask, as designed and created by Amleto Sartori, has an expression intended to be that of a face caught just in the moment before it is about to change. It expresses neither happiness nor sadness, only readiness. The mask has neither a history nor a future but simply exists in the moment, without comment. The neutral mask was used as a teaching tool by Lecoq to enable his students to work in a state of openness and availability. The neutral mask is about stripping away superfluous personal habits and idiosyncrasies. Working with the mask leads to what Lecoq calls a disponible, or "available" actor, who is perpetually open to discovery and exploration. My study of the neutral mask was with Dody DiSanto, a protégé of Jacques Lecoq. Through her teaching, I have strengthened my performance abilities. Using the neutral mask as a training tool frees me to explore the expressive potential of my whole body and discover commonalities with any character I play. Examples of my practice with neutral mask will be presented at URCAD.

This work was supported, in part, by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

The Irene Ryan Acting Competition: Commitment, Focus and Specificity in Acting

Jessie M. Poole, Katie D. Hileman
Alan Kreizenbeck, Associate Professor, Department of Theatre

Considerable work is required as actors when rehearsing a new piece of theatrical text. We must research the playwright, the time period, the historical references and context. Play analysis illustrates the life of the character, her previous actions, objectives, needs, wants, and desires. We must have enough knowledge of the character's world in order to act within it, and to be able to personalize it with our own lives. This year I was nominated to participate in the Irene Ryan Acting Competition through the Kennedy Center American College Theatre Festival. The competition requires the preparation of two scenes and a monologue performed in less than six minutes. The competition tested our commitment and focus to a character and scene, as well as our abilities in playing strong actions and specificity in movement and voice, which are required to believably move from character to character so quickly. My partner and I chose scenes from *Once a Catholic*, by Mary O'Malley, *Stop, Kiss* by Diana Son, and a monologue from *a feminine ending* by Sarah Treem. The characters in these scenes are remarkably different in age, location, time period, education, social status and relationship to one another. In-depth research and study of these details, as well as memorization and rehearsal culminated in our performances at the competition and will be performed at URCAD.

This work was funded, in part, by a Travel Award from the UMBC Office of Undergraduate Education.

AccessMT: A Multi-touch Tabletop Built with Accessibility in Mind

Alec M. Pulianas
Shaun K. Kane, Assistant Professor, Department of Information Systems

AccessMT is an accessible multi-touch table designed with accessibility in mind. AccessMT is a self-contained hardware prototype consisting of a projector, computer, infrared lights, and a modified camera. Users can interact with AccessMT using simple touches, gestures, and tagged objects. The table tracks touch by using a PlayStation Eye Camera modified to capture only infrared light. The inside of the table contains four infrared lamps in order to create a consistent swath of infrared light. The inside walls are painted white for even distribution and diffusion of light. When a user touches the glass top, his or her finger reflects back infrared light and creates a bright spot. Using the open source software packages Community Core Vision and BSQSimulator, we are able to track a user's fingers and translate each of them into touch events. AccessMT builds upon prior multi-touch tables, but was designed to enable it to be easily adapted for use by people with disabilities. This presentation describes the challenges we have encountered and overcome in developing this new prototype.

This work was funded through an Undergraduate Research Assistantship Support (URAS) Award from the UMBC Office of Research Administration.

Effects of Meditation on Memory, Learning, and Stress among College Students

Mercedes J. Randall
Shawn Bediako, Associate Professor, Department of Psychology

A growing body of literature suggests beneficial effects of meditation for improving mental focus and reducing stress. This study examined the effects of meditation on learning, memory, and perceived stress in a sample of high achieving undergraduate students. Thirty first-year students in the Meyerhoff Scholars Program were randomly assigned to one of three conditions: a control condition, an instructor-guided meditation condition, or an instructional e-mail condition. All participants were given the Auditory Verbal Learning Test and the Perceived Stress Scale at the beginning of the study and again three weeks later. During the interim period, participants in both experimental conditions were asked to meditate for ten minutes each weeknight between 9pm and 11pm and completed a daily diary regarding the quality of their meditation. Participants in the instructor-guided meditation condition met with a trained meditation instructor once per week for three weeks and were guided through a ten-minute meditation exercise. Data analyses compared differences in learning and stress at baseline and post-meditation among the three conditions.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Opsin Adaptation to High Pressure in the Deep-sea Fish *Gonostoma elongatum*

***Matthew Rapp**, Evan Cameron, Megan Porter*
Phyllis Robinson, Professor, Department of Biological Sciences

In the eye, photoreceptor cells contain visual pigments, which consist of a vitamin A derived chromophore bound to an opsin protein. The visual pigments absorb photons, transforming light energy into an electrical signal that the brain can interpret. Studying opsins from species living in different habitats provides insight into how the protein has evolved and adapted to different environments. By comparing many fish opsin sequences, the Robinson lab identified three amino acid sites that are under selection in species living in the deep-sea. Based on an opsin structural model the three different amino acids are located at the dimer interface between two proteins. Our hypothesis is that these three sites are structurally important to how the opsin protein has adapted to the significant hydrostatic pressure of the deep-sea. The goal of this project is to test this hypothesis by performing a functional analysis of the opsin protein from the deep-sea fish *Gonostoma elongatum*. I constructed mutants in the wildtype *G. elongatum* opsin gene. Then we expressed the mutants in COS cells and assayed for their expression using western blotting and confocal imaging. After expression, we assayed whether the mutations had affected protein function.

This work was funded, in part, by an Undergraduate Research Award from the UMBC Office of Undergraduate Education and NIH Grant 5R01EY019053-04.

Tracking Attendance and Tardiness

***Joe Raucher, Jonathan Carr, Preethy Prasad,** Heather Morris*
Jonathan Singer, Professor, Department of Education

The goal of this study is to track student attendance and tardiness of students based upon different practices and policies that teachers implement. Teachers, students, and parents will be given surveys to help track the attendance and tardiness of students. These surveys include questions for parents such as their knowledge of how their children are doing in school, how they get to school, and how often they're on time to classes. The surveys also gauge the knowledge of teachers in regards to how their students get to school and what they do about consistent lateness or absences. The analysis will focus on four major features. These features include the major reasons for student tardiness/absences, whether parents are aware of their child's tardiness or absences to classes throughout the day, the policies that several teachers employ in their classrooms to combat lateness, and an inquiry on whether the policies that the teachers use are effective.

The Impact of the Media in a Developing Egypt: National Policy vs. Collective Action

Mawish Raza
Brigid Starkey, Lecturer, Department of Political Science
Donald Snyder, Lecturer, Department of Media and Communication Studies

Current theoretical work on social mobilization suggests that the integration of media into civil society evokes action. Indeed, the recent events in Egypt commonly referred to as the "Arab Spring" point to a new role for the media as a tool to express dissent and fight authoritarianism in the region. Throughout contemporary Egyptian history, the media has been used as an instrument by both the government and its dissenters to try to influence political opinion inside Egypt. For many decades, the government has had the ability to censor the role of media in Egypt. However, the events of the 2011 uprising have ushered in a new era. Using social media platforms including Facebook, Twitter and various news outlets, the demonstrators were able to move around traditional censorship and instigate and organize collective action against the regime of Hosni Mubarak. As is now being widely discussed by media theorists, the ongoing revolution provides a framework to discuss how media has encouraged stimulation within protests. With the incorporation of film excerpts and interviews that highlight changes in the role of the media from the Mubarak to post-Mubarak period, this research examines these changes and how they have impacted collective action against the government in Egypt.

Baltimore, We Love You

Mawish Raza, Shannon Palmer
Fred Worden, Associate Professor, Visual Arts

While technological advances have made it easier for information to spread virally, a catalyst is often required to start the process. "Baltimore, We Love You" is a social media project that uses film to promote awareness of the levels of poverty that exist within the city of Baltimore. The film investigates homelessness, immigration/refugee policies and the state of the public school system. The film examines these issues primarily by exploring the personal experiences of individual Baltimore residents who are impacted by these situations and conditions. The intention of the film is to bring increased public awareness to the myriad of problems that exist within the city and to make these problems more understandable and more compelling by having real people describe them in their own voices. Based on statistics and research released by non-profit organizations, this campaign creates direct dialogue between with the impacted public in order to progress policy and action. This observational approach not only uniquely shapes the conversation of the film, but also personalizes the production process, due to the inability to 'preplan' the content. The use of audio-visual oral histories of actual poor people could provide the kind of catalyst necessary to mobilize public support for more concerted and effective efforts to address these wide spread problems of poverty and powerlessness amongst Baltimore's underclass.

This work was sponsored, in part, by Amnesty International USA and The Roosevelt Institute | Campus Network.

Changes in Spirituality, Optimism and Self-esteem among Participants in a Women-Centered Wellness Program

Abigail J. Rein, *Magda Permut*
Kenneth Maton, Professor, Department of Psychology; Magda Permut, Department of Psychology

Spirituality, optimism, and self-esteem are important aspects of individual well-being. Interventions that impact these variables may provide insight about how to create positive change in people's lives. Transformation 101, an eight-week course developed by a women-centered social change organization called Shakti Rising, aims to increase self-esteem, optimism, and spiritual awareness among participants. The curriculum includes activities that encourage participants to explore the physical, mental, emotional, and spiritual domains of their lives through meditation, group discussion, and guided journaling. Participants also learn to make small changes that positively impact their lives. This study investigated the success of the program by analyzing differences in participants' pre- and post- scores on the Spiritual Involvement and Beliefs Scale - Revised (SIBS), the Rosenberg Self-Esteem Scale (RSES), and the Life Orientation Test - Revised (LOT-R). Researchers hypothesized an increase in spirituality, optimism, and self-esteem. The results of the analysis will be discussed during the presentation.

This work was supported, in part, by a Travel Award from the UMBC Office of Undergraduate Education.

The Effects of International Law on Civilian Populations

Eric M Reitz
Jeffrey Davis, Associate Professor, Department of Political Science

The civilian population around fighting zones have borne a great deal of suffering. As a result, the international community has created standards, such as the Geneva Convention, and the Rome Statute of the International Criminal Court (ICC), to establish rules and guidelines for conflicts. The goal of these statutes is to limit the scope and effects of conflict. However, there has been uncertainty over the international community's enforcement the protections. In examining case studies that have occurred in Afghanistan, I have determined that these international laws have not been strictly enforced. This has led to situations where war crimes are committed against civilians without any prosecutions. Possible indiscriminate attacks are typically drone strikes or regional bombing that results in both militant and civilian deaths. An issue is that violations, such as these indiscriminate attacks on civilians, have not been prosecuted by the ICC or another international tribunal. The research shows that vague open-ended definitions of what is a war crime, causes problems over who should prosecute war crimes and what the punishment should be. Case law has not yet adapted and without a major case in the ICC or another major Court, war crimes committed against civilians will continue unprosecuted.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Introduction to a Language Acquisition Model

Rachel L. Robinson*, Germán F. Westphal*
Germán F. Westphal, Associate Professor, Department of Modern Languages and Linguistics

This paper presents an introduction to a theoretical model of language acquisition that incorporates the psycholinguistic principles of Generative Grammar on which the Theory of Principles and Parameters is based, and argues that the following conclusions follow in a natural and logical manner from such a model:
(1) The [mental] Language Acquisition Device becomes functionally less efficient during puberty for reasons pertaining to its internal structure and related to the values on which the parameters of the first language are fixed.
(2) First language acquisition involves setting the parameter values available in Universal Grammar (Chomsky (1989: 27-29), whereas post puberty language acquisition involves the creation of a new set of parameters in reference to the parametric values of the first language.
In addition to the presentation of the above said theoretical model and relevant arguments, the paper elaborates on the neuro-linguistic correlations between such a model and several brain scans of monolingual and bilingual subjects.
Given the theoretical nature of this paper, its methodology follows the principles of deductive argumentation.

This work was supported, in part, by a Travel Award from the UMBC Office of Undergraduate Education.

Angels Carrying Savage Weapons

Matthew Roe
Frederic Worden, Associate Professor, Department of Visual Arts

The mainstream media often fails to address the subject of abuse, both physical and emotional. My film, *Angels Carrying Savage Weapons* investigates the wide-ranging effects of relationship abuse on victims as well as on the abusers. The film employs washed-out colors and stark contrast in the images so that the audience comes to feel similar feelings of anxiety and fear to those expressed by the characters in the film. Screenwriter Scott Swan says, “something happens when you point the camera at something terrible.” and in this case, audiences are exposed to a very real element of human nature. However, just as these darker beasts live within the primordial nature of the characters, the good still can creep through. The film is intended to show that abuse that goes by unnoticed, even by those involved, is dangerous and must be confronted.

Political Displays in Art Museums: How Italy Exhibits Objects Repatriated from the United States

Christina Ross
Richard Mason, Lecturer, Ancient Studies

Repatriated objects are antiquities that were smuggled out of a country and then later returned to their country of origin through international negotiations. They are a new 'genre' of items to be curated because they are politically charged. I visited the archaeological museums in Naples, Paestum, and Aidone in Italy and researched how each museum curated repatriated artifacts, which were previously exhibited as solely aesthetic objects in the United States. In the past two decades, numerous works, purchased for millions of dollars, have been returned to Italy from museums in the United States with no reimbursement on the basis that they are the cultural property of Italy. This link to modern politics, international cooperation, and cultural heritage makes them unique to study as a set and each museum handles the display in a different manner. I studied this by visiting each museum, observing the exhibit, and making note of how each was advertised, highlighted, or discussed within the framework of the museum. Ultimately, it was clear that the three individual museums each emphasized different agendas driven by such various influences as nationalist politics, the connection between art and human emotion, and local history.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and a research abroad scholarship from the UMBC Department of Ancient Studies.

Technology as a Tool for Writing Instruction

Holly M. Roumeliotis
Linda Oliva, Assistant Professor, Department of Education

Writing is challenging for many high school students. This study aimed to examine the effect of technology integration on writing instruction. Preliminary writing samples showed students to be weak in the areas of writing effective, coherent theses and providing and analyzing appropriate and relevant evidence for those claims. The project attempted to track these two writing skills: providing complete, coherent, and effective theses and analyzing and implementing appropriate evidentiary support. The subjects involved in this study were students in my eleventh grade English class in Baltimore City. The technology tool that used to support writing instruction was Intel Education's "Showing Evidence Tool", an online activity designed by the instructor that helps students visualize the relationships between claims and evidence. This tool was used before writing final drafts of argumentative papers to see if it had any effect on student performance. Student progress was recorded through the use of portfolios and the "6+1" rubric. An analysis of the data showed varying trends and outcomes on the quality of writing.

Presentation of Stage Management Portfolio at KCACTF

Lena B. Salins
Alan Kreizenbeck, Associate Professor, Department of Theatre

The Stage Manager is an essential role in the process of rehearsing and performing theatre . The Stage Manager is responsible for the overall organization and communication for a theatrical production. A Stage Management portfolio is meticulously precise so that in case of an emergency, someone external to the production could step into the Stage Manager's role and complete the process. At URCAD I will be presenting the Stage Management portfolio I created during the process of working on *OTMA*, a show performed by the UMBC Department of Theatre in Fall 2011. The portfolio showcases all of the organizational work for the production, and contains the "Cue Script" that the performance was called from. I was invited to attend the Kennedy Center American College Theatre Festival (KCACTF) based on "Outstanding Stage Management," where my portfolio was put on display. The portfolio was created and maintained by myself over the course of the rehearsal and performance process of *OTMA.*

This work was supported, in part, by a Travel Award from the UMBC Office of Undergraduate Education.

Effect of Estrogen on Murine Model of Light Induced Retinal Degeneration

Lara M. Seidman
Mausumi Bandyopadhyay, Staff Scientist, Department of Ophthalmology, Medical University of South Carolina; Bärbel Rohrer, Professor, Department of Ophthalmology, Medical University of South Carolina

Age-related macular degeneration (AMD) is characterized by progressive loss of central vision resulting from damage to the photoreceptor cells in the central area of the retina, the macula. AMD occurs in two forms: wet and dry; with the dry form accounting for 80-90% of total cases. Dry AMD involves atrophy to the retinal pigment epithelium followed by slow degeneration and photoreceptor cell loss. The effect of estrogen on the retinal degeneration is poorly understood. Estrogen mediates its functions mainly through its receptors, ER alpha and ER beta. Following menopause, females are particularly susceptible to retinal degeneration, while those taking hormone replacement therapy were at a lower risk. In this study we investigated the effect of estrogen and estrogen inhibitor in a murine model of light-induced retinal degeneration. Our results showed that mice with estrogen supplementation had a higher visual acuity. Rod and cone photoreceptor function as determined by ERG tests showed change in comparison of estrogen treated to control. These results suggest a protective effect of estrogen in the constant light- induced retinal degeneration in mice and its therapeutic importance in retinal degenerative diseases.

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Phosphorylation of RPS7A Protein: Impact on Ribosomal Composition and Function

Reema Sharma, *Jesse Fox, Janice Zengel, Lasse Lindahl*
Lasse Lindahl, Professor, Department of Biological Sciences

Cancer cells are able to grow without regard to signals from the environment in the body that would limit growth of normal cells. Kinases are important for maintaining the cancerous state because they control many regulatory functions in the cell by adding phosphates to specific amino acids of other proteins. A proto-oncogene kinase, PIM1, is upregulated in prostate cancer cells and phosphorylates serines and threonines in other proteins, including RPS7A (Ribosomal Protein S7), one of 40 proteins found in the small subunit of the human ribosome. Two threonines are phosphorylated in RPS7, but functional implications of this modification are not known. To determine the impact on ribosomal function of such phosphorylations, we are studying the *Saccharomyces cerevisiae* (baker's yeast) orthologue (evolutionary equivalent) by mutating the threonine and serine residues in the yeast RPS7A gene to alanine, which cannot be phosphorylated, and to glutamic acid, which carries a negative charge similar to phosphate. Studying the phosphorylation of RPS7 can provide us insight about the importance of this protein in ribosome function and may give us a better understanding of how cancer cells function to favor their own growth.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Character and Play Research for Reinterpretation of Presentational Styles

Brandi Sheppard, Samrawit Belai
Alan Kreizenbeck, Associate Professor, Department of Theatre

In this presentation my partner and I researched specific plays, playwrights, and characterizations in order to create our own original interpretations of the scenes and monologue. We researched general topics including the playwrights' writing styles, other plays they have written, and the time period they lived in. We also investigated the background story of each of the selected characters, their dress, and speech patterns. Once that research was compiled we were able to make decisions about the characters' physical and psychological qualities and therefore how to present these characters in a convincing way.

This work was supported, in part, by a Travel Award from the UMBC Office of Undergraduate Education.

A Role for *prolyl-4-hydroxylase alpha* in Cell Migration in *Drosophila melanogaster*

Jinal Sheth
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences

During animal development, some cells are required to migrate at a precise time to fulfill their destiny. One such example is the migration of border cells in the *Drosophila melanogaster* ovaries. In this case, a single steroid hormone determines the correct timing for cell movement. Previous experiments have identified a gene downstream of the steroid hormone receptor, *prolyl-4-hydroxylase alpha* (*PH4alphaEFB),* that may be an important mediator of signaling. To characterize the function of the *PH4alphaEFB* gene, we studied several different lines of flies that had insertions of transposable elements at this locus, creating putative loss of function mutations. We confirmed mutations all affected the *PH4alphaEFB* gene through genetic and molecular tests. Using the technique of fluorescence microscopy, we assessed cell migration by comparing the difference and degree of development in egg chambers of mutant and wild-type flies. Loss of function mutations all affected oocyte growth, and some alleles also disrupted border cell migration. Some Prolyl-hydroxylase proteins have been shown to act in oxygen-sensing pathways and are downregulated in response to hypoxia. Inadequate growth of the oocyte as well as altered migration can occur in hypoxic conditions. Thus, our observation of these phenotypes in the mutants as well as in mutants known to disrupt oxygen sensing, suggests that PH4alphaEFB may act as a link between steroid hormone and environmental signaling pathways. The success of this project will contribute to a better understanding of border cell migration and may provide insight into tumor metastasis.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

***De Oratore* as a Justification for Rhetoric in Rome**

Jake R. Shilling
Anna Peterson, Visiting Lecturer, Department of Ancient Studies

What is the best way to learn: discussion or lecture? This question is at the heart of two dialogues from antiquity: Plato's *Phaedrus* and Cicero's *De Oratore*. In the *Phaedrus,* Socrates attempts to convince Phaedrus that philosophical discussion is a better way to learn than the rhetorical lectures of the speechwriter Lysias. As they talk, they escape the heat of the Athenian countryside in the shade of a plane-tree. Three-hundred years later, the Roman senator, Cicero, also places his characters under a plane-tree in the country to discuss the question of rhetorical education. In his paper, *"From Athens to Tusculum: Gleaning the Background of Cicero's De Oratore*," Görler analyzes the parallels between the settings of these two dialogues. My research explores not only these parallels, but also how the settings of both works diverge. By filling his dialogue with Platonic allusions and then breaking away from this model, Cicero manages to reground Plato's debate around rhetorical education into a new context. His setting allows him to respond to the *Phaedrus'* criticisms against rhetoric and present his own idea of the educated man. Cicero's ideal Orator possesses the knowledge of Plato's philosopher, but with practical experience of the rhetorician.

A Digital Renaissance Experience

Hannah R. Skolnick
Bodil Otteson, Adjunct Professor, Department of Visual Arts

My research aimed to recreate the experience of Italian Renaissance art in the city of Florence for the average viewer. I created an interactive web page using motion graphics, maps, and images to explore specific works of artists featured in the museums of Florence. 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 museums. 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 accomplish. The artistic achievements of Italy, and Florence in particular, are central to both fine art and contemporary design. My website utilizes stylistic techniques of graphic design to communicate the concepts and experience of the city's Renaissance art. The website will be presented at URCAD 2012.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Obtaining the Structure of the Monomeric Form of the 5'-UTR of HIV-1

Patrice S. Starck*, Sarah Monti, Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

The structure of the monomeric form of the 5'-untranslated region (5'-UTR) of the human immunodeficiency virus type one (HIV-1) is unknown. Each retrovirus packages two copies of unspliced RNA in dimeric form. Because dimerization is crucial for the production of new virus, the region of RNA known to be important for dimerization (the 5'-UTR) is a good target for HIV therapies and vaccines. Knowing the structure of the monomeric form is crucial to potentially blocking dimerization. In order to obtain this structure using nuclear magnetic resonance (NMR) spectroscopy, the RNA was truncated with the aim of finding the shortest sequence of RNA needed to retain the properties of the monomeric form, while allowing for simplified analysis by NMR. The physiological relevance of the conformations made were assessed using isothermal titration calorimetry (ITC), native gel electrophoresis, and *in virio* experiments. The structure of the truncated RNA will be solved by NMR. The structure of the complete 5'-UTR will be solved using the knowledge gained from the truncations. This three-dimensional structure will give insight into the importance of the RNA structure to the life cycle of the virus and create targets for rational drug design.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC, the HHMI Undergraduate Scholars Program at UMBC, and the Howard Hughes Medical Institute.*

Field Assisted Charge Dynamics in P3HT and P3HT/PCBM

David A. Sweigart
L. Michael Hayden, Professor, Department of Physics

We investigated the charge carrier dynamics in photoexcited solid films of regioregular poly(3-hexylthiophene-2,5-diyl) (P3HT) and P3HT/[6,6]-phenyl-C61-butyric acid methyl ester (PCBM) using optical-pump terahertz-probe (OPTP) spectroscopy in the presence of an electric field. Photo-generated charge carriers pairs were created in the films using 400 nm light from an amplified Ti:Sapphire laser. A sub-picosecond THz pulse then allowed us to monitor the dynamics of the electron-hole pairs and their subsequent evolution into either free or bound charges. This research was designed to better connect our OPTP laboratory experiments with device measurements in organic solar cells. Currently, high carrier yields of ≥60 % for such devices have been reported. However, the carrier yields reported using OPTP spectroscopy have been ≤1.5 %. Our results attempt to determine whether this discrepancy was due to the fact that real world organic solar cells have an intrinsic electric field present throughout the material.

This work was funded, in part, by a grant from the National Science Foundation No. DMR 0120967 and an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Monitoring Mixed Self-Assembled Monolayer Formation on Micro- and Nano-Electrodes for Electrochemical DNA-Based Sensors

James B. Taylor, *Ryan J. White*
Ryan J. White, Assistant Professor, Department of Chemistry and Biochemistry

Electrochemical, DNA-based (E-DNA) sensors have emerged as a promising new sensing platform exhibiting exquisite specificity and selectivity for a variety of targets, including nucleic acids, small molecules, and proteins. Mixed self-assembled monolayers (SAMs) of sensing DNAs and surface passivating alkane thiols are critical to the function of E-DNA sensors. Unfortunately, in transitioning our sensors to small-scale electrodes (≤ 25 μm) for improved sensitivity, we find that sensor performance is more susceptible to defects in the monolayer than observed on macro-scale electrodes. To overcome this limitation we monitored the deposition process of both passivating alkane thiol and DNA sensing monolayers onto our in-house fabricated micro-electrodes and determined the optimal conditions for sensor fabrication. Specifically, using cyclic voltammetry we monitored the accessible surface area (and thus defects) of the electrodes during the deposition process of the SAMs in terms of thiol concentration and deposition time. We are observing that increasing both time and concentration leads to more pristine SAMs on the electrode surface. With these optimized conditions, we aim to fabricate sensors using two representative sensing DNA architectures (a linear probe DNA and an anti-ATP DNA aptamer) and optimize sensors for use in detecting small molecule intercellular messengers.

This project was funded by the UMBC Start-Up Fund.

Effects of Prolonged Sweetener Exposure on Taste Receptor Expression and Satiety Hormone Release in STC-1 Cells

Blossom A.Z. Tewelde, *Maartje C.P. Geraedts*[1], *Steven D. Munger*[1]
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Steven D. Munger, Professor, Department of Anatomy and Neurobiology and Department of Medicine, University of Maryland School of Medicine

Low-calorie sweeteners (LCS) are commonly used to provide sweetness without the calories associated with sugars. LCS elicit a sweet taste by activating the same gustatory receptor--composed of obligatory subunits T1R2 and T1R3--as do sugars. Recently, it was found that this same sweet taste receptor is expressed on endocrine cells throughout the gastrointestinal (GI) tract, where it appears to influence hormonal responses to luminal sugars and to influence glucose uptake. Disruption of these processes can contribute to the development of obesity or obesity-related disorders. While both sugars and LCS can activate the sweet taste receptor, it remains unclear whether they have similar effects on GI physiology. Addressing this issue, we asked whether prolonged exposure to sucrose, sucralose and cyclamate differentially effects responses in STC-1 cells, a mouse enteroendocrine cell line that expresses the sweet taste receptor and exhibits sweetener-dependent secretion of satiety hormones, such as glucagon-like peptide-1 (GLP-1). We are using quantitative RT-PCR to assess T1R3 expression levels, and ELISAs to quantify GLP-1 secretion. Preliminary studies suggest that prolonged exposure to certain LCS decreases both T1R3 expression levels and resting secretion of satiety hormones. We will discuss the results and their implications for normal metabolism and obesity and obesity-related disorders.

This work was funded, in part, by the National Institute on Deafness and Other Communication Disorders (DC010110, SDM) and the HHMI Precollege and Undergraduate Science Education Program.

Investigation of Poly(N-Isopropylmethacrylamide) Hydrogels

Robby L. Tietz, *Steven Manning*
Lisa Kelly, Associate Professor, Department of Chemistry and Biochemistry

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. *Poly-n-isopropylmethacrylamide* (PNIMPAm) hydrogels have been synthesized via free radical polymerization yielding cross-linked spheres of uniform diameter. Size control has been achieved as a function of variable surfactant concentration. PNIPMAm has exhibited a lower critical solution temperature, known as the LCST, near 44°C. Heating through the LCST initiated a coil to globule transition upon which the spheres collapsed to nearly half of their original size. This transition has proven to be fully reversible upon cooling. Hydrogels containing variable ratios of PNIPMAm to other acrylamides have been synthesized and have been shown to exhibit different LCST values. Characterizations of the hydrogels along with preliminary fluorescence analysis of dye-doped particles are ongoing.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Low Cost Incubator/Warmer/Cooler/Transporter Design for Neonates

Dagmawi S.Tilahun
Govind Rao, Director, Center for Advanced Sensor Technology

Infant mortality in developing parts of the world remains high, with premature birth and asphyxia two of the leading causes. The well regulated thermal environment provided by an incubator in a Neonatal Intensive Care Unit is crucial for a newborn's survival. However, mothers of premature infants in developing countries are often socially, culturally and economically pressured to return to their traditional family duties as soon as possible. The UMBC team led by Dr. Govind Rao plans to circumvent the problem by providing a low-cost home incubator kit for in-home care of high-risk infants, which could greatly impact survival rates by reducing infant mortality. Our proposed device is a combination of transporter (for the move between hospitals and home), cooler, heater and incubator. It consists of a heat pipe-coupled evaporative cooler (water-filled clay pot) connected to a pod-like bubble for housing the infant. The heat pipes will allow both heating and cooling. The incubator design includes digital temperature readout on the front and solar panel with a backup battery for off-grid functionality.

This work is funded through NCIIA.

Effects of Technology on Student Writing

Stanley James Topa
Linda Oliva, Assistant Professor, Department of Education

As students attempt to enter the increasingly difficult job market, it is more important than ever that they learn essential skills such as writing. While many students appeared to have excellent content area skills, these abilities did not translate into other areas. As students left the school for employment opportunities and internships, many reports showed that students lacked functional literacy skills such as writing emails, reports, and documents. Writing diagnostics found that students were weak in areas of interpersonal communication and clarity, both of which play an important role in the work force and academia. This study examined the effect of technology integration in writing instruction. Students' writing abilities concerning specified audiences and formats were tracked using 6+1 rubrics, which allowed an in-depth look at students' writing. The students involved in this research were English II Honors students in a Baltimore City public school. The technologies used in the classroom were regular computer access, email correspondence, and Blackboard. These tools were used in regular instruction and writing-intensive lessons that targeted specific skills. An analysis of the data showed varying trends and outcomes on the quality of writing.

Discovering New Dance and Choreographic Techniques

Kevin Truitt
Doug Hamby, Professor, Department of Dance

Dance is an ever changing art. The best way to improve as a dancer and choreographer is to study under professionals in the field. At the *Bates Dance Festival*, I studied for three weeks to improve my technique with the guidance of dance scholars. My goal was to expand my knowledge on how the body moves. I studied modern dance techniques and vastly broadened my insight in dance composition, learning the importance of body movement and the functions of muscles. My research focused on personal advancement, specifically applying new ideas into my choreography. Under the guidance of JoAnna Mendl Shaw, I realized the importance of spatial awareness- how to use space in the best way possible. The study gave me insight into how to use expressive media, such as poetry, art or music to choreograph modern movement. To complete my research I choreographed a work on UMBC dancers using my new knowledge and awareness. I was able to provide the dancers in my work with hands-on experience in new methods of dance making. The final product of my research, "Cerebral Entrapment" was presented in the dance departments "Fall 2011 Senior Dance Concert."

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and the Summer Research and Study award through the UMBC Dance Department.

Understanding the Interaction between Melanopsin and Arrestin using FRET

Devyani T. Ujla*, Evan Cameron*
Phyllis R. Robinson, Professor, Department of Biological Sciences

A small subset of retinal ganglion cells known as the ipRGCs regulate several non-image forming processes including pupillary light reflex, circadian rhythmicity, and sleep. These processes are mediated by the photopigment, melanopsin, expressed in the ipRGCs. Upon illumination, melanopsin initiates a signaling transduction cascade within the cell. Like most G-protein coupled receptors (GPCRs), melanopsin signaling is attenuated by G-protein coupled receptor kinase (GRK) phosphorylation. This phosphorylation is a cue for arrestin binding, which terminates the signal. However, it is unknown if arrestin deactivates melanopsin. In mammals, three isoforms of arrestin are expressed: visual arrestin, βarrestin 1 and βarrestin 2. Studies have shown that βarrestin 1 and 2 are co-expressed with melanopsin, while visual arrestin localizes exclusively in the rods and cones. Therefore, we hypothesize that melanopsin is deactivated by either βarrestin 1 and/or 2. Using Förster resonance energy transfer (FRET) we will determine the degree to which melanopsin and arrestin interact. To date, we have successfully constructed melanopsin–eGFP, βarrestin 1–eRFP, and βarrestin 2–eRFP expression vectors. We have also created stable mammalian tissue culture cell lines with the βarrestin–eRFP constructs and verified their expression and localization by confocal microscopy.

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Innovations in Computer Game Development

UMBC Game Developer's Club: Jonathan Moriarty, Kenner Miner, Isaac Sohn, Zoe Kilbourne, Katherine Jay, Dan Cassel, Eve Addison, Andrew Battisti, Joey Breeden, Eliot Carney-Seim, Sam Farabaugh, Jonathan Hicks, David Kim, Alex Lacey, Nathaniel Lam, Kevin Markey, Josh Poole, Kevin Somers, Paul Tschirigi
Neal McDonald, Assistant Professor, Department of Visual Arts

Every year the UMBC Game Developer's Club divides into smaller groups with the purpose of pursuing innovative game concepts. This year our club will present three projects, in both 2D and 3D environments. Cosmoknights is a simple 2D side-scrolling multiplayer game of capture-the-flag in an asteroid field. X-Zip-It is a simple 2D mobile game involving manipulating a zipper and avoiding obstacles within a time limit. Bounty Trail is a 3D adventure game emphasizing the importance of who you choose as your allies. Our efforts taught us a lot about the programs used to create our games, as well as important processes that are effective in general group game development.

The Impact of Mentoring on Baltimore City Girls' Academic Achievement

Jared Utley
Kenneth I. Maton, Professor, Department of Psychology

My Sister's Circle (MSC) is a mentoring program that recruits community mentors for at-risk Baltimore City girls, beginning in fifth grade and continuing through the completion of high school. The purpose of this study was to identify the long-term (high school and post-high school) academic outcomes of MSC, and associated mentoring relationship predictors. The sample included 42 mentor pairings; 34 were African American, five "other," two Asians, and one American Indian. The academic outcome data provided by the MSC staff were compared to the Baltimore City Public School System (BCPSS) as a whole. Relationship quality measures had been collected as part of an earlier study of MSC in 2006-2007, and were used to predict the outcomes. Findings indicated dramatically higher rates of college entrance among MSC girls (87.5%) than among female (BCPSS) students from the 2010 graduating class (49.6%). One-way analyses of variance indicated a significant relation between the perceived closeness of the mentor-mentee relationship and later college entrance. The findings underscore the potential of high quality mentoring relationships to enhance the long-term academic success of at-risk Baltimore City girls.

Binding Studies of T4 Gene 32 Protein with dsDNA and a Sliding Model of Interaction

Ajay Vaghasia, Divya Patel
Richard L. Karpel, Professor, Department of Chemistry and Biochemistry

Bacteriophage T4 gene 32 protein (gp32) is a classical single-stranded DNA (ssDNA) binding protein. gp32 is involved in DNA replication, repair and recombination. It is improbable that a collision of gp32 with the DNA would result in binding to the ssDNA patches. Thus, 3D diffusion alone will likely not result in the timely binding of single-stranded regions by the protein. We hypothesize that a positively-charged protuberance on the surface of gp32 (the "Leno chin") binds to and slides along dsDNA until it encounters a ssDNA patch. The chin mutant, prepared by Mike Orlando, is a truncated version of gp32 lacking the C-terminal domain (CTD) with three of five lysine residues in the chin substituted with alanine. A spectrophotometric competition assay employing a DNA-binding cationic dye, azure A, and protein indicates that gp32 binds weakly to dsDNA. The truncate *III (core domain, lacking the NTD and CTD) has the highest affinity for dsDNA, followed by *II (lacking the NTD), whole gp32, and *I (lacking the CTD). The Leno-chin mutant has no measurable affinity for dsDNA, but fluorescence binding experiments shows it binds to ssDNA. We conclude that the binding sites for ssDNA and dsDNA on gp32 are different and a cluster of five lysine residues in the chin-like region is responsible for the interaction with dsDNA.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Detection of Attaching/Effacing *E.coli* in Human Tissue

Claudia P. Valenzuela
Michael S. Donnenberg, Professor, Department of Medicine, University of Maryland Baltimore

Enteropathogenic *Escherichia coli* (EPEC) attaches to host cells and uses type III secretion system to efface microvilli. Preliminary data suggest a correlation between colorectal cancer and attaching/effacing *E. coli* (AEEC) colonization. Here, bacteria attached to both tumorous and adjacent normal colon tissue were examined by multiplex PCR (MPCR) to validate and further define the association between AEEC and colorectal cancer. This MPCR facilitates the differentiation of typical EPEC, atypical EPEC, and enterohemorrhagic *E. coli* (EHEC) based on the presence of specific indicative genes. No AEEC were detected from colectomy samples taken from patients who had received antibiotic treatment prior to surgery. We identified five colonies positive for genes found in AEEC, among biopsy samples taken during colonoscopy from normal colonic tissue. Hence, preliminary results indicated that antibiotic pretreatment of patients may have altered the microbial population prior to our examination. Furthermore, we have evaluated the frequency of cefotetan resistance among those bacteria recovered from antibiotic treated patients. Twenty-five percent of the recovered bacteria were resistant to this antibiotic, suggesting selectivity among this population. To test the hypothesis that the incidence of AEEC colonization is higher on tumor samples than normal tissue additional assay optimization and increased sample numbers will be required.

*This investigation was sponsored by NIH/NIGMS ARC U*STAR T34 08663 National Research Service Award to UMBC.*

Elevated IL-21 Expression in Serum and Peripheral Blood Mononuclear Cells from Lupus Patients

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Violeta Rus, Associate Professor, Department of Medicine, Division of Rheumatology and Clinical Immunology, University of Maryland School of Medicine

Systemic lupus erythematosus (SLE) is an autoimmune disease characterized by the production of autoantibodies. IL-21 is a type I cytokine that promotes autoimmunity in animal models of lupus. In humans, the expression of IL-21 and the effect of IL-21 on T and B cells have not yet been evaluated. Serum levels of IL-21 were determined by ELISA in samples from 28 patients with SLE, eight disease controls and 16 healthy volunteers. IL-21 mRNA expression and intracellular levels were detected by real-time PCR and flow cytometry. Mean level of IL-21 in serum was significantly higher in SLE patients compared to normal controls. Mean IL-21 mRNA and intracellular protein IL-21expression was higher in CD4 T cells from lupus patients compared to healthy controls. Plasma cell differentiation was significantly higher in the presence of IL-21 in patients compared to controls ($p=0.02$) and phosphorylation of STAT-3, the major signaling molecule induced by IL-21, was increased in lupus B cells. These results suggest that the IL-21/IL-21R pathway is aberrantly expressed in patients with lupus. The increased production of IL-21 by CD4 T cells along with the increased expression and responsiveness of IL-21R in lupus suggests that IL-21 can be targeted therapeutically in SLE.

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The Effects of Anger and Happiness on Preschoolers' Compliance to Peer Requests

Laura M. Viar, *Sean K. Logie*
David Schultz, Associate Professor, Department of Psychology

Affect and emotion are responsible for influencing a number of behaviors including pro-social behaviors in preschool-aged children. The development of social competence is largely determined by a child's ability to successfully navigate interactions with his or her peers. Prior research has found angry children less likely to exhibit pro-social behavior than happy children, and happy children 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 requests made by their peers. Participants received a basket of coins at the start of the experiment. The outcome of computer games induced anger and happiness in children. After each induction, a same-aged peer asked each participant to donate some of their coins. This study will test how the participant complies to requests from an unfamiliar peer and one who contributed to the participant's angry or happy state. The preliminary results of this study illuminate relationships between emotional states and pro-social behavior, as well as how peer interactions are influenced by prior emotion eliciting exchanges. The findings may aid in the development of best teaching practices in the preschool setting, and aid teachers in maintaining a positive educational environment.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Two Cell Penetrating Peptides, Crotamine and SNARE, and Their Binding to DNA over Different Ionic Conditions.

Maria D. Vitery, *Richard Karpel*
Richard Karpel, Professor, Department of Chemistry

What does a snake venom protein, such as crotamine have in common with the SNARE protein family? These two protein families have the ability to penetrate the cell membrane. Crotamine is a protein from the venom of the South American rattlesnake (*Crotalus durissus terrificus*). This 42-residue polypeptide is a nucleic acid binding protein that is capable of penetrating cells and targeting chromosomes. It has the ability to carry plasmid DNA into cells that are actively proliferating. This quality makes crotamine a potential candidate for drug transport. SNARE proteins are required for intracellular membrane fusion. The goal in the lab is to compare the behavior of these two basic peptides. Our experiments focus on studying the binding of crotamine and SNARE peptide to single- and double-stranded DNA over different ionic conditions.

This work was funded, in part, by the UMBC Designated Research Initiative Fund (DRIF).

Promoting Self-Reflection for Elementary Students Developing Art Portfolios

Jessica C. Voss
Linda Oliva, Assistant Professor, Department of Education
Barbara Bourne, Clinical Instructor, Department of Education

Written and verbal reflections have potential to increase understanding and knowledge and help students view challenges from an objective point of view. According to the National Art Education Standard five, students are expected to be able to reflect upon and assess the characteristics and merits of their work and the work of others. Young art students who are preparing for advanced studies need to develop their abilities to respond to constructive criticism and recognize the strengths and weaknesses of their work. This study investigated the effect of both teacher provided constructive criticism and self-generated written and verbal reflections on the quality of artwork produced over a six-week period. The subjects were three art students who produced a total of three works each for submission to their portfolio for a gifted and talented program. The art works of the three subjects were photographed in different stages of the creative process to provide visual evidence of how much they improved upon value range, originality of their subject matter, composition, and proportions. A rubric was developed to measure the same elements that they will be judged on when the county reviews their portfolio.

Characterization of Femtosecond Laser Pulses Using Interferometric Autocorrelation

Sharon L. Wall
L. Michael Hayden, Professor, Department of Physics

Many lasers are now capable of emitting pulses on the order of 10^{-15} seconds in duration, but these pulses are too short to measure using conventional techniques. However, the pulse may be measured using the interference between the pulse and a copy of itself. The objective of this research was to design and build a Michelson interferometer with a two photon detector, which can be used to make second-order interferometric autocorrelations of femtosecond pulses. Data analysis required the development of a MATLAB program that uses the Fourier transform of the spectrum to determine the relationship between the duration of the transform-limited temporal pulse and the width of its autocorrelation. This program was implemented using experimentally measured interferometric autocorrelations of the pulses produced by a femtosecond fiber laser. Based on the pulse analyses, the fiber laser settings were systematically optimized, minimizing the effects of frequency modulation while obtaining a high power pulse of the shortest possible duration. In the future, the machinery developed in this research will be used to provide easily accessible measurements of the femtosecond pulses produced by a widely tuneable optical parametric amplifier, allowing Dr. Hayden and his colleagues to more accurately interpret the results of their experiments.

This research was funded, in part, by an Undergraduate Research Award from the UMBC Office of Undergraduate Education, and is based upon work supported by the STC program of the National Science Foundation No. DMR 0120967.

Technology Integration in the Classroom: Enhancing Student Engagement With the Use of Online Networking

Bryanna H. Walls*, Matthew Firman, Grace Blackburn, Anton Washington, Hannah Brogi*
Jonathan Singer, Associate Professor, Department of Education

Online programs are becoming an integral part of educational institutions as computer technology improves and becomes more accessible to individuals. As such, it is necessary for instructors to adapt to these changes and incorporate online technology into their lessons. Through the use of various online resources, we sought practical ways of using online programs in and outside the classroom. Our goal was to enhance student engagement, improve student's scores, and reduce dependency on paper. To accomplish these, each of us created lessons using technology to complete tasks typically done in class with paper. Our team collected data on the number of completions, the number of documents used, and the average scores for each task. We compared the different types of lessons and found that the medium of the online lessons had an impact on student engagement and learning – social networking sties decreased engagement and learning while discussion boards increased them in and out of class. In all cases online work significantly reduced the amount of paper that was used. We concluded that depending entirely on online methods of instruction was not effective, but using a mix of traditional methods of instruction along with those online produced the best results.

Mesenchymal Stem Cells Provide Protection of Cardiac Ventricular Myocytes by Paracrine Mechanism

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Terry B. Rogers, Professor, Department of Biochemistry and Molecular Biology

Although human mesenchymal stem cells (hMSCs) are being used clinically to treat heart disease, their mechanism of cardiac repair is uncertain. This study explores the notion that hMSCs provide benefit to cardiac myocytes. Cultured primary neonatal mouse cardiac myocytes (nMCM) were treated with bacterial endotoxin, LPS, and the proinflammatory cytokine, IL-1β, to induce cardiac stress. In fluo-3 loaded nMCMs chaotic intracellular Ca^{2+} signaling was seen following treatments with these agents. Normal Ca^{2+} signaling was preserved when hMSCs were cocultured in transwell dishes for 24 hours, illuminating a paracrine mechanism in this protective effect. In addition, a three-hour treatment of stressed nMCMs with conditioned hMSC media reversed the damage evoked by 24-hour treatments with either LPS or IL-1β. Neutralizing antibody experiments identifyed IL-18 as a mediator of the dysfunction caused by these stressors. We conclude that hMSCs are able to protect and repair MCMs via a soluble factor that acts by reprogramming of a cardiac signaling cascade involving IL-18. Future studies will seek to identify the ability of MSCs to integrate with and improve the function of ventricular tissue samples. These new data provide a better understanding of the therapeutic benefits of hMSCs in diseased heart.

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Stormflow Response to Precipitation in Urban and Forested Baltimore Watersheds

Kelsey J. Weaver, *Aditi S. Bhaskar*
Aditi S. Bhaskar, Ph.D. Candidate, Center for Urban Environmental Research and Education, and Department of Chemical, Biochemical, and Environmental Engineering

As a greater number of people inhabit urban areas, it is becoming increasingly important to understand the effects of urbanization on hydrology, and in particular, stormflow. It is often assumed that urban areas cannot infiltrate much precipitation due to impervious surface cover, so almost all rainfall becomes runoff and contributes directly to stormflow. Research in forested watersheds has indicated a threshold relationship where there is an increase in slope with storm precipitation totals. The purpose of our research was to investigate the relationship between precipitation and stormflow in an urban area. We focused on Dead Run at Franklintown, an urban 14 square km watershed, and Pond Branch at Oregon Ridge, a forested 0.3 square km watershed. Dead Run and Pond Branch are study watersheds of the Baltimore Ecosystem Study LTER. Using streamflow data from the U.S. Geological Survey and radar-rainfall data made available by the Hydro-NEXRAD project, we isolated individual storms from 2008 to 2009 and calculated the precipitation and stormflow totals for each. We investigated the slope between stormflow and precipitation at each site. Our findings indicated a slope one order of magnitude greater at Dead Run than at Pond Branch, although the Dead Run slope increases with precipitation.

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The Effect of Long Tones on Tone Quality and Other Performance Factors: Are They Good for Everyone?

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Beginning music students, unsurprisingly, have poor tone quality and breath support, and neglect seemingly time-wasting warm-ups. Although teachers assume that warm-up exercises are beneficial to all wind musicians, there is little research about beginners and woodwind players to support this assumption, unlike the plethora of evidence for professionals and brass players generally. This study sought to narrow the evidence gap by testing beginning music students of various instruments who incorporated simpler warm-ups (long tones – playing one note for an extended time) focusing on consistency versus quantity of time. After hearing a thorough warm-up explanation, the students recorded when they included long tones in their practicing. The students were assessed on various factors in a formal playing test before and after the trial period. This data were compared to the improvement from previous playing tests of the same students and the drastic results speak volumes for the benefit of long tones, even in beginners and woodwind players. Discovering simple methods to improve the tone and ability of beginning music students will make elementary band concerts more enjoyable, as well as allow students to excel even more in the arts, which in turn (as research has noted over and over) improves their other academics.

Acting: Finding the Truth within the Pretense

Anderson W. Wells, Brady Whealton
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In preparing to take on the roles we sought to present at the Irene Ryan Acting Competition, we wanted to ensure that our work centered around a concentration on acting from a place of truth. Finding this truth required a full and thorough understanding of each character's life story and the influences that brought them to their place in the time of the play. The three selections took place in very different geographic locations and times. The varying characters also were from significantly different economic backgrounds, had different political influences, and had differing religious backgrounds. We did additional work on each playwright to find the significance of each character and what more general points the playwrights were trying to make. Once we began rehearsals, keeping all of this information in mind, we took our work in a more physical direction. We went into the text, allowing our bodies to inform the actions and intents of our characters. To feel truly comfortable with the final product, we reconciled all of these components to create characters and actions that were clear and strong.

This work was supported, in part, by a Travel Award from the UMBC Office of Undergraduate Education.

The Effects of Rebalancing Frequency on Portfolio Performance

Ryan M. Wentworth
Douglas Lamdin, Professor, Department of Economics

Portfolio rebalancing is a tool that is often recommended by financial advisors, but rarely quantified more specifically in terms of frequency. Rebalancing a portfolio refers to the reallocation of funds between different asset classes, such as stocks and bonds, to match the targeted portfolio allocations, such as a 50-50 split. As the market moves, it will cause the portfolio to deviate from the targeted allocation. This deviation requires the portfolio to be rebalanced. However, what is the optimal time frame that investors should rebalance their portfolio? Using popular portfolio allocations, simulations over multiple time frames and the use of many sensitivity analyses, I have deduced an optimal rebalancing period. If investors were to wait five years to rebalance their portfolio, they would, on average, maximize their Sharpe Ratio (the standard risk-return statistic). This information is highly useful for portfolio managers in helping set and develop portfolio management practices and strategies.

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Investigating the Effects of Different Aspects of Couple Conflict on Relationship Satisfaction

Brittany M. Wharton
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Couple conflict is typically found to predict poorer relationship functioning and lower relationship satisfaction. As a result, many couple therapies focus on helping couples to manage and reduce conflict. Different researchers have focused on different aspects of couple conflict including conflict frequency, severity, quality of resolution, and conflict behaviors (e.g., avoidance, yelling). However, previous research has not compared the relative influences of these aspects of couple conflict on relationship satisfaction, nor has previous research examined the associations among all of these aspects. This independent research project investigates which aspect of conflict (e.g., conflict frequency, severity, quality of resolution, behavior) has the most adverse effect on relationship satisfaction, and secondly, the associations between each aspect of conflict. This project analyzed self-report questionnaire data provided by fifty students who attended UMBC. This research will benefit society by identifying ways to improve couple therapy to focus on aspects of couple conflict that are particularly detrimental to couples' relationship satisfaction.

Determining the Efficacy of a Gestural Interaction Device for Communication

Matt M. Wheeler
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A study was conducted to uncover the most effective gestural input using a consumer-level non-invasive brain-computer interface. With a selection of a gesture from each major category the device recognizes – brow-related, eyelid-related, and oral-related movement – the study found smiling to be the most effective. Additional gestures examined include upward brow movement and blinking. However, because of the manner in which the device permits configuration and its subsequent operation – notably in a manner where many false negative inputs occurred – more research is warranted with academic or professional-level gestural headsets. This is because this study in actuality examined what gestural input was easiest for the device, which may not be representative of the gestural headset field as a whole.

This work was funded through an Undergraduate Research Assistantship Support (URAS) Award from the UMBC Office of Research Administration.

The Effect of Small Group Tutoring on Student Achievement

Robyn M. Williams
Linda Oliva, Assistant Professor, Department of Education

The Improvement Plan for my middle school placement calls for almost 90 percent of their students scoring within the proficient area of both the math and reading sections of the MSA test. Data from the past two years indicates that the school is having issues in both the reading and math areas. Currently, "Tutoring Tuesday" is a program established by the school for students to stay after with their teachers to receive extra help on work. This study investigated the effect that small group tutoring has on increasing student test scores in science classrooms. The tutoring intervention occurred regularly for a period of eight weeks. Low-achieving students were tutored in science content. In order to measure the effectiveness of the small group tutoring, student test scores were examined before, during, and after the program. Students were given a pre-test, quiz and a post-test during the duration of the eight weeks. The results of these tests were compared to previous science test scores of the same group of children. These results indicated whether the smaller tutoring groups were effective in increasing student test scores in science classrooms.

Promoting Academic Discourse through Student-to-student Interactions

Luke D. Willis
Jonathan Singer, Associate Professor, Department of Education

Motivating students to have student-led academic discussions is a challenge that many teachers encounter. A major contributing factor to this phenomenon is that many teachers report feeling inadequately equipped to foster an environment where student inquiry and critical thinking develop. This study examines the effectiveness of five key strategies that can be implemented by teachers to improve academic peer interaction. Aligning with the schools improvement plan to raise each students SAT verbal scores and to better prepare them to excel in the Advanced Placement programs, the purpose of the study was to test whether or not implementing the researched strategies would lead to an increase of student-lead discussions. Participants in this study ranged from grade 9 to grade 12, with a majority of the data being collected from 90 freshmen enrolled in three different sections of an introduction to drawing class. Pre- and post-study questionnaires were administered to assess if teacher and student perception of academic achievement would be higher as a result of integrating more student-led conversation. Voice recordings, classroom observations, and interviews were also used to evaluate the effect of implemented strategies on quality and quantity of discussions over a period of four weeks. Results are forthcoming.

Does Consistent Classroom Closure Have a Positive Effect on Student Learning, Participation or Management?

Lisa F. Woroniecki, Natalie Rau, *Blayne Fox*
Linda Oliva, Assistant Professor, Department of Education

Whether it is because of losing track of time or forgetting to include it in the creation of a lesson plan, teachers often neglect classroom closure. The purpose of this study is to examine if a class can benefit from teachers making an effort to include classroom closure in each and every lesson. Two classes were compared throughout one full unit, where one class was given regular classroom closure, and the other was not. A journal of daily reflections was kept on each class to measure student's level of comprehension based on participation and a review of their classroom closure exercise, measuring how much of the material each class mastered on a day-to-day basis. The students were also rated with a well-defined number scale on their level of understanding, participation, and classroom management during closure each day. A case study documenting closure activities, quizzes and tests on comparable individuals from each class was also preformed, based on the presence of absence of closure in their class. The class with closure preformed slightly better than the class without closure, and the behavior of that class was significantly better, as well.

The Costly Tradeoff between Immune Response and Enhanced Lifespan in *Drosophila melanogaster*

Isleen M. Wride
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Immunosenescence is a universal phenomenon, best defined as the age-related decline of the immune system. *Drosophila melanogaster* was used to examine the effect of age on immune function. Two populations, one control population and one population artificially selected to have a longer life span were compared to explore age-specific immune response. Studies in Drosophila and other organisms suggest an energy trade-off must occur between basic somatic maintenance and immune function. Given this trade-off, the population with extended life span should have a poorer age-specific immune response. To test the trade-offs between immune function and enhanced lifespan, separate populations of control and selection flies were maintained and adult females were injected with *E. coli*. The bacteria incubated for twenty-four hours before being quantified by a plating and colony assay, which indicated overall immune function. Levels of an antimicrobial peptide in females of the same populations were tested using real-time PCR assays to explain any differences in age-specific immune function between populations. Results showed better clearance ability in control lines and a decreased ability in all aged flies, which suggested diverted energy allocation to mounting an immune response.

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Anti-phase Expression of the BK Channel (Kcnma1) Alters Circadian Locomotor Activity in Mice

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Circadian rhythmicity, driven by the suprachiasmatic nucleus (SCN) of the hypothalamus, is essential to the fitness of all organisms. The BK Ca^{2+} and voltage-activated K^{+} channel is expressed in a circadian manner in the SCN, peaking at night, and genetic deletion of the BK channel (*Kcnma1*$^{-/-}$) disrupts circadian behavioral rhythms. To determine whether the nighttime-phased expression pattern was essential for normal circadian rhythmicity, we analyzed wheel running activity of transgenic mice that expressed the BK channel opposite to its normal phase in the SCN (Per1:BK^{R207Q}). We predicted this alteration of BK phase by expression of one or two copies (1C, 2C) of the Per1:BK^{R207Q} transgene, or one copy of Per1:BK^{R207Q} with one deleted endogenous copy of *Kcnma1* (1C; BK het), would disrupt circadian wheel rhythms. In contrast, 1C, 2C, and 1C; BK het mice all had normal baseline circadian rhythms. However, 2C mice had a longer active interval compared to WT, suggesting that nighttime-phased expression of BK is important for restricting locomotor activity. Additionally, 2C mice had a larger light-pulse induced phase delays, suggesting these mice were more sensitive to phase-shifting stimuli than WT. Understanding the neural encoding of circadian rhythms may help treat disorders of circadian rhythmicity.

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Determining Growth and Branching Rates of Autophagy Mutants in *Aspergillus nidulans*

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Autophagy is a cellular-level recycling process that occurs in a wide range of species from yeast to human beings. In this study, autophagy was induced in the model filamentous fungus, *Aspergillus nidulans*, using environmental stress in the form of 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 (growth) in the absence of exogenous nutrients. We hypothesized that autophagy plays a role in regulation of hyphal branching. To test this hypothesis, this study compared the growth and branching rates (i.e., morphology) of wild type *A. nidulans* with two autophagy mutant strains, Δ*atg8* and Δ*atg13*. Each strain has a single gene deletion (symbolized by Δ). Optical microscopy and digital image analysis were used to quantify growth and branching rates for each strain in both autophagy inducing (nutrient starvation and/or rapamycin treatment) and non-autophagy inducing growth conditions.

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Chemical Imaging Using Surface-Enhanced Raman Scattering With Nano-imaging Gold Probes

Kojo Yeboa, *John Kiser*
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Surface Enhanced Raman Scattering (SERS) is a technique used for chemical detection in biological systems, based on the vibrational modes of an analyte of interest. Combined with a substrate fabricated on the tapered tips of fiber bundles, it is possible to perform high-resolution chemical imaging. To create SERS probes for high resolution imaging, fiber bundles consisting of 30,000 four-micron-in-diameter light transmitting elements are polished optically flat, chemically etched and coated with a SERS active metal, in this case gold. Resulting probes are ~ 960µm in diameter and are SERS active with a resolution capable of providing a biological imaging system. An experimental system was then set up for obtaining SERS spectra and chemical images using the SERS active gold probes. Chemical imaging was performed using known SERS active chemical species including mercaptobenzoic acid and brilliant cresyl blue. Chemical images obtained at a desired wavelength were viewed and analyzed using multispectral imaging system software for future analysis. Future analysis will allow for chemical species to be visualized dynamically providing insight into various nanoscale biological phenomena.

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The Functional Analyses of a Mutated Tentacle within the L4 protein

Brandon F. Young, *Oseogie Okojie*
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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 L4 ribosomal protein tentacle contributes to the structure of this exit tunnel. Mutations within the tentacle of *Escherichia coli* L4 cause detrimental effects to the function and assembly of the 50S subunit. Bioinformatic analyses were used to compare the amino acid sequences of the L4 tentacle in *E. coli* and three other bacteria: *Haemophilus influenzae, Bacillus subtilis,* and *Vibrio cholerae.* Having identified amino acid differences in organisms that are genetically similar to *E. coli*, we are using polymerase chain reactions (PCR) and site-directed mutagenesis to introduce these changes into the *E. coli* L4 protein. One mutation within the L4 tentacle has been made. This tentacle mutation will be analyzed to determine if it confers antibiotic resistance, and to determine if it has a detrimental effect on ribosome assembly or function. Studies of this and other similar mutations effects will shed light on the role of specific amino acids in the L4 tentacle.

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Where Matters: Geography and the Internet

Rachel Younghans
Fred Worden, Professor, Department of Visual Arts

The Internet has redefined the role of geography in contemporary life, and continues to do so at a rapid pace. Geography was once a prime identifier for humans, and arguably the most consequential one, but as the Internet interconnects the entire world, geographic identity becomes less consequential than other factors (age, interests, beliefs, ethnic and religious identity, etc.). The Internet can be thought of as a single "place," binding all of the world's diverse geographic locations into a single location. Distance is eliminated. Proximity becomes global. With this new singularity of place, it can be difficult to know or even care where one is located on the planet. In this research, a video was produced which investigated this transition, and the agony and delight of existing in a new "place," with a radically new and different definition. Feelings of despair, confusion, perseverance and thrill were addressed as a dancer, a homemade robot, some athletes, and a young boy got lost amongst the fields of Earth and the fields of Net.

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Annotation of Mutations using Crowdsourcing Extractor of MUtations (CEMU)

Ye Sol Yun, *Emily Doughty*
Maricel G. Kann, Assistant Professor, Department of Biological Sciences

Associating mutations to disease phenotype is pivotal for the diagnosis and prognosis of disease. However, these mutations remain primarily in the biomedical literature. Several groups manually curate these mutations in a time-consuming and costly process. We previously developed the Extractor of MUtations, EMU, tool to extract disease-related mutations from biomedical text. EMU reduced the amount of overall curation time; however, the manual curation involved still presented concerns of time and speed. Here we introduce Crowdsourcing Extractor of MUtations, CEMU. Crowdsourcing is a technology at which a specific task is outsourced to groups within a population. Using crowdsourcing to annotate the mutations extracted by EMU has great potential for our curation process. CEMU will enable individuals in the biomedical community to easily curate mutation/phenotype information from literature. Different levels of access will be allowed depending on an individual's level of relevant education and specialty. For instance, individuals with less concentrated information of the biomedical field would have limited access; their task would only be confirmation of a disease-related mutation. All curated data from CEMU will be publicly available to the biomedical community as an extensive resource for annotated mutational data.

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Auditory Background Noise and the Efficacy of Virtual Reality Distraction on Pain Tolerance in College Students

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Videogame distraction is an emerging pain intervention that can be used to distract patients who are undergoing painful medical procedures. However, additional benefits derived from the use of a virtual reality helmet have not been supported conclusively in the literature. The present study examines whether delivering videogame distraction through the use of a head-mounted display (HMD) provides greater improvements in pain tolerance than delivering videogame distraction via a television screen, particularly when in the presence of auditory background noise. A sample of UMBC students underwent three cold-pressor trials consisting of a baseline and two distraction trials, one utilizing an HMD and the other projecting the videogame on a television screen. Half of the sample was exposed to an unpredictable auditory stimulus while the other half completed the trials in a quiet environment. Data collection had not yet concluded at the time of press. A mixed design analysis of variance will be conducted to examine the effects of the distraction intervention on pain tolerance and pain intensity in the presence and absence of background noise. If the hypotheses are supported, the potential effectiveness of virtual reality technology-assisted videogame distraction in noisy medical settings will be substantiated.

Understanding Parental Control in the Chinese Context

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Parental control is one of the most prominent and controversial aspects of Chinese parenting (Chao & Tseng, 2002). A large body of research has indicated that Chinese mothers reported higher rates of physically coercive and verbally hostile parenting practices than Western mothers (e.g., Leung et al., 1998), and inconsistent findings regarding the association between authoritarian styles and child outcomes. However, Chao (1994) proposed the concept of "training," a form of control characterizing parental involvement and concern, which is beneficial rather than destructive to child development. Recent studies increasingly find that Baumrind's parenting typology works similarly within the Chinese and European American cultural contexts when such styles are more adequately measures (e.g., Sorkhabi, 2005). This project aimed to utilize both observation and self-report methods to understand parental control among Chinese American mothers, and identify the associations between parental control and children's outcomes. Specifically, we examined mothers' (1) observed positive control, negative control, and culturally unique perfectionistic behaviors, and (2) self-reported parental regulative and coercive control, in predicting their children's socioemotional outcomes. Sixty Chinese American mothers with preschoolers participated in this project, and implications for understanding universal and culture-specific parenting will be discussed.

Difference in Key Neuronal Adhesion Protein Expression Under Two Versus Three-Dimensional Environment

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Neuronal cell cultures to date are normally performed on two-dimensional (2D) surfaces. However, neurons in vivo are exposed to a three-dimensional (3D) dynamic environment and hence it becomes physiologically accurate to culture neurons in 3D scaffolds. This project aims to uncover the differences in neuronal behavior due to dimensionality. This study illustrates the importance of studying cells in 3D and is critical to better engineer physiologically relevant scaffolds for treatment of spinal cord injury and other biomedical diagnostic and treatment technology. Specifically, we investigated difference in neuronal cell surface receptors-extracellular matrix interaction, when cultured on 3D versus 2D environment. PC12 neuronal cell line and mouse embryonic dorsal root ganglions were cultured on 2D collagen coated surfaces and in 3D collagen hydrogel. Differences in expression of key proteins such as β1-integrin, FAK, FAKpY397 and FAKpY861 due to dimensionality were analyzed using immunofluorescence and western blot techniques. Results indicate that in 3D cultures, there is significantly low expression of β1-integrin and FAK phosphorylation at the Y397 site. This suggests that unlike cells cultured in 2D, there is independence of FAK phosphorylation signaling pathway at Y397 site for cells cultured in 3D.

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