# URCAD 2013 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 six of this booklet.**

**Using Student Designed Extra Credit to Increase Student Academic Achievement**

***Jason S. Adams***
Jonathan Singer, Associate Professor, Department of Education

Students who find themselves uninterested in, and disengaged from, the material being taught in the classroom may be more prone to suffer academically than students who are more invested in the curriculum being taught. This study investigated what effect empowering students to design their own extra credit projects would have on student engagement, motivation, and subsequently academic achievement. Data was collected from the entire inclusive population of eighth grade students in a Baltimore City middle school, 65 students in total, during the third quarter of the 2012-13 school year. The methodology of this study included periodic encouragement of the entire eighth grade student body to design their own extra credit projects in order to enhance their academic achievement. Additionally, marginally achieving students were specifically targeted throughout the quarter. At the conclusion of the third quarter, participating students were surveyed in order to measure both the academic and motivational effects of this study. Data from this study was compiled and used to determine the effectiveness of allowing students to design their own extra credit projects.

**Cross-sectional Analysis of Cognitive Impairment and Depression among Older Hispanics in Washington, D.C.**

***Timileyin Adediran, Sharada Shantharam,*** *Jorge Sodero, Miguel Guerrero,*
Angelica P. Herrera, Assistant Professor, Department of Sociology and Anthropology

Older Hispanics are disproportionately affected by declining cognitive health and depression. There is limited research on effective community-based interventions that protect the mental health of low-income, immigrant seniors. Drawing on administrative electronic data from the Efforts to Outcomes system and case files from 2009-2010, we conducted a cross-sectional analysis to identify the sociocultural and health risks associated with depression and cognitive impairment among community-dwelling, urban Hispanic seniors (N=98) receiving health and social services at the Vida Senior Centers in Washington, D.C. Descriptive statistics, correlational analysis, and ANOVAs were performed. Seniors averaged 80 years of age (SD=8.4), and 44 percent lived alone. One-third (31.6 percent) were overweight, half (47.4 percent) were obese, and 20.5 percent moderately to totally functionally dependent. We performed a comparative analysis of their Geriatric Depression Scale score and cognition (Mini Mental State Examination), adjusting for sociodemographics, health status, BMI, and functional capacity. The majority reported≥2 chronic diseases (88 percent), although 43 percent rated their health as good/excellent. Mild cognitive impairment was significantly higher among seniors who lived alone($X^2$=11.82, p<.01) or were overweight/obese ($X^2$=5.93, p=0.05).Overweight/obese Hispanic seniors and those living alone may be particularly vulnerable to cognitive decline, and thus benefit most from community-based health and wellness programs.

*This work was funded by the UMBC, Department of Sociology and Anthropology.*

**Investigating the Role of RGMa during Neurulation in Zebrafish**

***Samira Afzali***
Rachel Brewster, Associate Professors, Department of Biological Sciences

Neural convergence extension (NCE), a conserved process in vertebrates, involves polarized cell migration towards the midline to shape the neural tube, the future brain and spinal cord. Although NCE is essential, the mechanisms that promote directional migration towards the midline remain unknown, but may involve a midline-derived chemoattractant. One putative midline-derived signal is the Repulsive Guidance Molecule *a* (RGMa), which is expressed in the notochord, a region previously implicated in secreting proteins important for driving NCE in *Xenopus laevis*. Furthermore, disruption of RGMa using morpholinos prevents NCE, as cells fail to migrate in a directed manner. Based on these observations, we propose that RGMa encodes a midline attractant secreted from midline tissues to form a gradient that is highest medially. Since immunolabelling endogenous RGMa was unsuccessful, my current project uses a different approach, namely expression of a GFP-tagged form of RGMa in the floorplate (midline) using the tiggy-winkle promoter. I expect to observe GFP expression in the floorplate and, if secreted, in the extracellular space some distance from this midline source. These studies will increase our understanding of how RGMa functions to mediate neural tube morphogenesis and may confirm the identity of the long sought after midline signal.

*This work was supported, in part, by The National Institutes of Health (NIH).*

**Promoting Social Change through Service-Learning**

***Kathleen Algire-Fedarcyk***
Jessica Guzman-Rea, Adjunct Professor, Baccalaureate Social Work Program

A basic component of social work is understanding the challenges faced by society and local communities. Using the Social Learning Theory and the Social Change Model, this research explores the process in which college students become civic-minded during the progression of a semester-long course. During the fall 2012 semester, 27 students were enrolled in Social Work 200 and spent the semester engaged in a service-learning placement at a local agency or organization. Students enrolled in the course were encouraged to develop their own ideas on social issues and to connect those ideas with action across levels of influence in relation to the practice of social work. We used three aspects of the Social Change Model: Consciousness of Self, Collaboration, and Citizenship, to theme and code the students' reflective writings which enabled a qualitative research study on students' increased awareness and knowledge of civic-mindedness. This research posits that encouragement and exposure to a service-learning activity increases the likelihood that students will become more civic-minded and will have the opportunity to create positive social change. Findings will be presented.

*This work was funded through a BreakingGround grant from the Office of the Provost at UMBC.*

**Defining the Origin of an Abnormal Brown Adipose Phenotype in the Mammary Gland of Brca1 Mutant Mice**

***Chinwendu L. Amazu***
Laundette P. Jones, Assistant Professor, Department of Pharmacology and Experimental Therapeutics, University of Maryland School of Medicine

There is strong evidence that breast tumor development is regulated by the interactions between epithelial cells and their microenvironment. In our lab, we have discovered a highly vascularized, brown adipose tissue (BAT)-like phenotype in the microenvironment of postpubertal mammary glands of *Breast Cancer Susceptibility gene one (Brca1)* mutant mice. Normally, BAT disappears from the mammary gland microenvironment after puberty; in contrast, BAT abnormally persists in our Brca1 mouse model. The study's aim was to determine the BAT-like phenotype's origin. My experiments sought to identify proteins that could distinguish between the newly described, inducible brown adipose (BRITE) from "classical" brown adipose (BAT) commonly described in the literature. Antibodies for TBX1 (marker for BRITE) and EVA1 (marker for classical BAT) were selected for immunohistochemical (IHC) and immunofluorescence (IF) analysis. IHC results detected TBX in adult Brca1 mammary glands, but not in the classical BAT controls. IF results with EVA antibody revealed high background staining, therefore results are currently inconclusive. Presently, data supports a role for BRITE in the mammary microenvironment of Brca1 mice. Ultimately, these studies will provide key data needed to effectively design studies establishing whether this abnormal phenotype provides a permissive environment for tumor growth.

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**3D Modeling for Older Adults**

***Uvonne Andoh, Farnaz Feizian, Joshua Dutterer***
Amy Hurst, Assistant Professor, Department of Information Systems

Vision impairment and cognitive disabilities (Such as Alzheimer's disease and dementia) are common within the older population. These problems create higher risk of disability among older adults and limits functional independence. We believe that providing older adults with the ability to design and build 3D prototypes has the potential to assist and support their everyday tasks and help them regain independence. Our team's research goal is to examine how older adults use 3D printers and if they design and build their own objects right in their home without going out to buy them. The objective of my project is to design 3D models attached to a calendar that will assist older disabled adults with their daily schedule. By building various 3D objects representing biological, societal, interpersonal, creative and symbolic needs, we will enable older individuals to determine their day-to-day tasks. Some of the beneficial things older adults can design and build on their own are an everyday custom pill bottle to keep track of their medicine intake, as well as an assistive bag holder to help older adults with arthritis.

**Media Crisis**

***Pierre Daniel André***
Fred Worden, Professor, Department of Visual Arts; John Sturgeon, Professor, Department of Visual Arts

This experimental video is inspired by the critical writings of marginalized British filmmaker Peter Watkins. According to Watkins, "media crisis" refers to "the increasingly irresponsible manner in which the mass audiovisual media (MAVM) function, and to their disastrous impact on society, human affairs, and the environment." In my video, a fixed camera observes joggers on treadmills in a gym, each with their own TV set. The screen is divided vertically into columns of color that change frantically and sporadically, dictated by the rhythms of the edits on the TV sets. The sounds of all the TVs in the room are heard simultaneously creating a deafening cacophony that matches the visual action. The intention is to bring viewers to an increasing awareness of the underlying, hidden and often manipulative nature of the MAVM.

**My Gray Life: Performing for the Spectator**

***Christina Animashaun****, Mark Durant*
Mark Durant, Professor, Department of Visual Arts – Photography

Since the rise of performance art in the 1960s, artists began to use their bodies as a medium to transmit cultural commentary, creative expression, and sequential narrative. In the documentation of those performances the artists often took the main focus, overlooking an essential entity that is crucial to existence of performance as a whole. This past year, I executed a piece utilizing my body in order to critically analyze audience spectatorship and participation in Baltimore City, Washington D.C., New York and Philadelphia. After painting my skin gray and wearing only black and white clothing, I walked in these cities as a pedestrian with a sound recorder embedded on my person and with a photographer taking pictures of my interactions. Though these works sought to challenge the focus often kept on the performing artist, this project highlighted the inseparable dynamics of the artist and witness and the wide range of artistic interpretation held by spectators of performance. Photographs of the performances and video response to the overall performance experience can be viewed on a website dedicated to the project.

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

**Dynamic Access to the Web Using Haptics**

***Yevgeniy D. Arber****, Kirk Norman*
Ravi Kuber, Assistant Professor, Department of Information Systems

While assistive technologies are valuable to individuals with disabilities, research suggests that challenges continue to be experienced when using these technologies to interact with graphical user interfaces. Haptic (touch-based) technologies have been designed to improve non-visual access to graphical user interfaces, by providing many of the structural cues which are inadequately presented by speech-based assistive devices. This research focuses on improving web access for individuals who are blind. After undertaking a guided literature review, interviews were conducted with six blind web developers to identify the problems faced by visually impaired web users. A multimodal haptic web browsing tool designed to support blind web users has been evaluated with six participants (5 blindfolded sighted, 1 blind). The observational study has aimed to determine the efficacy of the browser, to convey the spatial layout of objects on the screen, and to determine the subjective experience of using haptic and speech-based technologies to browse the Web. Findings have revealed the promise offered by multimodal technologies to support the non-visual browsing process.

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

**The Radiative Deceleration of Large-Scale Extragalactic Jets at Large Cosmological Redshifts**

***Aryana Arsham***
Markos Georganopoulos, Associate Professor, Department of Physics

The purpose of this research is to study the radiative deceleration of relativistic jets of plasma found in very distant, thus high cosmological redshift *z*, quasars. The deceleration is due to inverse Compton scattering of CMB photons off the jet relativistic electrons. In this case, and if the jets decelerate substantially, no significant X-ray emission due to inverse Compton scattering of the CMB is anticipated from the large scale jet. We casted a system of two coupled autonomous, non-linear ordinary differential equations (ODEs). We produced an analytic solution, under the approximations: (i) the energy density of the plasma in the jet is dominated by the relativistic electrons and that the contribution of the protons can be neglected and (ii) the electron energy distribution is monoenergetic. We showed that the first assumption is justified for those large scale jets that exhibit a hard synchrotron spectrum extending to the optical energies. We found substantial deceleration taking place for values of *z* greater than approximately 4, corresponding to 11.5 billion years ago, about 2.2 billion years after the Big Bang. We are dropping the second assumption by adopting more realistic electron energy distributions, producing numerical solutions, and assessing its astrophysical implications.

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

**Effect of the rpsE Mutation on the Strep Dependent Escherichia Coli**

***Sara Azeem**, Monika Bhatt*
Philip J. Farabaugh, Chair, Department of Biological Sciences

Proteins are synthesized in cells by ribosomes in a process called translation. Ribosomes are molecular machines that polymerize amino acids into polypeptide chains which form proteins. The function of proteins depends on the order of amino acids in the polypeptide chain. Ribosomes determine the order of the amino acids by reading messenger RNA (mRNA), an unstable copy of the genetic information carried by DNA. Sometimes ribosomes read the mRNA incorrectly which causes errors. Misreading is one type of error in which the ribosome inserts the wrong amino acid into the polypeptide chain. Streptomycin is an antibiotic that induces misreading errors. Rosset and Gorini(1969) found mutations that made fewer errors than normal; they are also resistant tostreptomycin. Some of these mutations are so hyperaccurate that they need streptomycin to live; these are called streptomycin dependent. There are mutations that can grow without streptomycin affecting a ribosome protein called rpS5. These mutations can suppress streptomycin dependence and change it into streptomycin resistant (strepR). We are trying to determine if other rpS5 mutants can also suppress strepD. To do this we will transfer the mutants into a strepD strain and will confirm the presence of strepD mutation by sequencing the DNA.

**Literary Discourses on Women's Evolving Social Status in Nigeria**

***Comfort C. Azubuko-Udah***
Jessica Berman, Professor, Department of English

Studies on women's status in post-colonial countries like Nigeria often fail to acknowledge the multifaceted nature of women's station and role in the society. In such developing countries, women's status is a historically evolving phenomenon and imported patriarchal ideas have both speeded up and changed the paths of its evolution. My project suggests that by studying literary works produced by a crop of Nigerian academics and feminists we can begin to understand the complexity of women's positions. Applying a blend of post-colonial and feminist theories, I explore depictions of the legacies of colonization in three novels: *Efuru* by Flora Nwapa (1966), *Joys of Motherhood* by Buchi Emecheta (1979), and *Purple Hibiscus* by Chimamanda Ngozi Adichie (2003). I uncover an underlying stream of discourse in the way all three writers chose to represent women and men, their relations, and their navigation of societal norms and traditions, which reflects the sequence of changes in culture. This discourse serves to educate readers on the neglected female in Nigerian fiction, and expand our understanding of her. They also fill in the gaps in the literary history caused by insufficiency of female presence in Nigerian Literature.

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

**The Consequences of Combining Mitochondrial DNA and Nuclear DNA for Evolutionary Trees**

***Leila Z. Bahmani-Kazerooni***
Kevin Omland, Professor, Department of Biological Sciences; Matthias K. Gobbert, Professor, Department of Mathematics and Statistics

Beginning with Darwin, biologists have sought to reconstruct a "Tree of Life" showing how all species on Earth are related to one another. A branch of evolutionary biology focuses on determining relationships among closely related species. Using evolutionary trees called phylogenetic trees biologists display species relationships as rooted networks. The main way that biologists infer these phylogenetic trees is through the use of DNA sequences. Historically biologists have been using just one part of the genome, mitochondrial DNA (mtDNA), to build molecular phylogenies. In recent years evolutionary biologists have started using multiple nuclear genes (nucDNA). Although mtDNA has been a faithful tool there is evidence that it can produce misleading trees. A frequently used method to resolve the conflict between mtDNA and nucDNA is to simply combine both sequences of DNA into one large matrix of data. This technique is known as concatenation. The intent of this technique is to give both nucDNA and mtDNA an "equal" opportunity to resolve the branches in the tree. Using the eastern Baltimore Oriole, western Bullock's Oriole, and the Mexican Black-Backed Oriole (the "Northern Oriole" group) as a model group, we have tested how the tree topology is influenced when combining mtDNA and nucDNA.

*This work was funded, in part, by the UBM program at UMBC.*

**Investigating the Effects of Beta-Amyloid's Interaction with G-protein Coupled Receptors on a Rat Hippocampal Neuron**

***Zach Bailey***
Mariajose Castellanos, Assistant Professor, Department of Chemical, Biochemical and Environmental Engineering

We are using a computational model to explore the complex interactions between Beta-Amyloid (Aβ) and a neuron that has proven to be experimentally difficult to resolve. Aβ is a 39-43 amino acid peptide that originates through mutations in the genes for the Amyloid Precursor Protein. One of the most researched and widely accepted hypotheses about the etiology of Alzheimer's disease is the Aβ cascade hypothesis, which postulates that an increase in Aβ peptide production and aggregation disrupts normal neuronal function including ion homeostasis, membrane permeability and effects on specific ligands resulting in apoptosis (cell death.) We hypothesize that Aβ causes aberrant activation of $G_0$ subunit of G-protein coupled receptors (GPCR), resulting in neuronal dysfunction. This hypothesis will be tested through simulation of a C++ based neuronal model. The current model lacks some potentially influential mechanisms that will need to be considered through kinetic formulation. I will adjust the current model to include the Aβ interaction with the $G_o$ subunit of GPCRs. I will then use this model to investigate the changes in electrophysiological properties due to Aβ exposure. The incorporation of this interaction will take us a step closer towards a better understanding of how Aβ interacts with the neuron.

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

**Bone Disorder Study in Gaucher Disease Using GD-hiPSC-derived Cells**

***Alexander N. Ballard,*** *Leelamma M Panicker[1], Ricardo Feldmam*
[1]University of Maryland School of Medicine
Ricardo Feldman, Associate Professor, Department of Microbiology and Immunology, University of Maryland School of Medicine

Gaucher's disease (GD) is the most common lysosomal lipid storage disease prevalent among Ashkenazi Jews, resulting from mutations in the gene encoding the enzyme glucocerebrosidase (GCase). GCcase deficiency leads to accumulation of glucosylceramide, primarily in macrophages and neurons. The presence of lipid-engorged macrophages leads to hepatosplenomegaly, anemia, thrombocytopenia and bone disorders and lipid accumulation in brain leads to severe neurological disorders. The Feldman lab has been able to successfully model this disease using induced pluripotent stem cells (iPSCs), reprogrammed from the skin fibrobalsts of GD patients. The GD-hiPSCs exhibited all the properties of pluripotent stem cells, and hiPSC-derived macrophages and neurons recapitulated characteristic hallmarks of the disease. One of the primary symptoms of GD is skeletal growth retardation in severe cases and osteoporosis in mild, type 1 cases. Enzyme replacement therapy reverses the hematologic manifestations in type 1 GD; however the effect of this therapy does not alleviate bone pathology. We are differentiating the GD iPSCs into the cells responsible for formation and resorption of bone so that we can investigate the mechanisms leading to bone fragility in GD. We are employing Western Blot and RT-PCR to understand which genes are being over expressed and/or under expressed.

*This work was funded, in part, by NIH/NIGMS MARC U* STAR T34 08663 National Research Service Award to UMBC.*

**Deletion of Large Loop in Ribosomal Protein L4 Makes Incorporation of L4 into Ribosomes Temperature Dependent**

***A. Balogun****, M. Shamsuzzaman, M. Lawrence, J. Zengel, L. Lindahl*
Lasse Lindahl, Professor, Department of Biological Sciences

In ribosomes, rRNA performs the function of decoding mRNA and catalyzing peptide bond formation, whereas ribosomal proteins bind rRNA and assist rRNA folding and function. Ribosomal proteins L4 and L22 have globular domains and extension loops. Mutations in these loops confer resistance to macrolide antibiotics. To determine the functional role of the loops we have studied viable *Escherichia coli* mutants lacking L4 and L22 loops. Although the loops are not essential for ribosome function, the growth of the mutant strains is compromised. The L4 mutant strain is cold sensitive and, in comparison to wild-type, grows much slower at $37^0$C than at $42^0$C. We hypothesize two explanations for this observation: (i) at higher temperature, mutant L4 assembles more efficiently into the pre-ribosomal complex and (ii) ribosome function of translation improves at the higher temperature. Our results demonstrate that the increased growth rate of L4 mutant strain is due, at least in part, to more efficient incorporation of mutant L4 into ribosome at higher temperature. Our data also show that L4 is unstable when it is not incorporated into ribosomal complexes and that Lon protease is not responsible for degradation of mutant L4.

*This work was supported by NIH/NIGMS MARC U*STAR Grant T34 08663 Award to UMBC and NSF grant 092057.*

**Homework Motivation Strategies**

***Aimee L. Bark***
Jonathan Singer, Professor, Department of Education

The purpose of this research project is to discover ways to motivate students to do their homework without using extrinsic motivation. The focal point of this project is the use of agenda books and their impact on homework completion. This study focuses on sixth grade students. This population is ideal because they are adjusting to middle school and if they develop good homework habits their first year of middle school, they will have an easier time later. The treatment consists of having students to take out their agenda books and write down the homework, even if the homework assignment was "none." While they would write their homework down, the investigator would walk around the room and record who did not have an agenda book. Next, the investigator would cross-reference the list of those students without their agenda books with those that did not turn in a homework assignment. This data set is being collected on a daily basis for one marking period. The results are still pending; however, the preliminary results are promising.

**The Role of Positive Temperament in Promoting Intimacy and Overcoming Avoidant Attachment**

***Kathryn T. Benson****, Robin A. Barry*
Robin A. Barry, Associate Professor, Department of Psychology

Romantic intimacy is partly defined by an individual's sense of safety being vulnerable with their partner. This sense of safety being vulnerable is reinforced or punished by the partner's response. Attachment style, or proximity-seeking behavior, also affects sense of safety, where there are those who anxiously seek proximity (anxious), those who maintain healthy proximity (secure), and those who avoid proximity (avoidant). While the impact of insecure/avoidant attachment on the intimacy process is profound, the potential protective ability of positive temperament has yet to be researched. Positive temperament can be loosely understood as a positive outlook. To this end, this study examined whether temperament has a protective influence, separate from attachment style, in promoting safety being vulnerable. Sixty newly-married couples completed measures of attachment, safety being vulnerable and positive temperament. Regression analyses revealed that avoidant husbands and husbands low on positive temperament felt less safe being vulnerable overall. However, the influence of wives' avoidance depended on wives' positive temperament. When avoidant wives were high on positive temperament they felt safe being vulnerable. These findings suggest that positive temperament is not only useful for promoting intimate safety but may also be useful in overcoming attachment limitations.

**Syncretism in Pompeii**

***Sierra Benson-Brown,*** *Greg Brinsley, Heather Burtch*
Marilyn Goldberg, Associate Professor, Department of Ancient Studies

This research investigated the various elements of the blending of cultures, syncretism, throughout Pompeii, demonstrating the diversity of influence from several cultures that can be found in the excavated portions of the town. This project was initially inspired by a collection of figurines from a household shrine at Pompeii now displayed at the Walters Art Gallery. It was expanded from a study of religion to one that also took into account cultural, social and religious impact of various neighboring civilizations. Through a focus on certain deities represented in the Walters collection, specifically Isis-Fortuna, Alexander-Helios, and Jupiter, some of the complexities of Egyptian and Greek interactions with Roman culture were found. The research concerning Isis-Fortuna identified a substantial Egyptian connection with Pompeii in both social and religious life. The investigation of Alexander-Helios was focused on the adoption of a Greek figure and style. The study of Jupiter was based on the two temples in which he was worshipped in Pompeii, one depicting the Roman Jupiter of the Capitolium and the other Hellenistic Zeus Meilichios. After researching these various examples of syncretism demonstrated in Pompeii, it can be concluded that Pompeii was part of a larger cultural sphere than originally believed.

**Using Machine Learning to Classify Trouble Tickets**

***Michael Berlin***
Tim Finin, Professor, Department of Computer Science

The IT help ticket queue for the UMBC Department of Information Technology uses keywords to sort help tickets into more manageable categories, so that the tickets can be directed to people who specialize in that sort of problem. During the course of a ticket's lifetime, a typical trouble ticket gets reclassified several times, adding significantly to the time it takes to respond to it. In order to proper classify future tickets, it was decided that some sort of AI approach could be used, which would provide much better accuracy. This kind of category choosing is common to machine learning, and is called a Classification problem. A lot of very high quality data was given to me, so I first ran Naive Bayes, a very common machine learning algorithm, on the set in order to establish a baseline accuracy. The next step is to try at least two other algorithms on the data, probably K nearest neighbor and a Support Vector Machine, in order to see which handles this kind of data best. I'd also like to try to use WEKA's feature selection algorithms, and see if I can improve upon all three approaches, or just find a best approach outright. In addition, the original comparison was only done on a small subset of the data, so I'd like to re-run it on a larger portion, maybe all of it, which the team has provided me with. Finally, there is the matter of when to update the model and how to limit the the problem of too little data in a category, which gives poor accuracy, or too much data overall, which leads to a very long re-build time for the model. One proposal for dealing with the problem of too many features overall is to use faceted browsing, which classifies along several explicit dimensions instead of single, unique ordering. In order to deal with small amounts of data in certain categories, sampling (cloning) the small number of instances may be the way to go.

**Inhibiting the Matrix Targeting of the Gag Polyprotein towards the Plasma Membrane during HIV-1 Replication**

***Pallavi Bhargava,*** Peter Mercredi
Dr. Michael Summers, Professor, Department of Chemistry and Biochemistry

Despite the success of current antiviral treatments for HIV/AIDS in reducing viral loads, there are still limitations. Unfortunately, drug resistant strains are produced due to viral mutations, rendering treatments ineffective. In efforts to create novel viral targets, we look into viral assembly. Directed by the amino-terminal domain of the Gag polyprotein, matrix (MA), Gag is targeted towards the plasma membrane of the host cell, where MA binds to phosphatidylinositol 4,5-biphosphate [$PI(4,5)P_2$]. $PI(4,5)P_2$ binding induces conformational changes that permit exposure of a sequestered myristate group covalently attached to MA, allowing Gag to anchor to the lipid bilayer. The goal of this project is to inhibit matrix mediated Gag targeting to the plasma membrane. The methods that are used to help achieve this are to screen in vitro small molecule inhibitors that will bind MA and inhibit its binding to $PI(4,5)P_2$. This is performed by overexpressing and purifying isotopically labeled HIV-1 MA. Pure MA is titrated with small molecules and binding is observed through NMR. Recent NMR results have shown significant chemical shifts upon titration with one small molecule inhibitor, MAI-1. In the future, this molecule will be tested *in vivo* to observe if it adversely affects viral assembly.

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

**Portraying the Sea in Two Dimensions**

***Ronald A. Blevins***
Frederic Worden, Associate Professor, Department of Visual Arts

Animation can be presented through many mediums including clay, computers, drawings and paper cutouts. Animation allows the artist to create characters within real and fantastical worlds. From the 1920's to 1979, Lotte Reiniger created a series of paper "silhouette" films bringing fairy tales to life. This project involved the process of stop-motion animation of paper cutouts as well as Dragonframe software and a mounted camera. My project explores elements of her storytelling through water, by having the young hero fall overboard from a boat. The technical approach to the project required shooting a minimum of 3000 frames to create a film of sixty seconds duration. I also edited and integrated a musical score into the film. I develop the character through changing facial expressions. My animation mimicked the motions of fish swimming, produced air bubbles and provided movement of sea creatures to create a sense of being underwater. The film portrays a fantasy world where the viewer can enjoy the music, mermaids and sea serpents and witness a surprising ending.

**Minorities in Adaptive Physical Activity: A Community Exercise Intervention Program for Stroke Patients**

***Abigail Boateng***
Mary Stuart, Professor, Health Administration and Policy Program

Stroke is the fourth leading cause of death in the United States and is most common in minority populations. As insight is increasing on the physiological mechanisms activated through exercise in chronic stroke patients, exercise rehabilitation and prevention have proven successful in combatting this illness and certain cardiovascular diseases. Known benefits of rehabilitation programs include increased bone health and ambulatory function, and decreased incidents of depression and social isolation. As the efficacy of exercise models for improving physical fitness and cardiovascular health is explored, the potential for reductions in healthcare use and costs for treating stroke has been highlighted. Adaptive Physical Activity (APA), a community exercise program developed in Italy, has demonstrated success in improving physical function and quality of life after stroke. An ongoing clinical trial to translate this program into a U.S. context has been funded by the Veterans Health Administration. This poster explores factors that influenced attendance and continuation for this high-risk population. Suggestions for incorporating APA into chronic care models for secondary and tertiary prevention for minority health are provided.

*The work was funded in part by a grant from the Department of Veterans Affairs # B6329-R Adaptive Physical Activity for Chronic Stroke and by the NIH/NIGMS MARC U*STAR GM 08663 National Research Service Award to UMBC.*

**Synthesis of Carbocyclic Nucleosides**

***Kelin Brace,*** *Sarah Zimmermann*
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, carbocyclic nucleosides 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, but the replacement of the furanose oxygen with a methylene makes the glycosidic bond more resistant to cleavage, a serious problem for many nucleoside drugs. The focus of this investigation was to synthesize several carbocyclic analogues as potential drug leads. Their synthesis was accomplished through the use of Mitsunobu coupling reactions and other key synthetic steps. Once the compounds are synthesized and fully characterized to confirm their structure and purity, their biological activity will be assessed through the use of biological screening to be carried out by our research group's biological collaborators in Belgium and NCI. The results of this study provide new insight into the biological importance of the carbocyclic 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.*

**Student Involvement, Academic Achievement, and Social Interaction**

***Tatiana Bradshaw***
Jonathan Singer, Associate Professor, Department of Education

The purpose of this research is to look at the effects of student involvement on both academic achievement and social interactions. It has been demonstrated through multiple studies that student involvement in extracurricular activities before, during, and after school improves student academic achievement. This research studies expands upon the current research literature by exploring if students who are involved in extracurricular activities have a higher level of classroom-based social interactions. The research was conducted through anonymous surveys and individual interviews with middle school students. Findings from this study demonstrated that the social interactions and level of academic understanding of students involved in extracurricular activities are higher and more in depth than students who are not involved in extracurricular activities.

**Where Do I Fit in?: Affixing a Scholar in Soviet Historiography in the West**

***Abigail Bratcher***
Kate Brown, Associate Professor, Department of History

This research tracked the arc of Soviet historiography in the West surrounding civil society under Khrushchev to reveal significant gaps in methodology, approach, theoretical background, and interpretive mishandlings. Critical to any prospective historical inquiry is a comprehensive review of what other scholars have already written about the topic, and, why they have written what they have. In the field of Soviet historiography, academics self-consciously debate the state of their own discipline, vaguely attributing their scholarship to generational differences, hegemonic schools of thought, and broader political or social developments. Using civil society under Khrushchev as my subject, I surveyed historical scholarship from contemporary publications to the present to trace how historians have interpreted two bodies of Soviet civil society, *druzhiny* and comrades' courts, over the decades. From this, I postulated why historians of the totalitarian, New Left, revisionist, and neo-revisionist slant have interpreted as they have. In so doing, I noticed that missing in the literature was a critical discussion of gender with respect to civil society, illuminating not only an area of uncharted research within the field, but also informing an aggregate methodology indicative of Soviet social history in the twenty-first century that could be used to investigate this question further.

**Role of *Skywalker* in Border Cell Migration**

***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, which is the coordinated movement of a cluster of cells. Understanding collective cell migration in *Drosophila* can lead to a better understanding of such mammalian process as wound healing and cancer metastasis. During egg development in *Drosophila,* a group of epithelial cells travel posteriorly to the border of the oocyte. Multiple molecular pathways are known to be involved in cell migration, including secreted cytokines that specify motile cells, and extracellular growth factors that promote directional movement. To identify additional components in cell migration, we employed a forward genetic screen. Preliminary data suggest that a mutation in the *skywalker* (*sky*) gene disrupts border cell migration, which we will genetically confirm. The role of *sky* is not clearly defined, but it is known to function as a regulator of Rab35 GTPase activity in neurons. Thus, we are looking at *Rab35* and *Rab5* mutations in border cells in comparison with the loss of *sky*. 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, and the NSF Career Award.*

**Platform 9 ¾: The Entrance to a Potterhead Created Community**

***Mallory L. Brooks***
Kathy Scales Bryan, Senior Lecturer, Department of American Studies

The Harry Potter series is a popular culture phenomenon. As was said in the first chapter of the initial book in the seven-part series, "There won't be a child in our world who doesn't know his name." This study examines seven different fan groups or Potter-based organizations to explore why they become fans, to create groups and establish organizations in Harry's name. Textual analysis of the web pages of these groups and participant observation were used to identify cultural themes in the discourse of these communities and analyze the intertextual experiences of selected fans through their written accounts of their involvement in the fan community. Consistent cultural themes were identified across the various groups, including but not limited to love, equality, dedication, unity, and literacy. The analysis of accounts of fan involvement suggests that the series appeals to our natural desire to be social. As the groups reflect, there is a diverse following of Harry Potter. People are able to find themselves within the story and see themselves uniting with people who are unlike them. The series represents the desire to find community among the differences.

**The Universality of Roseobacter Motility Inducer (RMI) within the Roseobacter Clade**

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

The Belas lab is studying a representative roseobacter, *Silicibacter* sp. TM1040 that forms a symbiosis with unicellular marine algae. One current interest of the lab is a compound known as Roseobacter motility inducer (RMI). RMI induces transcription of bacterial motility genes, such as *fliC3* (encoding the major protein of the flagellum), and also acts as an algicide that kills the host and ends the symbiosis. We are determining the universality of RMI in the *Roseobacter* clade. If produced by all roseobacter, this compound has the potential to alter other systems by inducing motility and affecting the symbiosis between marine bacteria and their algal host. We hypothesize that many roseobacters produce RMI, and selected 17 diverse species of the clade to test this hypothesis. We used a mutant strain of TM1040, PS02, that does not produce RMI, and introduced into it a plasmid harbouring a transcriptional fusion between the *fliC3* promoter and a promoterless *lacZ* gene (encoding β-galactosidase). Thus, in the presence of RMI this reporter strain produces β-galactosidase, which can be measured using the Miller assay. Our results indicate that 64.7 percent of strains produced RMI indicating that production of this chemical is common in *Roseobacter* clade bacteria.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR GM 08663 National Research Service Award to UMBC and by National Science Foundation award IOS-0842331 to RB.*

**Synthesis of Cyclic and Acyclic Nucleotide Viral Polymerase Inhibitors**

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

Nucleoside and nucleotide analogs have proven to be a valuable approach in the treatment of many viral, fungal and cancer-related diseases by targeting the polymerases responsible for the replication of pathogenic DNA and RNA. However, the accumulation of various point mutations in these polymerases has led to a general decrease in the efficacy in many of these nucleoside and nucleotide drugs. The overall goal of this project was to introduce nucleobase flexibility explored by the Seley-Radtke laboratory into two nucleoside and nucleotide antiviral drug candidates with the goal of overcoming drug resistance. Based on previous computational and *in vitro* studies, the targets of my project are hypothesized to remain active against a number of Hepatitis C Virus (HCV) and herpes simplex virus (HSV) point mutants. Using traditional nucleoside and heterocyclic chemistry techniques, we have generated a key intermediate in the synthetic pathway of one drug target and have begun the synthesis of a second.

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**Using Mobile Technologies to Support Procedural Memory for Individuals with Executive Functioning Deficits**

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

The ability to plan, organize and execute tasks is often taken for granted. However, for individuals with executive functioning deficits (EFD), challenges with procedural memory, may directly impact the ability to care for themselvers or to live independently. The aim of this research is to identify the difficulties faced when performing daily tasks, with a view to designing a mobile application to rehearse the sequence of steps within these tasks (e.g., making a bed). Findings from a set of interviews conducted with participants with EFDs has revealed that such a solution offers promise for independent living, as the user is able to first practice tasks within in a virtual environment (i.e., the mobile application), until levels of confidence can be developed to perform the same tasks in a real-world environment.

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

**St. Cuthbert and Pilgrimage 664-2012 AD: The Heritage of the Patron Saint of Northumbria**

***Lauren Bucca***
Gail Orgelfinger, Senior Lecturer, Department of English

The purpose of this research was to shed light upon pilgrimage during the Middle Ages, as well as to reveal the continuity of a medieval pilgrimage route in contemporary times. To accomplish this goal, my research considered both the literal and figurative aspects of pilgrimage during the Middle Ages. This study centered on the cultural influence of St. Cuthbert, a seventh-century prior and patron saint of Northumbria who was himself a missionary and pilgrim. Today, a walking route retraces St. Cuthbert's journey from Melrose, Scotland to Lindisfarne, England. This route has been traveled by pilgrims since the Anglo-Saxon Era, both during and after St. Cuthbert's life; today the route has been termed "St. Cuthbert's Way." In addition to analyzing early illuminated manuscripts of two texts of St. Cuthbert's life, I also researched secondary sources on medieval travel. During the summer of 2012, I followed part of this pilgrimage route, photographing sites and interviewing present day pilgrims along the way. My research demonstrates that a 1,300 year old pilgrimage route has increased in relevance in the twenty-first century, evolving as an exercise appealing to the spiritual and physical needs of present day pilgrims.

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

**Determining the Structure of the HIV-1 Matrix and Native PI(4,5)$P_2$ Complex**

***Nadine Bucca,*** *Peter Mercredi*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

The HIV-1 matrix domain (MA) of the Gag polyprotein targets Gag to the plasma membrane. This targeting is mediated by the membrane marker phosphatidylinositol(4,5) bisphosphate [PI(4,5)$P_2$]. PI(4,5)$P_2$ binds to MA permitting an N-terminal myristate, a saturated 14 carbon chain, group on MA to switch from a sequestered to an exposed conformation. The myristate group anchors Gag to the plasma membrane and permits Gag oligomerization for viral assembly. Structural work on MA:PI(4,5)$P_2$ binding using two truncated saturated carbon chains of PI(4,5)$P_2$, has shown that the 2' chain binds to MA, supporting the current proposed hypothesis that Gag assembles at lipid rafts. To test this lipid raft hypothesis we have constructed a membrane like environment using lipid mixtures with and without native-PI(4,5)$P_2$ molecules. These constructs will be analyzed using nuclear magnetic resonance (NMR) to characterize the interaction between MA and native-PI(4,5)$P_2$. Preliminary data show that our lipid constructs do not denature MA and display native-PI(4,5)$P_2$ for MA binding.

*This work was funded, in paExrt, by NIH grant #R01 AI81604 and the Howard Hughes Medical Institute.*

**Characterization of Carbon Nano-Structure Infused Fiber Reinforcements on Glass Fiber Substrates**

***Matthew D. Buchanan***
Marc Zupan, Associate Professor, Department of Mechanical Engineering and Visiting Professor, FEUP-Faculdade de Engenharia da Universidade do Porto, Departamento de Engenharia Mecânica

The transition of laboratory processing to production volume often precludes new material insertion. Carbon based nano-structures (CNS) show great promise in becoming a disruptive material technology; however, currently their use is limited because they cannot be manufactured in large quantities. This research focuses on a scalable production method to grow CNS on to substrates as an end material system or for harvesting. A novel, open-ended growth chamber and reel-to-reel scalable chemical vapor deposition (CVD) processing system was used for the growth of carbon nano-structures directly on moving glass fiber substrates. Our group conducted research on as-received and CNS-infused glass fiber filaments utilizing single-fiber fragmentation (SFF) tests. The shape and size of the birefringence patterns were used to describe how fiber behavior changed with processing. Post-mortem measurements of the critical fiber fragment lengths were used to identify the quality of the interfacial load transfer. A new material selection performance metric based on the critical aspect ratio was established to evaluate the hybrid interface (fiber-CNS-matrix) response. The results gathered suggest that the presence of CNS increase interfacial load transfer. These results will be used in optimizing the novel open-ended growth chamber during scale up of CNS growth production.

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**Neo-Corporatism and the 2008 Financial Crisis: The Relations between Western States and Supranational Corporations**

***Nathaniel C. Buechler***
Carolyn Forestiere, Associate Professor, Department of Political Science

This research project examines why German insurance industries were more sheltered from economic hardship in the 2008 Economic Crisis relative to their American counterparts. The project suggests that Germany's extensive use of Neo-Corporatism is a primary explanation of German superior performance. Neo-Corporatism is a system of interest group aggregation whereby government, corporations, and labor unions work together to find consensus for economic policies. To assess the role that Neo-Corporatism demonstrated in sheltering German insurance industries, this study investigated the differences between Allianz in Germany and AIG in the United States. Specifically I find that AIG sold Credit Default Swaps allowing for economic vulnerability and other negative consequences of the securitization process, while Allianz encountered less adverse financial exposure due to differences throughout American and German markets. In sum, Neo-Corporatism is the key difference to the success of Allianz.

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

**Removal of Tetracycline Antibiotics from Water Using the UV-$H_2O_2$ Process**

***Robert Burton***
Lee Blaney, Assistant Professor, Department of Chemical, Biochemical, and Environmental Engineering

Tetracycline antibiotics are some of the most common antibiotics in use today for the treatment of bacterial infections in humans. Tetracyclines are also widely used in pets and farm animals. These pharmaceuticals have been detected in global water supplies. One source of this contamination is the low concentrations of tetracycline antibiotics found in the effluent from wastewater treatment plants, which ultimately leads to contamination of drinking water supplies. The focus of our research was to evaluate a treatment method for the removal of tetracycline antibiotics from water. We studied the ability of the ultraviolet/hydrogen-peroxide (UV-$H_2O_2$) advanced oxidation process to transform three tetracycline antibiotics (tetracycline, chlortetracycline, and oxytetracycline) into benign compounds. In particular, we investigated the reaction kinetics, i.e., the rate at which the oxidation reaction proceeds, and the transformation efficacy. Through experimentation we discovered that the UV light reacts with the antibiotics best at slightly basic solution pH. The experiments also showed that the most effective molar ratio of hydrogen peroxide to tetracycline antibiotic range from 1:1 to 1:10. The UV-$H_2O_2$ is an effective method to remove tetracyclines in wastewater treatment plants since the presence of hydrogen peroxide greatly increases the transformation rate of tetracyclines.

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**Acculturative Experiences, Psychological Well-being, and Parenting among Chinese Immigrant Families**

***Grace Calvin, Jing Yu***
Charissa Cheah, Associate Professor, Department of Psychology

The goal of the present study was to explore factors that may contribute to the parenting styles and practices of Chinese immigrant parents of young children, an understudied group. Previous research demonstrates that positive acculturation to American culture and higher psychological well-being in parents may predict more positive parenting (e.g., warmth and reasoning) (Bornstein & Cheah, 2006; Cheah, Leung, Tahseen & Schultz, 2009). In contrast, maternal depression is associated with harsher parenting behaviors (Bor & Sander, 2004). We hypothesized that positive acculturative experiences would lead to higher levels of psychological well-being and more positive parenting. Chinese immigrant mothers in Maryland (N = 155) reported on their acculturative experiences (behavioral and psychological acculturation), psychological well-being, and parenting styles (authoritative and authoritarian parenting styles). Preliminary analyses revealed significant correlations in the hypothesized directions between acculturative experience and psychological well-being, and between psychological well-being and parenting style. However, no direct relations were found between acculturative experiences and parenting

styles. Further analyses will be conducted to explore the mediational processes through which acculturative experiences may influence parenting.

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**Rat Ultrasonic Signals as a Novel Measure of Spontaneous Pain in the Formalin Model**

***Sarah A. Campbell***, *Jasenka Borzan*[1]
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Jasenka Borzan, Instructor, Department of Anesthesiology and Critical Care Medicine

Rat ultrasonic vocalizations (USVs), sounds anywhere in the 20 to >100 kHz range, have become a recent focus in pain-related research due to their potential application as a measurement of ongoing (spontaneous) pain. Current pain research relies primarily on injury-induced hypersensitivity measures in rodents by examining responses to evoked mechanical or thermal stimuli. These methods do not effectively analyze higher integrated pain-related behavior associated with ongoing pain. Because USVs function as a form of communication in rodents, these signals may be a powerful tool to study mechanisms of pain and the effects of novel therapeutic drugs. This study examines USVs of rats in the formalin model, an effective chemical model of persistent pain, and aims to differentiate each vocalization through an original classification system that analyzes a wider range of USVs. Previous studies typically reported no differences in the number of alarm calls in various pain models, but these studies failed to include other types of vocalizations in higher frequencies or other ultrasonic signals rats produce by various behaviors such as teeth chattering or tail rattling (ultrasonic collaterals). The results suggest that these ultrasonic collaterals, but not USVs, are an effective novel measure of persistent pain.

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**MP3 Players and Other Handheld Devices in Schools**

***James Carlson, Andrew Pannoni***
Jonathan Singer, Associate Professor, Department of Education

As with all technological advancements, handheld devices have found a certain niche of use in schools. One type of handheld device that is particularly controversial is the MP3 players. This type of device has been anecdotally attributed to increasing student tardiness as well as decreasing student focus. In this study we have reviewed the impact of a new school wide policy allowing students to use their MP3 players in the hallways, though they must put them away as they enter the classroom. Comparing referral and tardiness numbers between this year and previous years, as well as surveying students from grades 10-12, faculty members, and our own observations determined the impact of this new policy. Given our results, the school will gain new insight as to the effect of the policy.

**Psychedelic Dungeons: Aesthetics, Satire, and the Counter-Counterculture**

***Glen J. Carpenter***
Kathy Bryan, Senior Lecturer, Department of American Studies

The pacifist, liberated psychedelic movement of the late 1960s met opposition from both the American government and political conservatives. However, some ideological opponents emerged from within the counterculture itself, and were paradoxically met with popularity and acceptance. This study employs close reading and is informed by subcultural theory, musicology, and Bakhtin's constructs of the *carnivalesque* and the *grotesque body* to examine the works of musicians Frank Zappa and Van Dyke Parks, and artist Robert Crumb. These artists utilized the aesthetics of the psychedelic movement to satirize it as shallow, naïve, and materialistic. Zappa characterized the counterculture as a complacent extension of American consumerism. Crumb satirized the hypocrisy and pseudo-intellectualism of hippiedom. Parks' criticism was aimed mainly at the entertainment industry's dichotomous relationship between true artistic integrity and financial success, as well as the commodification of sanitized psychedelia. The themes of pop music as sexual capital and American race relations in the direct wake of the Civil Rights movement were also routinely targeted. After analyzing the recurring themes and images of each artist's work, it becomes clear that the ultimate target of satire is not the psychedelic movement itself, but the post-War, materialist society that fostered it.

**Mathematical Modeling for Signal Transduction in Mammalian Olfactory Sensory Neurons**

***Jen Chang, Andrew Coates***
Jonathan Bell, Professor, Department of Mathematics and Statistics; Weihong Lin, Associate Professor, Tatsuya Ogura, Research Assistant Professor, Steven Szebenyi, Research Assistant, Department of Biological Sciences

The sense of smell in mammals is initiated by the excitation of the olfactory sensory neuron (OSN) via signal transduction, which is mediated by one or more signaling pathways where an increase in intracellular calcium level occurs in response to stimuli. The signal transduction process is initiated once an odorant binds to the G-protein coupled receptor (GPCR), resulting in dissociation of the alpha subunit ($G_{\alpha}$) and beta-gamma subunits ($G_{\beta\gamma}$), which activate the canonical and alternative signaling pathway, respectively. The alpha subunit activates adenylyl cyclase (AC), leading to activation of cyclic nucleotide-gated (CNG) channels and subsequently an influx of calcium into the OSN. The beta-gamma subunits trigger phospholipase C (PLC), which indirectly causes the endoplasmic reticulum (ER) to release calcium from the internal store to intracellular space. We apply different chemicals to stimulate the two pathways and analyze changes in intracellular calcium levels *in vitro* using calcium imaging. Based on literature and our results, we create mathematical relationships between the two pathways and intracellular calcium level, and utilize MATLAB for modeling. Using our model, we can make inferences on the significance of the alternative pathway relative to the canonical pathway.

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**A Volumetric Analysis of the Mouse Accessory Olfactory Bulb**

***Yu-Rei Raymond Chang****, Sarah Ashby*
Weihong Lin, Associate Professor, Department of Biological Sciences

In the olfactory system, odorants are detected by sensory neurons in one of several spatially segregated olfactory subsystems, such as the main olfactory epithelium (MOE) and the vomeronasal organ (VNO). The MOE relays olfactory information to the main olfactory bulb (MOB), whereas the VNO projects its axons to the accessory olfactory bulb (AOB). Sensory information by the VNO plays a critical role in aggression and mating, which are behaviors with significant differences based on gender. These behavioral differences led us to investigate potential distinctions in AOB size and circuitry between males and females. To do so, we examined AOB size and cell number in male and female SVJ wild-type (WT) mice. Paraformaldehyde-fixed brain tissue was sectioned, immune-labeled, imaged under a microscope, and volumes were measured using NIH ImageJ. We found that AOB volume of male mice to be statistically significantly larger than the AOB of female mice. Within the AOB, the glomerular layer and external plexiform layer were statistically larger in males, and thus cell number counts for the layers are being analyzed. In conclusion, the increased AOB size in males may indicate variations in AOB circuitry that may affect odor information processing in a gender specific manner.

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**Understanding the Interaction between Glyceraldehyde-3-Phosphate Dehydrogenase and Endothelin-1 mRNA**

***John T. Chavis III****, Mohd M. Khan, Pauline Xu, Tobias Clevinger*
Elsa Garcin, Assistant Professor, Department of Chemistry

Glyceraldehyde-3-phosphate dehydrogenase (GAPDH) is a multifunctional glycolytic protein, involved in a variety of functions including glycolysis, cell death, DNA repair, and the regulation of gene expression. Recent reports showed that GAPDH can post-transcriptionally modulate cellular expression of the most potent vasoactive peptide, Endothelin-1 (ET-1), by binding and destabilizing the ET-1 mRNA. Numerous cardiovascular and nervous system diseases, such as hypertension and subarachnoid hemorrhage can be attributed to over-expression of ET-1. As GAPDH can regulate cellular levels of ET-1, there is an incentive to understand the specific interactions and mechanism by which GAPDH destabilizes ET-1 mRNA. The purpose of this project is to combine biophysical and biochemical techniques to determine the structural and functional aspects of the GAPDH and ET-1 mRNA interaction. We plan to accomplish this goal by using chromatography, crystallography, site-directed mutagenesis, electrophoretic mobility shift assay Fluorescence spectroscopy and circular dichroism.

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**Fear Be Gone: Endocannabinoids Modulate Subsecond Dopamine Release during the Extinction of Fear Memories**

***Vivian C. Chioma****, Erik B. Oleson, Joseph F. Cheer*
Erik B. Oleson, Post-doctoral Fellow, Department of Anatomy and Neurobiology; Joseph F. Cheer, Associate Professor, Department of Anatomy and Neurobiology, Department of Psychiatry, University of Maryland, Baltimore School of Medicine

Post-traumatic stress disorder (PTSD) is a debilitating anxiety disorder caused by experiencing dangerous situations. Environmental stimuli associated with such events can independently produce persistent fear responses, a central feature of PTSD. Fear-conditioning models involve rats presented with three consecutive tones, each culminating with a foot shock and then, 24 hours later, presented with 18 iterations of only the conditioned tone in a novel context. These models are used to investigate the therapeutic potential of drugs for PTSD and neural mechanisms responsible for their utility. Here, we investigate how endocannabinoid and mesolimbic dopamine systems interact during the extinction of fear memories using a fear-conditioning model, pharmacology and fast-scan cyclic voltammetry. Prior to assessing conditioned fear responses, animals were pre-treated with either vehicle or the cannabinoid CB1 receptor antagonist rimonabant. In vehicle-treated rats, the conditioned tone produced freezing behavior that persisted through the first 10 trials and produced a sharp decrease in dopamine concentration. Rimonabant-treated rats were more resistant to the extinction of fear memories, as freezing behavior persisted through 15 presentations of the conditioned tone and the tone-induced decrease in dopamine was less apparent. These data suggest that endocannabinoid and mesolimbic dopamine systems interact during the extinction of fearful memories.

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**Biodiversity and Community Structure Regarding the Interaction of *Drosophila* Host and its Parasitoid Wasp Interactions**

***Hye Hyun Choi, Phuong T. Nguyen, Ngochan G. Tran, Saiah C. Yates****, Chia-Hua Lue*
Jeff Leips, Associate Professor, Department of Biological Sciences

Biological communities have well-known effects on the ecology of interacting populations. Nevertheless, how community structure influences the evolution of interacting species is less understood. Our project aims to understand the significance of species biodiversity on coevolution using the *Drosophila* host and wasp parasitoid relationships as a model system. *Drosophila* and their parasitoids have tight connections in their ecology and evolution. We are examining how geographic variation, in the hosts and parasitoids community structure, influences the coevolutionary relationships. The first step in this project is to describe the species comprising these communities. We are collecting *Drosophila* hosts and their parasitoid wasps from five locations in eastern North America, from Canada to Florida. Samples (both flies and wasps) from fly traps and peach baits were collected in each location (sample periods ranged from May - October). At present, we have completed the fly identification from each location and found high variation in the *Drosophila* species when comparing populations from different geographic locations. Future goals include finishing the identification of parasitoid-wasps and analyzing their geographic host-parasitoid interaction in the varying locations. This research will help us to understand how geographic variation in community structure influences the patterns of coevolution among interacting species.

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**Genetic Basis of Natural Variation in Innate Immune Function: The Role of Phagocytosis**

***Briani D. Claggett**, Margaret Kemper, Kathryn Bus, Michelle Starz-Gaiano*
Jeff Leips, Associate Professor, Department of Biological Sciences

All multicellular organisms rely on the innate immune system to provide the first line of defense against infection. Despite its importance, there is a great deal of variation in the ability to clear infection among individuals within populations. This variation is due to environmental and genetic factors. Our lab is interested in identifying genes responsible for this natural variation in innate immune function. We used *Drosophila* melangaster in a genome-wide association study (GWAS) and identified 1700 polymorphisms throughout the genome that affect the ability to clear bacterial infection. Phagocytosis and the production of antimicrobial peptides, two parts of innate immune response, could have contributed to the results of that study. In this study we are focusing on validating the effect of genes identified in the GWAS for their effects on phagocytosis. We used the Gal4/UAS system to drive the expression of RNAi constructs to knockdown expression of candidate genes in blood cells and assessed the cells' ability to engulf bacteria. As many aspects of the innate immune response in *Drosophila* are similar to that in humans, results from this study could provide a general understanding of the genes regulating phagocytosis and elucidate its relative importance in the clearance of infection.

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**Designing a Choice Test for Song Preference in Songbirds**

***Sergiu Costinas, Charles A. White***
Bernard Lohr, Assistant Professor, Department of Biological Sciences

A number of song characteristics may be subject to sexual selection in territorial songbirds. In preparation for conducting tests to study song choice in this context, we designed a software algorithm for performing choice tests with female birds using a modified operant conditioning chamber and procedure. Such chambers can vary in design, but share similar features. At its core, this type of operant chamber presents at least two alternative choices for the subject and allows for the subject to differentiate between those choices. We used RP Visual Design Studio Ex. (RPVdsEx) to construct digital schematic circuits on a Tucker-Davis Technologies RZ6 processor. The circuits we designed facilitated operant conditioning of the subject by providing auditory "rewards" for the subject after a selection. Once the subject is trained to respond in the operant chamber, choice testing can commence. The choice test circuit we designed measures the type and number of selections made to activate the playback of specific songs, and uses these results to determine song preference. Our initial choice test will focus on the two song types produced by grasshopper sparrows, "buzzes" and "warbles," and preferences of the female for the two song types under different conditions.

*This research was funded by the UMBC Department of Biological Sciences.*

**Mutated CD80 May Facilitate T-cell Activation by Inhibiting PDL1-PD1 Suppression and by Costimulation**

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

Programmed Death Ligand-1 (PDL1) is expressed by tumor cells and increases tumor progression by binding to its receptor PD1 on T-cells, thereby inhibiting T-lymphocyte activation and causing T-cell apoptosis. Cluster of Differentiation 80 (CD80) provides a costimulatory signal needed for T-cell activation by binding to its receptor, CD28, on T lymphocytes. By modifying cancer cells to express CD80, PDL1 no longer binds to its receptor, resulting in increased T-cell activation. To determine the mechanism by which CD80 increases T-cell activation, we must determine if CD80 is binding to CD28 to send a costimulatory signal into T-cells or if CD80 is binding to PDL1 to prevent PDL1-supression or both. A CD80 mutant in which amino acids 96, 97, and 99 were mutated to alanine was produced and cannot bind to CD28. We are generating a soluble $CD80_{96,97,99}$ ($sCD80_{96,97,99}$) by ligating the two extracellular domains of $CD80_{96,97,99}$ to the Fc region of human IgG1 to increase stability, followed by incorporation into the $Pet21a^{+}$ plasmid. Recombinant protein will be isolated from transformed *Escherichia coli* and purified using a nickel column, and tested in functional experiments to elucidate CD80's mechanism. If CD80 restores T-cell activation by suppressing PDL1 it could become a therapeutic agent.

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

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

Successful control of plant diseases depends on a thorough understanding of the mechanisms of plant disease resistance. Previous studies 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 plant 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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**Design and Construction of a Helium Cryostat for use in Terahertz Spectroscopy**

***Soutry De***
Michael Hayden, Professor, Department of Physics

The need for electro-optic materials is becoming extensive due to their applications in optical signal processing and telecommunications. In Michael Hayden's research laboratory, these kinds of materials are studied by performing terahertz spectroscopy. This research was focused on investigating electro-optic crystals and their phonon composition using terahertz (THz) time-domain spectroscopy (TDS) over a wide temperature range (8K - 300K). Such low temperatures were achieved in the laboratory using helium gas. As a major part of this project, I have integrated a new closed-cycle helium cryostat into the THz-TDS system. We then used sub-picosecond THz pulses at a variety of temperatures to study the major THz absorption features of some important electro-optic crystals ($\alpha$-BBO, and $\beta$-BBO) used in the generation of THz radiation. Determination of the low-temperature phonon line widths and peak frequencies helps to identify the atomic motions responsible for these lattice vibrations. We noticed that the amplitude and position of the absorption peaks evolved as a function of temperature and the peaks become sharper as temperature decreased.

*This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, NSF, MDITR, and NIST.*

**Puzzle Box: Video Game to Challenge Spatial Perception through Three-Dimensional Puzzles**

***Kenneth Derda, Jon Schubbe, Ian McGaughran, Richard Adjogah, Jason Garcia, Timothy Noel***
Marc Olano, Associate Professor, Department of Computer Science and Electrical Engineering

In general, puzzle games develop problem solving skills which allow the player to utilize critical thinking and consider alternatives to common perception. In the process of creating Puzzle Box, we sought to challenge the player through puzzles that incorporate a fully rotatable world in three dimensions. We designed various puzzle elements that depend on the orientation of the world from a first person perspective. We followed the agile software development model in order to gain the experience of game development in the real world. Agile methods provide the ability to repeatedly refine a software product through the course of the entire development. This model is well suited to the creation of video games, whereas traditional models can inhibit a more organic creation process. In line with this model and the business practices of the gaming industry, our team is composed of a mix of both Computer Science and Visual Arts students. The mixture of students from various fields allowed us to integrate a variety of perspectives.

*This work was funded, in part, by gifts from Microsoft, Next Century Corporation, Northrup Grumman, NVIDIA, and Zynga, and with guidance by Will Miller and Steve Ogden of Firaxis Games.*

**Ceremony of Memory**

***Alexis R. DeVance***
Doug Hamby, Professor, Department of Dance

In cultures where the written word is not the primary method for communicating history and knowledge, the body serves as a repository holding the collective narrative of a community's cultural heritage, identity, and history. Interested in deepening my understanding of dance and the dancing body as an embodied form of collective remembering within diasporic communities, I traveled to Trinidad. While in Trinidad, I immersed myself in rhetoric and movement that examined the intersections of transnational identity and the contemporary dance world. I gained a deeper understanding of my own multiethnic heritage and furthered my study of traditional and contemporary dance styles of Africa, India and the Caribbean. *Ceremony of Memory*, a contemporary dance performance work, explores issues concerning body and identity politics as they relate to colonized bodies. My process involved experimenting with contrasting both movement and music to illustrate a mass of contradictions that exist as diasporic and indigenous bodies contest and subvert colonization and domination. I deconstruct the power of dance as a form of cultural resistance and a primary vehicle for holding cultural memory and experience. Ultimately what surfaces are questions of authenticity, identity and the constructs of "home."

*This work was funded by the Summer Research and Study award through the UMBC Dance Department.*

**The Irene Ryan Acting Competition: Practical Process for Performance**

***Christopher Dews, Samrawit Belai***
**Eve Muson, Assistant Professor, Department of Theatre**

A great deal of work goes into the actor's performance on stage. I follow a specific process: research, analyze, rehearse and perform. When handed a new piece of theatrical text, I first research the time period and location of when the piece was set. This includes any cultural/historical events that occurred during the action of the play and the cultural hegemony of the region. I also research the playwright's motivations or political intent for writing the play. For example, in my second scene *Yellowman*, my research showed that the play is intent on educating both black and white audiences about the sociological degradation that comes from internalized racism in the African-American community. Next, I allowed the playwright's intent to affect how I analyze my character's previous circumstances, needs and actions. The character in *Yellowman* became an agent of social justice seeking to rid society of racism by sharing an alarming event from his childhood. In my rehearsal process, his voice turned dark, his movement slowed, and his gaze sharpened as he pursued his action. I performed what I researched and rehearsed in this scene and two others at the Irene Ryan Competition. My partner and I will perform these three scenes at URCAD.

*This work was funded, in part, by a travel award from the UMBC Office of Undergraduate Education.*

**Optimization of a Process: Are Algae-based Biofuels the Solution to the Energy Crisis?**

***Andrew D. Dillon***
Mariajose Castellanos, Assistant Professor, Department of Chemical, Biochemical, and Environmental Engineering

With the price of crude oil growing, a search for the next generation liquid fuel that can replace dependence on crude oil is essential. For some time corn and other plant-based biofuels have been in the forefront of this search, but scientists are discovering problems with these alternatives that cripple their sustainability. Recently, algae-based biofuels have entered the spotlight and are believed to be a potential alternative. While algae as an alternative fuel source is promising, and there are many efforts studying algae as a model organism, there are very few industrial-sized studied with algae. This research project provides a critical analysis on whether a pilot algae-to-biofuel plant is currently feasible. The plant was modeled with Aspen Plus, a powerful chemical process simulator. The unit operations that make up the basic pieces of a production plant were included in the model, and optimization techniques were applied to individual components and to the processing plant as a whole. Our results were evaluated through both comparison to other plant designs and analysis of the best energy output per energy input for the process.

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

**The Effect of Listening to Different Genres of Music on Cognitive Processing Outcomes**

***Arielle Dolegui***
Karen Watkins-Lewis, Lecturer, Department of Psychology

Listening to music for relaxation is common among students to counter the effects of stress or anxiety when completing difficult academic tasks. Some studies supporting this technique have shown that background music promote cognitive performance while other studies have shown that listening to music while engaged in complex cognitive tasks can significantly impair performance. This study focuses on the impact different genres of music played at different volume levels have on cognitive abilities. Additionally, the research aims to identify the effect of listening to a favored genre of music on performance. Thirty-three undergraduate students complete a series of five arithmetic tests while listening to two types of music, classical and hard rock, at two volume levels: high and low. Participants also complete a questionnaire to assess their interest with the background music and its distracting effect on their concentration. This research expects performance to worsen with increasing music intensity and the hard rock music condition at high intensity is predicted to be the most detrimental suggesting that both the type of music and the volume at which the music is played are major distracters. This research also predicts lower test scores for participants exposed to their favored genre of music.

**Mood Disorders and Romantic Relationships**

***Casey Dubac***
Robin A. Barry, Professor, Department of Psychology

Mood disorders can be a strain on romantic relationships. Previous research shows that individuals with bipolar disorder have more strained romantic relationships than individuals without bipolar disorder. Nevertheless, mood disorders represent a wide variety of behavioral, cognitive and affective symptoms; likewise, relationship problems also take many forms (e.g., intimate partner violence, lack of affection). Therefore it is unclear which mood symptoms are associated with which relationship problems. This research examined this question. We hypothesized that most symptoms of depression would correlate with poorer couple communication. We also hypothesized that symptoms of mania (bipolar disorder) would correlate with relationship dysfunction. Results supported hypotheses. Specifically, individuals who reported higher depressive symptoms engaged in more adversarial communication with their partners (e.g., being mean, arguing with their partner). Individuals who reported higher levels of mania reported lower levels of trust in their partners and individuals who reported higher euphoria (a more severe symptom of bipolar disorder) reported more adversarial behavior, psychological aggression (yelling, swearing and threatening the partner), physically violence with their partner and reported that their partner was more physically violent with them. This research highlights the specific relationship difficulties that individuals with different mood symptoms experience.

**Images in the Classroom: The Influence of Media in Vocabulary Instruction**

***Jason N. Dubbs, Jordan M. Dubbs***
Jonathan Singer, Associate Professor, Department of Education

This study is an analysis of vocabulary techniques in the classroom that utilize images in addition to written vocabulary instruction. Vocabulary instruction is important to all content areas and works to aid students in taking examinations. This study aimed to find the benefit in adding visual media to written vocabulary instruction. The data were collected from two different professional development schools, a high school and a middle school, in separate school systems. With these two data sets, the study compared the difference between written-only instruction with media inclusion instruction. Findings are currently being analyzed.

**Modeling Nanoparticle Heat Transfer in Tumors**

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

Nanoparticle infusion is a rapidly growing cancer treatment research thrust. When placed in an alternating magnetic field, specialized nanoparticles have the unique ability to generate thermal energy. As elevated temperatures effectively kill cancer cells, the non-invasive heating capability of these nanoparticles provides a promising pathway for a controlled localized treatment of this disease. In this multidisciplinary effort, a predictive mechanism for the potency and overall behavior of this treatment is invaluable. Accordingly, in this work images from a Micro-CT scanner of nanoparticle injected mouse tumors are virtually reconstructed and tested. For this early stage, focus has been given to accurately reconstructing the tumor and nanoparticles in COMSOL Multiphysics then assigning appropriate material properties. Preliminary results determined by direct comparison to the CT images reveal that a tumor has been successfully reconstructed. Also, corresponding SAR distributions have been determined from raw Micro-CT data, allowing for initial heat transfer analysis. Results from preliminary studies reveal that temperatures within the tumor surpassed steady state by 10-15 degrees Celsius.

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**Visualizing Levels of ATP in the Brain following Anoxia**

***Christopher Ecker,*** *Katherine Cerra, Neus Sanchez Alberola*
Rachel Brewster***,*** Associate Professor, Department of Biological Sciences

Stroke is one of the leading causes of death in the world. During a stroke, a blood clot blocks the supply of oxygen to the brain, resulting in neuronal apoptosis. Currently, the only FDA-approved drug for treating stroke must be administered within three hours after the injury, limiting its utility. However, for several hours following the hypoxic injury, a latent period exists before neuronal cells undergo apoptosis. This period offers the opportunity to intervene with novel treatments. To facilitate drug development, we seek to understand the adaptive response in anoxia-resistant species. Recent studies have demonstrated that zebrafish embryos have a transient tolerance to anoxia. We hypothesize that this organism survives by balancing ATP consumption and production in response to anoxia. We plan to utilize Perceval, a genetically encoded ratiometric ADP/ATP biosensor, to monitor ATP levels during anoxia. Using a transient expression assay, we demonstrate that Perceval can be expressed in a living organism. Ongoing studies seek to validate the functionality of Perceval with drugs that prevent ATP production. In the future we plan to perform a forward genetics screen using Perceval to identify genes required for ATP homeostasis. These studies may identify novel therapeutic targets for the treatment of stroke.

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**Impact of Population Growth and Urbanization on Local Climate Change**

***William T. Eckert, Thomas A. Hervey***
Junmei Tang, Assistant Professor, Department of Geography and Environmental Systems

Rapid urbanization in the past 50 years, triggered by population growth and migration from rural to urban and suburban areas, has had profound effects on local, regional, and global climates. As of 2011, more than 75 percent of the U.S. population resided in urban areas, which constituted only three percent of the nation's land area. Using historical NOAA climate data and census population data, our research developed advanced Geographic Information Systems (GIS) to study the impact of concentrated population growth on urban climate conditions. The study area included 17 of the major metropolitan areas with the most dramatic urbanization in the United States. Historical temperature and precipitation maps were created through advanced Kriging methods and then overlaid with population maps. The correlation between population growth and climate change over time was analyzed using the Pearson's correlation coefficient. This study provided a new perspective on human-induced climate change by incorporating historical data with advanced geospatial technology. This project's results will be beneficial to climatologists and educational institutions interested in studying the ties between urban growth and physical geography.

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**Mid-Infrared Optical Stimulations for Non-Contact Neural Excitation**

***David M. Eisen,*** *Douglas Janssen*[1]*, Xing Chen, Fow-Sen Choa, Jennie Leach, Dan Kostov*
[1]Science, Greater Grace Christian Academy
Fow-Sen Choa, Professor, Department of Computer Science and Electrical Engineering

Optical devices coupled with a mid-infrared (MIR) fiber can offer a non-contact method of stimulus delivery directly to a neural site. This holds promise for a number of biomedical applications including improved human prosthetics, optical pacing, and audio/visual support. The use of photon-neuron stimulations has advantages over traditional electrical probing techniques as the latter usually cannot achieve a well confined excitation spot and is liable to both electrode and cellular damage. In this research, the wavelength, frequency and power dependence on optical excitation is explored in plant, insect, and cultured neuron cell studies. This includes investigating the absorption spectra of test specimen as well as various techniques for physically delivering optical stimulus deep into the cells. Although plants do not contain any neurons, they are equipped with intelligent transport cells that act as neurotransmitters, which rapidly send out signals to the tissue and whole-plant levels by way of ionic mechanisms, much in the same manner neurons do in animals. This work shows encouraging results as MIR light was able to successfully generate action potentials, which can be utilized for sensation inputs or interfaces with followed motion controls.

*This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, as well as MIRTHE, and NSF. Travel funds for the study were provided by the UMBC Office of Undergraduate Education.*

**Expression of the Murine Leukemia Virus CANC Domains of the Gag Polyprotein**

***Alexander D. Emmanuelli****, Deborah Girma*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry

The Human Immunodeficiency Virus (HIV) is a retrovirus that causes Acquired Immunodeficiency Syndrome (AIDS) in humans. The Murine Leukemia Virus (MLV) is a retrovirus that causes cancer in mice. MLV and HIV share a common life cycle and use the same structural proteins. MLV is simpler than HIV, lacking accessory proteins and possessing a smaller genome, making MLV a great animal model for structural studies of the viral structural proteins. The Gag polyprotein is essential to the assembly of new virus particles in both HIV and MLV. Gag consists of three domains; Matrix, Capsid, and Nucleocapsid. Nucleocapsid binds to the viral RNA during assembly and Capsid engages in Gag-Gag lattice interactions but has been shown to play a role in Gag-RNA interaction. Our project focuses on the expression, purification, and concentration of the Capsid and Nucleocapsid domains (CANC). We have successfully expressed CANC in BL21 DE3 E. Coli cells. We have employed a GST fusion tag system to purify CANC followed by cation exchange. While expression of the protein has been successful we are working towards increasing solubility at higher concentrations.

*This research is funded in part by NIH grant R01AI81604 and the Howard Hughes Medical Institute.*

**Vocabulary Acquisition and Retention: An Inner City Profile**

***Kristen R. English***
Jonathan Singer, Associate Professor, Department of Education

At this inner city school, the standardized test scores are below the standards that the staff has deemed as acceptable. The school improvement team's main goal is to raise the test scores on the Maryland High School Assessment tests, and the SAT. Reading and writing are both key portions of these tests, and studies have shown that a rich vocabulary can greatly influence comprehension and composition (Greenwood, 2007, 1). This research project addresses the differences between the more "traditional" techniques of instructing vocabulary and a differentiated instructional strategy. The methodology employed for this study replicates the strategies detailed in the 2008 article *A Differentiated Vocabulary Unit for John Knowles's A Separate Peace*, by Shannon Coulter and Susan Groenke. A comparison between the two techniques was conducted by evaluating both student daily assignments as well as levels of student retention of Tier II vocabulary words.

**Improving Rates of Attendance through Student Awareness**

***Joseph P. Evans, Justin W. Plott***
Jonathan Singer, Associate Professor, Department of Education

The direct correlation between rates of attendance and students' measured performance has led to a concerted effort by teachers and administrators to implement effective strategies that may result in a decrease of absences (LeBlanc, 2005). In order to improve the level of attendance within our classrooms, thus increasing the rate of academic performance among our students, we designed a plan in which student grades were negatively impacted as a result of unexcused absences. At the end of each week we notified every student of his or her overall score and the mathematical influence their attendance had on it. Each week the number of unexcused absences was recorded, and then graphed with the aim of determining the effectiveness of both impacting grades and keeping the students informed of their weekly standing. Our goal was to accomplish nothing less than positively affecting the motivation for students to attend class, ultimately improving overall performance.

**Novel Inhibitors of the Hepatitis C Helicase**

***Nathan Fastman***
Paul Smith, Associate Professor, Department of Chemistry and Biochemistry

Non-structural protein 3 (NS3) plays several essential roles in hepatitis C viral (HCV) replication, making it an attractive target for therapeutic drugs. Our lab has identified and synthesized several novel compounds proven to halt HCV replication at low micromolar concentrations via inhibition of NS3 helicase activity. Determining where the inhibitors bind NS3 is essential in order to design more potent compounds. Accordingly, inhibitor analogs with a photo-reactive substituent will be used as an affinity label in order to identify the NS3-inhibitor binding site. Established methods are being adapted to the synthesis of a photo-reactive analog, which involves an aromatic nitration and subsequent reduction before the resultant amino group can be converted into an azido group. This aryl-azido group is photo-reactive and, upon irradiation with light, will covalently bind the inhibitor analog to NS3. Protease digestion followed by mass spectrometric analysis will be used to identify the amino acids to which the inhibitor bound. With this information, computer modeling will be used to gain a three dimensional picture of the inhibitor-NS3 complex. Rational structural modifications can then be made to increase favorable interactions with the amino acid residues in the binding pocket, providing a new generation of more potent potential drug candidates.

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

**A High-Performance, Low-Power Many-Core Processor for DSP Applications**

***Julian G. Feild***
Tinoosh Mohsenin, Assistant Professor, Department of Computer Science and Electrical Engineering

In recent years there has been an ever-increasing demand for high-performance, low-power hardware for digital signal processing. Many common algorithms for this processing (such as, Fast Fourier Transforms) benefit greatly from a high degree of parallelism, which must be implemented in the processing hardware. The project consists of the design, development and implementation of a specialized many-core processor for digital signal processing, along with the software tools required for programming it. The processor system is coded in the Verilog Hardware Descriptor Language (HDL) and is implemented on a field-programmable gate array (FPGA). My work consisted of the router system to enable inter-core communication as well as the layout and synthesis of the overall design. My work also included the development of a compiler for translating assembly code into binary code to be programmed onto the processor, and the development of an IDE (Integrated Development Environment) to facilitate the writing of the assembly code.

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

**High Throughput Extraction of Phenotypically Altering Genetic Variants in Model Organisms**

***Alyssa Florwick,*** *Thomas A.Peterson*
Maricel G. Kann, Assistant Professor, Department of Biological Sciences

Understanding the manner in which genetic variants alter phenotypes is essential for understanding the molecular mechanisms of disease. It has been shown that insight can be gained into these molecular mechanisms by studying similar variants in homologous genes across species, enabling a myriad of applications to research genetic illness. However, most of the information known about these mutations is buried within the scientific literature and the complexity of harvesting this information from these publications poses a barrier to useful organization of the information. We have developed a semi-automated method to extract phenotype-altering genetic mutations in model organisms from PubMed and database records from online organism-specific resources. Using this tool, we have harvested the desired data from these disparate resources in a format that is more readily available for use in computational methods and that will facilitate the generation of new hypotheses about the molecular mechanisms of biological processes. In collaboration with the Online Mendelian Inheritance in Animals (OMIA), we have coordinated for periodic updates for newly published literature that will be manually reviewed before distribution to the community.

*This work was supported by the National Institutes of Health (NIH) 1K22CA143148 to M.G.K.*

**Storytelling**

***Mabelle Fomundam***
Alan Kreizenbeck, Associate Professor, Department of Theatre

In order to identify what techniques a storyteller should use to bring their story to life, I have drawn comparison between the art of storytelling and the craft of acting. Lessons in acting can be applied to storytelling. For example, the experienced actor knows that the process of playing their character goes beyond knowing how to memorize lines and therefore conducts character-work. Similarly, simply knowing the lines to the story is not sufficient in storytelling. The storyteller needs to go through the process of re-experiencing the story multiple times. Undoubtedly, there are also differences between acting and storytelling that prevent the two from being identical. For example, the actor and the storyteller have two different challenges: The actor deals with the question 'why is this important to my character?' The storyteller answers the question 'what happened', and then connects together the various happenings. As a result, it is important for the storyteller to learn how to graceful make connections between occurrences. At URCAD, I will present original stories to which I have applied different skills, some of which are borrowed from the craft of acting and others that distinguish acting from storytelling.

**Easing the Transition to High School for Freshmen Students through Positive Peer Influence**

***Zachary Francis***
Jonathan Singer, Associate Professor, Department of Education

The transition from middle school to high school can be difficult for students. There are many interventions in place at high schools throughout the country to help freshmen with this. One intervention used in many schools is the "Freshmen Academy." The Freshmen Academy involves scheduling and locating all freshmen classes in a single hallway. The goal of the Freshmen Academy is to increase student attendance based on the idea that because all of the students' classes are close in proximity to one another. This action research examines the effectiveness of the Freshmen Academy in terms of student attendance and student behavior. The action research involved efforts to increase the effectiveness of the Freshmen Academy by incorporating positive upperclassmen influence to increase positive student behaviors, mainly in the hallway environment during the transition between classes. Data sources used to evaluate the impact of this strategy included interviews with teachers, interviews with students, and observations of students. Initial findings support the hypothesis that presence of current high school students hastens the adjustment of middle school students to the high school learning environment, improving both student behavior and attendance.

**The Gray Area: Learning How to Reach Unmotivated Students**

***Lisa M. Fritts***
Jonathan Singer, Associate Professor, Department of Education

The focus of this study to was test how intentionally building relationships toward targeted low-achieving students could affect their motivation and the quality of their class work. The study focuses on eight unmotivated students and follows their progress over the course of four weeks. The first week was strictly for observational purposes and document baseline patterns. The following two weeks involved the treatment of engaging each student daily using positive affirmation for academic achievements and getting to know them personally unrelated to their school performance. Day one of week four each student was individually approached to find out how they were doing personally and how we could create a plan for the week to better their learning experience. Over the course of the four weeks an observation journal was maintained on each student's behavior, participation and class work grades. At the end of the study data were analyzed and conclusions formed based on the recorded progression.

**A Photographic Study of Motion**

***Maxx J. Gaigler***
Steven H Silberg, Lecturer, Department of Visual Arts

Focusing on martial arts, I capture actions of athletes that come and go in fractions of a second. Each image shows movement instinctual to the athlete, yet performed in complete darkness. The only light sources are two strobe lights, which flash repeatedly making each still, transparent image. The major challenge in this research is calibrating the timing and the duration of the flashes with the movements of each athlete to create an aesthetically appealing image. The lights and the athletes go back and forth playing catch up; sometimes the athlete moves too fast for technology to keep up and vice versa. As a photographer, I find the most compelling moments are when the athletes ready themselves and then unleash a burst of energy.

**Long Chain Saturated Fatty Acids Prevent the Decline in Contractile Function Compared to Low Fat Diet in Heart Failure**

***Dionna M. Gamble****, Kelly A. O'Connell*[1]*, James W. Cox*[1]*, Kadambari C. Shekar*[1]*, Wenhong Xu*[1]*, Brad Woodman*[1]*, William C. Stanley*[1]
[1]Department of Medicine, University of Maryland, School of Medicine
William C. Stanley, Professor, Department of Medicine, University of Maryland, School of Medicine

Heart failure (HF) is a leading cause of death in the US. Evidence suggests that non-obesogenic high fat diets can prevent left ventricular (LV) dysfunction and/or improve survival in HF. The mechanisms for this effect and optimal dietary fatty acid composition are unclear. Long chain saturated fatty acids (SFA, 16:0 and 18:0), monounsaturated fatty acids (MUFA, 18:1) and n6-polyunsaturated fatty acids (n6-PUFA, 18:2n6) differentially affect cardiac mitochondria and LV function. This project evaluates effects of diets high in SFA, MUFA, n6-PUFA, or a mixed fat diet (40 percent energy from fat) compared to low fat/high carbohydrate diet (STD, 15 percent energy from fat) on LV function in HF induced by transverse aortic constriction (TAC). Rats subjected to TAC or Sham surgery were randomized to dietary treatment for 16 weeks (n=16-17/group). Echocardiography was performed and animals sacrificed. TAC increased LV mass and chamber size in all groups but was unaffected by diet. TAC decreased LV ejection fraction in STD diet compared to Sham (83±1 percent vs. 48±5 percent) but was prevented by SFA (67±5 percent, $P<0.05$ vs. STD TAC). In summary, high intake of long chain SFA ameliorated the TAC-induced decline in LV function compared to the low fat/high carbohydrate diet.

*This work was funded, in part, by NIH Grant HL 074237.*

**Horror Movies and Emotional Calibration: How Revulsion Heightens Fear**

***Briana Garrett***
Diane L. Alonso, Program Director/Senior Lecturer, Department of Psychology

Horror films, especially grotesque and bloody cinema, are becoming increasingly popular and prevalent. This study examines the two major emotions that horror films prey on, disgust and fear; specifically, how these emotions affect arousal during a short movie clip. Prior research on arousal, fear, and revulsion has focused on advertising appeals. In the current study, 60 participants age 18 and above are recruited from the Universities at Shady Grove. Participants are assigned to one of three conditions: observing a disgust-inducing scene, a fear-provoking clip, or a fear *and* disgust-producing scene. All participants have their heart rate taken, are videotaped, and fill out four self-report questionnaires concerning their arousal level, disgust-propensity, enjoyment of horror films, and what emotions the film generated. Data collected from this research will shed light on the interactive effect of disgust and fear and may contribute to an etiology of mental disorders with this mixed emotion component such as obsessive-compulsive disorder.

**The Integration of the Biological and Psychological Manifestations of Traumatic Brain Injury (TBI)**

***Adam Gerber***
Rachel Brewster, Associate Professor, Department of Biological Sciences; Zoe Warwick, Associate Professor, Department of Psychology

According to the Centers for Disease Control (CDC), 1.7 million traumatic brain injuries occur annually in the United States, killing over 52,000 people. Traumatic brain injury (TBI) is characterized by brain damage caused by a "blow" to the head resulting in the collision of the brain with the skull. These collisions can be a result from falls, assaults, physical strikes and motor-vehicle collisions. Initial research from the journals of *Molecular Neurobiology* and *Cerebellum* revealed cerebellar injury, neuroinflammation, and other cognitive impairments following a blow to the head. From a psychological perspective, research alluded to psychosocial modifications, affecting cerebral executive functions and social behavior of the patient. I hypothesize that these neurobiological events are connected and related to the psychological events that follow specific traumatic incidents to the brain. Investigating both manifestations required an intensive analysis of the literature in Biology and Psychology as well as thorough interviews with medical professionals. Many studies provided evidence for impairments in their respective disciplines; however, no studies found thus far have provided a link between the two pathways. Preliminary results have suggested a causal relationship between both manifestations that need be further investigated.

**Cell Surface Receptors Involved in T-Cell Activation are Down-Regulated in Presence of Tumor in Mice**

***Sanchari Ghosh,*** *Pratima Sinha*
Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

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

*This work was funded by NIH R01CA84232 and RO1CA115880.*

**Fluorescence of Dually Labeled Acrylamide Nanogels**

***Margaret A. Gillan****, Ahmed Gahelrasoul*
Lisa Kelly, Associate Professor, Department of Chemistry and Biochemistry

Previous work has shown that dyes exhibiting a solvent-dependent fluorescence response can be used to probe the local environment of temperature-responsive acrylamide nanogels, which have applications in "smart" packaging and non-invasive temperature sensors. Specifically, benzoperylene monoimides (BPIs) and their derivatives have been found to be appropriate dyes for this application. The fluorescence properties of the BPI dyes have been well characterized. Preliminary work has shown that the fluorescence spectrum of BPI-labeled nanogels changes with temperature. In this work, we demonstrate that 1,8-naphthalimide (NI) derivatives also exhibit a solvent-dependent fluorescence response. In addition, we have investigated the fluorescence properties of a covalently linked BPI-NI dyad, which shows fluorescence (Förster) resonance energy transfer (FRET) from the NI moiety to the BPI moiety. Preliminary energy transfer efficiency has been found to be 0.19. An NI-labeled N-isopropylacrylamide (NIPAM) nanogel has been synthesized and the temperature-dependent fluorescence studied. In addition, this work will characterize FRET in NIPAM nanogels that are dually labeled with BPI and NI. Results from the quantitative temperature dependence of this process will be presented.

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

**HLA-A*29:02 Transgenic Mice as a Model for Birdshot Chorioretinopathy Disease**

***Blen B Girmay,*** *Mary J Mattapallil*[1]*, Rachel R Caspi*[1]
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Mary J. Mattapallil, Laboratory of Immunology, National Eye Institute

Birdshot Chorioretinopathy Disease (BSCR) is a rare form of posterior uveitis manifested as cream colored, round to oval lesions in the eye. Previous research suggests that BSCR is strongly associated with the human MHC class I gene, HLA-A*29:02. The main objective of this project is to study BSCR pathogenesis associated with HLA-A*29:02 using a transgenic (Tg) mouse model generated using patient cDNA. Transgenic expression of HLA-A*29:02 was confirmed at RNA and protein level. Cell surface expression of the transgene was found to be lower than expected. In addition, the incidence of spontaneously developing retinal lesions in these transgenic mice was found to be minimal. Unfortunately, the background strain was later shown to have an inherent mutation in the *Crb1* gene causing retinal degeneration (rd8). Therefore, a new construct was designed to encode a murine:human chimeric MHC class I molecule. This construct will contain sequences that encode the transmembrane and cytoplasmic domains encoded by the MHC class I gene ($H\text{-}2K^b$) for proper anchor of the transgene molecule to mouse cells and the functional domains of human MHC class I (HLA-A*29:02) from BSCR patient, under the murine $H\text{-}2K^b$ promoter for expression in mouse. Studies will be conducted in the future using the new transgenic mouse model of BSCR.

*This work was funded by the Intramural Research Program at NEI/NIH and Bench to Bedside Grant to MJM and RRC from Clinical Center/NIH.*

**Multi-Genre Approach to Critical Thinking**

***Samantha Glass,*** *Shawn Douglas, Shannon Ryan*
Jonathan Singer, Associate Professor, Department of Education

Can applying Universal Design for Learning to composition help all students succeed in critical thinking and abstract expression? Universal Design for Learning has three tenets: present content to students in different ways, differentiate student assessment, and inspire motivation for learning. The traditional approach to assessing critical thinking in English Language Arts is through essays. A multi- genre approach to composition was implemented to assess critical thinking. Baseline data were collected from previous essays and compared to multi genre approaches that utilized the foundations of Universal Design for Learning in grades eight through ten in English Language Arts.

**Analysis of Common Phenotypic Disruptions Between Organisms Using a Protein Domain Framework**

***Scott Goldweber,*** *Thomas A.Peterson*
Maricel G. Kann, Assistant Professor, Department of Biological Sciences

A crucial step in understanding the molecular effects underlying diseases is to identify genomic variations responsible for phenotypic variations. Previous studies have concluded that insight can be gained into the function of a human gene by studying the function of homologous genes in other organisms, i.e., analyzing how the removal of a homologous gene impacts the observable phenotypes. However, specific point mutations might have different effects depending on the position in the gene, a fact that cannot be captured when studying variations at the whole gene level. In previous studies, we have shown that using a protein domain framework enhances the ability to associate phenotypically altering variants in model organisms with human diseases, including cancer and Mendelian diseases. To identify and annotate the phenotypic effect of point mutations, we have developed a method that compares variants between organisms using protein domains. In addition to re-identifying gene-centric results, we have been able to identify novel non-obvious relationships between phenotypic variations in humans and yeast. One of the advantages of identifying these non-obvious similarities between species is that, for instance, information about drug sensitivity in yeast can now be translated into new drug treatments for human diseases.

*This work was supported by the National Institutes of Health (NIH) 1K22CA143148 to M.G.K.*

**Non-invasive Integrated Fluorescence Sensor for Measuring Blood Glucose Levels in the Body**

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

Developing non-invasive tools for measuring concentrations of metabolites, such as glutamine and glucose, is a growing necessity within the medical field. Our previous experiments have shown that dual-fluorescent labeled glucose and glutamine binding proteins can detect micromolar concentrations in samples through fluorescence spectroscopy. Our group found that glucose passively diffuses through the skin. The skin glucose concentration appears to track blood glucose levels. We researched techniques and devices to analyze the skin glucose samples with the fluorescent glucose binding protein as a noninvasive way of measuring medically relevant glucose levels. A previously constructed portable fluorometer has been tested and validated by using typical fluorescent dyes used for protein labeling. The accuracy and drift of measurements were studied experimentally. In addition, we created a sampling device for obtaining the human fluid samples. Specifically, medical silicone has been molded into a sampling patch to be kept in place on the skin with an adhesive. Under the patch, a water solution is introduced to extract the glucose that diffuses through the skin. In the future, a microfluidics approach will be taken to integrate the sampling device and fluorometer so that it can be used in a clinical setting.

*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.*

**Earn Your Wings**

***Anne Gray, Wesley Lok, Kameron Pyron, John Ford, Timothy McFadden, Samuel Parrish, Andrew Yoell***
Marc Olano, Associate Professor, Department of Computer Science and Electrical Engineering

In a rapidly expanding world that is dominated by media, no other industry seems to have grown like the gaming industry. Now more than ever games are rapidly becoming a major source of entertainment, and with this expansion has also come a new art form. Unlike painting or photography, games are a truly interactive art form that aims to allow the user to truly be involved in what they are seeing. *Earn Your Wings* is a single player platforming computer game designed to run on Windows operating systems as well as on the Xbox. Utilizing the latest in computer software and combining it with traditional animation and art-making methods, *Earn Your Wings* aims to fuse the old with the new. Along with the visuals, story elements are also included to make the connection with film and video. All together *Earn Your Wings* aims to provide the user with a fun and beautiful game experience.

*This work was funded, in part, by gifts from Microsoft, Next Century Corporation, Northrup Grumman, NVIDIA, and Zynga, and with guidance by Yuzun Kang and Ben Walsh of Pure Bang Games.*

**Teaching Music Notation Using Music Learning Theory Pattern Instruction versus Traditional Instrumental Methods**

***Ellen L. Green***
Jonathan Singer, Associate Professor, Department of Education

Two fourth grade classes, one consisting of 21 students and the other consisting of 22 students, are to begin learning music notation after aurally practicing the first three songs in the *Recorder Karate* curriculum by Barb Philipak. Most instrumental method books follow a sequence of teaching students to read notation through logical steps that make sense to mathematically minded adults. However, recent research in the development of Music Learning Theory by Edwin Gordon and other members of the Gordon Institute for Music Learning has shown that children understand music syntax and music notation best through pattern instruction. In this method of teaching, tonal and rhythm pattern instruction are initially separated. In this comparison study one class was taught using the traditional instrumental sequence and the other class was taught using Music Learning Theory-based pattern instruction. Instruction occurred over the course of four weeks with one 45-minute lesson each week. Students were assessed for prior music notation knowledge at the beginning of the first lesson. At the end of the fourth lesson, students were given a short piece to perform and assessed based on accuracy.

**Demystifying the "Sea Peoples": Nomadic Tribes and Causes of Migration from Anatolia in the Late Bronze Age**

***Molly Greenhouse***
Esther Read, Lecturer, Department of Ancient Studies; Carolyn Koehler, Associate Professor Emerita, Department of Ancient Studies

The end of the Bronze Age (ca. 1100 B.C.E.) in the eastern Mediterranean witnessed a “catastrophe” of sudden, severe economic decline, political instability, and inexplicable ends to powerful communities in Greece and Asia Minor. One popular theory attributes this to an influx of mysterious foreign pirates or mercenaries – the so-called “sea peoples.” This research investigates the ethnographic identity of the “sea peoples” and the circumstances surrounding the abrupt collapse of the region. It reexamines primary sources, such as late New Kingdom Egyptian military records on which the “sea peoples” thesis is largely based, and combines a more accurate interpretation of these sources with literary, archaeological, and environmental analysis. It discredits the “sea peoples” thesis, proving that these were tribes from Anatolia displaced by political chaos or natural disasters, who were now travelling southward in search of safe places to resettle near Egypt. It also shows that the downfall of many Bronze Age cultures was due to weakening infrastructure and environmental changes. By eliminating the theory that the end of the Bronze

Age was caused by foreigners, we can understand the internal factors that did cause it and begin to analyze the "sea peoples" as tribes native to the region.

## Quilts for Soldiers

***Vicki Greisman***
Kathy Scales Bryan, Senior Lecturer, Department of American Studies; Nicole King, Assistant Professor, Department of American Studies

This study examines the composition and practices of quilting groups that produce quilts for soldiers during wartime. Archived documents, census records and historical studies were used to describe quilting for soldiers during the Civil War, World War I and World War II. The primary method used with current quilters sewing for soldiers was participant-observation research. Two quilting groups were visited in the Baltimore/Washington area. Ten quilt guilds, ten quilting stores, five quilt distribution support groups and two quilt-centric Facebook pages were contacted to identify individual quilters. Interviews were conducted in person and by email with individual quilters. Differences and similarities of quilters and quilt groups were analyzed, including economic status, affiliations, education, age, and racial diversity. The study found that the majority of the quilters are white, middle class women. The profile of these modern quilters does not reflect the diversity found in the metropolitan Baltimore-Washington area. Analysis of the practices of the groups showed that quilting abilities, techniques and materials vary between quilting groups and individuals. Motivation of the quilters varies from expressing patriotism to replacing the anguish of previous veterans with gratitude. Time, money, sewing ability and tools are necessary to enable more variety in the quilting public. The need for quilts for current wounded warriors, and veterans is still present.

## Economical Method of Developing a Short Film

***Deon Griffin***, *Caitlyn Shires*
Fred Worden, Associate Professor, Visual Arts Department

The creative project, a twenty-minute short film entitled *Rex*, uses innovative and adaptive thinking in order to create a visual narrative using limited equipment, location, crew and financial resources. *Rex* revolves around psychiatrist Dr. Gabrielle Allen, who finds herself being consoled by Rex, her new, highly observant child patient. Various creative methods and production techniques were utilized to achieve a result that is both an aesthetic and immersive experience for the audience. These methods include training a small number of untrained actors, designing sets for small empty spaces, working with natural lighting and limiting production time to two days. Making use of the method acting training developed by Lee Strasberg, the people chosen to star in the film were forced to answer surveys, write letters, and act in public as the character they were to play in the film. The lighting design made use of

both natural and artificial sources, which were bounced onto the actor's face using white boards. The project required careful pre-planning and an extensive knowledge of film production techniques to demonstrate that an effective film can be made without extensive resources. It marks an innovative approach to both art and technology that is accessible to a wide variety of individuals.

*This work was funded, in part, by UMBC Visual Arts Department.*

**Umbrella - Charisma as Gameplay in Modern Videogames**

***Steven P. Hart, Shing-Ling Huang, Alisa Burdeyny, Kyle Conway, Thomas Brickwedde, Isaac Sohn***
Marc Olano, Associate Professor, Department of Computer Science and Electrical Engineering

Modern day video games trend towards using complex physics and graphics systems to frame the player experience. The goal of this project is to argue for the effectiveness of charismatic characters paired with uncomplicated gameplay to create an entertaining experience. The likable protagonist is a small Tawny Owl rendered in less than 300 polygons, far below the standard amount of detail in major games ranging upwards of 40,000 polygons per character. The straightforward gameplay uses only two actions in addition to the directions, thus limiting the actions of the player. This project is a success if it accomplishes entertaining and meaningful gameplay with its restricted palate of actions, relying on the projection of a player onto a likable protagonist. The acknowledgement of a successful project will inform the industry that there are many ways to create lasting meaningful gameplay with a limited budget and scope of resources.

*This work was funded, in part, by gifts from Microsoft, Next Century Corporation, Northrup Grumman, NVIDIA, and Zynga, and with guidance by Ben Walsh and Yuzun Kang of Pure Bang Games.*

**Perspective**

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

“INDY” is an extraordinarily personal audio-visual exploration of my soul. It is an attempt to create a representation of myself and my perspective on life. “INDY” is an experiment that explores the extent to which a video project can sincerely represent what was originally envisioned for it. The video is separated into three distinct sections: 1) beauty and consciousness, 2) darkness and the subconscious, and 3) the value of life. To realize an abstract visual portrayal of the mind, I have made use of After Effects, a video processing software suite, to manipulate video images from my personal library into visually spectacular representations of the mind. Visuals range from beautiful landscapes from Puerto Rico’s El Yunque rainforest and the Smokey Mountains of Tennessee, to the chemical plants and underground music scene of Baltimore, and are presented in a non-narrative, but systemic temporal structure. Each sequence is

composed of contrasting and morphing elements juxtaposed from a variety of different shots, then arranged within a three-dimensional space into a series of truly unique synthesized visualizations. The abstract video, with its original music, uses non-language based communication to elicit viewer responses. Working with sound-picture relationships, the video attempts to evoke an emotional response equivalent to the dynamic sensations one experiences traveling through the journey of life.

## A Mathematical Model of Melanopsin Activation

***Kevin Herold, Drew Thatcher***
Hoffman Kathleen, Professor, Department of Mathematics and Statistics;
Robinson Phyllis, Professor, Department of Biological Sciences

Melanopsin is a photopigment found in intrinsically photosensitive retinal ganglion cells (ipRGCs). Melanopsin is involved in non-image forming responses, including the pupillary light reflex, circadian rhythm regulation, and light related disorders such as seasonal affective disorder. A mathematical model was developed to describe melanopsin's activation using the law of mass action to translate the chemical cascade, from G-protein activation to the opening of ion channels, into a system of differential equations to be solved using MATLAB. The solution was fit to whole-cell patch clamp recordings of ipRGCs and to calcium imaging readings taken from human embryonic kidney (HEK) cells. An analysis of the sets of model parameters that represent the best fit of the model to the regressions suggests that, for both the HEK cell and the ipRGC response, the rate of melanopsin isomerization by light, the first step in the cascade, and the rate of ion channels opening, the final step, are the rate limiting steps. Additionally, a sensitivity analysis reveals that the same parameters that are most sensitive for the model in ipRGCs are most sensitive for the model in HEK cells. These results suggest that the HEK environment does not change fundamental aspects of the phototransduction cascade.

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## Lights, Camera, Motion, Action: The Dance Application of Microsoft's Kinect and Intelligent Stage Lighting

***Thomas A. Hervey, Aneep S. Bindra, Zachary B. Hullihen***
Marc Olano, Associate Professor, Department of Computer Science; Carol Hess, Department Chair, Department of Dance

In the last few years, Microsoft has allowed individuals to create open-source software for their Xbox Kinect, to extend the development and creativity of the device's infrared camera system. Our research created software allowing a Kinect to talk to intelligent stage lighting, which could then be applied to a live dance performance. Two major software components, including our own light controller and a library,

linked the devices with basic instructions to control all of a light's capabilities. Once a link was created and basic gestures were recognized, we brought in dance students to practice and make adjustments as well as choreograph a routine for a performance. We provided a basic system for Kinect recognition and static lighting effects. Further implications could include programming dynamic lighting effects, or daisy-chaining multiple lighting fixtures. This project is important to the performing arts community because dance performances will have another creative lighting tool, and to Computer Science because it creates open-source software, allowing anyone to learn from, use, modify and expand upon our project.

*This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, and our mentor Carol Hess through a Department of Dance grant.*

**Parametric Study of a Precise Heating and Cooling Technology Applicable to Microchannel Flow**

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

We are evaluating a pre-commercial device concept suitable for microscale heating and cooling. Our laboratory has already built and demonstrated several related versions each able to establish a different pattern of nonlinear temperature variation, for example, in the temperature of a fluid flowing through an embedded microchannel. The desired variation in temperature is achieved through interleaving a thin comb-like metal structure with insulating polymeric material to produce nonhomogeneous conduction. A constant temperature source heats the device on one side of the microchannel and a constant temperature sink is used to maintain a lower temperature on the opposite side of the microchannel. Suitable metal structures can be obtained using conventional lithographic technologies. In recent months, we have been using COMSOL Multiphysics 4.1 to study and predict the influence of comb tooth width, height, and spacing on the effective thermal properties of various patterns. Based on available data, it should be possible to achieve cyclic heating and cooling at frequencies exceeding 5 Hz and rates exceeding 100C/mm. As proof of feasibility, we are currently preparing to build and demonstrate a prototype able to meet these requirements given a source held at 100C and a sink held at 0C.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC.*

**Ozone Treatment of Tetracycline Antibiotics: Transformation Kinetics and Removal in Water/Wastewater Matrices**

***Zachary Hopkins***
Lee Blaney, Assistant Professor, Department of Chemical, Biochemical and Environmental Engineering

The transformation kinetics of five tetracycline antibiotics (i.e., tetracycline, chlortetracycline, rolitetracycline, doxycycline, and oxytetracycline) with ozone was studied. Recently, concerns relating to the fate of antibiotics in the environment have increased due to ongoing toxicological and ecological studies. Antibiotics represent a unique threat to humans and ecological health due to the potential for

development of antibiotic resistance. The method employed here treats tetracycline antibiotics using a concentrated aqueous ozone solution (~16 mg/L as $O_3$), which is generated by bubbling gaseous ozone into deionized water. The aqueous ozone was dosed into various samples ranging in pH from 2-9 to determine the reaction kinetics of tetracycline transformation by ozone. The apparent second order rate constants for tetracycline transformation by ozone ranged in magnitude from $5\times10^4$ to $10^6$ $M^{-1}s^{-1}$. While pH affects the reaction kinetics of tetracycline transformation by ozone, a variety of water quality parameters including alkalinity and natural organic matter (NOM) influence the overall transformation of tetracycline during water and wastewater treatment. For that reason, the overall impact of water quality on the transformation efficiency for select tetracycline antibiotics was investigated using synthetic, surface, and wastewater sources. The results provide evidence that even in solutions exhibiting a high ozone demand, transformation of tetracycline antibiotics is effective.

*This work was funded, in part, by a travel award from the UMBC Office of Undergraduate Education.*

**The Correlation between the Level of Performance and Classroom Outlook and Self-Efficacy**

***Yoshiaki Horiguchi***
Jonathan Singer, Professor, Department of Education

Do progressing students tend to have a more positive classroom outlook and higher self-efficacy? In this research, I evaluated the correlation between students' level of musical performance and their classroom outlook. In addition I evaluated the correlation between students' level of musical performance and their musical self-efficacy (self-image). I began to determine both correlations by administering performance-based tests to track each student's level of performance. I then surveyed both classes on their classroom outlook and their musical self-image. I provided extracurricular musical training to a few students to improve their level of performance and resurveyed the class on their classroom outlook and musical self-image. My hypothesis was the higher the student's level of performance, the more positive their classroom outlook and their musical self-image will be. This research was done within the band and orchestra classrooms at the middle school level. This research affects the classroom management strategies used by music teachers in any school and may inspire research that investigates the same correlation in other content area classrooms.

**Development of a Low-Tech Process for Treating Bacterial Contaminants in an Unprotected Spring in Isongo, Kenya**

***Dalton Hughes, Chris Mullen***
Lee Blaney, Assistant Professor, Department of Chemical, Biochemical, and Environmental Engineering

Approximately 760 million people do not have access to clean drinking water; a disproportionate amount of those people are located in Sub-Sahara Africa. High chemical and bacterial contaminant levels in drinking water may cause a myriad of health complications. The small community of Isongo, Kenya lacks

clean drinking water for its 500 residents. The residents currently retrieve water from an unprotected spring located roughly 20 minutes away. In January 2013, the UMBC Chapter of Engineers without Borders (EWB-UMBC) travelled to Isongo to assess the current water quality and interview community members that use this water source. Results from the water quality tests reveal high levels of nitrogen and phosphorus. The stream is also contaminated with high levels of indicator organisms and tested positive for fecal and rapid coliforms. Interviews indicated that most children suffer from dysentery and a high prevalence of other waterborne diseases. Residents also expressed an interest in receiving information on topics of sanitation and hygiene. We are currently developing an inexpensive and low-tech method for the removal of these contaminants from the water source. The results of these studies will result in a treatment system that will help to improve the overall health of the Isongo population.

**Quantitative Profile of Astrocyte Morphologies in 2D and 3D Environments**

***Dalton Hughes,*** *Swarnalatha Balasubramanian*
Jennie Leach, Associate Professor, Department of Chemical, Biochemical and Environmental Engineering

Astrocytes deliver a wide range of supportive activities for neuronal functions including nutrient provision and establishing homeostasis. However, injury to the central nervous system results in an astrocytic response that inhibits the regenerative process by forming a glial scar. The glial scar is a physical and chemical barrier to nerve regeneration. We propose that biomaterials can be designed to mollify activated astrocytes while promoting neuronal regeneration. Using cells derived from the postnatal mouse cortex, astrocyte morphologies were characterized in both two-dimensional (2D) and three-dimensional (3D) microenvironments by a panel of protein markers and immunofluorescence imaging. Findings suggest that culturing astrocytes in three-dimensional matrices allows the cells to respond in a way that more closely resembles the *in-vivo* morphology. The results of this study will identify the required biomaterial parameters needed to produce physiologically relevant astrocyte morphologies.

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**A Comparison of Songs in the Critically Endangered Florida Grasshopper Sparrow (*Ammodramus savannarum floridanus*) and the Eastern Grasshopper Sparrow (*A. s. pratensis*)**

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

The Florida subspecies of the Grasshopper Sparrow is the most critically endangered of the subspecies in North America. There is a need to be able to discriminate birds of the morphologically similar Florida and

eastern subspecies residing in the same habitat until early May. We investigated whether these subspecies might be distinguishable based on song. We measured the frequency and duration of several components of the principal advertisement song, which consists of four short notes followed by a longer, rapidly amplitude modulated ("RAM") sequence, in turn followed by a final note. We compared these measurements across subspecies, including a population of eastern birds in Georgia that is geographically distinct but only 525 km from the Florida subspecies. We found that the duration of the introductory portion of the RAM sequence was longer, the frequency of the song's last note and peak frequency of the RAM sequence was lower, and the bandwidth of the RAM sequence smaller in the Florida subspecies than in the eastern subspecies. We also found population-level variation within the Florida subspecies songs, suggesting that acoustic characters may be useful in distinguishing among populations as well as subspecies.

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

**Detection of a Fatal Reo-like Virus among Blue Crabs on the Northeastern U.S Coast**

***Erica Igwacho****, Emily Flowers, Ammir Hanif, Vincent Carbone*
IMET - University of Maryland Center for Environmental Sciences
Eric Schott, Assistant Professor, IMET - University of Maryland Center for Environmental Sciences

The Blue Crab (*Callinectes sapidus*) is found throughout the North Atlantic Coast, and is considered both iconic and economically essential. This research focused on the infectious Reo-Like Virus (RLV), fatal to blue crab, using molecular methods to detect and quantify the double stranded RNA genome of the virus. The method involved total RNA extraction and amplification of viral RNA using Reverse Transcription - quantitative Polymerase Chain Reaction (RT-qPCR). Prior to RT-QPCR, primers were mixed with crab RNA and heated, a unique addition to our process referred to as the Heat Step. The Heat Step dissociates the dsRNA, allowing primers to anneal to RNA strands, and primes first strand DNA synthesis. The heat step increases the sensitivity of the RT-QPCR assay by 1000x-fold. Detection of the Reo-Like Virus (RLV) is reported by analyzing melting temperatures and amplification cycles. Analysis of crabs from Barnegat Bay, NJ depicts the overall RLV prevalence to be about nine percent. According to previous records, the crabs analyzed from the Barnegat Bay are the furthest north the RLV has been observed. Winter and summer temperatures have risen by half a degree Celsius in recent decades allowing us to proposal that as waters warm RLV may become more prevalent.

*This work was funded through an Undergraduate Research Internship from the NOAA-Living Marine Resource Cooperative Science Center and a travel award from the UMBC Office of Undergraduate Education.*

**Losing Attendance in School**

***Taylor O. Jenkins***
Jonathan Singer, Associate Professor, Department of Education

The purpose of this research was to address the issue of whether extrinsic rewards, extrinsic rewards with the addition of intrinsic rewards or neither had an effect on the attendance of students. Utilizing one A-day class and one B-day class, I was able to have one control group and one treatment group. Both classes were given a survey to complete as to what prize they found most exciting. They were both told that whoever had the best attendance would win the prize. The A-day class (control) only had the extrinsic reward, while the B-day class (treatment) was given an added intrinsic motivation as to why they should increase their attendance. The B-day class was consistently reminded that what they were doing would allow their school to obtain additional funding by having exemplary attendance

**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 the NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and a grant to UMBC from the Howard Hughes Medical Institute through the Precollege and Undergraduate Science Education Program and the mentorship of Ian Thorpe.*

**Evaluating the Impact of Guest Speakers in the Foreign Language (Spanish) Classroom**

***Gabriela C. Joseph***
Jonathan Singer, Associate Professor, Department of Education

Students often ask themselves “Why do I need to learn Spanish? I am not going to use it!” As a result, student performance in foreign language classrooms is low, mostly because they do not have an intrinsic motivation to learn a second language. To address this issue, I invited bilingual guest speakers to my classroom. These professionals were able to share their experiences using Spanish in the workplace, showing students that even a basic command of Spanish is useful in everyday life and in the workforce. Students’ motivation to learn a second language was assessed through the use of questionnaires. Responses were analyzed to determine the impact of the guest speakers. Results indicate that students’ motivation to learn Spanish increases as they become aware of real world applications and opportunities afforded by knowing a second language.

**Song Type Patterning and Song Output in Grasshopper Sparrows *(Ammodramus savannarum)***

***Ki Jung**, Mary Willard*
Bernard Lohr, Assistant Professor, Department of Biological Sciences

We investigated patterns of song type use, as well as overall song output in Grasshopper Sparrows (*Ammodramus savannarum*). Grasshopper Sparrows produce two classes of song; buzz song, and warble song. Twenty-five long-term autonomous recording units (ARUs) were deployed in order to record the songs of males in a restored population at the Chester River Field Research Station during the summer of 2012. Twenty of these units were programmed to record from 04:00 - 10:00 EDT (6 hours/day) to capture the major singing peak of individual males in the population. Another five ARUs were operated for 18 hours/day (04:00 - 22:00 EDT) to record all songs sung by Grasshopper Sparrows at those locations throughout the course of the day. Digital sound files were analyzed using the Syrinx sound analysis software. We counted the number of buzz, warble, and combined songs produced, and mapped these onto specific periods of the female breeding cycle (egg-laying phase, hatching, etc.). Birds gradually transitioned from buzz to warble song throughout each cycle. We also found that males had variable song output, suggesting that this song feature might be available for females to use in selecting either pair mates or extra-pair mates.

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

**Assessing the Affective Component of Pain in Rats**

***Shana Kadavil***
Ke Ren, Professor, Vanessa Anseloni, Assistant Professor, Department of Neural and Pain Sciences, School of Dentistry, University of Maryland, Baltimore

Pain can be assessed through the aspects of hyperalgesia based on the factors of anxiety, risk assessment, withdrawal from noxious stimuli, and locomotion. Experiments were conducted to analyze the effect of inflammation on affective behavior and determine if there is a correlation between pain and anxiety. Noxious heat was applied to the plantar surface of the rats' hind paw in order to measure the withdrawal latency. Complete Freund's adjuvant (CFA), an inflammatory agent, was injected into the rat's paw. Zebularine, an anxiolytic agent, was injected at the L4-5 region of the spinal cord through an epidural approach. An inflamed rat paw resulted in shorter withdrawal latency to the stimulus due to the intense pain from the CFA. The rat was placed on the maze to assess the behavior. The rats that are anxious when placed on the maze tend to stay in the enclosed arms. After zebularine was given, the rats spent more time in the open arms of the maze, suggesting decreased anxiety. However, the rat spent more time in the enclosed arms after CFA, lacking interest to explore the new environment. Thus, CFA increased anxiety due to the severity of the pain, indicating increased anxiety associated with inflammatory hyperalgesia.

*This work was funded, in part, by the University of Maryland Baltimore Foundation and NS059028 grant.*

**Tanagra Figurines: The Role of Women in Ancient Greek Society**

***Henry A. Kahl***
Esther Doyle Read, Adjunct Professor, Department of Ancient Studies

Tanagra figurines were produced from the late fourth century BCE into the mid third century BCE, primarily in the town of Tanagra in the Northern Biotia region of Central Greece. These mold-cast figurines depicted full figures of women in everyday attire. The UMBC Spiro artifact collection contains two Tanagra female figurine heads. Detailed research into Tanagra figurines of comparable age and geographic location has suggested the possible appearance of the Tanagra figurine fragments within the Spiro collection before the heads were separated from the bodies. Artifact reconstruction is a part of archaeological interpretation that enables us to expand the interpretation of the objects beyond a restrictive functional analysis and be able to view them as having culturally constructed meanings. The majority of the Tanagra figurines have been found in graves and within places of worship. However, others have been found within households. The reconstruction of these figurines helps to allow for the interpretation of the role of women in Ancient Tanagra. The interpreted role played by these figurines also allows for analogies in interpreting the role of women in other nearby regions of Ancient Greece.

**Integrating Dance & Math: How can Dance be used to Help Students in Math?**

***Josephine N. Kalema***
Jonathan Singer, Associate Professor, Department of Education, UMBC

Many studies have been done to improve math scores, such as interventions with students, offering additional assistants, and taking pre-exam classes. This research explores a new way of improving math scores by teaching math through dance. Researchers have determined that integrating subjects allow students to further develop an understanding for both subjects. In this research project, students were involved in dance activities that also included geometry concepts such as reflections, angles, translation, and patterns. In this research we measured the students understanding of vocabulary and seeing if they can comprehend the relationship between the terms in dance and in math. Physical demonstration were taught to the students and an evaluation was given to see if the students comprehend the material. The evaluation consisted of combining vocabulary with defining, matching vocabulary with pictures, and then having the same concepts in a math worksheet.

**Identification of a Potential cis-Regulatory Module of *pax-3* in *Caenorhabditis elegans***

***Christine Y. Kang, Kenneth W. Thompson***
David M. Eisenmann, Associate Professor, Department of Biological Sciences

In vertebrates, the Paired-Box (PAX) family of genes plays key roles in embryogenesis, specifically in processes such as stem-cell proliferation, cell type specification, and cell regionalization. In the invertebrate model species *C. elegans*, the *pax-3* gene has been identified as a homolog of the PAX3/7 class of genes. As in vertebrates, *pax-3* functions in cell fate specification in a subset of epithelial cells of the embryo. In this project, we sought to identify a potential cis-regulatory promoter fragment that is necessary for *pax-3* expression in *C. elegans* embryos. Using serial deletion of the *pax*-3 promoter, a series of *pax-3* promoter GFP reporter constructs were created and analyzed for reporter expression in transgenic embryos using fluorescence microscopy. We were able to identify a 517 base pair fragment that is necessary for *pax-3* embryonic expression. Further analysis allowed us to isolate a 284 base pair subfragment that is sufficient for the expression of *pax-3* in embryos. This small fragment can be used in future work to help identify the transcription factor(s) that bind to this region to regulate embryonic expression.

*This work was funded, in part, by NSF grant IBN-0131485 and NIH grant GM65424.*

**A Rat's Brain on Cannabis: Sub-Chronic Treatment Produces Conditioned Tolerance to its Dopamine-Increasing Effects**

***Madhu Karamsetty***
Erik B. Oleson, Joseph F. Cheer, Assistant Professor, Department of Anatomy and Neurobiology, University of Maryland, Baltimore School of Medicine

Cannabis is the most commonly abused illicit drug in the United States. Similar to all drugs of abuse, cannabis increases dopamine concentrations in terminal regions of the brain’s mesolimbic pathway, such as the nucleus accumbens. Increases in nucleus accumbens dopamine mediate the positive reinforcing/rewarding properties of abused drugs and may be altered during the transition to dependence. According to the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV), developing tolerance to effects of cannabis is a key feature of cannabis-dependence, occurring in the majority of individuals who use cannabis chronically. In this study we investigated whether repeated cannabinoid administration produces conditioned tolerance to its dopamine increasing effects. Rats were repeatedly treated with either vehicle or a synthetic cannabinoid (WIN-55-212-2) using an escalating dosing approach (0.2-0.8 mg/kg IV over nine treatments) before dopamine release was assessed in either a drug-paired or a novel environment. Preliminary data suggest that tolerance develops to the dopamine increasing effects of cannabinoids, an effect susceptible to Pavlovian conditioning. Specifically, cannabinoids were least effective at evoking dopamine release when cannabinoid-treated rats were assessed in the drug-paired environment.

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**Democracy and Peace Reconsidered**

***Jacob Keener***
Cynthia Hody, Associate Professor, Department of Political Science

The purpose of this research is to examine the historical evolution of democracy and to determine whether or not democratic states are less likely to go to war than non-democracies. It is often thought by both politicians and scholars that democracy and peace naturally complement each other. The idea that democratic states are inherently more peaceful than non-democracies is referred to by International Relations (IR) scholars as the democratic peace theory. While there has been substantial research into the behavior of states in times of war and peace, there has been little IR research that inquiries into the nature of democracy itself, and the field could benefit from a more nuanced understanding of democracy. Through this research I compared the practice of democracy throughout modern history to the predictions of democratic peace theory. I found that the peace that exists between democratic states is best explained by complex social and historical factors they have in common rather than the mere presence of democracy. This question is of relevance because, while democracy is the dominant form of government worldwide, many policymakers hold an overly simplistic view of how being democratic affects states' behavior on the world stage.

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

**Analysis of the Epigenetic Regulator Polycomb and its Role in *Volvox carteri* Cell Differentiation and Multicellularity**

***Salar Khaleghzadegan,*** *Jose Ortega*
Stephen M. Miller, Associate Professor, Department of Biological Sciences

The evolution of multicellularity remains one of the least understood biological phenomena. The volvocine green algae are an ideal model for studying this process because they contain unicellular and multicellular species, including *Chlamydomonas reinhardtii* and *Volvox carteri*, that have diverged recently and are good models for molecular genetic analyses. *Volvox* possesses two cell types—somatic and reproductive—and mutations at a single locus (*regA)* cause the Reg (Somatic Regenerator) phenotype, in which somatic cells behave much like *Chlamydomonas* unicells. *regA* encodes a transcription factor (RegA) that has homologs in other species. A plant RegA homolog is part of a trithorax group (trxG) complex. TrxG complexes activate gene expression and counteract the repressive activity of Polycomb group (PcG) proteins. We hypothesize that RegA also functions with a trxG complex, and that since trxG and PcG complexes work in opposition to each other, it should be possible to suppress the Reg phenotype of *regA* mutants by inactivating one or more PcG genes. To test this hypothesis we have generated RNAi (gene knockdown) constructs for two different *Volvox* PcG genes and will transform them into a *regA* mutant. Here we report an analysis of the phenotypes of transformants that express the RNAi constructs.

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**Effect of GsMTx4 on Mouse Urinary Bladder Smooth Muscle (UBSM) Contractility**

***Zulqarnain Khan**, Thomas M. Suchyna[1], Fred Sachs[1], Andrea L. Meredith*
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Andrea L. Meredith, Assistant Professor, Department of Physiology, University of Maryland School of Medicine

Urinary incontinence is a common problem with limited treatment options. Stretch-activated channels (SACs) enhance UBSM excitability, and have been proposed as a novel target for reducing overactive bladder. The goal of this study was to determine whether an inhibitor of SACs (GsMTx4) decreased UBSM contractions in wild-type (WT) and BK KO (*Kcnma1-/-*) bladders, a mouse model for urinary incontinence which harbors a deletion of the BK $K^+$ channel. GsMTx4 was applied to isolated UBSM strips at 0.1-10 μM and spontaneous (phasic) and nerve-evoked (EFS) contractions were investigated using isometric tension recordings. As expected, baseline BK KO contractile amplitudes were significantly larger than WT. Application of 5 μM GsMTx4 induced a smaller reduction in BK KO phasic amplitude than in WT (KO: -12 ± 0.22 percent, WT: -31 ± 0.04 percent), and reliably decreased phasic frequency in BK KO strips (KO: -14 ± 9 percent, WT: +11 ± 4 percent). Additionally, 10 μM GsMTx4 suppressed EFS evoked contractions (10 Hz amplitude, BK KO: -19 ± 12 percent, WT: -4 ± 1 percent). This data suggests that GsMTx4 may be effective at reducing spontaneous and nerve evoked contractions in overactive UBSM, while having a limited effect on normal UBSM.

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**The Effects of an L4 Loop Deletion on Lon Protease Activity and CpsB Regulation in *Escherichia coli***

***Maithri Kondapaka***
Lasse Lindahl, Professor, Department of Biological Sciences; Janice Zengel, Senior Research Scientist, Department of Biological Sciences; Md. Shamsuzzaman, Department of Biological Sciences

The synthesis of capsular polysaccharides in *Escherichia coli* involves the concerted efforts of three main proteins: Lon protease, RcsA, and CpsB. When Lon protease, a protein cleaving enzyme, is present at higher concentrations, it degrades RcsA, a transcriptional regulator. This prevents the activation of CpsB synthesis as well as the subsequent formation of capsular polysaccharide by the CpsB enzyme. The opposite is true when Lon is present at lower concentrations. However, when Lon protease activity is significantly down regulated, excess polysaccharide production can result in mucoidicity, an accumulation of capsular polysaccharides. Previous studies have shown that a loop deletion in the L4 ribosomal protein results in a similar phenotype. Preliminary experiments suggest that there is a connection between the L4 loop deletion and Lon protease regulation. In this study, the *cpsB* gene was paired with the *lacZ* gene to

quantify the amount of Lon protease activity in the presence of the L4 loop deletion and to confirm whether the deletion is connected with Lon protease down regulation. An understanding of how the deletion affects Lon protease can not only elucidate the extra-ribosomal nature of L4, but can also elucidate the mechanisms by which *E.coli* builds its outer capsule.

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

**Do You See What I See?: Self-Partner Agreement for Disengaged and Engaged Behavior During Couple's Communication**

***Sam Kott***
Robin A. Barry, Assistant Professor, Department of Psychology

In romantic relationships, disengaged and avoidant behavior between partners can have a negative effect on the quality of couple's communication and, in turn, the relationship as a whole. This effect can be further amplified when partners do not agree with one another on the extent of their disengagement (e.g., when a spouse perceives their partner to be more disengaged than the partner perceives themselves). Disengaged behavior is likely to be less observable than engaged behavior because partners may disengage by, for example, changing the subject or engaging in another topic or activity. This study was conducted to determine if self-partner agreement for disengaged behavior is lower than self-partner agreement for engaged behavior during couple's communication. Sixty couples participated in two problem-solving discussions, and individually completed measures of their own and their partner's engaged and disengaged communication behavior following each discussion. We expected that husbands' and wives' agreement about disengaged behavior would be lower than their agreement about engaged behavior. Analyses did not support the hypothesis. Husbands and wives showed similarly high self-partner agreement for both engaged and disengaged behavior. This research advances the understanding of how couples experience problem-solving communication and may inform couple therapists' efforts to improve couple's communication.

**The Effects of Virtual Reality Distraction and Background Noise on Pain Tolerance in College Students**

***Kristen R. Kreider, Samantha M. Braatz,*** *Julia A. Zeroth, Antonia N. Jankowiak, Nicole A. Magin, Rachel M. Nicholson, Sydney J. Baker, Chelsea R. Meh, Andrea S. Owusu-Sekyere*
Lynnda M. Dahlquist, Professor, Department of Psychology

Studies have shown that adults demonstrate significant improvement in pain tolerance when distracted. Virtual reality distraction using a head-mounted display (HMD) helmet is an emerging distraction pain management technique that has been shown to reduce pain in children and adults undergoing painful medical procedures. However, the additional benefits of the virtual reality helmet have not yet been supported conclusively in the literature. The present study examines whether delivering videogame distraction through the use of an HMD helmet provides better improvement in pain tolerance than delivering videogame distraction via a television screen, especially when background noise is present. A sample of UMBC students underwent three trials in which they placed their hand in uncomfortably cold

water--a baseline trial and two video game distraction trials (one using an HMD and the other with the videogame on a television screen). Half of the sample was exposed to an unpredictable background noise. A mixed design analysis of variance was conducted to examine the effects of the distraction intervention on pain tolerance and pain intensity in the presence and absence of background noise. Results indicated that distraction using the HMD was more effective in increasing pain tolerance, regardless of the presence of background noise.

**Ethnic Differences in Gender-Role Attitudes**

***Catherine E. Krynick***
Nicole Else-Quest, Assistant Professor, Department of Psychology

Gender-role attitudes are culturally-constructed beliefs and expectations about the roles and behaviors of men and women. Traditional – in contrast to egalitarian – gender role attitudes are held by individuals who endorse conservative, often stereotyped, ideas about men and women. Very little research has examined how attitudes about the roles of men and women might vary across ethnic groups. Thus, the purpose of this study is to examine ethnic differences in gender-role attitudes. Over 350 individuals from four major ethnic groups (African American, Asian American, Latino/a, and White) participated in this study. Participants were recruited from high schools in the School District of Philadelphia. Participants completed mail-out surveys and were compensated for their participation. Surveys included the Traditional-Egalitarian Sex Role scale (TESR; Larsen & Long, 1988), which assesses Gender-Role Attitudes. It contains 20 items, each rated on a five-point scale from strongly agree to strongly disagree. High scores indicate egalitarian attitudes and agreement with statements such as "It is just as important to educate daughters as it is to educate sons." Data are analyzed with a one-way between-subjects analysis of variance to determine whether there are significant differences in gender-role attitudes across the four ethnic groups.

*This work was funded by National Science Foundation grant 1153678 to NEQ.*

**The Influence of Social Anxiety Symptoms on Perceptual Bias during Couple Conflict**

***Karah Kuczarski***
Robin Barry, Assistant Professor, Department of Psychology

Individuals higher in social anxiety have less adaptive social functioning often leading them to negatively evaluate their own behavior during social interactions. Further, they tend to interpret ambiguous, interpersonal events with a more negative and threatening bias. Nevertheless, previous research has only examined interactions between socially anxious individuals and stranger confederates. Thus, it remains unclear whether socially anxious individuals' biased perceptions of interactions extend to romantic relationship partners. It is widely established that a negative perceptual bias of romantic partners is associated with relationship distress. The present study, therefore, examined whether individuals higher in

symptoms of social anxiety tend to have biased perceptions of their own and romantic partners' behavior during interactions characterized by threat or distress. Research questions were assessed using 60 newlywed couples' questionnaire assessments of their own social anxiety symptoms and their own and partners' communication behavior following relationship-based conflict discussions. Results indicated that husbands, but not wives, who were more socially anxious had a more negative bias of their own behavior during conflict interactions. Findings demonstrate that symptoms of social anxiety may contribute to interpersonal biases that influence couples' communication and relationship functioning.

**The Culture in Linguistics: How Language Colors Childhood Imagination**

***Hannah Kurlansky***
John Stolle-Mcallister, Assistant Professor, Department of Modern Language, Linguistics, and Intercultural Communication

Though communication is often thought to be transparent, language is closely related to culture and inherently conveys societal differences. This research examines the relationship between language and perception, specifically the role in imagination and artistic creation of bilingual children. I wrote the text of a children's book using simple vocabulary in both English and Spanish, then asked bilingual children to illustrate the sets of texts. The meaning of the text remained the same, yet the different languages evoked different illustrations from the students. Though many factors may have contributed to the differences, I am exploring language as a principal influence. An analysis of the pictorial differences and similarities demonstrates the possible influence of language on interpretation and artistic output.

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

**Speaking for Whom: Authenticity and Vocal Performance in *Invisible Man***

***Hannah Kurlansky***
Dr. DiCuirci, Assistant Professor, Department of English

This research examines Ralph Ellison's novel *Invisible Man* in terms of the relationship between authentic identity and personal expression. Previous scholars most commonly examine the novel for its racial and social implications, but I believe the most profound relationship is the dynamic exchange established between narrator and reader. I use critical race theory, performance theory, and deconstructive theory to analyze the narrator's role within the text and with the reader. The narrator's use of direct address, juxtaposed with the concealment of relevant plot information challenges the traditional reader-narrator relationship by suggesting that all communication can be viewed as a performance rather than authentic expression. The reader's experience with the text follows the protagonist's journey as both learn to

question vocal authority and social identities. Ultimately the narrator calls upon the reader to recognize him and his narrative as an authentic experience rather than a performance. However, only with the reader's disregard as an inauthentic performance can the narrator maintain his self-proclaimed position as an invisible man, challenging his entire notion of invisibility. My research into the textual awareness of vocal performance in the reader-narrator relationship provides a framework through which to read other first-person narratives featuring socially marginalized protagonists.

**Expression of Opsin in the Eye of the Crayfish *Procambarus clarkii***

***Shelly Lai**, Alexandra Kingston*
Thomas W. Cronin, Professor, Department of Biological Sciences

The visual system of the crayfish *Procambarus clarkii* consists of a pair of reflecting superposition eyes that use visual pigments to detect light in order to sense and perceive the animal's surroundings. A visual pigment is comprised of an opsin protein covalently bound to a Vitamin-A derived chromophore. In *P. clarkii*, visual pigments exist in the membrane regions of photoreceptor cells in the retina called retinular cells. The goal of this project is to visualize the expression of the middle wavelength opsin in retinular cells of *P. clarkii* using *in situ* hybridization. To achieve our goal, we used *P. clarkii* retinal sections and RNA probes to determine the expression pattern of the middle wavelength sensitive opsin. We hypothesize that the middle wavelength sensitive opsin will be present in the retinular cells that build the photosensitive microvilli in the retina of *P. clarkii.* Future work includes *in situ* hybridization experiments to localize expression of the middle wavelength opsin in the nerve cord and also of a putative short wavelength crayfish opsin in the retina and nerve cord.

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**Multiple Imputation Analysis of Cognitive Differences in Schizophrenia Subgroups Compared to Controls**

***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

Multiple imputation is a method used in statistical analysis to estimate any missing values from a dataset, using the Markov Chain Monte Carlo method. This process was applied to a dataset examining differences in neuropsychological impairments among two subgroups of schizophrenia patients and a control group. A

collection of 26 neuropsychological tests, which were grouped into eight different cognitive domains, were administered on the subjects. Cohen's D statistics were then calculated to determine the magnitude of difference in neurocognitive scores between the three groups of patients across each domain and individual test scores. The ultimate goal was to compare the potential improvement in estimation of the Cohen's D statistic upon imputation. Exploratory analysis was conducted in the distribution of standardized imputed values. Variation between the schizophrenia subgroups was largest in processing speed and smallest in working memory. Both subgroups were markedly impaired in comparison to the control. Multiple imputation increased precision on the Cohen's D statistics and reduced potential bias due to missing data.

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**Can Technology be used by Classroom Teachers to Reduce Office Referrals**

***Sarah Lang**, Chad Shaffer, Scott Sorensen*
Jonathan Singer, Associate Professor, Department of Education

Are teachers able to combat against students using personal electronic devices in their classrooms? Some high schools today are letting students bring their own personal devices such as iPods, MP3 players, and Smart phones for nonacademic purposes. School officials are allowing students to use these devices to listen to music during certain times of the day in order to help lower referral rates for minor offences. Many teachers are currently fighting a losing battle because the devices that students use are multi-purpose and allow the students to play games, text, make phone calls as well as listen to music. For the purposes of this study selected classes are being denied their privilege to use their devices while in class to measure how often the teacher will write office referrals for students who use devices inappropriately in classes, as compared to classes that are given free access to their devices during class time, and the amount of office referrals accrued.

**Multiple Intelligence and Music**

***Brandon M. Lebe***
Jonathan Singer, Associate Professor, Department of Education

Multiple intelligences, utilized in a music classroom, can enhance the effectiveness of the lessons taught. Multiple intelligences, established by Howard Gardner, makes apparent the fact that students are capable of learning in a variety of ways. My research looks at all the ways multiple intelligences affect the everyday classroom. I will attempt to increase the effectiveness of music lessons through the use of emphasizing multiple intelligences with sixth grade brass and woodwind classes. Through multiple intelligences, students will be given a wide variety of approaches to connect with the music they perform

and gain a higher understanding of what it means to be musical, not just playing notes on a page. After exposing the classes to multiple intelligence teaching, audio recordings of rehearsals will be analyzed and critiqued based upon a predetermined set of criteria. Researching the effects of utilizing multiple intelligence will create data on whether or not Howard Gardner's Multiple Intelligence Theory can benefit students across all academic subjects.

**Effects of External Incentives on Secondary Students to Complete Homework Assignments**

***Janet D. Ludlow***
Jonathan Singer, Associate Professor, Department of Education

Many educators have unmotivated students sitting in their classrooms not participating or turning in any homework. Research behind the lack of motivation of students has found that many students do not complete homework simply as a coping mechanism because it is easier to do nothing rather than to try the work and fail. Intrinsic motivation is the goal of any educator, and this study used the strategy of positive reinforcement in order to increase homework completion. I examined the effects of external incentives in a seventh grade Language Arts class to complete homework during a two week period. Instead of grading the students only on achievement, the students were given positive reinforcement by way of the school-based reward system for completion. The students were rewarded at the time that they turned in the homework assignment. A survey was also conducted in regards to the school-based reward system and the students' ideas about the rewards. The goal for rewarding homework completion, through external motivation, is to help the students develop self-efficacy which leads to intrinsic motivation.

***Detached,* Video Game**

***David Mai, Lisa Thompson, Erin Williams*, *Deborah Firestone, Brianna Paige, Stephanie Ruff, Jonovan Sanders, Shelvie Taylor***
Marc Olano, Associate Professor, Department of Computer Science and Electrical Engineering

*Detached* is a video game in which we used a new game dynamic where, as a zombie, players journey to obtain the limbs of defeated foes to defeat a villainous Necromancer. The core gameplay has the player discover various combinations of limbs for tactical purpose. Challenges for animators in this game circled around creating a believable and manageable environment for the gameplay. Animators worked together creating a cohesive style for characters and the environment. In addition to the overall look of the game they worked diligently to depict the body language of undead creatures and to stimulate players during gameplay. Programmers were challenged to create an effective user interface and manage nesting of animated parts within the game environment. Furthermore, programming control schemes that felt natural to ensure smooth gameplay and enemy artificial intelligence behavior that were challenging to the player. Most importantly, the challenge of synchronization between both groups played a vital role in our successful teamwork.

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***This Moroccan Life***

***Asif Majid***
Steven McAlpine, Assistant Director, Interdisciplinary Studies

My yearlong study abroad experience resulted in an interdisciplinary play that highlights multiple themes - migration, transnational identity, human rights, gender, sexual harassment, and the Arab spring - specific to Morocco. In writing, I was influenced by Berthold Brecht's epic theatre structure and the performers of Marrakech's Djemaa el Fna, both of which are reflected in the interrupted frame story of *This Moroccan Life*. After researching Brecht's model and visiting Djemaa el Fna while still in country, I authored the play as part of an Independent Study Project for my study abroad program. After a semester's worth of rehearsals, the end result of this research is a production of *This Moroccan Life* to be held on May 12 in the UC Ballroom. At URCAD, I will chronicle the journey of interdisciplinary influence, contextualized process, and final product that is *This Moroccan Life*.

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**Role of TRPM5 in Survival of Olfactory Sensory Neurons**

***Hiba O. Malik****, David Dunston*
Weihong Lin, Associate Professor, Department of Biology

The survival of olfactory sensory neurons (OSNs) is influenced by sensory activity. We have previously found the transient receptor potential channel M5 (TRPM5) in a subset of OSNs that also express cyclic nucleotide gated channel A2 (CNGA2), an essential ion channel in the canonical pathway responsible for most odor transduction. OSN axons terminate in glomeruli in the olfactory bulb. In CNGA2 heterozygous (CNGA2+/-) female mice, OSNs express either a functional or null CNGA2 tagged by green fluorescence protein (GFP+). To determine whether TRPM5 activity in OSNs provides signal to sustain the survival of OSNs, we used an olfactory bulb mapping program GLOM.MAP and manually marked GFP+ glomeruli, that receive axons from OSNs with a null CNGA2, in the olfactory bulbs of mice expressing either TRPM5 or a null TRPM5. We found significantly higher intensity and density of GFP+ glomeruli in the ventral regions of the MOB of mice with functional TRPM5. This corresponds with previous evidence that OSNs expressing TRPM5 target to the ventral regions of the MOB, and supports our hypothesis that functional TRPM5 enhances the survival of OSNs. Future studies will explore whether a TRPM5 dependent pathway can activate OSNs.

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**Testing Ability of Live Attenuated Tetravalent Dengue Vaccine to Develop Antibodies against All Types of Dengue Virus**

***Sania Malik***
Anna Durbin, Associate Professor, Center for Immunization Research (CIR), Johns Hopkins School of Public Health

Dengue Virus (DENV) is a mosquito-borne virus that infects millions of people living in tropical or subtropical regions annually. DENV has four serotypes Dengue1, Dengue 2, Dengue 3, and Dengue 4. Each of which can cause the full spectrum of dengue illness which ranges from a mild febrile syndrome to hemorrhagic fever/shock syndrome and can even cause death. Being subsequently infected with a second DENVserotype that is different from that which caused a first infection can make a person severely ill. For this reason, it is very critical to develop a vaccine that will protect against all four DENV. In this Phase I clinical trial, healthy adult subjects were given an experimental live attenuated vaccine containing all four DENV to see evaluate the safety of the vaccine and to determine if they develop antibodies to each of the DENV serotypes. Replication of each of the vaccine virus strains was evaluated by titrating the DENV at frequent time-points post-vaccination. This study will evaluate the safety of the vaccine and will quantify the antibody response against all four DENV serotypes.

*This work was funded by the National Institute of Allergy and Infectious Diseases (NIAID), National Institutes of Health (NIH).*

**Epigenetics of Sickle Cell Pain: Is Perceived Stigma Associated with Expression of the COMT Gene?**

***Palmira N. I. Mangae,*** *Shawn Bediako*
Shawn Bediako, Associate Professor, Department of Psychology

Sickle Cell disease (SCD) is caused by amino acid substitutions in hemoglobin resulting in malformed red blood cells that block blood vessels and prevent the flow of blood and nutrients to various parts of the body. Individuals living with SCD experience high levels of pain due to this anomaly and recent studies have shown psychosocial variables are strongly associated with pain severity. In this study, we are interested in catechol-O-methyltransferase (COMT), a gene that influences responses to pain. We hypothesize that patients who report high levels of SCD stigma will be more likely to express the COMT gene compared to those who report low levels of SCD stigma. We will administer the *Measure of Sickle Cell Stigma* (MoSCS) to about 200 adults and also collect a standard blood draw. Quantification of the COMT single nucleotide polymorphisms (SNP) will be done by our collaborators in Georgia. Chi-square

analyses will be conducted in order to determine whether there is a significant association between stigma and expression of the COMT gene.

**Identification of Genes Regulating Stem Cell-Like Division of Epithelial Cells in *Caenorhabditis elegans***

***Gabriella L. Marano, Kathryn E. Cronise***
David M. Eisenmann, Associate Professor, Department of Biological Sciences

In many species, adult stem cells are present in tissues to replenish cells lost during aging or following injury. Stem cells divide in an asymmetric manner to generate one cell that remains a stem cell and another that differentiates. The division of the epithelial seam cells of the *C. elegans* larva is analogous to that of stem cells; however, the genes regulating this behavior are not completely understood. Our project aims to identify novel genes that affect seam cell development and to begin to characterize their function. From a library of 950 genes encoding transcription factors, we concentrated on 77 genes that are expressed in seam cells. We performed RNA interference (RNAi) to reduce the function of these genes by feeding the worms bacteria that produce double-stranded RNA for a specific gene. The presence of this dsRNA in the cells leads to the destruction of the normal message for that gene, thereby reducing the protein level. We screened those genes that affect any characteristics of the seam cells, such as seam cell number, distribution, morphology or division pattern. After performing RNAi for eight genes in the library so far, we have discovered one additional gene that affects seam cell development.

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

**Assessing the Impacts of Corridor Conservation on Local Communities in Costa Rica**

***Kelley Mason***
Margaret Holland, Assistant Professor, Geography and Environmental Systems

As of 2010, 37 conservation corridors had been formally declared in Costa Rica. A conservation corridor is a connected system of protected areas where conservation and sustainable development go hand-in-hand. However, the national corridor program has yet to develop a set of clear indicators for monitoring the socioeconomic impacts of corridor conservation on local communities. The goal of this research is to help fill that gap and recommend a set of measures by which the corridor program could track its impact. The first phase of research focused on generating baseline socioeconomic profiles for a set of conservation corridors in Costa Rica through an analysis of census and GIS data. These data were compared to national level trends and differences identified. The second phase involved travel to the Arenal-Tenorio corridor in Costa Rica to conduct key informant interviews. Upon our return, we sent surveys to the other local

councils. Using this baseline information we created a set of recommendations for the national corridor program to assess the conservation corridor's influence on communities living within Costa Rica.

*This work was funded by the Undergraduate Research Award from the UMBC Office of Undergraduate Education and the Ronald E. McNair Summer Research Institute.*

**Non-invasive Glucose Biosensor with Fluorescent Glucose Binding Protein**

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

Diabetic patients monitor their blood glucose levels using self-monitoring blood glucose devices. These devices involve finger pricking and analyzing the blood glucose levels using glucose oxidase (GOx). Our lab is developing a non-invasive glucose biosensor that utilizes glucose binding protein (GBP). GBP is purified from *E.coli* L225C strain and glucose response to GBP is measured through florescence using a spectrophotometer. The presence of glucose induces a conformational change in GBP from "open" to "closed," resulting in a decrease in fluorescence intensity. My project focuses on GBP response to the glucose in skin samples in order to find the condition under which blood glucose concentration is correlated with the trans-epidermal diffusion rate. The water loss is measured in the finger, and the glucose in the finger is calculated from a set of glucose standards analyzed by GBP. These concentrations will be compared with a YSI analyzer.

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**The Development of Optimized SERS SAM Nanosensors for Intracellular Applications**

**Adam Mayer,** *Pietro Strobbia, Charles Klutse*
Brian M. Cullum, Associate Professor, Department of Chemistry

Countless macromolecules inside every cell have an impact on crucial body systems as a direct consequence of their function, activity level and concentrations. In recent years, highly advanced intracellular sensors have been introduced to monitor these factors. A novel sensor geometry has been developed to drastically improve the sensitivity of Surface-Enhanced Raman Spectroscopy (SERS) studies. By separating multiple metal layers with dielectric spacers, chemical cross-linkers known as self-assembled monolayers (SAMs), the electrochemical enhancement of the analyte signal is significantly increased. While these SAMs have been optimized for length and terminal functional group on planar substrates, they lacked optimization for use as free-floating nanosensors. Using 4-mercaptobenzoic acid as a model analyte, these SAM sensors were shown to relay clear signals of analyte structure even as

suspended nanospheres, displaying the further applicability of this technology to the detailed examination of intracellular processes.

*This work was funded, in part, through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and the UMBC Department of Chemistry and Biochemistry.*

## *Al Tishkach*: A Story of Holocaust Survival in the Context of Modern Anti-Semitism

***Adam Mayer***
Susanne Sutton, Lecturer. Department of Modern Languages, Linguistics, and Intercultural Communication

Much literature and video documentation have been produced over the years in the hopes of preserving the memory of the Holocaust in the face of a rapidly dwindling eyewitness generation. As the number of Holocaust survivors continues to decline, a concomitant increase in denial of the Holocaust has been observed. This documentary aims to tell the story of two Holocaust survivors against the backdrop of twenty-first century anti-Semitism and Holocaust denial. The survivors are English-speakers and retell their experiences in English. The narrator, a direct descendant of the survivors, narrates the documentary in German, symbolizing the triumph of the oppressed against their persecutors. Ultimately, this work allows viewers to relate to the survivors' story and raises awareness of growing Holocaust denial.

## Monte Carlo Simulation (MCS) of Photon Transport in Three-Dimensional Clouds

***Brent McBride***
Zhibo Zhang, Assistant Professor, Department of Physics

Radiative transfer contributes to the growing influence of heat pollution, weather patterns, and the energy balance of our planet on human activity via the permeability and reflectivity of Earth's thin atmospheric layers. Using Monte Carlo pseudo-random number generation simulation, this research inspected the presence, uniformity, and unpredictability of Sun-based photon "packets" entering and travelling through one, two, and three-dimensional isotropic and anisotropic cloud systems. By likening the model to a "pinball game" and the Earth as a virtual blackbody, MCS was used to visualize the bounce-like scattering behavior of particle-like photons on their way to extinction. Factors including single-scattering albedo, directional scattering modeled by the Henyey-Greenstein phase function, cloud depth, the angle of solar incidence, and azimuthal scattering angle contributed to the determination of chaos and homogeneity in photon samples sent through ideal cloud structures. This modeling was supported by previous observations of planetary surface and atmospheric reflectivity at pre-determined photon incidence angles.

This research provides a foundation for future investigations into atmospheric intensity and temperature patterns as a factor of planetary latitude, longitude, or solar strength.

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**How Sports and Exercise Affect Tobacco and Alcohol Use Risks Among Maryland High School Students**

***Stephanie L. McKenney****, Katherine Wright, Janine Delahanty, Carlo DiClemente*
Carlo DiClemente, Professor, Department of Psychology

Physical activity generally predicts good physical and psychological health in adolescents; however, some types of physical activity may not be entirely beneficial. Research shows that sports team participation can increase adolescents' risk for alcohol and smokeless tobacco use, while other exercise may be protective against alcohol, smoking, and smokeless tobacco use. Since adolescent substance use significantly increases the risk of adult lifetime substance use, studying substance use risk factors is an important area of research, particularly around a seemingly healthy activity like physical activity. Data derived from the 2010 Maryland Youth Tobacco Survey, conducted in middle and high school classrooms, were used to perform binary logistic regression analyses to explore predictors of substance use among a subsample of high school youth (N=49,183). Specifically, this study examined whether past year team sports participation, exercising for 60 minutes three or more days/week, sex, and socioeconomic status were predictors of current substance use by high school grade level. Results showed that both sports participation and exercise were associated with increased risk for binge drinking and smokeless tobacco use, whereas both activities were protective for smoking cigarettes. This study did not support previous findings of a differential effect between exercise and sports team participation.

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**The Impacts of Technology on a Non-Traditional (Flipped) Classroom**

***Casey A. Medairy****, Janet M. Fairbank, Lauren N. Chestang*
Jonathan Singer, Associate Professor, Department of Education

Common core standards challenge secondary teachers to provide their students with optimal learning opportunities by designing instruction that integrates content literacy, investigative practices, and knowledge of key STEM concepts. Traditional practices of science instruction restrict classroom engagement and investigation due to the demands of curriculum requirements and time restrictions. One set of strategies for meeting the new demands associated with implementing the common core is inverting traditional methods of instruction through simulated laboratories and the flipped classroom. Our project evaluated the use of these strategies in middle school and high school science classrooms. Student performance in four science classes was tracked to assess the strengths and weaknesses of these non-traditional instructional methods. Three science classes were given preselected computer simulations, videos, and PowerPoint presentations to learn information normally taught in classrooms. The class time after the flipped lessons were used to practice and investigate science concepts. Students were surveyed to determine their level of favorability in this instructional process. The fourth science class acted as a control where students only received standard instruction and the same assessments as the other three (treatment) classes. The grades of all four sets of students were analyzed and correlated to the results of the student surveys to determine the effectiveness of this investigation.

**Identifying PRRSV Structural Components that Activate Regulatory T Cells and Diminish Protective Immunity**

***Chelsea R. Meh***, *Stephanie Michelle Todd*[1], *Tanya LeRoith*[1]
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Tanya LeRoith, Assistant Professor, Department of Biomedical Sciences and Pathobiology

Porcine reproductive and respiratory syndrome (PRRS) is widespread throughout swine populations worldwide. PRRS is caused by an arterivirus, which causes many symptoms including abortion, weak or stillborn piglets, edema, and a spectrum of respiratory ailments. Though there is a vaccine currently used, the PRRS modified live virus (MLV) vaccine contains epitopes that induce regulatory T cells ($T_{regs}$), which may contribute to delayed protective immunity and lack of homologous protection. To determine which epitopes activate $T_{regs}$, the open reading frames (ORFs) of the PRRSV genome were isolated and inserted into a plasmid, which was then introduced into *Escherichia coli*. Translation was induced using IPTG and protein concentrations were quantified. Only ORF 4 produced the protein of interest so further experiments are required to produce proteins from the other ORFs. After this is accomplished, the proteins will be incubated with dendritic cells and analyzed for $T_{reg}$ induction. Lastly, specific epitopes will be identified and mutated to produce a more effective vaccine.

**Inhibition of Human Immunodeficiency Viurus-1 Capsid Protein Assembly**

***Mansi Mehta***, *Cory Kyser, Peter Mercredi, Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Investigator, Howard Hughes Medical Institute

Since data collection began in 1981, 30 million people have died of AIDS and 34 million people currently live with HIV/AIDS. Current treatments for HIV patients primarily target two enzymes, reverse transcriptase and protease, and significantly reduce viral loads. Unfortunately, due to the extremely high rate of mutation in HIV-1, viral resistance has emerged, resulting in the need to design new drugs that target other viral proteins. Recently, the capsid protein (CA) has been demonstrated to be a potential target for anti-viral drugs of viral assembly. Recent work has identified small molecules and peptides that bind to the N-terminal domain (NTD) and C-terminal domain (CTD). During assembly, CA forms its conical core around the viral genome for the mature infectious virion. The two domains of CA, NTD and CTD, are connected by a 5 amino acid linker. The NTD is important in forming the viral core. We propose the use of stapled peptides designed to specifically bind to the CTD and hypothesized to inhibit CA assembly and disassembly, which are both part of the viral replication cycle. To characterize the effect of these peptides, we use in vitro assembly assays and NMR to observe CA assembly and the direct interactions, respectively.

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**The Changing Standards of Flute Performance in the Nineteenth and Twentieth Centuries**

***Elizabeth A. Milligan***
Lisa M. Cella, Professor, Department of Music

Standards of performance are ubiquitous in the world of music. Unfortunately, there is widespread lack knowledge with regard to the historical standards from which the modern ones have evolved, despite the innumerable ways in which this information may enhance one's abilities as a musician. To increase knowledge on this subject among flutists, I have observed and documented the progression of requirements as demonstrated by the annual graduation competition repertoire for flutists of the Conservatoire National Supérieur de Musique et de Danse de Paris (CNSMDP). In examining the compositions, I noted common elements, and how the nature of the technical demands shifted or increased in difficulty. My attendance of and participation in international music festivals and master classes clarified my knowledge of the modern performance practices of the repertoire, and revealed pertinent knowledge that is held solely within the oral tradition. The knowledge gained from this research and these experiences will be shared with the public through a presentation that will include both demonstration and explanation of the information at hand.

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**Extracting Protein-Protein Interactions of Orthologous Proteins from Literature**

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

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

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**Modeling Diffusion of Signaling Molecules and Consequential Cell Fate Determination**

***Bilal A. Moiz, Ann Marie K. Weideman**, Donald M. Richardson*
Bradford Peercy, Assistant Professor, Department of Mathematics and Statistics
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences

Cell fate determination is a key issue in developmental biology. Cells that physically neighbor each other within an organism have the potential to adopt diverse fates. This phenomenon is abundantly clear in the egg chamber of *Drosophila melanogaster*, where epithelial cells that are in proximity along the anterior end of the egg chamber are determined to be either static or motile. The respective fates of the epithelial cells originally appeared to be dependent on their proximity to a polar cell and its secretion of a morphogen. However, our observations lead us to believe that this cell fate determination does not always occur as expected by straightforward morphogen diffusion. To understand this phenomenon, we have developed a partial differential equation model for the secretion, diffusion, and binding of morphogens in an extracellular space comprised of an irregular landscape of nurse (accessory) cells. The distribution of morphogens in the extracellular space is dependent on the source and uptake along the epithelium as well as the diverting space between nurse cells. With our mathematical model, we can test the impact of the physical structure of the egg chamber on the ability of morphogens to support cell fate determination in alternate circumstances.

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***Derelict*, an Experiment in Virtual Reality Game Development**

***Jonathan Moriarty**, **Joseph Rigoroso, Jake Duong, Rotem Ganel, Sean Cosentino, Paul Tschirgi, Dave Van***
Marc Olano, Associate Professor, Department of Computer Science and Electrical Engineering

Derelict is a videogame made to explore the possibilities presented by a popular new virtual reality device known as the Oculus Rift. This horror game draws influence from classic alien abduction lore to create an atmosphere of terror that immerses players through the use of virtual reality. The gameplay involves using stealth to avoid being captured by holding your breath and keeping to the shadows. The game uses various audio and lighting techniques to create an unnerving environment for players to explore, and demonstrates a new way of creating immersive experiences in videogames through the use of virtual reality.

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**Comparison of Dimension Reduction Techniques**

***Alexander Morrow***
Marie desJardins, Professor, Department of Computer Science and Electrical Engineering

Dimension reduction techniques reduce the complexity of data by lowering the total number of attributes in a data set. These techniques are useful for a variety of scientific and professional fields to simplify data, to produce two-dimensional visualizations of data, and to extract patterns from data. Popular dimension reduction techniques include principal components analysis (PCA), multidimensional scaling, self-organizing maps (SOM), and feature selection. While these techniques have been studied in depth individually, a comparative analysis of their traits in the context of characteristic data sets has not previously been performed. Using custom statistical analysis methods that capture desirable features of dimension reduction techniques, we evaluate the behaviors of each of these dimension reduction techniques for common data sets. Comparing the statistical performance of the different dimension reduction techniques on a variety of data sets provides insight into the relative strengths and weaknesses of the techniques. This enables a user to make better informed decisions when selecting a dimension reduction technique to use.

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**Spatial Dynamics and Territory Estimation for Grasshopper Sparrows (*Ammodramus savannarum*): a Mathematical Model**

***Oliver Muellerklein,*** *Pavan Vutukur*
Bernard Lohr, Assistant Professor, Department of Biological Sciences

Understanding territoriality and the population structure of individuals within a given area in a dynamic way is an essential tool in animal ecology research. Our research focuses on a comparison of the changes in size, accuracy, and statistical variance of territories using two techniques: minimum convex polygons and kernel density estimations. The data were taken from GPS waypoints of Grasshopper Sparrows (*Ammodramus savannarum*) at the Chester River Field Research Station, Chestertown, MD during the 2003 – 2012 breeding seasons. Based on a sample of 25 songbirds, we found average territory estimates and major sources of reduction in variance at varying intervals of GPS waypoints for both these techniques. To account for within-season movements in territory, we applied a novel dynamic time window algorithm that computes minimum convex polygons at fixed time frames throughout the entire breeding season for each individual songbird. Our research coincides with a major conservation effort in establishing proper breeding area for a potential reintroduction of the critically endangered Florida subspecies of Grasshopper Sparrows (*Ammodramus savannarium floridanus*). Habitats in both Maryland and Florida are similar, so what we learn for Maryland birds may have direct applications in estimating necessary space for reintroduction efforts in Florida.

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

**Investigating the Role of Ribosomal Protein L17A in Ribosome Biogenesis and its Post-Translational Modifications**

***Victoria Ng****, Jesse Fox*
Lasse Lindahl, Professor, Department of Biological Sciences

In ribosome biogenesis, the role of ribosomal proteins and the effects of their post-translational modifications in the assembly process have yet to be characterized. Defects in ribosome biogenesis have been linked to diseases in humans classified as ribosomopathies. Ribosomal proteins have also been shown to have their own roles in cellular activities such as cell growth. The eukaryotic ribosome itself is composed of four rRNAs and 79-80 ribosomal proteins. Ribosomal Protein L17 (Rpl17) is one of the 47 ribosomal proteins in the large subunit (60S) of the ribosome and is an orthologue to Ribosomal Protein L22 (Rpl22) in *Escherichia coli*. To study the role of Rpl17, RPL17A in *Saccharomyces cerevisiae* (yeast) was tagged and expressed in a yeast glucocorticoid induction system. The tagged version of Rpl17A exhibited the same phenotype as the wild-type Rpl17A, indicating that the tag does not affect the protein that is being made. Currently, we are using the tagged Rpl17A in co-immunoprecipitations to determine what proteins and RNAs associate with RPL17A. Through this investigation, we can determine the function of Rpl17A and the effects of its post-translational modifications in ribosome biogenesis.

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**Using DNA Barcoding to Identify Hydropsyche Species in the Patapsco Lower North Branch Watershed**

***Damaris M. Ngantche,*** *Sonja Schmitz*
*Sonja Schmitz, Associate Professor, Department of Biology, CCBC*

DNA barcoding can be used as a diagnostic technique for species identification using a short, standardized DNA. In this research, we used DNA barcoding to identify caddisfly larvae to species using the mitochondrial cytochrome oxidase gene (mtCOI). The purpose of this research was to (1) examine Hydropsyche species or genotypes present in the Patapsco Lower North Branch Water Watershed and (2) identify the seven Hydropsyche molecular operational taxonomic units (mOTUs) from Pilgrim (2011) to species using Genbank submissions. Twenty-three caddisfly larvae were collected from Herbert Run, Bull Run, and Santee Branch and stored in 95 percent ethanol. DNA was extracted from 10-20 mg of abdomen tissue, and the COI gene was amplified by polymerase chain reaction with universal primers. Of the 23 specimens processed for DNA analysis, 12 specimens (52 percent) yielded COI sequences that were approximately 700 base pairs (bp) in length. An initial BLAST search of the full length 700 nucleotide sequence of one of our specimens revealed 72 hits that were all in the genus Hydropsyche confirming that our PCR product was indeed what we expected. Preliminary results from barcode analysis with Hydropsyche species from GenBank revealed the existence of at least two genotypes of Hydropsyche betteni in Herbert Run, Bull Run, and the Santee Branch. In addition, we identified caddisfly larvae belonging to genus Neophylax (Uonidae) in the Santee Branch.

**Determination of dsDNA Binding Site on Gene32 Protein**

***KimChi Nguyen***
Richard Karpel, Professor, Department of Chemistry and Biochemistry

Bacteriophage T4 gene 32 protein is known to be a single-stranded binding protein which aids in the replication and repair of bacteriophage DNA within a host cell. In DNA replication, gene 32 protein helps in protecting the DNA from nuclease attack, destabilizing the double-stranded helix, and guiding important protein factors to the replication site. Gene 32 protein has a high affinity for binding to single-stranded DNA; its cooperative binding abilities are due to the conserved amino acid sequence (Lys-Arg-Lys-Ser-Thr) within the binding cleft known as the Last Motif. Recent experiments suggested that gene 32 protein also contains a cluster of positive charges in a chin-like region that electrostatically interacts with double-stranded DNA which allows the protein to approach the replication fork and carry out its replication functions. The focus of the proposed experiment is to use DNA affinity chromatography and sedimentation velocity methods to obtain the binding constant for the interaction of the wild type protein with DNA. This experiment tests the idea that the lysine residues are important for the protein's interaction with double-stranded DNA.

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**A Comparison of Genetic and Epigenetic Diversity between Urban and Nonurban Populations of a North American Stream Fish**

***Michael Nguyen,*** *Tracy A. Smith*
Tamra Mendelson, Professor, Department of Biological Sciences

Epigenetics is the study of heritable modifications to the genome that result from anything other than a change in the DNA sequence. Chemical modifications to DNA bases or histones that associate with the DNA affect and regulate gene expression. One type of DNA modification, methylation at the 5-carbon of cytosine residues, may be transgenerationally heritable. Moreover, many urban pollutants such as metals (e.g., cadmium, arsenic), peroxisome proliferators (e.g., trichloroethylene), and endocrine-disrupting/reproductive toxicants (e.g., bisphenol A) have been shown to alter DNA methylation. The goal of this study was to test the hypothesis that urban pollution affects epigenetic DNA methylation diversity both within and between natural urban populations and clean reference nonurban populations of a freshwater stream fish. If urban pollutants alter DNA methylation, we would predict an increase in epigenetic diversity and differentiated structure of methylation-susceptible loci in urban populations. Using Genome-scan methods known as Amplified Fragment Length Polymorphism (AFLP) and Methyl-Sensitive Amplified Polymorphism (MSAP) we were able to assess both genetic and epigenetic diversity in six different urban/nonurban populations of *Etheostoma olmstedi* (Tessellated Dater) in the Potomac basin.

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**Expression of G-protein βγ Subunits in Mouse Vomeronasal Organ**

***Akua Nimarko, Aaron Sathyanesan***
Weihong Lin, Associate Professor, Department of Biological Sciences

Olfactory transduction is triggered by interactions between odorant molecules and odorant receptors, which are coupled to guanine nucleotide binding proteins (G-proteins). In the mouse main olfactory epithelium (MOE), α subunits of G-proteins play important roles in signal transduction and development. However, the role of the βγ components of the G-proteins is still enigmatic. We previously reported using RNA *in situ* hybridization (RISH), that multiple Gβγ subunits are present in the MOE and also in the accessory olfactory subsystem, the vomeronasal organ (VNO). To further investigate the expression profile of Gβγ subunits, we used real time quantitative polymerase chain reaction (RT-qPCR) on total RNA obtained from freshly dissected adult mouse VNO tissue. Using highly specific primers designed against unique sequence fragments of the 5 known Gβ and 12 known Gγ subunits, we found that the VNO expresses multiple Gβγ subunits in varying levels. Using *GAPDH* as a calibrator gene, we found an abundance of $G\beta_1$, $G\gamma_2$, $G\gamma_3$, $G\gamma_8$ and $G\gamma_{13}$. Double-label RISH experiments reveal colocalization of $G\gamma_2$, $G\gamma_3$ and $G\gamma_{13}$ in $G\alpha_{i2}$-expressing vomeronasal sensory neurons (VSNs). However, $G\beta_1$ and $G\gamma_8$ are expressed in upper and lower layers of VSNs. Our results indicate differential expression of Gβγ subunits among different populations of VSNs.

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**Diversity of *Hematodinium* and Other Dinoflagellates in Estuarine Environments**

***Ihuoma O. Njoku***
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*Hematodinium* sp. is a parasitic dinoflagellate that impacts game crustaceans, including the Blue Crab (*Callinectes sapidus*). Nearly 30 crustacean species are infected by *Hematodinium* sp with the majority of hosts residing in the Atlantic and Pacific oceans (Morado). Crab-to-crab carnivorous interactions have been suggested as a major venue for parasite transmittance. Early methods detected *Hematodinium* associated with crab tissue. *Hematodinium* has a complex life cycle and, possibly, at a certain stage in the free-living life cycle, can present in the water column. However, little is known of the distribution and diversity of host-free parasites. The focus of this study was to test environmental samples collected from the Chesapeake Bay, in 2005, and the Delmarva coastal bays, in 2010, for the parasite's presence. A primer set designed by Oldach (2000) for the 18S rRNA region was used for detection. Of 18 samples, 15 yielded positive results and were then tested for diversity; results showed several dominant and several variable banding patterns between locations and seasons. One banding pattern was temporally and spatially consistent. The sequence of the DNA corresponding to this band suggested the presence of *Hematodinium* also suggesting its presence in the water column. Future studies are warranted to investigate the abundance of these free-living parasites.

*This work was funded, in part, by the NOAA Living Marine Resources Cooperative Science Center.*

**Increasing Homework Turn-in Rates in Tenth-Grade Biology Classes**

***Natasha M. Nubgaard***
Jonathan Singer, Associate Professor, Department of Education

The purpose of this study was to investigate the effects of shorter, more frequent, homework assignments on student homework turn-in rates. Homework completion in high school students has been shown to be an effective method of reinforcing concepts taught in class. Unfortunately, low homework turn-in rates is the norm for the school involved in this study. In order to address this problem a strategy of decreasing homework length and increased frequency was implemented. For two weeks, students received short homework assignments four to five times a week. Before the study, a baseline of turn in rates was taken among three tenth grade biology classes. After the study, the turn in- rate was reviewed for changes. A survey was conducted at the end of the study to evaluate student opinions towards this style of homework.

**Brown Adipose Tissue, Friend or Foe?**

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

A goal of the Jones Lab is to discover key biomarkers as preventive measures against BRCA1 associated breast cancers primarily because they are early onset and aggressive. Using a Brca1- mutant mouse model that mimics human disease, we previously discovered that these mice still possess an angiogenic brown adipose tissue (BAT)-like phenotype in the mammary gland as adults. Angiogenesis is an early hallmark for tumor growth. Considering that this finding was detected prior to tumor development and was not observed in non-mutant mice, we believe this abnormal phenotype may serve as an early biomarker for cancer. An important next step is to evaluate how this BAT-like phenotype progresses over the course of the tumor development. Analysis of H & E stained slides from Brca1 mutant mice that formed preneoplastic lesions and/or tumors appear to show the multilocular adipocyte morphology characteristic of BAT in the mammary gland. To confirm the appearance of BAT immunohistochemical experiments are currently underway to optimize the detection of BAT using uncoupling protein 1 antibodies. Considering, angiogenesis is a primary target for anti-cancer therapy; these proposed studies seek to shed light on whether BAT could be considered as a key early angiogenic biomarker for targeted therapy.

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**Chronic Inflammation May Promote Tumor Growth**

***Maeva Nyandjo**, Dan Beury*
Suzanne Ostrand-Rosenberg, Professor of Biological Sciences

Our immune system has the natural ability to fight off pathogens and to destroy diseased cells, and has been doing this throughout our lives. However, once in a while a damaged cell may grow out of control, forming a tumor. Myeloid-derived suppressor cells (MDSC) are a population of immature myeloid cells that facilitates tumor progression by suppressing adaptive and innate immunity. Inflammation, in turn, promotes the proliferation and suppressive activity of MDSC. Using the mouse 4T1 mammary carcinoma, we previously demonstrated that mice deficient for Interleukin-6 (IL-6), a pro-inflammatory cytokine, have delayed primary tumor growth and increased survival compared to wild type mice. To determine if IL-6 promotes the growth of other tumors we tested CT26, a murine colon carcinoma. IL-6 -deficient and wild type BALB/c mice were injected subcutaneously on day one with $1 \times 10^6$ CT26 cells. Tumor diameters were measured with a caliper every three-four days and mice were followed for survival. IL-6-deficient mice survived longer and their tumors grew more slowly as compared to wild type mice. These results demonstrate that the pro-inflammatory cytokine IL-6 increases tumor growth rate and reduces survival time, further demonstrating that chronic inflammation promotes malignancy.

**Characterizing the AC1-Exemestane Resistant Cell Line in Estrogen-Dependent Breast Cancer**

***Joyce Ohiri, Armina Kazi, Amanda Schech***
Angela Brodie, Professor, Department of Pharmacology and Experimental Therapeutics, University of Maryland School of Medicine

Estrogen synthesis mediated by the enzyme aromatase is the main stimulus promoting breast cancer. Aromatase inhibitors (AIs) are used to treat estrogen receptor positive (ER+) patients by reducing the levels of estrogen produced via the aromatase enzyme. We treated mice with ER+ tumors with exemestane, a type of AI. 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 its drug sensitivity. The aromatase activity in these cells was measured following treatment with $10^{-6}$ M of exemestane. When the AC1-ExR cell line was treated with exemestane, the aromatase activity was reduced to less than that of the AC1 parental cell line: average aromatase activity of 31.1 fmol/mg protein/hr compared to average aromatase activity of 72.1 fmol/mg protein/hr in the parental cell line. However, the average mammosphere count (measure of cell proliferation) for AC1-ExR and AC1 cells was increased to 54 from 33.3 mammospheres, respectively. This suggests that although the AI reduced estrogen production, the cells had become independent of estrogen for their growth and may be more dependent on growth factor signaling pathways. Several growth factors were found to be increased in the AI resistant cells. A comprehensive understanding of the underlying mechanism of AI resistance may lead to a better means of treatment for patients with ER+ positive breast cancer.

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**An Analysis on the Effect of Erythromycin on Ribosomal Pausing in *Escherichia coli***

***Oseogie Okojie***
Lasse Lindahl, Professor, Department of Biological Sciences

At the conclusion of translation, all nascent peptides exit the ribosome through a narrow channel referred to as the exit tunnel. The exit tunnel is composed of mostly 23S rRNA. In *Escherichia coli,* the L4 and L22 proteins are closely associated with the exit tunnel. Mutations in the L22 protein that confer erythromycin resistance prevent SecM induced ribosomal pausing, whereas mutations to the L4 protein that confer erythromycin resistance prevent $Crb^{CmlA}$-chloramphenicol-induced ribosomal pausing. We are currently developing a plasmid vector containing a $Crb^{CmlA}$ gene. In the absence of ribosomal pausing, $Crb^{CmlA}$ should terminate translation prematurely, yielding a shorter protein. Through Western Blot, we can determine whether early termination occurred through the size of protein produced. In developing our plasmid vector, we will use homologous recombination to replace the SecM gene with a $Crb^{CmlA}$ gene.

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**Flexible Guanosine Nucleobase Analogues as Antiviral Agents**

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

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

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**Information Technology and Consumer Transportation Expenditures: Substitutes or Complements?**

***Atara Oliver***
Dennis C. Coates, Professor, Department of Economics

The increased availability and prevalence of Information and Communications Technology (ICT) provides opportunities to use such products as substitutes for transportation. Common examples of this substitution are telecommuting, video conferences, and online classes. However, despite the intuitive appeal of a substitution relationship existing between ICT and transportation, prior research has indicated that the relationship between ICT and transportation is quite complex; at times ICT substitutes for travel and at other times ICT and travel complement one another. Therefore, using a Quadratic Almost Ideal Demand System (QUAIDS) model and data from the US Consumer Expenditure Survey and the Consumer Price Index, I analyze the effect of ICT expenditures on transportation demand. The analysis indicates that ICT serves as a substitute for air travel, but primarily serves as a complement for private transportation.

**Evaluation of *Toxoplasma gondii* Infection in Patients with Nonfatal Suicidal Self-Directed Violence**

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*Toxoplasma gondii* (*T. gondii*) is a parasite which infects approximately one-third of the worldwide population. Several studies have revealed an association between *T. gondii* IgG antibodies and nonfatal suicidal self-directed violence (NFSDV). More recently, a positive relationship has also been reported between *T. gondii* seropositivity and serointensity to scores on the self-rated Suicide Assessment Scale (SUAS-S), a scale used to predict suicide fatalities. Specific SUAS-S items have not yet been analyzed in relationship to *T. gondii*. This cross-sectional, observational study evaluates 54 adults with recent history of NFSDV and 30 adult control subjects. Psychiatric diagnoses were made according to the Diagnostic and Statistical Manual of Mental Disorders-IV. *T. gondii* seropositivity was measured with enzyme-linked immunosorbent assay. Multivariable logistic regression was applied to identify the association between *T. gondii* seropositivity to items of the SUAS-S, adjusting for age. Our results revealed that *T. gondii* seropositivity is associated with somatic concern. As chronic pain and somatic symptoms represent suicide risk factors, it is possible that *T. gondii*, also infecting the muscle tissue, is elevating risk of NFSDV through an increase in or perception of physical symptoms. This could represent a particular focus of individualized preventative efforts for suicide, a public health priority.

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**The Role of HIF-1α in CD1d-mediated NKT Cell Responses to Mantle Cell Lymphoma**

***Royce E. Onyimba****, Tonya Webb*
Tonya J. Webb, Assistant Professor, Department of Microbiology and Immunology, University of Maryland School of Medicine

Mantle cell lymphoma (MCL) is an aggressive, incurable subtype of non-Hodgkin's lymphoma. MCL is characterized by chromosomal translocations, overexpression of cyclin D1, and aberrant activation of PI3K/Akt and mTOR signaling cascades. Two well-established targets of PI3K/Akt and mTOR signaling pathways are hypoxia-inducible factors (HIF)-1 and 2. HIF-1 plays a role in the reprogramming of cancer metabolism. Studies from our lab and others have shown that MCL patients have a significant reduction in Natural killer T (NKT) cells. NKT cells are activated by lipid antigens presented in the context of CD1d molecules and are critical mediators of anti-tumor responses. Thus, the goal of this study is to determine whether the induction of HIF-1α modulates CD1d-mediated NKT cell responses to MCL. Following the induction of HIF-1α in lymphoma cell lines, NKT cell responses were assessed using ELISA. Western blots were performed to check the induction of HIF-1α in MCL cell lines. Preliminary results suggest that HIF-1a induction enhances CD1d-dependent NKT cell activation and that Jeko cells, an MCL cell line, constitutively express high levels of HIF-1a. Collectively, our results suggest that HIF-1a induction in MCL may be a mechanism used to cause CD1d-dependent NKT cell exhaustion and evade immune detection.

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**Whooping Crane Photopigments**

***Elelbin Ortiz, Ifeolu Akinnola,*** *Devyani Ujla, Robert McCready, Evan Cameron, Alexandra Kingston, Megan Porter*
Phyllis Robinson, Professor, Department of Biological Science

The whooping crane (*Grus Americana*) is an endangered species of bird native to North America and has yet to have its visual system characterized. Our lab has received the rare opportunity to do so and is focusing on the photopigments of the whooping crane. Photopigments are a class of G-protein coupled receptors that respond to light. Each photopigment responds to a different wavelength of light. Our project focuses on documenting the sequences of the whooping crane's photopigments so that we can learn more about its visual system and compare it to those of other birds. We have extracted retinal mRNA, created cDNA, and documented the sequences of the whooping crane's five opsins. Currently we are expressing the proteins in a heterologous expression system in order to understand how the protein functions. Upon completion of the project, we will compare the whooping crane opsin sequences and spectral properties to those of other avian species. This information will allow us to determine which amino acids within each photoreceptor are important in determining the spectral tuning of the overall protein.

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**Evaluation of Brown Adipose Tissue Distribution in the Adult Mouse Mammary Gland**

***Kwadwo E. Owusu-Boaitey***
Laundette P. Jones, Assistant Professor, Department of Pharmacology, University of Maryland School of Medicine

The mammary gland architecture undergoes constant remodeling during and after puberty. Poorly regulated tissue remodeling results in increased breast cancer risk. Prior studies in our lab demonstrate that in contrast to normal mice, *Breast Cancer Susceptibility Gene 1 (Brca1)* mutant mice possess an abnormal deposition of brown adipose tissue (BAT) in the mammary gland that persists after the remodeling stage of puberty. This BAT phenotype has been correlated with increased angiogenesis, a property favorable for tumor growth. Although current research in our lab has sought to explain the persistence of this abnormal phenotype, much of this work is hindered by the lack of knowledge on the distribution of BAT in the adult mammary gland. Further, the available evidence is limited to 2-dimensional images. The current project has two specific aims: (1) identify what is known about BAT and its presence/role within the normal adult mouse mammary gland, and (2) design a feasibility study to evaluate the spatial extension and depth penetration of BAT in the mammary gland. It is anticipated that measurements of BAT penetration in the normal and mutant mouse mammary glands will shed light on how changes of BAT within the tissue architecture may impact tumor development.

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**Qualitative Characterization of Astrocytes in 2D and 3D Environments**

***John A. Packard***
Jennie Leach, Associate Professor, Department of Chemical Engineering

In the central nervous system, astrocytes provide a large range of supportive activities for neuronal functions. However, upon injury astrocytes become reactive and form a glial scar. Though considered to be beneficial in sealing the injury, the glial scar is a physical and chemical barrier to nerve regeneration. To overcome this impediment, we suggest that biomaterials can be designed to deactivate astrocytes while promoting neuronal regeneration. To reach this goal, the major aim of this project is to classify astrocytes after culture in two-dimensional and three-dimensional biomaterial environments in order to develop an *in vitro* model that can better mimic the *in vivo* environment. We expanded and purified astrocytes taken from the dissociated cortex of postnatal mice. We characterized several distinct astrocyte morphologies that express distinct sets of protein markers, as determined by immunofluorescence imaging. The most significant find was that the astrocytes sense the three-dimensionality of their environment and more closely mimic astrocytes *in vivo*. We also observed the presence of spindle-shaped radial progenitors and spherical astrocytes. In conclusion, we have qualitatively and quantitatively characterized the various types of astrocytes present in culture and identified biomaterial conditions that yield physiologically-relevant astrocyte morphologies.

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

**Role of Guanine Nucleotide Exchange Factors (GEFs) in the Synaptic Depression**

***Abhishek Pandey, Michael Graves***
Thomas W. Abrams, Professor, Department of Pharmacology, Program in Neuroscience, University of Maryland School of Medicine

Synaptic depression, caused by the inactivation of release sites for synaptic vesicles, leads to behavioral habituation. Evidence suggests that small monomeric G proteins in the ARF (ADP ribosylation factor) family and Protein kinase C are involved in the synaptic depression process. Small G proteins are major proteins involved in cell signaling. Small G proteins are regulated by GEFs and GAPs. Guanine nucleotide exchange factors (GEFs) catalyze the exchange of GTP for GDP on ARF proteins. GTPase-activating proteins (GAPs) counteract GEF activity by hydrolyzing GTP to GDP. The ultimate goal of our project is to elucidate the interactions between GEFs and ARFs and to determine their roles in synaptic plasticity. Five different ARF GEFs were cloned and sequenced, and mutant proteins were then created to investigate the roles of specific GEFs in synaptic depression. We have successfully achieved expression of wild type and mutant type ARF GEFs in Rosetta-gami competent cells. Experiments were then performed using a recombinant version of BRAG, a type of Arf6 GEF. Results recorded using this mutant BRAG suggested that BRAG is involved in the synaptic depression process. Currently we are attempting to create Arf6 reporters using Fluorescence Resonance Energy Transfer (FRET), which will allow us to monitor the activation of Arf6.

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

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

Targeted nanoparticle delivery of chemotherapeutics aims to decrease drug toxicity and increase drug efficacy in order to provide more effective cancer therapies. The transferrin protein can be used as an active targeting moiety when connected to a drug. This drug delivery platform is suitable for a number of cancers, because transferrin is a naturally occurring protein and many malignant cells overexpress transferrin receptors. The goal of this lab is to design a multifunctional gold nanoparticle drug delivery platform for advanced stages of cancer whose cells have an abundance of surface transferrin receptors, such as pancreatic, brain, and breast cancers. A transferrin functionalized poly(propylene imine) (PPI) dendron was previously synthesized by coupling the dendron to the transferrin protein via a dimethyl suberimidate (DMSI) linker. The objective of this project is to replace the DMSI linker in the transferrin functionalized PPI dendron with an amide bond between the PPI dendron and transferrin. The generation-two PPI dendron has been synthesized and will be converted to generation-three in one step before coupling to the protein and gold nanoparticle. The completion of these last steps will be verified by mass spectrometry, polyacrylamide gel electrophoresis, absorption spectroscopy, and dynamic light scattering.

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**Surface-sensing Gene Expression in *Proteus mirabilis***

***Julius A. Patellis****, Yi-Ying Lee*
Robert Belas, Professor, Department of Marine Biotechnology

*Proteus mirabilis* is a dimorphic, motile gram-negative bacterium associated with urinary tract infections. Pathogenicity of this species is directly correlated with the formation of a differentiated "swarmer cell" that is produced only when *P. mirabilis* is on a surface. Swarmer cells are a prerequisite for *P. mirabilis* movement over surfaces, a phenomenon known as swarming. It is known that *P. mirabilis* senses surfaces by detecting the inhibition of rotation of its flagella (helical proteinaceous filaments that are used for bacterial swimming and swarming). It remains unknown how information from stalled flagellar motors is transmitted into the cell to affect gene transcription; however, recent transcriptomic data highlight several genes that are likely involved in transducing the signal. The regulatory region of each of these genes has been genetically coupled to *lacZ* (encoding the enzyme β-galactosidase) producing a set transcriptional fusion plasmids that can be used in *P. mirabilis*. Using this set of reporter plasmids, expression of each target gene can be determined by measuring β-galactosidase activity. During this project plasmids with reporter genes were moved into *P. mirabilis* and measured under a variety of growth conditions using using assays of β-galactosidase activity.

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**Local Mechanical Behavior Measurements of Friction Stir Welded Titanium**

***Christopher Paymon***
Marc Zupan, Associate Professor, Department of Mechanical Engineering and Visiting Professor, FEUP-Faculdade de Engenharia da Universidade do Porto, Departamento de Engenharia Mecânica

Friction stir welding (FSW) is an alternative fusion welding technique that offers many advantages over current methods including reduced cost, waste, and possible improved performance. Nickel foil is introduced to reduce tool pin wear, decrease forging force, and to map the complex flow within the stir-zone. This research used direct micro-sample testing, to link local microstructure and localized texture to the mechanical properties of FSW titanium with nickel tracking foil. This was achieved by making direct measurements of the unprocessed base metal and stir-zone mechanical properties using micro-scale tensile tests. The local mechanical properties throughout the stir-zone exhibited yield strengths and ultimate tensile strengths within one standard deviation of those of the base metal. This can be attributed to two reasons: High deformation caused by the movement of metal around the tool pin, and high temperatures caused by friction heating of the tool and metal. The strain to failure inside the stir-zone showed a fourteen percent decrease than that of the base metal. Scanning electron microscope images were used to visually inspect the fracture surface of the deformed specimens. These observations showed that the FSW titanium exhibited reduced ductility away from the weld center. The data suggested that the use of a nickel foil in FSW titanium plates resulted in no reduction in strength. These results are important to improving process parameters in FSW as well as providing basic design data.

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**Video Game Distraction for Acute Pain: The Effects of Pre-Trial Training**

***Megan C. Pejsa**, Amy L. Hahn, Nicole A. Magin, Chelsea R. Meh*
Lynnda M. Dahlquist, Professor, Department of Psychology

Pain intervention research examining video game distraction effectiveness is critical for young patients in hematology-oncology clinics, who could benefit from distraction during repeated uncomfortable medical procedures. However, there are no guidelines on how long to train individuals with video games before video games can be used as effective pain-reduction tools. The current study investigated: (1) the effectiveness of video games as a distraction for acute pain management during exposure to an uncomfortable cold water stimulus (cold pressor), and (2) the impact of training duration on the video games' effectiveness as a distractor. A sample of 58 UMBC students underwent a baseline cold pressor trial, a pre-trial video game practice session, and a distraction cold pressor trial. Participants were randomized into one of two conditions: a 4-minute pre-trial practice session and a 12-minute pre-trial practice session. A mixed-design ANOVA revealed a significant main effect of trial, $F(1, 56) = 26.29$, $p < .001$, such that pain tolerance scores significantly improved from baseline to distraction trial. However, there was not a significant main effect of practice condition ($p > .05$). Understanding how pre-trial practice sessions influence distraction intervention will serve as a useful guide for future distraction research designs.

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**Detecting Unhealthy Eating Attitudes and Behaviors among African-American Girls of Varying Weight Status**

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The childhood obesity rate in the United States tripled in the past decade, disproportionately affecting African-American youth. Unhealthy eating attitudes/behaviors are common among adolescent girls and may be associated with weight status. African-American girls may be at increased risk for unhealthy eating attitudes/behaviors because of the higher prevalence of overweight/obesity. The present study hypothesized that overweight and obese African-American adolescent girls have higher rates of unhealthy eating attitudes/behaviors than healthy weight girls. The study included 715 sixth and seventh grade African-American girls using the Anorexia Nervosa (AN) and Bulimia Nervosa (BN) subscales of the Children's Eating Attitudes Test (ChEAT) and measured weight/height. Participants were 49.1 percent underweight/healthy, 20.0 percent overweight and 30.9 percent obese. Using an ANOVA, there was a significant effect of weight status on the AN, $F(2,714)=44.98$, $p<.001$ and BN subscales, $F(2,712)=21.94$, $p<.001$. On the AN and BN subscales, obese and overweight girls reported more symptoms than healthy weight girls. Obese girls reported more symptoms than overweight girls on the AN subscale only with no difference between these two groups on the BN subscale. Understanding adolescent risk for negative psychosocial outcomes related to overweight/obesity can inform future interventions by detecting potential eating disorders through assessing eating attitudes.

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**Self-Consistency of Starting Motif in Sequence Scoring Motif Searching**

***Talmo Pereira,*** *Patrick O'Neill*
Ivan Erill, Assistant Professor, Department of Biological Sciences

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

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**Gold Nanoparticle as X-Ray CT Contrast Agent in the Detection of Cardiovascular Diseases**

***Kedar Perkins***
Marie-Christine Daniel, Assistant Professor, Department of Chemistry and Biochemistry

Cardiovascular diseases rank among the top causes of death worldwide. The overexpression of Angiotensin-Converting Enzyme (ACE) has been associated with various cardiovascular diseases in humans. The detection of the overexpression of ACE could therefore allow for early diagnosis and monitoring of some cardiovascular diseases. Gold nanoparticles absorb X-rays making them effective contrasting agents for X-ray Computed Tomography (CT). Lisinopril, an ACE inhibitor has been conjugated to gold nanoparticles via thioctic acid linker to form a contrasting agent for the detection of ACE via X-Ray CT. Synthesized thioctic acid-lisinopril conjugates were characterized using NMR and mass spectroscopy and the functionalized gold nanoparticles were characterized via dynamic light scattering and transmission electron microscopy. The thioctic acid-lisinopril, functionalized gold nanoparticles may serve as a cardiac imaging agent in tracking various cardiovascular diseases.

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**Increasing Writing Activities to Improve Test Scores**

***Joshua D. Pleasant***
Jonathan Singer, Associate Professor, Department of Education

Effective writing skills are something that students struggle with regardless of ability level. Students struggle to present a clear argument with support in almost all cases in which they are asked to construct responses. This study investigated whether or not increasing writing activities in the classroom would have a positive or negative effect on students' testing performance. The plan was implemented at a local middle school in two seventh grade gifted and talented World Cultures class. The plan itself involved gradually increasing the amount of constructive responses the students complete and helping the students distinguish what information is important. Students were provided additional supports by requiring them to outline information and organize their thoughts into a well laid out response. Student progress was measured by a pre/post-test given before and after a unit as well as classwork and homework issued throughout the implementation.

**Motivational Interviewing and Intimate Partner Violence Recidivism: An Eight Year Follow-Up on Men Who Batter**

***Megan Powell***
Christopher M. Murphy, Professor, Department of Psychology

Intimate partner violence (IPV) has persisted in society as a major public health issue. The current study focuses on intervention for men who perpetrate IPV. The findings are generally divided and inconclusive, and experts in the field continue to struggle to find a universally-successful IPV intervention program. However, recent literature shows promise in the way of an approach called motivational interviewing (MI), which is meant to instill a sense of responsibility and a desire to change in batterers. Recent study findings have revealed improvements in IPV perpetrators' engagement into a change process when exposed to MI. The current research analyzes the long-term criminal recidivism rates over an eight year period after treatment, comparing groups of men who were treated either using MI or a standard intake (SI) at the Howard County Domestic Violence Center. Data on criminal recidivism is currently being organized and quantitative findings will be available to present at URCAD. If the findings demonstrate significantly lower recidivism for men who received MI, this will provide strong support for more IPV intervention programs to adopt MI methods, and will contribute to the search for more universally-effective treatments for male perpetrators of IPV.

**Babies and Biodiversity: How Stomatopod Larval Sampling Improves Estimates of Biodiversity in the Great Barrier Reef**

***B. Prince,*** *K. Feller, S. Lai, M. Porter*[1]*, T. Cronin*
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Tom Cronin, Professor, Department of Biology

The Great Barrier Reef is one of Earth's largest collections of living organisms.
Home to thousands of species of fish and plants, this coral reef system not only acts as a food source for the locals, but also supports many economies. Understanding the biodiversity of Lizard Island, a national park on the Great Barrier Reef, is vital to furthering the efforts of marine conservation biology. Stomatopods, or mantis shrimp, are important predators within reef systems like Lizard Island. The mantis shrimp life cycle includes a planktonic larval phase, the ecology of which is very different from the benthic-living adult. This research was aimed at characterizing the biodiversity of stomatopod larvae at Lizard Island. Based on previous findings in the Indo-Pacific region, we expected to find a greater diversity of stomatopod species by sampling larvae than was previously described for adults. Using specimens collected over a four-year period, DNA barcoding of the cytochrome oxidase I mitochondrial gene was used to identify wild-caught species. The results were as expected. The sequences collected in this study will be used for further analysis of the genetic structure and estimated population size of target species.

*This work was funded, in part, by The Australian Museum & Lizard Island Reef Research Foundation, The Air Force Office of Scientific Research, and The Crustacean Society.*

**SHOWHAUS: An Open-Source Directory for Underground, Fringe Music and Art Communities**

***Luis Queral***, ***Pedrum Golriz***
Greg Metcalf, Adjunct Professor, Department of English

*Showhaus* is a web-based directory specifically designed for the promotion of independent music and art events. After interviewing key members of Baltimore's underground music and art communities and exploring Baltimore's wide array of independent venues, we were able to pinpoint areas of concern and inconvenience for promoting these kinds of events (or "shows"). While the internet has given independent musicians and artists a strong, flexible medium through which to promote their work, its open nature presents a threat to the required exclusivity of their live performances. Many independent artists perform at venues or "showspaces" that are not registered with the State of Maryland and, in many cases, are required to shut down after they become too popular. *Showhaus* provides a network of *show pages*, user-submitted pages which advertise a specific event (providing Soundcloud, Bandcamp, and Youtube integration) and several classes of *venue pages*, user-submitted pages which provide information about local, independent venues, in some cases listing the address of local. *Showhaus* also includes *city pages*, city-specific pages which provide an overview of local, independent shows on a given day. By taking into consideration the cultural context that surrounds these kinds of events, we hope to make *Showhaus* an applicable and relevant tool for growing independent music and art scenes.

## *Bartleby* 2013: Behind the Scenes

***Marissa Regelin, Laura Lefavor***
Sally Shivnan, Senior Lecturer, Director of Writing and Rhetoric, Department of English; Guenet Abraham, Associate Professor, Department of Visual Arts

UMBC's creative arts journal is an interdisciplinary effort that showcases the creativity and diversity found in the university's student body. Every year *Bartleby* receives more submissions than can possibly be printed, and staff members are faced with the daunting task of deciding which pieces to include in the journal. While most people are familiar with the finished product, not many are aware of the behind-the-scenes work that goes into producing the journal. Throughout the fall, *Bartleby* staff members review incoming submissions and narrow down the pool of top contenders. After final selections are made in early January, a team of copy editors and a student designer work together on the layout of the journal before it is professionally printed. In further collaboration with the Visual Arts Department, graphic design students provide visual interpretations of the written works to be displayed at *Bartleby*'s annual release event. The process spans over eight months, and the result is a polished collection of poems, stories, essays, and art. This exhibit celebrates the release of *Bartleby* 2013 and shares behind-the-scenes images of the staff collaborating on this project that involves students across many majors, bringing together writing and art from students throughout the university community.

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

## The Humble Beginnings of Public Education

***William Rice***
David Mitch, Professor, Department of Economics

Many people in this country take for granted the immense benefit that public schooling provides for the citizens of the United States. Even those of us who have been instructed in the public fashion are not privy to the processes by which universal education came into fruition. This research investigates the driving factors behind what caused public institutions for education to first be established in eighteenth century England. When taking a close look at the underlying themes, one soon realizes that these schools were being created for a number of reasons other than solely the betterment of youth. From powerful bureaucrats stroking their already enormous egos, to the devout Christians attempting to bolster their chances of receiving a heavenly reward; the incentives that eventually led to the expansion of public schooling are diverse and in some instances, ethically questionable. This presentation will feature leading figures that both supported and opposed the creation of public schooling in eighteenth century England. Specific examples may be selected from Mandeville's writings and those of Sarah Trimmer. This presentation aims to convey the conflicting motivations behind the origins of public education in the world's first industrial nation.

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**Development of a Cell Migration Model to Characterize Clustered Movements**

***Donald B. Richardson,*** *David Stonko, Bilal Moiz, Ann Marie Weideman*
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences
Bradford Peercy, Assistant Professor, Department of Mathematics and Statistics

A main issue in developmental biology is how cells transition from a stationary to a migratory phase. Many factors determine a cell's movement through complex and changing environments. We aim to understand how the adhesive, repulsive, migratory, and stochastic forces are involved in the initiation of motility, and the subsequent rearrangement of non-migratory cells. Our group uses egg development in Drosophila to study cell movement because it is well-characterized and amenable to molecular and genetic analysis. We developed a mathematical model defining computationally identical mathematical cells (IMCs), which represent motile cells in vivo. Sets of IMCs make up large non-motile biological cells. Using this dynamic cell model based on force balance, we can simulate the impact of different forces to determine how they contribute to cell movements. We hypothesize that the initiation of motion follows two steps: 1) increased adhesive force causing cell clustering followed by 2) increased sensitivity to chemical gradients causing migration. These two steps allow a cluster of cells to migrate out of a tissue, while promoting the re-closure of the gap left behind. Understanding this process could potentially help further studies in other contexts such as the metastasis of tumor cells throughout the human body.

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**The Educational Theory of W.E.B. DuBois: The Continued Relevance and Success of the HBCU**

***Anthony Rizkalla***
Lisa Vetter, Assistant Professor, Department of Political Science

The future role of Historically Black Colleges and Universities (HBCUs) is an important issue in education policy because the state-sponsored segregation that led to their founding no longer officially exists. The fact that HBCUs gave African Americans opportunities for higher education that they otherwise would not have had is widely accepted. The extent to which HBCUs continue to help African Americans today, however, has been strongly disputed. Many HBCUs have encountered financial difficulties, decreasing enrollments, and declining educational outcomes. Much of the literature on the subject analyzes the performance of HBCUs from an empirical perspective. Additional study is needed of the broader, ethical issues posed by the segregative impact of HBCUs through funding policies and other regulations. W.E.B. DuBois is a well-known theorist whose ideas and actions help shape HBCUs in the United States. An evaluation using DuBois's theory would add to the important discourse about the continued relevance and success of HBCUs.

**Mulitmodal Learning with Tablet Computers**

***Dana S. Robinson***
Diane L. Alonso, Program Director/Senior Lecturer, Department of Psychology

Technology has offered educators a wide variety of ways to share information. Instructors can provide students with text, diagrams, lectures, videos, hands-on experiences, and more. This study seeks to explore whether targeting multiple sensory modalities in instruction can improve students' learning of material. A single modality (aural) instruction design is compared with a bi-modal (aural and visual), as well as, tri-modal (aural, visual, and kinesthetic) design, each group with 30 participants. Emerging research has shown that general tablet use in the classroom may improve students' exam performance. The current study specifically proposes the use of tablet computers as a means of kinesthetic/tactile instruction. It is hypothesized that students in the tri-modal condition will demonstrate the greatest increase in learning from pre- to post-test, whereas students in the single modality condition will demonstrate a lesser increase in learning. It is also expected that kinesthetic learners will perform better in the tri-modal condition than kinesthetic learners in other conditions. Learning, as measured by the difference from pre- to post-test scores for each participant, will be compared between conditions using a one-way analysis of variance. Results could provide insight for educators on which methods of instruction yield the best results in student learning.

**"Terms of Art": Interpreting Mamet's *Oleanna* for the Stage**

***Daniel Roeder***
Susan McCully, Senior Lecturer, Department of Theatre

When David Mamet's *Oleanna* debuted in 1992, reviewers immediately contextualized the play as a response to the Clarence Thomas-Anita Hill sexual harassment scandal. The play was widely seen as a polemic against notions of political correctness in academia, and past productions have provoked notoriously misogynistic reactions from its audiences, with many critics labeling the play as inherently anti-feminist. My research attempted to challenge these perceptions. While directing the play, I have used script analysis skills, rehearsal techniques and the manipulation of promotional material to create a production that subverts anti-feminist insinuations and focuses on the power of language and the dangers of corrupt or inefficient pedagogy.

**Examining the Relationship between BMI and Depressive Symptoms in African-American Adolescent Females**

***Heather W. Rogers***, *Dawn Witherspoon[1], Erin Hager[1], Stacy Buckingham-Howes[1], Maureen Black[1]*
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Childhood obesity is a major public health concern in the United States. The past 30 years have seen increases in obesity, especially among African-American adolescent females. Because obesity is a risk factor for negative mental health, the increase in obesity rates raises concerns about mental health issues such as depressive symptoms. The present study tested the hypothesis that overweight and obese African-American adolescent girls have higher rates of depressive symptoms than normal weight girls. The data were collected from 727 sixth and seventh grade girls in Baltimore, Maryland. Methods include measured height and weight to calculate BMI and the Children's Depression Inventory short form to assess symptoms of depression. Analysis will include descriptive statistics, Analysis of Variance, and Chi-square analyses to examine how weight status relates to depressive symptoms. Understanding the association between depressive symptoms and overweight/obesity in adolescent girls can inform future intervention research designs.

*This work was funded, in part, by General Mills Champions for Healthy Kids Legacy Award and NIH, National Institute of Child Health and Development (R01 HD054727).*

**The Subtle Homework Transition: Starting Homework Achievement in Class**

***Morey Rosner, Jonathan Lee***
Jonathan Singer, Associate Professor, Department of Education

The research question presented is the following: is homework achievement related to higher test scores, and if so, what are possible ways to strengthen homework achievement? The presented methodology is based on the concept that if a student's homework grades improve, it will increase his or her confidence and academic performance. The project will revolve around the concept of providing time at the end of class periods to allow students to get started on their homework in the form of an exit ticket. The hypothesis is that if students are allowed a chance to get started on their homework in class, as well as ask questions, then they will 1) display higher homework completion rates, 2) receive higher homework grades, and as a result, 3) receive higher test scores. This hypothesis, the subtle homework transition, presents the exit ticket as scaffolding with homework, which in turn will contribute to greater levels of homework completion and academic achievement. To gather data, pre-test, exit ticket, homework, and post-test scores will be recorded and correlated.

**The Development of a Coding System to Measure Memory for Conversation**

***Caitlin Rush***, Megan Muduck
Robin A. Barry, Assistant Professor, Department of Psychology

Romantic relationships are built through the interactions and conversations that they have with one another. Thus, individuals' memory for interactions with their partner should influence couple functioning. Additionally, past research has shown that memory can be influenced by a number of variables. Despite the importance of memory for conversation in romantic relationship functioning, researchers have found it difficult to accurately gauge memory recall for conversation. We developed a coding system to measure how accurately individuals recalled conversations with their romantic partners. Memory recall was assessed by comparing each couple's discussion to a separate post-discussion interview. Inter-rater reliabilities for discussions and interviews were found to be high. This coding system will be helpful in future research aimed at examining what influences memory for interactions with romantic partners, and how memory for interactions contributes to romantic relationship development and functioning.

**Anoxia Results in Microtubule Disorganization in the Hindbrain of Zebrafish**

***Samantha A. Russell***
Rachel Brewster, Associate Professor, Department of Biology

Stroke is caused by ischemia, an occlusion that prevents sufficient oxygen from being delivered to brain tissue, resulting in apoptosis. In order to develop treatments for stroke there is a need to understand the cellular responses to anoxia. Investigating these responses in the zebrafish embryo, which is transiently resistant to anoxia, is advantageous as it may be possible to identify adaptive and pathological changes in response to lack of oxygen. A proteomic analysis performed by the Gitlin laboratory revealed that cytoskeletal proteins are modified in the zebrafish embryo following prolonged anoxia, however these authors did not investigate the organization of the cytoskeleton *in vivo*. The goal of my project is to determine whether anoxia leads to transient or prolonged changes in microtubule organization. I subjected zebrafish embryos to 10 hours of anoxia and fixed them at different time points following this treatment. I visualized the microtubule cytoskeleton in hindbrain sections immunolabeled with anti-tubulin antibodies. Preliminary data indicates that anoxia causes a disorganization of the microtubule network, as the microtubules fail to form tight bundles – (24hr control 23.6%; 34hr control 45.8%; anoxia 72.4%). We speculate that this response may be due to the modification of a microtubule-associated protein.

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**Building a Better Community: St. Augustine's City of God**

**Morgan Russo**
Lisa Pace Vetter, Assistant Professor, Department of Political Science

In *The City of God*, Saint Augustine establishes essential philosophies and structures necessary for a more spiritually and morally just community at a revolutionary period between the fall of the Roman Empire and the rise of Catholicism as an organized religion. Saint Augustine, an early Church father, may be considered too rigid and exclusive for our multicultural and globalized society. However, diversity has in many cases been achieved at the expense of unified communities. My research question is the following: Can Saint Augustine offer us a better guidance in building a greater sense of community than we typically would think? My hypothesis is that as a transitional thinker, Augustine is a more tolerant and accepting figure than previously thought. An important part of my argument will compare the ideas of Saint Augustine with those of John Rawls, a contemporary liberal political theorist who had a great respect for the religious life.

**Does Sense of Belonging Affect One's Perception of Community?**

***Keena Santos***
Mariano Sto. Domingo, Adjunct Assistant Professor, Department of Psychology

Sense of community stems from the belief that community will provide resources one needs to succeed, that one can influence the community, and one has a high level of similarity and interdependence with other members. An important element of sense of community is membership or sense of belonging, which may be influenced by demographic background, experience, and interaction with other members. This study tests the theory that one's sense of belonging shapes one's perception of the community. Using a sample of Meyerhoff scholars, it also tests the interaction effect of ethnic background and sense of belonging on their perception of the Meyerhoff community. A sample of 70 Meyerhoff scholars was administered questionnaires during the 2011 Summer Bridge Program. A factor analysis was conducted to determine if the items that define sense of belonging formed a unique factor. Between-groups factorial analyses of variance (ANOVA) were conducted to determine whether ethnic background and sense of belonging influenced perceptions of Meyerhoff community. We hypothesized that those who have greater sense of belonging will have favorable perception of the community. These results may be used to create more effective ways to enhance people's perception of their community by improving their sense of belonging.

**An Investigation of Wind Shear in the Coastal Mid-Atlantic with Applications to Wind Energy**

***Nathan Scavilla***
Lynn Sparling, Associate Professor, Department of Physics

It is widely recognized that fossil fuels are not sustainable and affect climate change; therefore, research into alternative sources of energy is an important endeavor. There is much interest in wind energy offshore in the mid-Atlantic, but there are relatively few vertical wind profiles in the lowest two hundred meters of the atmosphere which are measured directly and continuously. This study is an investigation of the statistical characteristics of the height dependence of the wind speed and direction, using data from anemometer towers with measurements at several vertical levels. Three different geographic locations near the Chesapeake Bay were analyzed and uncertainties in the wind speed caused by the disruptions of wind flow near the anemometer tower were estimated. After an extensive analysis of the data, this research suggests that the largest changes in wind shear occur during the winter months. The data was also used to test how closely the vertical wind profile correlated with a commonly used power law model; our results show that a power law holds in some cases, but in others is more variable. This work provides a detailed analysis of the diurnal and seasonal variability of wind shear and the results are important for wind resource assessment and engineering turbine designs.

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

**Exploratory Time Series Analysis of Urbanization Impacts on Stream Chemistry and Macroinvertebrates**

***Matthew L. Schley***
Matthew E. Baker, Associate Professor, Department of Geography and Environmental Systems

Over the past 25 years, freshwater ecosystems have become increasingly threatened by urbanization and a concurrent increase in impervious surface cover. Ecosystems have shown both chemical and biological responses to changes in land cover, and most prior analyses have inferred a direct causal relationship. Utilizing 25 years of impervious cover maps derived from satellite imagery of the DC-Baltimore metropolitan area, we related changing patterns of human land use to stream chemistry and biota (macroinvertebrates). Individual study watersheds showed response patterns in dissolved material and biotic community composition consistent with either pulse (discrete events) or ramp (gradually intensifying) disturbance patterns. Many pulse responses correspond to abrupt increases in impervious surface cover or more gradual increases punctuated by major weather events, including rainstorms and blizzards, thus highlighting potential for interaction between increasing levels of urbanization and climate. Through its unique temporal perspective, this type of analysis offers potentially important insight regarding the impacts of urbanization on the integrity and resilience of stream ecosystems.

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

**Text-Mining Tools to Aid Diagnosis of Cancer**

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

In cancer gene mutations are responsible for initiation, progression, and development of the disease. Knowledge of cancer mutations is crucial to provide information about the molecular underpinning of the disease. As patients are screened, associations to cancer human variants are necessary for better diagnosis and prognosis. Due to the growth in the number of publications, manual effort to obtain information is expensive and inefficient to implement and update databases. Our team has developed a semi-automatic tool, the Extractor of MUtations (EMU), which extracts mutations, from literature. We are investigating the application of EMU in the clinical environment. We used NCBI resources to extract a corpus of 880,000 abstracts. Applying EMU, we found 8,185 mutations, of which 129 mutations relate to the BRAF gene. Our results show that it is possible to generate an increase of reports for clinicians using a semi-automatic approach. We estimate our manual effort to generate the BRAF gene file to take approximately two hours. We conclude, while the use of EMU with manual curation is feasible, the existence of over 1,000 currently known cancer genes calls for more sophisticated methodologies to minimize the time requirement for manual effort in the clinical environment.

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**Designing Online Content to Involve Parents in School-Based Prevention Programming**

***Sabrina A. Shah****, Mary Shuttlesworth, Katherine Flynn, Jennifer Betkowski*
David Schultz, Associate Professor, Department of Psychology

Previous research shows that parent involvement in school-based prevention programs is generally low. The current study examined the potential of online technology to involve parents in a school-based program to prevent child behavior problems, the GOALS Program. Thirty parents from two Head Start centers in Baltimore tested a website based on the GOALS Program and offered suggestions for website improvements. Website testing resulted in a finalized version of the GOALS website that is both user-friendly and contains content relevant to the target population. To market the website, the present study used various modalities (i.e., text messaging, newsletters) based on parent preferences. Although the present study aimed to implement various methods of contacting parents to encourage all the parents to access the website, results showed that only 20 percent of the parents visited the website. A possible direction for future research includes focusing on a small sample of parents in order to demonstrate the relationship between website engagement and improved child outcomes.

*This work was funded, in part, by the UMBC Graduate Student Association.*

**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 guided migration of border cells in *Drosophila melanogaster*. Developmental specification of border cells and their subsequent migration is induced by activation of the Janus Kinase and Signal Transducer and Activator of Transcription (JAK/STAT) signaling pathway. We have identified a gene, *prolyl-4-hydroxylase alpha* (*PH4alphaEFB),* expressed in follicle cells at the time of border cell movements, that may be an important mediator of signaling. To characterize the function of the *PH4alphaEFB* gene better, we studied several putative loss of function mutations with transposable elements inserted at this locus. We determined the strongest mutant allele of *PH4alphaEFB* through genetic and molecular analysis and comparison with a deficiency. Loss of function mutations all affected oocyte growth, and some alleles also disrupted border cell migration. Some experiments suggest PH4alpha may interact with the receptor that activates STAT signaling. We are currently investigating a link between PH4alphaEFB and STAT activation. The success of this project will contribute to a better understanding of border cell migration and may provide insight into cell movement more generally.

*This work is funded in part by an NSF Career Award given to Michelle Starz-Gaiano.*

**Interpretation in the Museum: An Ancient Gem in a Modern Context**

***Caitlin Smith***
Timothy Phin, Lecturer, Department of Ancient Studies

Museums are often presented as repositories for material culture from ages past or distant places. They are storehouses where visitors can go to look at and learn from objects they might otherwise never see in their lifetimes. This presentation adopts a different perspective, examining the museum instead as a reflection of modern mental constructs and interpretations of a past which we can never objectively know. It explores the history of the *Gem with Oedipus and the Sphinx* from its creation in Hellenistic Greece to its current setting in the Walters Art Museum's massive collection, focusing on the gem's changing functions and meanings over the course of its existence. My research suggests that as the gem has evolved from a private object to a public one, its uniqueness has been largely subverted. Instead, it is only one among many objects which the museum categorizes and employs to convey a highly generalized modern interpretation of the people and culture of Ancient Greece.

**Wastewater Treatment of Fluoroquinolone Antibiotics Using UV-Based Processes**

***Sebastian J. Snowberger***
Lee Blaney, Assistant Professor, Department of Chemical, Biochemical, and Environmental Engineering

With recent advancements in medicine, consumption of pharmaceuticals is steadily increasing and unprecedented amounts of pharmaceuticals are entering wastewater streams. Currently, wastewater treatment plants do not specifically treat for pharmaceuticals, and concentrations of pharmaceuticals are discharged to the environment and drinking water supplies. Health concerns of ingestion of pharmaceuticals through drinking water are widespread, and numerous studies have identified ecological impacts associated with pharmaceutical contamination. Fluoroquinolone (FQ) antibiotics are among the most frequently detected classes of pharmaceuticals in wastewater and surface water. As more wastewater treatment plants implement ultraviolet (UV)-based disinfection processes, we posit that there is potential for transformation of FQs into benign derivative compounds. To test this hypothesis, we studied the transformation of pharmaceuticals under UV irradiation and the UV-hydrogen peroxide (UV-H2O2) advanced oxidation process. For direct photolysis (UV only) testing, experimental solutions were prepared by spiking FQs into buffered deionized water with varying concentration of tertiary effluent (partially treated wastewater); hydrogen peroxide was added during UV-H2O2 testing. Fluoroquinolone concentrations were measured using high performance liquid chromatography. Analysis of the results from both methods, varying pH and concentration tertiary effluent, showed a superior transformation rate using UV-$H_2O_2$, which demonstrates the effectiveness of the process for water and wastewater treatment of pharmaceutical contaminants.

*This work was funded, in part, by the UMBC Undergraduate Research Assistantship Support program.*

**Correlation between Anemia and Congestive Heart Failure with Hospital Stay**

***James W. Stewart II****, Nowreen Haq*
Nowreen Haq, Instructor of Medicine, Johns Hopkins University Medical School

Millions of Americans are living with congestive heart failure (CHF) and thousands are being admitted into the hospital every year for their condition. Many patients who are admitted to the hospital for CHF have also been found to have a lower red blood cell (RBC) count, otherwise known as anemia. This correlation led our lab to investigate the possibility of anemic, CHF patients having a longer hospital stay. The methodology includes analyzing more than 1000 patients at Johns Hopkins Bayview Medical Center through a hospital database. Some of the variables evaluated include: current diagnosis or history of CHF, whether they are on anticoagulantion medication, a metabolic panel evaluation, a full blood examination (FBE), and basic demographic information. As anticipated, preliminary results suggest a correlation between CHF patients with anemia and longer hospital stays. The final steps of the investigation include collecting a larger population sample and evaluating other variables such as patients who have chronic obsessive pulmonary disease (COPD), a disease that correlates to anemia. The results of this research have importance with respect to patient care. If the hypothesis holds true, physicians could use this information to make strides to reduce CHF patients' hospital stays.

**A Force-Based Approach to Unraveling the Mechanism of Cell Migration**

***David Stonko***
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences
Bradford Peercy, Assistant Professor, Department of Mathematics and Statistics

Cell migration is essential for the normal development of multicellular organisms. Despite its prevalence throughout biology, the mechanism of cell locomotion is poorly understood. This is especially true of the situation where a cluster of motile and non-motile cells translocate together. Our team studies a genetically orchestrated process of this type within *Drosophila melanogaster*. During development migratory cells begin in the epithelium, differentiate, form a cluster and collectively migrate toward a chemoattractant. This movement is dictated by forces that act between neighboring cells. To understand these interactions we constructed a force-based ODE model of the dynamics of adhesion, repulsion, migration and stochastic fluctuation between cells. Our results indicate that our model is sufficient to reproduce the behavior observed *in vivo*. Moreover, this model predicts the migratory behavior associated with altering the number of migratory cells, provides insight into the mechanism sufficient to cause rotation in the migratory cluster, and makes predictions about the epithelial to motile transition of the inchoate cluster. This model will thus be useful for streamlining experimental work, providing a context to interpret experimental results and for elucidating the mechanism of collective migration from fundamental bio-physical interactions.

**Designing and Simulating THz Waveguide Devices using Finite Element Techniques**

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

We designed and simulated a waveguide device at terahertz (THz) frequencies using a finite element method implemented in COMSOL Multiphysics. By applying the governing physical equations, THz generation was simulated for a laser pulse travelling through the nonlinear core of a five-layer structure. The effect of different device structures on the efficiency and bandwidth of the THz radiation was investigated to find the optimal configuration. This research was designed to optimize the structural and material properties of a THz waveguide device before it is built in the laboratory. Currently, conventional metal and dielectric waveguides are not able to transport THz radiation over long distances due to high losses in this frequency regime. Our results attempt to determine how to construct an effective THz waveguide for a broad range of applications such as security imaging.

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**Social Entrepreneurship: My Strategy to Bring about a Change on UMBC Campus**

***Yohka Tanaka***
David Hoffman, Assistant Director of Student Life for Civic Agency, Office of Student Life

My project involves action research (oriented to practical problem-solving) to explore options for encouraging healthier eating on campus. My project has both an information gathering and analysis component and an advocacy component. My information-gathering addresses the question, "What changes to menu options in UMBC campus restaurants would result in students' consuming a more balanced diet and win support from UMBC's primary food vendor?" My advocacy has involved the relationship-building, pulse-taking and information-sharing needed to lay the groundwork for the potential changes I have identified. My research methods have included conducting a literature review relating to nutritional health; participating in meetings with administrators from UMBC and its primary dining services provider, Chartwells; soliciting opinions from students using social media; and conducting observation studies at campus eateries. I reviewed my data and refined my strategy with help from peers and instructors in my Civic Agency & Social Entrepreneurship course. What I found was that nutritional health is an enormous problem on U.S. college campuses; UMBC students are likely to respond favorably to more healthy options; and Chartwells is willing to experiment with menu changes. Chartwells is reviewing my specific proposal for the addition of an affordable menu option in The Commons.

**How Much Pain Exactly? Quantifying Spontaneous Pain due to Spinal Cord Injury from Electrolytic Lesion Model**

***Doris Taylor,*** *Asaf Keller*
Department of Anatomy and Neurobiology, Program in Neuroscience, University of Maryland School of Medicine, Baltimore, MD

In the United States alone, more than a million people suffer from spinal cord injury (SCI) every year. Most of these victims go on to suffer from excruciating chronic pain (SCI-Pain). Our research aims to understand the how SCI and chronic pain relate so that therapies can be made to prevent and treat the progression of the condition. We hypothesize that behavioral and physiological abnormalities in SCI-Pain are dependent on the extent to which the spinothalamic tract (STT) – the spinal pathway conveying pain – is affected. To test this, we made electrolytic lesions in the spinal cords of rats and then monitored for behavioral and physiological changes. The spinal cords are collected and cut into this sections using a cryostat. A myelin specific stain is used to reveal the extent of spinal damage, which is quantified with a computer-aided morphometry system (Neurolucida). The volume of the lesioned area will calculated to determine if the amount of damage correlates to behavioral and electrophysiological metrics of pain. The results will provide a baseline for future testing of treatments to improve SCI-Pain in human patients.

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**Characterizing Surface Conditions of Micro- and Nano-Electrodes for Electrochemical DNA-Based Sensors**

***James B. Taylor,*** *Melissa Davila Morris, 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 sensors to small-scale electrodes ($\leq 25$ μm) for improved sensitivity, we find that sensor performance is more susceptible to defects in the monolayer than observed on macro-scale electrodes. We have characterized the monolayer on our in-house fabricated micro-electrodes by determining the accessible surface area by using cyclic voltammetry as we change the thiol concentration and deposition time and observe that as we increase both, we produce more pristine monolayers. Furthermore we are characterizing both how different kinds of thiols can affect the monolayer's passivating capabilities and how the DNA surface packing density and signal are affected by the method of DNA deposition. From our preliminary data, it appears that using a thiolated carboxylate as a monolayer gives the greatest signal blockage and that signal is a function of surface packing density. As we continue to characterize our sensor surface, we plan to optimize the conditions and scale them down to the micro/nanoscale for small-scale analyte detection.

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**Effects of Prolonged Sweetener Exposure on Taste Receptor Variant Expression in NCI-H716 Cells**

***Blossom A.Z. Tewelde****, Steven D. Munger*[1]***,*** *Stephan Vigues*[1]
[1] University of Maryland School of Medicine
Steven D. Munger, Professor, Department of Anatomy and Neurobiology and Department of Medicine, University of Maryland School of Medicine

The same receptor that mediates the sweet taste of sugar is also found on endocrine cells throughout the gastrointestinal (GI) tract, where it couples luminal glucose to the secretion of metabolic hormones. It has been suggested that sugars in the gut lumen may influence the expression of the sweet taste receptor, including the obligatory subunit T1R3. To address this issue, we asked whether prolonged exposure to glucose at varying concentrations differentially affects T1R3 expression in NCI-H716 cells, an enteroendocrine cell line derived from an adenocarcinoma of human cecum. We are using quantitative real time-PCR with primers specific to both the full-length and truncated forms of T1R3 to detect expression levels in response to varied glucose concentrations. Preliminary studies with non-quantitative PCR confirm expression of both full-length and truncated T1R3 variants in response to nutritional levels of glucose. We will discuss the results and their implications for nutrient sensing and sensitivity.

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*UMBC and the Howard Hughes Medical Institute's Precollege and Undergraduate Science Education Program.*

**Overcoming Reproductive Barriers: Memoirs of Gay Fatherhood**

***Kevin Triplett***
Carole McCann, Professor, Department of Gender and Women's Studies

Gay fatherhood identities are constructed in relational terms which configure access to alternative reproductive practices as a means of negotiating the contradictory traits of gay and fatherhood identities. Contemporary rhetoric has policed the boundaries of appropriate families and reproduction to exclude gay couples from being active participants. A content analysis engaging two memoirs, *The Kid: What Happened after My Boyfriend and I decided to go Get Pregnant* (1999) by Dan Savage and *A Gay Couple's Journey through Surrogacy: Intended Fathers* (2006) by Michael Menichiello, looks to critically examine how gay men speak regarding their assimilation of gay fatherhood identities through both adoptive and surrogate methods. Recognizing the concept of multiple positions of fatherhood helps to not only create legitimacy for same-sex parenting, but also debunk the naturalized assumptions regarding who can participate in reproduction based on gender and sexuality. The analysis is self-reflective on the procedures which limit authenticity of the memoirs as effective, yet complex texts.

**Dance as Support for an English Classroom**

***Franki L. Trout***
Jonathan Singer, Associate Professor, Department of Education

In an era when the public school system is overwhelmed with pressure for students to score highly on standardized tests, an elective dance class must adapt to fit these new values, or face being deemed irrelevant. Numerous studies have shown that dance can facilitate the transfer of learning across curricula, while other studies have shown that there is a correlation between training in the arts and improvement in a student's reading skills. My research looked at the ways in which an elective dance class can support the needs of a required tenth grade English class, by having students explore the concept of theme as it relates to both Dance and English studies. Students participated in a weeklong dance compositional mini-unit, that used the theme of the short story they were reading in English class, *The Key Game* by Ida Fink, as creative stimulus to construct dances. Students were able to translate the theme into movement, therefore demonstrating a deeper understanding of the text as evidenced by higher classwork scores than their peers in English who did not participate in the dance activity. This research shows the validity of dance as a support to academic subjects, in a rigorous testing environment.

**Innovations in Computer Game Development**

***UMBC Game Developer's Club: Andrew Battisti, Paul Tschirigi, Michael Leung, Alex Lacey, Isaac Sohn, Jeremy Rimpo, Eliot Carney-Seim, David Kim, Jimmy Horner, Jonathan Moriarty, Alex Grube, Nathan Lam, Katherine Jay, Calvin Kumagai, Ashley Dotson, Gloria Ngo***
Marc Olano, Associate Professor, Department of Computer Science and Electrical Engineering

Every year the UMBC Game Developers 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. Each game was selected after a game jam, during which multiple ideas were rapidly prototyped over the course of 48 hours and then selected for completion. KleptoClockers is a 2D platformer where the goal is to run through a level as quickly as possible in order to steal back time. Each level is designed to force the player to strategize in order to optimize their time and complete the objectives. Pulse is a 2-D platformer where the player must utilize a pulse mechanic to navigate through levels. The pulse mechanic accelerates the player in the opposite direction, creating a unique way of moving through each level. Quantum Gene is a third-person robot combat game where you fire rockets at the enemies while trying to shoot down rockets fired at you. Quantum Gene focuses on maintaining smooth performance while using detailed models and graphics.

**CTL-promoting Effects of IL-21 Counteracts Murine Lupus and Outweighs B Cell Stimulatory Effects**

***Daniel Veizaga-Udaeta,*** *Vinh Nguyen[1], Cosmin Tegla[1], Ching Chen[1], Horea Rus[1], Violeta Rus[1]*
[1]Department of Medicine, Division of Rheumatology and Clinical Immunology, University of Maryland School of Medicine
Violeta Rus, Department of Medicine, Division of Rheumatology and Clinical Immunology, University of Maryland School of Medicine

IL-21 promotes autoimmunity in the chronic graft versus host disease (cGVHD) model through both B and CD4 T cell intrinsic mechanisms. To determine the importance of IL-21R signaling in CD8 T cells in murine lupus, we assessed the effect of IL-21 administration on autoimmune parameters in the DBA-into-F1 model of cGVHD. In addition, the effect of IL-21R deficiency on CD8 T cells was assessed in the B6-into-F1 model of acute GVHD using IL-21R sufficient and deficient donor cells. cGVHD mice that received rmIL-21 exhibit attenuated autoimmune parameters with respect to host B cell expansion, anti-ssDNA autoAb production and renal disease along with enhanced dCD8 expansion and donor anti-host CTL activity. Phenotype of aGVHD induced with IL-21R-/- donor cells converted from an acute to a chronic pattern characterized by increased autoAb production, decreased host B cell elimination, impaired CTL activity and decreased dCD4 and dCD8 cell expansion. In both models, IL-21R signaling on dCD8 cells resulted in increased dCD8 expansion, granzyme B level and IFNg expression. These results suggest that lack of IL-21/IL-21R interaction on CD8 T cells converts acute to chronic GVHD, while in cGVHD, IL-21 administration counteracts the humoral component by enhancing CTL generation and host B cells elimination.

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**The New Left of Latin America: Popular or Authoritarian leaders? The Case of Ecuador's Rafael Correa**

***Soraya Veloso Williams***
John Stolle-Mcallister, Associate Professor, Department of Modern Languages, Linguistics and Intercultural Communications

In recent years Latin American politics has been dominated by left-leaning "new populism," which can be defined as a political movement headed by a charismatic leader that represents lower classes against the elite minority. Focusing on the phenomenon of populism this research analyzes the trajectory and contradictions of Ecuador's President Rafael Correa. On the one hand, Correa has won the support of many marginalized groups, by providing jobs, economic support and infrastructure improvements. On the other hand, he has alienated some of his social movement allies by refusing dialogue with any group that criticizes his policies. This research explores the tensions between a President with socially inclusive policies, but somewhat authoritarian tendencies, and raises questions about Ecuador's future. Is the new populist project a democratic one, which endeavors to guarantee that the people in the country are treated equitably and given their rights, or is it an authoritarian one, more reminiscent of a dictator who will not tolerate any obstacles to govern? Or is it a combination of both?

**Improving Students Self-review Skills**

***Thomas J. Vigliotti***
Jonathan Singer, Associate Professor, Department of Education

The ability of metacognition, or "thinking about thinking" is a technique for self-improvement. For most people, this is an acquired skill that requires consistent practice. To teach a student metacognition, they must first be taught self-review techniques. Often students do not read comments teachers have made on papers, and fail to answer all parts of the question on writing prompts because they fail to review their work before submitting it. For my Action Research Project, students will be provided with different writing prompts that will require them to assume different perspectives based on the historical content studied in class. Before the writing prompts are submitted, they will have undergone a peer-review, a peer-to-peer discussion, and a self-review. The writing prompts will be graded on how well students have answered all parts of the question, clarity, and content knowledge. By having students assignments go under multiple reviews by themselves and their peers, my goal is for students to think about how they write, recognize common mistakes they make, and work to improve them independently. Student improvement will be evaluated on the change in the quality of their performance on the essay portion of their unit test, administered on April 13, compared with their performance on the essay responses of a previous test administered on March 8, before they completed the preparatory writing prompts.

**Popular and Academic Comparisons of the United States' Iraq War and Vietnam War**

***Jennifer L. A. Wachtel***
Dr. Meredith Oyen, Assistant Professor, Department of History

Contemporary scholars and political commentators frequently draw parallels between the U.S. experiences in Vietnam and Iraq. My project examines whether past conflicts can serve as historical lessons for current problems through analysis of popular and academic comparisons of the two wars. Scholars and policymakers use the memory of failure in Vietnam and divided popular support to promote partisan views of U.S. foreign policy in Iraq. My research examines how these comparisons prevent a nuanced understanding of each conflict as a discrete event and can lead to questionable or even dangerous foreign policy choices. In particular, I focus on how the strategic manipulation of rhetoric influences comparisons of the two wars. I use a variety of sources, derived from academic, scholarly, and policy journals. I juxtapose scholarly warnings against analogies employed by partisan policymakers and journalists with op-eds and public debates making those comparisons in such print and online media sources as *The Washington Post* and the History News Network. In the process, I focus on particular points of comparison including the nature of intervention, the force of public opinion, military tactics, and the timing of withdrawal.

**Biocompatible Coated Electrodes for Long Term *in vivo* Sensing**

***Samiullah Wagan***, *Lauren Schoukroun-Barnes, Jennie B. Leach*
Ryan J. White, Professor, Department of Chemistry and Biochemistry

The ability to perform real-time monitoring of chemotherapeutics (e.g., aminoglycoside antibiotics - tobramycin) could revolutionize modern healthcare. Development of devices that would be capable of continuous detection in real-time would provide physicians and patients with personalized information necessary to make informed decisions about further treatment. Few platforms are available that can properly function *in vivo* and measure small molecule targets like tobramycin while retaining the capacity to function over long timescales due to biofouling at the sensor surface. Implanted sensors are subjected to cellular responses that lead to adsorption of cells and proteins to the surface. This causes signal loss of the sensor, which correlates with decreased sensitivity. Thus, the purpose of my research is to combine the specificity, selectivity, and sensitivity of electrochemical aptamer-based sensors with biocompatibility of hydrogels, in order to create biosensors capable of long-term *in vivo* measurements of a representative drug molecule, tobramycin. I will attempt to accomplish this by focusing on three aims. First, I will fabricate sensors on micro-electrodes incorporating anti-tobramycin DNA aptamers as specific recognition elements. Following this, I will incorporate biocompatible polyacrylamide gels to protect sensor surfaces from biofouling. Finally, I will evaluate the biocompatibility of the hybrid sensor surface. The results of this research will aid in the development of a new class of biocompatible sensors.

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

**People's Liberation Army Navy - Can it Defeat the U.S. Navy?**

***Paul Weisko***
Devin Hagerty, Professor, Department of Political Science

With China's rise, it may decide to become a regional or global hegemon, a feat that may require defeating the United States Navy. This presentation will investigate if the People's Liberation Army Navy, as is, can defeat the United States Navy if a battle that occurred in Chinese Littoral Waters occurred today. The presentation will use extensive research about the capabilities of all relevant technical aspects of both navies, which, when combined with the Salvo Combat Model, can fairly accurately predict the outcome of a battle between the two navies. It seems as if the United States Navy would win, however, the cost of that victory is hard to predict, given that a battle of this type has never occurred. This presentation will demonstrate my research by showing the numerical outcome of a naval battle between the U.S. and the People's Liberation Army Navy if that battle occurred today.

**Strategies for History Teachers to Raise Student's SAT Verbal Scores**

***Connor M. Wilkinson***
Jonathan Singer, Associate Professor, Department of Education

Raising student's SAT scores is a critical step in increasing the number of high school students who are able to go on to college and further their education. If teachers are able to prepare students for this important test while also teaching their specific curriculum, student learning within the classroom can be maximized. Two junior level US History classes were used as test subjects to see if this is possible. All the classes were given a SAT Verbal pre-test to establish a baseline. Then, one of the classes was taught the regular curriculum, while the other class was taught a modified curriculum that focused on both content specific knowledge and boosting reading comprehension to improve SAT verbal scores. After three months all the classes were given another SAT Verbal section to see if the modified curriculum helped boost some of the student's scores or if it made no difference at all.

**Mapping Baybrook: From Main Street to the Harbor**

***Jennie Williams, Katie Hern, Thomas Myers, Hayley Nelson, Lacey Wilson, Collin Wojciechowski***
Nicole King, Assistant Professor, Department of American Studies

This presentation features research on the role of historic main streets in understanding the significance of a community's past and how it reflects its modern day presence. During the fall 2012 semester, Professor King taught the third iteration of an upper-level undergraduate research seminar "Preserving Places, Making Spaces in Baltimore" for the Department of American Studies at UMBC. Each student in the course conducted an individual research project focusing on the cultural history of the struggling South Baltimore industrial community, referred to as Baybrook. These projects included a breadth of place-based research techniques including a neighborhood charting of the progressive development of main street businesses and oral history interviews with business and organization owners. Students gathered information from historic phone books and city directories in order to build a comprehensive record of the changing business and cultural framework of two once thriving main streets. This quantitative structure was then filled with qualitative personal experiences of what life was once like in this community through conducing oral histories with long-time residents. The results of the research have been complied and archived on the Mapping Baybrook website: http://mappingbaybrook.org/. Students organized an end-of-semester community event at the Polish Home Hall, which is listed on the National Register of Historic Places, in order to showcase this research and raise funds for the preservation of the building.

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**Isolating Polypeptides for Bio-tethering in Lithium Ion Battery Electrodes**

***Alexander J. Winton,*** *Scott Riley, Evgenia Barannikova, Danielle Schmitt*
Mark A. Allen, Assistant Professor, Department of Chemistry and Biochemistry

The goal of this research is to isolate multifunctional polypeptide sequences to bio-tether electrode material and carbon nanotubes in order to decrease internal resistance in lithium ion batteries and improve their performance. Phage display is the key technique performed in our research. This involves the use of an M13 bacteriophage library which has been genetically engineered to express a randomized polypeptide sequence between five and 20 amino acids on the pIII minor coat protein. To perform phage display a library of bacteriophage expressing these randomized polypeptide sequences were mixed with electroactive materials lithium manganese oxide and lithium titanate oxide. Samples were then shaken and elution of bound phage was performed by adding increasing concentrations of surfactant in order to isolate phage that stick tightly to the electroactive materials. The supernatants from each of the successive wash rounds were saved and titered. The strongest elutions represent bacteriophage expressing a peptide sequence with high binding affinity for the tested materials. Isolated colonies produced from single bacteriophage were then sequenced. Results showed the presence of many wild type bacteriophage which do not express randomized polypeptide sequences as well as some specific sequences that may stick to the material. As research progresses we will refine and isolate more peptides that bind specifically to these materials and use them to tether electroactive materials together to make more efficient battery electrodes.

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

**Coach Class: Effectiveness on Improving Student's Math and Science Content Knowledge**

***Ashley E. Witkowski, Ben Davis***
Jonathan Singer, Associate Professor, Department of Education

Afterschool help sessions, such as Coach Class, are used in many schools to assist in student learning. Coach Class allows students to come after school to receive one-on-one help and serves as a way for students to retake any assessments. Retesting is one strategy often used in Coach Class. Research shows that retesting and after-school help sessions benefit both the students and the teacher. During this research project we examined whether our implementation of Coach Class was an effective strategy to improve student learning and improve assessment scores. We will compare retest assessment scores to the original assessment after a series of Coach Classes. In addition, we will compare students' initial quarter grade in their course to their final quarter grades in their math and science courses. Coach Class has potential to benefit student learning.

**A Tiered Approach to Classroom Management**

***Lauren Wood***
Jonathan Singer, Associate Professor, Department of Education

This study investigated the effectiveness of using a tiered classroom management plan in a co-taught, tenth grade, world history classroom. Having a classroom management plan that is successful can improve class morale, student performance, time management, and a variety of other things. Observations were recorded two weeks prior to implementation and four weeks during the implementation process. A chart was used that presents the class disruption, how the student behaved, and what the correct behavior should have been. There was also a tally sheet used to monitor minor and major class disruptions that needed to be addressed; each day was summarized and reflected upon in an observation journal. Depending on the severity of the disruption a number of different methods were divided up among the tiers; things like proximity, planned ignoring, behavior contracts, antiseptic bouncing, temporal sequence charts, and hurdle help. The results showed that by breaking down classroom management into tiers talking in class and being disrespectful to the teacher were lower in the implementation phase than in the control phase. However, it showed that being disrespectful to peers was the same in both phases.

**Players for a String Quartet**

***Andrew Wright***
Linda Dusman, Professor, Department of Music

To explore the process of translating a piece of rock music into the classical idiom, I arranged a song by my band, Asbestos, for a classical string quartet. By studying works from groups like the Kronos Quartet, who play music by Jimi Hendrix, as well as quartets by Bartok or Beethoven, I learned how composers express what I express in my band's rock music, through string quartets. Replacing rock grooves with more commonly classical rhythms while layering and exchanging melodies between instruments allowed me to present my rock ideas in a way classical musicians would understand. This is evident after working with Peabody's Kubrick Quartet. These wonderfully trained classical musicians were able to interpret my musical ideas with little coaching needed. The performance particularly impressed my band members because they could hear the correlations between the rock and classical versions. This work is innovative in the field of music as animosity has existed between classical and rock musicians for decades. Recently, this rift has healed gradually, but this piece emphasizes that, although genres sound different, they both express similar ideas. Synthesizing these ideas is important to move music into the future, and The Sell-Out Police Quartet is a step in that direction.

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

**Morphological Characterization of *Aspergillus nidulans* Autophagy Mutants**

***Christopher L. Yankaskas***
Mark Marten, Professor, Department of Chemical, Biochemical and Environmental Engineering

Autophagy is a cellular-level recycling process that is highly conserved in eukaryotes from yeast to man. The pathway sequesters random cytosolic contents, including organelles, into double-membrane vesicles known as autophagosomes. In filamentous fungi, autophagosomes are transported to a vacuole, where they dock and their contents are degraded. Degraded cellular components are used to extend filamentous fungal branches, or hyphae, in the absence of exogenous nutrients. As a recycling pathway, autophagy has been shown to be important to the survival and productivity of filamentous fungi. We hypothesize that autophagy also plays a role in the regulation of hyphal morphology. To test this hypothesis we are studying the model fungus, *Aspergillus nidulans*. Autophagy is induced by growth in the presence of the drug rapamycin. Using optical microscopy and digital image analysis, the growth and branching rates (i.e., morphology) of wild type *A. nidulans* are compared to those of strains lacking the gene encoding one of these key autophagy proteins (Δ*atg8* and Δ*atg13*). Consistent with our hypothesis, the proteins Atg8 and Atg13 appear to be important for correct morphological development in *A. nidulans.*

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

**Functional Analysis of a Mutated Tentacle Within the L4 Ribosomal Protein**

***Brandon Young***
Lasse Lindahl, Professor, Department of Biological Sciences; Janice Zengel, Professor, Department of Biological Sciences

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 conducted 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 fairly close in the evolutionary tree to *E. coli*, we are using polymerase chain reactions (PCR) and site-directed mutagenesis to introduce mutations into the *E. coli* L4 protein. Two mutations to the L4 tentacle have been made and these will be analyzed to determine if they confer antibiotic resistance, and to determine if they have detrimental effects on ribosome assembly or function. Studying these mutations and the others yet to be made will provide new information on the role of amino acids in the L4 tentacle.

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**The Effect of Minority and Socioeconomic Status on Parental Involvement**

***Melissa Zarger,*** *Emily Foxen-Craft*
Lynnda M. Dahlquist, Professor, Department of Psychology

Minority and socioeconomic status have been linked to differences in parenting styles and practices, likely related to distinct cultural values and beliefs. Specifically, research has emphasized the significance of the importance placed on academic achievement, with minority and socioeconomic status being correlated with a higher value on academic achievement. While most of the research has focused on parental involvement within the school setting, more research needs to be done looking at the impact of minority and socioeconomic status on parental involvement in executive functioning tasks related to academic skills outside of the school environment. A sample of 133 mother-child dyads completed questionnaires and were videotaped as they completed a 6-minute difficult puzzle task. The duration of maternal involvement in this task was measured by trained coders. A sub-sample of 24 middle- and upper-class minority mother-child pairs will be matched on key demographics to 24 Caucasian mother-child pairs. Analyses will examine the relations among minority status, socioeconomic status, and maternal involvement. Results from this study may have important implications for parent-school interactions and the education of the growing number of minority children.

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**Design and Synthesis of Chlorin Dimer: Platform for Development of Fluorescent Probes for *in vivo* Imaging**

***Shannon Zik***
Marcin Ptaszek, Assistant Professor, Department of Chemistry and Biochemistry

An urgent need has arisen for a strong fluorescent molecule which exhibits tunable emissions in the 650-900 nm wavelength regions for potential use in medical diagnoses of diseases, such as cancer. Chlorins present themselves as an intelligent choice to explore, as they contain a highly conjugated system which exhibits absorption and emission in the optical range of 650-700 nm. This project focused on the synthesis of chlorin dimers, connected by different linkers. Such a dimer is anticipated to exhibit strong absorption and emission in the near infrared spectral window, providing an excellent platform for the development of fluorescent probes for *in vivo* fluorescence imaging. The chlorin monomer was created through a well-established zinc-mediated synthesis, whereas the chlorin dimer synthesis utilized a palladium-catalyzed, Suzuki coupling reaction. The structure, purity and spectral properties of the chlorin dimer, were determined through the use of $^{1}$H NMR, $^{13}$C NMR, mass spectrometry as well as absorption and emission spectroscopy.

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