Student Abstracts

In Alphabetical Order

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 can be found in the Program section of this booklet.

Computational Methods for Linking Domain Loss or Substitution in Alternative Splicing Variants with Diseases

***Asa O. Adadey**, Maricel Kann*
Maricel Kann, Assistant Professor, Department of Biological Sciences

During RNA transcription, a precursor RNA transcript from a single gene can be spliced in several ways to form several different mRNA molecules. In some cases, these variations are dramatic enough to remove or change a complete protein domain from the translated protein. We hypothesize that, by lacking an entire functional region, these protein variants will be less capable of carrying out their function, possibly resulting in disease. While several experiments have found genetic diseases based on dysfunctional or absent proteins, there exists no clear link to any particular domain loss that may be responsible. In order to examine this relationship, we used the Human Protein Domain Database (HPDD), which is composed of all domains that uniquely map to the human proteome. We have used the domain analysis in HPDD to identify domain substitution or loss in alternative splice variants. We are also currently developing search algorithms that scan biomedical publications for important keywords, to compile current data on these splice variants. Understanding the effects of these splice variants on disease expression will open up several possibilities for fighting genetic disorders via gene expression and regulation. The list of all genes encoding proteins with different domain compositions has been made available online at bioinf.umbc.edu/hpdd.

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

Feasibility Study of the Design of Artovastatin Calcium (Lipitor®) Pharmaceutical Plant

***Nizeet I. Aguilar**, Robert J. Marino, Robert P. Reeves, Adebimpe D. Oyede, Jessica DeWitt*
Mariajose Castellanos, Assistant Professor, Department of Chemical Engineering

High cholesterol is a leading risk factor for heart disease; Artovastatin Calcium (Lipitor®) is a synthetic lipid-lowering agent which inhibits 3 hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase. HMG-CoA reductase catalyzes the conversion of HMG-CoA to mevalonate, an early and rate-limiting step in cholesterol biosynthesis. Lipitor® is the best selling brand name medication in the world. The current US patent for Lipitor® belongs to Pfizer, a multibillion dollar pharmaceutical company. The US patent on Lipitor® will expire in March of 2010. The goal of the project is to design a feasible and profitable pharmaceutical plant for the production of Lipitor® by combining the engineering and economics knowledge learned through the courses of the chemical engineering curriculum. The study of the design of a Lipitor® chemical plant will contribute to a better understanding of the benefits of producing a generic drug form.

“From Chaos”: A Contemporary Piece based on Ivorian Traditions

Mya D. Ajanku
Doug Hamby, Associate Professor, Department of Dance

The Baltimore-Washington area has numerous West African Dance companies but only a few instructors teaching Ivorian styles. As a sixteen-year student of African dance I understand how the oral traditions of Africa require students to travel and learn amongst natives in their natural environment. This summer I was able travel to the Cote D’Ivoire to study with indigenous groups and Ballets (Dance Companies that perform choreographed pieces). In order to express my genuine interest to the native Ivorians, I had to study region-specific dances, prior to my departure. My foundational knowledge made it acceptable for me learn dances that celebrate the ethnic groups working together and to learn the proper way to greet royalty. During this trip I was able to witness and participate in the Minister of Peace’s efforts to rebuild the country through cultural arts programming. This project has inspired me to create a piece “From Chaos,” to further explore Cote D’Ivoire’s recent civil unrest and links between America’s Pan African Movement and the Ivory Coast.

This work was funded in part through Undergraduate Research Award from the UMBC Office of Undergraduate Education. This work was also funded in part by The Baltimore Teacher Network’s ConneXions Community Leadership Academy and members of the Sankofa Dance Theater.

The Serine Repeat Antigen5: A Promising Malaria Vaccine Candidate

Anissa N. Alexander
Christopher V. Plowe, Professor, Department of Geographical Medicine, University of Maryland Baltimore School of Medicine

The Serine Repeat Antigen5 (SERA5) is part of the *sera* multigene family of *Plasmodium falciparum,* in which *sera*5 is the most strongly expressed among the nine *sera* genes. The protein encoded for by this gene is the SERA5 protein which is located in the parasitophorous vacuole of *P. falciparum*, the most virulent among the species effecting humans. SERA5 is known to be the most abundant protein expressed at the schizont stage in the *P. falciparum* life cycle and to play a role in schizont rupture. This is a possible indication that the SERA5 gene has an important role in the life cycle of *P. falciparum*. It has also been shown that antibodies against SERA5 can inhibit parasite development *in vitro.* Furthermore, seroepidemological studies have found associations between anti-SERA5 antibody levels and clinical protection against malaria. As a step towards developing a *sera*5-based vaccine, we will measure the genetic diversity of the *sera*5 gene in patients with malaria. To accomplish this we developed a protocol consisting of a nested PCR, gel electrophoresis, purification, and direct sequencing. After designing the optimal protocol, it will be used to measure the genetic diversity of patient samples in *sera*5 across a population. From this information we will be able to determine which strain to include in the vaccine.

*This investigation was supported, in part, by NIH/HIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC, the HHMI Undergraduate Scholars Program at UMBC, the Howard Hughes Medical Institute, the Doris Duke Charitable Foundation and NIH-NIAID-ICIDR grant #U19 AI65683.*

Analysis of the MAP dclk1 and its Effect on Microtubule Stabilization During Neurulation in the Zebrafish

Yohance M. Allette, *Pradeepa Jayachandran*
Rachel Brewster, Assistant Professor, Department of Biology

Linguini (*lin*) is a gene of unknown molecular identity required for proper neurulation in the zebrafish. Analysis of linguini mutants revealed that microtubules appear to be destabilized. We hypothesize that the delay in neural tube formation in these mutants is caused by the failure of microtubules to regulate polarized cell movement, the driving force of neurulation in zebrafish. To further understand how linguini functions to stabilize microtubules, we are investigating other molecules implicated in this process. MAPs are prime candidates as they are known to directly bind to and stabilize microtubules. A MAP of particular interest is doublecortin (*dclk1*), which function in the *Reelin* pathway. The overall goal of my project is to investigate the role of *dclk1* in neural tube formation, and to further test the importance of proper microtubule function in neurulation. I will first analyze the expression of *dclk1* by in situ hybridization, to determine whether it is crucial at the time and place to regulate neurulation. If *dclk1* is expressed at the time of neurulation, I will further analyze the role of *dlck1* by depleting this protein using morpholinos. This research will ultimately increase our understanding of the molecular pathways that regulate neurulation.

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Effects of Using Head Mounted Display Helmet for Virtual Reality Distraction on Cold Pressor Pain in College Students

Bridget R. Armstrong, Craig Whitten*, Emily F. Law, Linda Jones Herbert*
Lynnda M. Dahlquist, Professor, Department of Psychology

Immersive Virtual Reality (VR) has gained prominence in clinical psychology literature as a powerful distraction intervention for procedural pain. VR offers an alternative to pharmacological treatments that may cause adverse side effects. Although VR distraction has been demonstrated as effective in laboratory and clinical settings, the method by which VR works to combat pain remains unclear. McCaul and Malott (1984) hypothesize that pain processing requires conscious attention. A highly immersive distracter should leave less attention for pain. This study examined whether a VR head-mounted display helmet increases the analgesic effects of interactive distraction. A head-mounted display occludes outside sights and sounds, making a person feel 'present' in the virtual world, leaving less attention available for pain sensations originating outside of the virtual world. College students between the ages of 18 and 25 were exposed to cold pressor pain without any distraction (baseline) and then while playing the Nintendo® Wii. They viewed the game on a 21" TV or through a VR head-mounted display unit. The study used a repeated-measures design with the videogame distraction trials presented in counterbalanced order. Initial results indicated increases in pain tolerance in both VR distraction conditions, with greater increases observed in the VR helmet group.

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

Analysis of the c-Myc Transcription Factor in Mouse Models of Prostate Cancer

Brook Asamenew, *Gretchen Hubbard, Charles Bieberich*
Charles Bieberich, Associate Professor, Department of Biological Sciences

The c-*MYC* gene is found on chromosome 8q24 and is overexpressed in a wide variety of human cancers. This gene encodes for c-Myc, a transcriptional oncogenic switch that is thought to regulate a variety of cellular functions through altering gene expression. Under normal cell conditions, c-Myc is highly regulated by external signals and internal clocks. It is only expressed during active cell growth and during the cell cycle. However, in cancer cells, c-*Myc* is regulated in an uncontrolled manner. Overexpression of the c-*Myc* gene contributes to nearly 100,000 cancer deaths per year in the US. Therefore, recent efforts have been directed toward understanding the function of c-Myc in cancer biology with the hope that therapeutic insights will emerge. The purpose of this project is to generate a mouse model of prostate cancer where c-Myc is expressed under control of a prostate-specific promoter. Southern blot analysis was used to screen mice which contained the transgene and immunohistochemistry was performed to examine expression. This novel mouse model will be useful to study the early stages of MYC-induced prostate carcinogenesis.

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

"Our Own World"

Agnes Asplund, Leslie Bristow
Cathy Cook. Associate Professor. Department of Visual Arts.

'Our Own World' is a 3D environment study created in Maya, focusing on texturing and lighting. The environment consists of two parts: an exterior and an interior. The exterior part of the scene takes place at night, where the camera takes the viewer down a street surrounded by narrow houses. Research was put into the contrasting lights in the scene; the blue moon light and the warm yellow glows from windows and the gas lit street lamps. Further study was taken into the texturing of 3D surfaces, created from 2D texture planes using bump, specular and occlusion maps. The illusion of doors and curtained windows was created from UV mapping paintings and photographs. The interior, on the other hand, consists of a bookstore, cluttered with books, candles and paintings. There is a fireplace, a window and a pop up book that opens as the camera explores the room. Research was put into the lighting of the room, exploring the blue light seeping through the window, and the light fog. The flickering from the fire and candles were explored and created to contrast the exterior light. The realistic animation of the pop up book was a major research aspect, creating the final touch to an otherwise still environment.

Analyzing the Interaction Partners, BfpU and BfpA, of the Bundlin Forming Pilus of Enteropathogenic *E. coli* (EPEC)

Olufolakemi Awe, *Michael Donnenberg*
Michael Donnenberg, Professor, Division of Infectious Diseases

Enteropathogenic *Escherichia coli* (EPEC) are bacterial pathogens that cause severe diarrhea in infants. A key step of infection of the host is the assembly of the bundle-forming pilus (BFP), which is necessary for adherence of the bacteria to its host cell. Understanding the molecular components necessary for *E. coli* to assemble the BFP is one of the major areas under investigation. Previous research has shown that a protein called BfpU from a prototype strain of EPEC interacts with another protein bundlin, which is the subunit that makes up the BFP. The focus of my investigation is to determine if this interaction occurs in an alternative strain. We cloned the *bfpA* gene encoding bundlin from the alternative strain into an expression vector. We also amplified the *bfpU* gene from the alternative strain and determined that the sequence is identical to the *bfpU* sequence of the prototype strain. We have expressed a large amount of highly concentrated BfpU. We have also co-purified bundlin from the prototype strain with BfpU. Currently, we are working on purifying bundlin from the alternative strain. Once we successfully purify both proteins we will be in a position to confirm the interaction between bundlin and BfpU, determine the association constant for this interaction using isothermal titration calorimetry, and attempt with a collaborator to produce crystals for x-ray diffraction.

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The Effects of Educational Content and Gender on the Perception of Individuals with Schizophrenia

Penina M. Backer
Mariano R. Sto. Domingo, Assistant Research Scientist, Department of Psychology

This experimental study used a 2X2 between-subjects factorial design to examine the effects of educational content and gender on prejudiced attitudes towards individuals with schizophrenia. A total of 32 participants, 16 male and 16 female, received educational materials about schizophrenia that were either fact-oriented or person-oriented. A fact-oriented educational material included symptoms, causes, and treatment of schizophrenia. A person-oriented educational material, on the other hand, included the same facts, but within the context of a fictitious individual person's life. Participants were subsequently asked to rate an individual with schizophrenia using a 7-point Likert scale on perceived dangerousness, unpredictability, and capability. Results showed that participants who received the person-oriented education material ($M = 3.44$, $SD = 1.21$) perceived the individual with schizophrenia as significantly more capable than participants who received the fact-oriented education, ($M = 2.5$, $SD = 1.15$), $F\ (1, 28) = 5.27$, $p < .05$; in addition, female participants ($M = 2.56$, $SD = 1.55$) perceived the individual with schizophrenia as significantly less dangerous than male participants ($M = 3.88$, $SD = 1.26$), $F\ (1, 28) = 7.55$, $p < .01$. The findings are important in designing programs to reduce the stigma of mental illness.

“Something Like It”

Joshua A. Barnard
Douglas Hamby, Associate Professor, Department of Dance

Human beings are creatures of habit. Sometimes this habit is in the form of addiction, addiction to a chemical substance or even addiction to the act of doing something. Even when these addictions are broken, a new one can take their place, possibly without conscious acknowledgment. While studying with Scott Wells, I learned a new kind of dance technique mainly involving support from one person to another in a variety of dynamic and interesting positions. The support system could simply be a support or it might cause one of the dancers to launch off in a new direction. I feel that the battles and struggles that anyone has encountered when facing an addiction and attempting to change has some parallels. In addition to simply finding new ways to move one or two people's bodies, I was introduced to new concepts in how to use groups of dancers and make emphasis from their presence. Due to my new knowledge I have created my largest dance project to date. This piece attempts to give examples of common addictions from drinking to exercise, how they are overcome in the mind and the possibility that an addiction is nothing more than a habit to an extreme.

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

Structure-Function Analysis of the Novel Defense Protein SUP3 in *Arabidopsis thaliana*

Stephanie L. Battle, *Guoying Wang, Hua Lu*
Dr. Hua Lu, Assistant Professor, Department of Biological Sciences

Pathogen infection activates expression reprogramming of thousands of genes in plants. It remains challenging to identify which genes regulate plant disease resistance and how they function. Taking advantage of the unique defense-dependent dwarfism conferred by the Arabidopsis mutant *acd6-1*, we developed a genetic screen to identify *acd6-1 suppressor* (*sup*) mutants, which potentially harbors mutations in novel defense genes. Among the genes identified was *SUP3,* encoding a phosphate transporter. The *sup3-1* mutant harbors a T-DNA insertion in the fifth exon of the *SUP3* gene, leading to the accumulation of a partial transcript. When introduced into the double mutant *acd6-1sid2-1* (The *sid2-1 mutant* confers disease susceptibility and suppresses *acd6-1* phenotype), one copy of *sup3-1* allele dominantly suppresses *acd6-1sid2-1* morphology. Thus *acd6-1sid2-1* can be used to dissect the functional region of the SUP3 protein. We made a series of deletions of the *SUP3* gene and transferred each fragment into *acd6-1sid2-1* plants. We expect that a functional SUP3 fragment would cause visible morphological changes in *acd6-1sid2-1* transgenic plants. Functional SUP3 fragments will be further tested in wild type for disease resistance. This study will reveal the functional domain of SUP3 that regulates plant defense and helps us to understand the mechanism of SUP3 action.

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The Effects of Parental Substance Abuse on Children and Families

Rhonda A. Bavis
Shelly A. Wiechelt, Assistant Professor, Department of Social Work

Substance abuse is a widespread problem in the United States that has profound effects on children and families. It is estimated that 22.6 million individuals abuse or are dependent on alcohol or illicit drugs and more than six million children live with a parent who has these problems. It is important to understand the effects of parental substance abuse on children and families so that appropriate social policy and treatment strategies can be implemented to redress associated problems in individuals and communities. This presentation will discuss the results of a review of the research literature on the effects of substance abuse on children and families. Databases used for this review were PsychInfo, PsychArticles, EBSCO, and SocIndex. The research indicates that there is a relationship between parental substance abuse and family functioning and that children may be affected across the life span in terms of personality characteristics, emotional and behavioral problems, risk for substance abuse, attachment issues, physical ailments, cognitive and adjustment difficulties, and child abuse and neglect. The research findings will be discussed with consideration of the level and quality of the research studies where they are reported. Implications for policy, practice, and research will be discussed.

Synthesis of Flexible Carboxycyclic Nucleoside

Maria N. Beckford*, Sarah Zimmerman, Josh Sadler*
Katherine L. Seley-Radtke, Professor, Department of Chemistry and Biochemistry

Antiviral therapeutics face a major challenge - overcoming drug resistance. Viral inhibitors target specific enzymes involved with viral replication. Over time however, mutant enzymes arise, and the drugs become ineffective. Our studies and others have shown that flexible compounds have the ability to adapt to mutations in the active site of an enzyme, thus retaining drug effectiveness. Viral replication relies on methylation of certain nucleotides on the terminal end of mRNA.This methylation is catalyzed by various methyltransferases, which use S-adenosylmethione as the methyl donor. The product from that reaction is S-adenosylhomocysteine (SAH), which is subsequently broken down by S-adenosylhomocysteine hydrolase (SAHase). Inhibiting SAHase also results in inhibition of methyltransferases, thus disrupting the methylations of mRNA needed for proper transcription. Interestingly, the binding site of SAHase has been shown to be flexible, therefore using a flexible inhibitor that can adjust to changes in the active site while still retaining activity, will allow the drug to overcome resistance mutations. To that end, a series of novel flexible carbocyclic nucleosides are being synthesized and the preliminary results to realize a key cyclopentenone intermediate are reported. Once obtained, the final compounds will be screened against SAHase to determine their level of inhibition.

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Perspectives in Global Health: Working with Survivors of Torture and Trauma

Samantha P. Bier, *Bambi Chapin, Steven McAlpine, Gül Seçkin*
Bambi Chapin, Assistant Professor, Department of Sociology and Anthropology

With the populations of refugees and asylum seekers increasing around the world, it is important for developed countries to understand the mental, physical, and emotional problems that come with being a survivor of torture or trauma. Also imperative, but often forgotten, are the health care practitioners who devote their lives to helping trauma victims. The present study investigated what it is like to work with survivors of torture or trauma. Several health care practitioners such as physicians and psychologists who specialize in the treatment and care of survivors of torture were interviewed. During these interviews, each professional was asked questions regarding their personal and professional experiences in treating members of this unique population. Additionally, the practitioners were able to expand on what it meant to be working in the field of global health in this capacity. Working with survivors of torture and trauma proved to be a powerful, important, and fulfilling experience both personally and professionally for these health care practitioners. This research provides insight into how working with traumatized victims can influence and shape one's worldview. Furthermore, it provides a better understanding about this specialized field within the realm of global health.

This study was funded by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

PGS: A Fishy Business

Richard S. Blissett
Andrea Kalfoglou, Assistant Professor, Department of Sociology and Anthropology

In 2007, the American Society for Reproductive Medicine (ASRM) concluded that available evidence does not support the use of pre-implantation genetic screening (PGS) for infertility patients. Despite this, some IVF clinics continue to market PGS to their patients at costs up to $5,000. They claim that PGS, which seeks to prevent the transfer of aneuploid embryos to a woman's womb, is clinically advantageous. While some IVF providers believe that at their clinics, PGS is effective for some patients, there is a lack of literature to support this belief. Is it ethical for IVF clinics to continue marketing PGS, even though the ASRM has said that it is still an experimental technique? I will argue that falsely marketing to patients an experimental test as clinically advantageous, despite a lack of evidence that supports this claim, clearly violates the four bioethical principles of nonmaleficence, justice, respect for autonomy, and beneficence, especially in regards to the latter two. In convincing patients to spend large sums of money for testing that shows no clear benefit (and often is a detriment) to the patient, the principle of beneficence is clearly violated. Respect for patient autonomy implies that the patient must be allowed to make informed and voluntary decisions regarding her health. When the truly experimental nature of this procedure and the lack of efficacy are masked, the patient cannot make an informed decision, thus violating patient autonomy.

Optimization of Species Selection for Genome-Wide Application of the Mirrortree Method

Richard S. L. Blissett
Maricel Kann, Assistant Professor, Department of Biological Sciences

Because proteins in the cell do not usually act in isolation, but rather in networks of complex relationships, the elucidation and prediction of protein-protein interactions is critical to understanding the molecular machinery of the cell. One computational method, the mirrortree method, looks at the correlated evolution of proteins to predict these interactions. The mirrortree method uses comparisons of phylogenetic trees derived from multiple sequence alignments (MSAs). The number of sequences that are included in each MSA is based on the clustering of the sequences. However, there are multiple ways to select groups of sequences for the MSA. We will explore how the selection of species affects the correlation coefficient, which is indicative of their interaction, for pairs of sequences in *Saccharomyces cerevisiae*. Preliminary computational tools determined pairs of orthologous proteins by comparing protein sequences across the entire genome. This research will serve to refine current mirrortree-based methods, increasing accuracy of prediction for protein-protein interaction.

***In silico* Modeling and Optimization of Algal Biomass Production**

Jonathan A. Bollinger**,** *Goncalo Maia, Michael Pacella*
Mariajosé Castellanos, Assistant Professor, Department of Chemical Engineering

Algae have the potential to reduce U.S. dependence on foreign petroleum due to their small size, short lifespan, and high lipid concentration. To increase the economic prospects of algal biodiesel, the genomic sequence and environmental conditions of the algae can be modified to boost biomass production. My research focuses on a simplified model of the alga cell, wherein it is treated as a steady-state system having uniform properties. This allows for *in silico* analysis of the concentrations of algal enzymes and chemical components over time; the vector space can then be optimized for maximum biodiesel production. Subsequently, the cell simulation can be re-run without certain enzymes (equivalent to genomic cuts) or with modified surrounding conditions, and the relative lipid production can be observed. The relative ease of simulation allows for many more combinations than could be physically tested, and the simulation conditions which yield high lipid concentrations can be passed to geneticists for physical testing.

Analysis of the Mechanical Behavior of Bovine Descending Aorta Under Various Conditions

Brandon H. Borde, Oluwatimilehin Fadiran, *Joseph Washington*
Timmie Topoleski, Professor, Department of Mechanical Engineering

There is a large potential for arterial damage when the human body is subject to traumatic conditions (e.g. a car crash). Understanding mechanical properties of arteries while contracted or relaxed may be key to prediction and prevention of such rupture. To assess the mechanical response of blood vessel constituents under various loads that simulate trauma, samples of bovine descending aorta will be tested using our Biological Materials Testing System (BiMaTS) in the UMBC Laboratory for Implantable Materials and Biomechanics. Research indicates that isoprenaline and theophylline induce relaxation in arteries while phenylephrine and carbachol induce contraction. We will induce either contraction or relaxation and The BiMaTS will be used to apply different loads to each specimen, while a CCD camera tracks the displacement of markers on the specimen's surface. From these measurements, stress-strain behavior will be analyzed. After testing, samples will be treated with specific staining solutions to differentiate between of the artery's elastin, collagen and the smooth muscle cells. Relationships between the arterial structure and the response to the mechanical loading will be investigated. Currently, the testing capability of the BiMaTS is being enhanced by the integration of a new software package called LabView and the addition of an updated bath system that will keep samples hydrated and simulate in vivo conditions.

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

Characterization of Mutation in *C. elegans* POP-1, a Core Component of the Wnt Signaling Pathway

Ashleigh C. Bouchelion
David Eisenmann, Associate Professor, Department of Biological Sciences

In development, one important event is the differentiation of different cell types in response to external signals in the environment. Our lab investigates the Wnt signaling pathway, which plays an important role in this process in normal animal development, and which can cause cancer when mutated. The Wnt pathway is activated when the Wnt ligand binds its receptor, ultimately resulting in the turning on of Wnt pathway target genes by the transcription factor TCF. My project is to study POP-1, the TCF protein in the nematode worm *C. elegans*. There are few known mutations in POP-1, therefore our lab and another lab performed a genetic screening to identify mutations, and identified nine missense mutations in the *pop-1* gene. As part of my current project, I am using PCR and DNA sequencing to determine if backcrossed *pop-1* mutant strains actually contain the *pop-1* mutations. If the results show that the strains are accurate, we will perform a phenotypic analysis of each strain by scoring its phenotype for several Wnt-regulated processes in *C. elegans* development. In this way we hope to extend our knowledge of this important factor acting in the Wnt signaling pathway.

This research was funded, in part, by the UMBC HHMI Undergraduate Scholars Program through the Howard Hughes Medical Institute.

"Ways of Seeing" - Looking at *The Creative Photograph in Archaeology* Exhibit in the Albin O. Kuhn Library Gallery

Cally E. Brandt, Sarah K. Ryan
Richard S. Mason, Lecturer, Department of Ancient Studies

A photograph comes alive when one looks into not only its subject, but also the photograph itself as a subject. During a fall 2008 internship with Richard Mason, students studied multiple aspects of individual photographs. Our research focused on works in the exhibit, *The Creative Photograph in Archaeology*, in the Albin O. Kuhn Library Gallery. The photographs spanned the mid-nineteenth and twenty-first centuries. The subjects ranged from classical architecture and sculpture of fifth-century BC Athens to the grand buildings constructed under Roman rule in the second-century AD. The images documented the present state of those ancient monuments, the growth of the modern city of Athens from a small village, and technological developments within photography. The shift in photography from objectivity in the mid-nineteenth century to abstraction at the end of the twentieth century revealed changing archaeological and aesthetic perspectives. Our class presented these findings to faculty and students as part of a "gallery walk" during Ancient Studies Week in October 2008. Our presentations illuminated the careers of photographers, the development of photographic technology and its affect on style, and the significance of ancient Greek and Roman architecture and sculpture within the context of early modern history, archaeology, and photography.

This work was funded, in part, by the Albin O. Kuhn Library & Gallery, and Special Collections.

Lexical Variations in Telling Clock Time: A Study of Age and Style Differences

Holly-Catherine S. Britton
Thomas Field, Professor, Department of Modern Language and Linguistics

This study investigated linguistic variation in methods of telling time in Maryland English speakers aged between fourteen and seventy. It was hypothesized that speakers of younger generations utilized the digital variant of time-telling (e.g. *one-fifteen)* rather than the analog variant (e.g. *quarter after one)* more than those generations who grew up before the digital revolution of the 1970s. It was also thought that speakers shifted their language expressions to and from analog time to accommodate speakers of differing ages. Informants from five different age groups were compared with each other to present an apparent-time trend. It was shown that speakers raised after the beginning of the digital age (aged 14-29), utilized digital time expressions significantly more than speakers over age 30. This study suggested reasons why social perceptions of analog and digital time expressions differed between speakers of different ages, and demonstrated shifting between analog and digital variants to increase and decrease formality between older and peer-age speakers. A difference between usage in females and males was also investigated. This study revealed a current linguistic shift, demonstrating how language usage constantly changes.

Characterization of Brown Adipose Tissue in the Adult Mammary Gland of Brca1-mutant Mice

***Destiney D. Buelto**, **Nkechinyere A. Emezienna**, Laundette P. Jones*
Laundette P. Jones, Associate Professor, Department of Pharmacology and Experimental Therapeutics, University of Maryland, Baltimore

Adipose tissue plays a crucial role in breast cancer development. This study examined whether brown adipose tissue (BAT) played a role in mammary tumorigenesis in a mouse model of Brca1-associated breast cancer. MG whole mounts and H&E slides were also prepared to visualize BAT morphology and locality throughout the MG. Uncoupling Protein 1 (UCP1) and its mRNA, widely-used markers for BAT, were measured by Immunohistochemistry and real-time PCR, respectively, to quantitate the level of BAT in the mammary gland (MG). We found that BAT is highly vascular and is more abundant in Brca1 adult mice by a 46-fold induction compared to wildtype mice. We also found that exposure to Bisphenol-A, an environmental estrogen, increases proliferation and BAT in the MGs of Brca1-mutant mice and not in wildtype mice. Our emerging hypothesis is that BAT plays a role in tumor development due to its increased vascularity and delocalization across the MG in Brca1-mutant mice. Future research will be conducted to determine how BAT is altered in MG of 12-mo old Brca1 mice and ultimately determine a possible mechanism for the role of BAT in breast tumorigenesis.

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Comparing Procedure, Evidentiary Rules, and Sentencing in Three World War II POW War Crimes Trials

Alexander A. Bush
Rebecca Boehling, Associate Professor, Department of History
Constantine Vaporis, Professor, Department of History

The events of the Second World War created many postwar challenges for the victorious Allies. Not the least of these tasks was the investigation of alleged war crimes, and the apprehension and trial of suspected criminals. The then lack of international standards resulted in great differences in procedure, evidentiary rule, and sentencing. In addition, each nation's degree of desire for vengeance had a profound impact on how such trials were conducted. In conducting this research, I compared three trials that involved different scenarios of crimes, victors, and vanquished in order to determine how the legal aspects of each trial were affected by the unique combinations of victims, perpetrators, and prosecuting agents. The three British and American-run trials I examined involved crimes committed at the following locations: Cabanatuan Prison near Manila, Philippines; Stalag Luft III in Żagań, Poland; and the Berga Slave Labor Camp in Thuringia, Germany. By presenting a detailed comparison of the legal aspects of these three trials I shed some light on how their procedures were affected by the perspectives and approaches of the parties involved. This comparative approach also provides a point of reference for future war crime investigations and trials.

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

Probing the Structure of Rhodopsin and Human Green Opsin Using Site Directed Spin Labeling

Erwin M. Cabrera*, Benjamin Nickle*
Phyllis Robinson, Professor, Department of Biological Sciences

G-Protein Coupled Receptors (GPCR's) comprise a family of heptahelical transmembrane proteins. Opsins, an important subset of GPCR's, are involved in light detection. The prototypical opsin, rhodopsin, is one of the most extensively studied GPCR. Previous studies of this protein have generated much of the current GPCR structural knowledge. Unfortunatly, no crystallographic data exists for the active state of rhodopsin. Most other opsin structures have yet to be determined including cone opsins which are used in color vision. The goal of this project is to further the understanding of cone opsin structure using site directed spin labeling. In order to accomplish this, we must first construct a series of mutant cone opsins where the native reactive cysteines are replaced with serines. Specific residues where we desire to place the spin label, are then changed to cysteines. For mutagenic purposes, a gene-SOEing approach is used, which includes construction of overlapping oligonucleotide primers with the desired mutation incorporated in the primer. Overlapping mutagenic primers are used to amplify fragments of the desired gene. Those fragments are used in a second reaction with each other to extend the product to the full length gene and cloned into an expression vector.

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The Effect of Incarceration on the Spouses and Partners of Inmates

Robin D. Cagey
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Though the U.S. prison population has been rather thoroughly researched, there is much less research exploring how the innocent spouses and partners of the incarcerated are affected by their companion's imprisonment. More than one percent of citizens in the United States are incarcerated. When considering the spouses/partners and families of prisoners, the impact of the prison system becomes even larger. I examined how spouses and partners are affected from a *qualitative* perspective. Three female members of this population with diverse backgrounds, found through activist groups and personal contacts, were interviewed regarding their feelings and experiences during the incarceration. Their responses were *coded* to uncover similarities and differences among the participants and to decipher the meanings attached to the themes embedded in their responses. Three major themes that appeared were extreme emotional stress, financial difficulties, and a transformation in their relationship with the incarcerated individual, as well as with family, friends, and coworkers. The impact of the incarceration varied with the differing circumstances surrounding the arrest. Understanding how inmates' significant others are affected could aid in designing better ways to assist families of inmates, possibly helping to reduce rates of recidivism by enabling offenders' loved ones to be more supportive and involved.

Solvent Effects on Charge-Transfer Complexes

Elizabeth A. Campbell
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Charge-transfer (CT) complexes play an important role in many organic and inorganic reaction mechanisms and are of particular interest in understanding biological processes, imaging applications, in the control of molecular assembly, and contribute greatly to a detailed understanding of electron transfer reactions. These complexes are characterized by the appearance of a new UV-visible absorption band when an electron rich donor (D) and an electron poor acceptor (A) are mixed. The absorption and emission spectra of a series of methylated benzene donors with 1,2,4,5-tetracyanobenzene as the acceptor have been measured. Analysis of the absorption spectra of these complexes using current electron transfer theories allowed detailed descriptions of the reorganization energies, the driving force, and the electronic coupling matrix elements to be determined. These studies revealed that the ground state stabilization of the complexes studied here is due to non-bonded interactions and that the ion-pair contributions are minor in the ground state. Furthermore, observation of how solvents of differing polarity influence the shapes of CT absorption spectra revealed specific information about the different types and strengths of individual solvent –solute interactions.

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Changes in MMP-9 Protein Levels as an Indicator of Brain Perturbation by Nicotine Exposure

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Cigarette smoking by pregnant mothers has been associated with adverse outcomes including low birth weight and reduced fetal oxygenation. Nicotine (NIC), a significant toxic component of this smoke, is harmful to the fetus, but the underlying mechanisms mediating its effect remain poorly understood. We hypothesized that prenatal NIC stimulates release of reactive oxygen species (ROS) in the fetal central nervous system, which induces injury via expression of proinflammatory cytokines. Pregnant guinea pigs were exposed to NIC in their drinking water and the fetal guinea pigs brains were collected at near-term. Brains were collected fresh-frozen and sectioned via cryostat. The CA1, CA2/3, and dentate gyrus regions of the hippocampus were micropunched and processed for Western blotting. Real-time PCR analysis of proinflammatory cytokine TNFα mRNA revealed a significant increase in expression in NIC exposed animals. Immunocytochemical analysis of glial cells revealed an increase in glial fibrillary acidic protein immunoreactivity in the CA1 of NIC exposed fetuses. Matrix metalloproteinases (MMPs) have been implicated in normal synapse formation and TNFα has been shown to activate MMPs. Preliminary results demonstrate that NIC exposure causes a trend towards a decrease in MMP-9 protein levels in CA1 ($p=0.08$) and no significant difference in CA2/3.

Mechanism of Action of the CDK5 – GR – APP Pathway in Aβ production and Alzheimer's Disease Pathogenesis

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CDK5 is a cyclin-dependent kinase involved in numerous neurological functions. It interacts with various intracellular receptors that regulate neuronal cells, affecting neuronal signaling and neurotransmitter activity. Recent research has found that CDK5 interacts with the glucocorticoid receptor (GR) which mediates hormonal activities of glucocorticoids and mineralocorticoids. These hormones, when binding to the GR, are directly implicated in its transcriptional activity. It has also been found that p25, a secondary form of a CDK5 activator protein, causes its aberrant activation and activity. This project investigates the effect of CDK5 and the GR in causing Alzheimer's disease. The premise of this investigation has been supported in previous research which documents the presence of p25 in inducing beta amyloid (Aβ) production, an Alzheimer's disease hallmark. In-vitro experiments with N2a, a mouse neuroblastoma cell line, allowed us to document the effect of CDK5 on Aβ production. Using a transfection technique, we documented the effect of p25 and its interaction with CDK5, and its subsequent interaction with the GR. Preliminary Quantitative Real Time PCR results showed that CDK5/p25 positively influenced APP production; however, further work is needed to understand whether an aberrant activation of CDK5 with the GR causes Aβ pathology and Alzheimer's disease.

This work was funded, in part, by the Department of Molecular Endocrinology, Section on Pediatric Endocrinology, National Institute of Child Health and Human Development, at the National Institutes of Health.

To Tell or Not To Tell? That Is the Question. The Case of Gaucher's Disease Carrier Testing

Melissa Chapman
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In order to minimize the incidence of lethal genetic disorders in the Jewish population, *Dor Yeshorim* (DY) provides anonymous carrier testing for nine autosomal recessive diseases. To safeguard young adults from social stigma, the results of the screening are not released. When a couple is considering marriage, the program simply tells them they are not a match if they are both carriers of the same disorder. The organization previously advised against marriage when both were carriers for Gaucher's disease; however, because new therapy has improved the prognosis for children with this disease, *DY* no longer informs the pair of their carrier status unless specifically requested. I apply the principles of biomedical ethics to argue that, based on the principles of *respect for persons* and *nonmaleficence*, *DY* has an ethical obligation to inform couples when both are carriers for Gaucher's Disease. Not informing couples is harmful because it puts them at risk of having an affected child when they might otherwise choose to avoid this outcome. Respect for persons demands that information relevant to reproductive decision making should not be withheld from couples because the organization paternalistically believes the disease is no longer serious enough to warrant informing couples.

Ring-Expanded Nucleosides/Nucleotides as Potential Anti-Viral and Anti-Cancer Agents

Mohsan M. Chaudhry
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Cancer and viral infection are the predominant factors for the high mortality rates. A number of ring-expanded nucleosides (RENs) and nucleotides (RENTs) have been reported to be highly active against a wide variety of tumor and viral cell lines. RENs/RENTs are a rich source of inhibitors of the enzymes in purine metabolism, and of those utilizing ATP/GTP either as energy cofactors or as nucleic acid building blocks. Most RENs/RENTs synthesized and screened thus far are planar, aromatic compounds. My project explores the effect of non-planar RENs/RENTs on the biological activity. We hypothesize that the non-planar inhibitors will better mimic the transition states of the relevant enzyme catalyzed reactions and therefore, would act as better inhibitors based on the enhanced protein binding characterisitcs. My project is aimed at synthesizing the appropriate heterocyclic precursors to the ultimate target RENs/RENTs. The synthesis of the target structure starts with the commercially available 4-Nitroimidazole followed by introduction and hydrolysis of the acetal group to form an aldehyde, reduction of the nitro group to an amino group, followed by ring closure. The final reduction of the imino into an amino group will afford the target ring system.

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Neighbor Helping Neighbor Time Banking Model: Vital to Communities?

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The time bank model of social exchange has been primarily discussed in the context of civic engagement and assistance programs. These structures focus on involving individuals in communities in an attempt to provide and exchange services that otherwise might not be attainable. To fully understand the efficiency and effectiveness of time banking, researchers must evaluate, through quantifiable measures, the strengths and weaknesses this model, i.e., contributions to communities, which have not been significantly addressed in the long term care/aging services literature. To further test the utility of the time banking model, we will survey residents of Stadium Place, an independent living community in Baltimore City, comprised primarily of African American adults 62 and older. The community has established the Neighbor Helping Neighbor program, patterned after the time banking model. By interviewing residents both in the Helping Neighbor program and those who are not involved in the program we will provide greater understanding of the program and its usage or lack thereof. Policy implications for time banking community assistance programs within minority communities will also be addressed.

Effects of Apparent Ethnicity in an Individual's Name on Perceived Qualifications in the Professional Service Industry

Doha Chibani
Diane L. Alonso, Program Director, Department of Psychology at USG

Ethnic biases have been shown to have an impact on people's hiring decisions. Minorities are affected by the ethnic penalty from their foreign sounding names. This study hypothesized that most participants would select professionals from different groups at varying rates according to familiarity or preconceived biases. Thirty-five participants, 11 males and 24 females, residents of the Greater Washington Baltimore Area, were presented with a list of six ethnically or racially distinct names per profession. Participants were asked to select the one service provider from each of six professions: doctor, dentist, architect, network engineer, financial advisor, and lawyer, they were most likely to contact for services. Results show that African-American professionals are selected considerably less often than Caucasians. Middle Eastern professionals are at a disadvantage compared to Hispanics, Jewish, and Anglo-Saxon professionals. Apparent ethnicity in the service providers' name appears to significantly affect their chances of being selected.

Food Deserts and their Presence in a Southwest Community of Baltimore City

Jessica M. Childs
Laura R. Lewis, Assistant Professor, Department of Geography and Environmental Systems

A 'food desert' refers to a geographic area where there is limited access to foods that are required for a nutritionally adequate diet due to physical and financial limitations within the community. Food deserts lack the presence of stores carrying nutritious foods, efficient transportation systems and, the cost of healthy food is generally more expensive than processed. It is established that adequate amounts of these foods are essential to a healthy lifestyle. Even though this is well-known, four of the leading causes of death are linked to poor diet. This pattern is particularly prevalent in lower income and minority populations. One of the reasons for this is that these demographics have a greater risk of living in a 'food desert'. This study is concerned with the presence of 'food deserts' in Baltimore City, focusing on the Cherry Hill community. What challenges to food access do individuals face? The methodology used involves both quantitative and qualitative techniques. An adapted ethnographic survey was used to analyze community access to food and local stores were inventoried. Preliminary results indicate the presence of a 'food desert'. This study contributes to a body of knowledge concerning unequal food distribution in urban communities.

Education and its Role in Recovery from a Hip Fracture

Nancy S Chiles, Ann Gruber-Baldini
Ann Gruber-Baldini, Associate Professor, Department of Epidemiology and Preventative Medicine

Hip fractures are a health problem of great magnitude among the elderly leading to a loss of neuromuscular function and an increase in cognitive deficits. Conversely, cognitive ability has been positively correlated to recovery from a hip fracture. The goal of this project is to determine if a correlation exists between education levels and hip fracture recovery. Although education positively correlates with cognitive ability, the details of the relationship between education and hip fracture recovery are yet to be elucidated. Additionally, we are investigating the differences in education that exist between males and females, and its affect on recovery. Previous research has shown males suffer worse consequences from hip fractures. Patients selected for the Male Hip Study are located in the greater Baltimore area and were admitted to one of eight area hospitals with a non-pathologic hip fracture. Patient data from the Male Hip Study has been obtained to describe the differences on education level between male and female hip fracture patients. Baseline cognitive scores will be tested by age, sex, and education. We will also explore whether differences in outcomes occur based on education. Lastly, we will test the effect of education on outcomes by sex.

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"Pluto 2086"

Angel D. Chinn
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Pluto 2086 is a dance work that challenges the audience to examine their interaction with others and look at how technology affects relationships with people in their community. As technology progresses, society relies on cell phones, and I-pods to keep them company instead of their neighbor. People are beginning to live such private, introspective lives and Pluto 2086 aims to challenge the audience to evaluate and reflect on such ideas. Pluto 2086 was composed of three different sections. The first section is very chaotic and busy. The dancers were aware of one another but had no communication with the person beside them. The piece then progresses into the idea of how society has little interaction with one another but how they are all affected by other's actions. The dancers begin to interact with each other a little more but in an unintentional manner. The final section of the piece demonstrates the possibility of what would happen if people retreated exclusively to their personal worlds. Throughout Pluto 2086, dancers are constantly walking with their ears covered symbolizing the unawareness of their surroundings. Pluto 2086 aims to entertain and create conversation amongst the audience about the role of technology in the community.

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

The Effects of the Gene *S6 kinase* on Immune Response in *Drosophila melanogaster*

Irene H. Cho
Jeff Leips, Associate Professor, Department of Biological Sciences

Identification of the genes that contribute to natural variation in the ability to fight infection is an important goal for immunological research. We use the fruit fly, *Drosophila melanogaster*, as a model organism to identify these genes because genes regulating the innate component of the immune response are evolutionarily conserved from flies to humans. A previous genetic mapping study identified *S6 kinase (S6k)* as a candidate gene that affected the ability of female flies to clear bacterial infection: genetic variation at *S6k* produced phenotypic variation in the immune response. The same experiment was repeated to confirm the results with a new mutant stock. In the previous experiment, we were not able to control for the effect of differences in the genetic background between mutant and control flies. In this experiment, we compared the immune response of a homozygous *S6k* mutant stock and a control stock with the identical genetic background but without the mutation. We found significant effects of variation at *S6k* on the immune response and so we were able to confirm our previous results. We are in the process of evaluating the role of *S6k* on the phagocytic ability of blood cells to identify the functional basis of the effect of this gene on the immune response.

The Wall Street Shadow Market

Jay Chung, Clayton Day, Thaha Shafi
Richard Wilson, Lecturer, Departments of Philosophy and CMSC/EE

Our research analyzes the unseen transactions involving credit derivatives by the financial institutions on Wall Street from a business-ethics perspective. The project includes a history of credit derivatives and explains the impact the credit derivatives market has had on the U.S. economy. It secondly discusses the technical issues associated with the credit derivative market. Lastly it explores the ethical complexities of this market by conducting a stakeholder analysis. Recommendations are provided based upon this ethical analysis. The presentation will address the ethical analysis using Kant's ethics, utilitarianism, distributive justice, and contractarianism. These ethical principles were applied to the methodology of the persons or institutions using the credit derivatives. Once applied, the principles aided us in determining whether a methodology was ethical or not. In addition, we made recommendations based on our ethical analysis and used the very same ethical principles for justification. The presentation also shows how the financial institutions on Wall Street created and used credit derivatives, in particular credit default swaps, to financially profit, hedge company funds, offset company debt, and mislead investors without having to report any of it on record. Although this new market enabled a few financial institutions to amass large profits, it also caused many of them to accrue substantial debt, causing many of the financial institutions on Wall Street to file bankruptcy or be taken over by other companies. Moreover, the effects of this new market led to the world financial crisis of 2008.

Modeling Sensory Input to the Lamprey Spinal Cord

Geoffrey D. Clapp
Kathleen A. Hoffman, Associate Professor, Department of Mathematics and Statistics

Sensory input is known to have a profound effect on vertebrate locomotion but is not well understood. The lamprey, a relative of the eel, is a model system for studying vertebrate locomotion because its spinal cord is experimentally accessible and contains the same types of neurons as its human counterpart, except in smaller quantities. Biological experiments reveal an intriguing dependence on position of sensory organs in the lamprey, called edge cells, which measure the bend in the body. To further understand this phenomenon, we model the lamprey spinal cord as a chain of coupled oscillators, and the edge cells are simulated by forcing the chain at various positions one at a time, as in the experiment. Using numerical simulations, we determined the range of forcing frequencies for which the electrical activity along the spinal cord oscillates with the same constant frequency as the forcer. Our results confirm the experimental results for strong coupling but differ for weak coupling. In the future, we propose to understand these discrepancies by comparing various types of coupling between oscillators, specifically nearest-neighbor, all-to-all, or randomly generated connections, lending insight into the coupling in the lamprey spinal cord, which is unknown and difficult to obtain experimentally.

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Identity Theft

Bryan Clark, Harshavardhan Bambawale, *Cierra Owens*
Richard Wilson, Lecturer, Department of Philosophy

Identity theft has become a widespread international problem that has only been fueled by the surge in World Wide Web access. The techniques and methods of cyber criminals are increasingly sophisticated and regulators and business alike have been lagging behind. A social problem has developed as a result of the increasing sophistication of technology. Moral agents such as software companies have a responsibility to their customers or moral recipients. That responsibility is to protect consumers from being harmed by technology that they do not fully understand. Three case studies link the duty-based deontological philosophical work, (where duties must be performed regardless of the negative or positive consequences) to the Association for Computing Machinery code of ethics. Kant's work in the 18th century and the conclusions reached by the Association for Computing Machinery governing the professional behavior of computing professionals are strikingly similar. The duty to protect consumers from the potentially harmful effects of a complex and increasingly sophisticated digital landscape are to be shared between moral agents and moral recipients. However, moral agents have the responsibility of ensuring that technology is not conducive for the purposes of criminals committing identity theft.

Fear and Wisdom and Others

Theresa Columbus
Steven Bradley, Professor, Department of Visual Arts

I expanded upon four theatrical performance pieces, Fear and Wisdom, Hopeful Softness, Rivals, and Knick Knacks Are like Words. The cast performed twice in Baltimore as well as in Brooklyn, Providence, Boston, and finally at the Philadelphia Fringe Festival, where we were joined by four experienced improvisational musicians. Their complex blend of cacophonous and harmonious sound informed and reacted to the theatrics, causing a tension between the planned and improvisational elements. I formed a new hybrid with this combination of experimental music and theater, usually seen in different contexts. I also incorporated costumes and backdrops, which, cut from the same fabric, became part of an aesthetically pleasing contrivance, reflecting the abstract structure of the plays themselves. Using both poetic language and linear narrative, each play expresses a desire to mythologize one's own experience of connecting to a person or place, as well as a dire longing to connect to and be heard by an audience. Part of this urgency is related to my feminist need to be represented culturally, which is partially addressed by seven of the nine actors and musicians being women.

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Poor Drug Penetration into the Central Nervous System and its Impact on HIV-1 Pathogenesis: A Mathematical Model

Ryan P. Connor
Mariajose Castellanos, Associate Professor, Department of Chemical and Biochemical Engineering

The Acquired Immunodeficiency Syndrome is responsible for approximately two million deaths each year and is caused by the Human Immunodeficiency Virus (HIV). An estimated 33 million people are infected and there are as many as 2.7 million new infections per year. With the advent of Highly Active Anti-Retroviral Therapy, there has been much progress in the management of the disease; however, the emergence of drug resistant strains of the virus still poses a major challenge. It has been shown that not all anti-retroviral therapeutics are able to cross the blood-brain barrier effectively. This, coupled with the virus' efficient crossing of the blood brain barrier, prompted studies to investigate the emergence drug-resistant strains of virus derived from the Central Nervous System (CNS). To this end, computer modeling of the HIV-1 infection using a two compartment model consisting of CNS located virus and systemic virus is being carried out. Additionally, *in vitro* studies are being conducted to investigate how therapeutic agents' effectiveness correlates to their concentration and how their effects are added. It is expected that a clear correlation between CNS derived HIV-1 and the origin of drug resistant strains of HIV-1 will be seen.

Efficacy of Protein Quantitation Assays Compatible with Two-Dimensional Gel Electrophoresis

Timothy D. Courtney*, Yonghyun Kim*
Mark R. Marten, Professor, Department of Chemical and Biochemical Engineering

Two-Dimensional Gel Electrophoresis (2DE) is used to separate mixtures of proteins for further analysis via mass spectrometry. It is a vital tool in understanding the biochemical processes occurring within cells. For successful 2DE it is critical to begin with an accurate assessment of the total protein concentration in the mixture to be separated. This is typically accomplished using a protein quantitation assay, which enables the accurate determination of the concentration of a protein sample; however, the detergents and reducing agents necessary for 2DE interfere with most commonly used assays. Several specialized, commercially-available protein assays (e.g., 2D-Quant, RC-DC, and EZQ) have been developed to overcome this problem, but proteomics results from the Marten laboratory appeared to depend on which assay was used. I analyzed 2DE compatible assays in terms of precision, time required, cost, ease of use, and robustness with respect to protein identity. While all assays exhibited high degrees of precision, EZQ was found to be the simplest, fastest, most reliable, and most cost-effective assay. By using the best assay possible, researchers at UMBC, and in the proteomics community at large, will spend less time analyzing protein concentrations and more time focusing on cutting edge research.

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Copper Amyloid-beta Complex in Alzheimer's Disease

George E. Cutsail, III*, Veronika Szalai*
Veronika A. Szalai, Associate Professor, Department of Chemistry and Biochemistry

Alzheimer's disease (AD) is the seventh leading cause of death in the United States. Extracellular proteinacous plaques of the amyloid-beta (Aβ) peptide are linked to dementia in patients. Metal ions like copper (Cu) are in Aβ plaques isolated from AD patients, but the relationship of this finding to disease etiology is not clear. We hypothesize that interaction of Cu with Aβ modulates the structure and neurotoxicity of the Aβ peptide. Aβ oligomerizes and changes its structure over time with or without bound Cu. Structural changes of Aβ and Cu:Aβ are detected using site-directed spin labeling, which requires attachment of a spin label to a cysteine engineered into the peptide. To achieve this aim, the Aβ gene has been amplified by PCR and ligated into a modified *pET-21* vector containing affinity tags and a protease site to release Aβ. Expression is evaluated using gel electrophoresis. The effect of structural changes of Cu:Aβ on neurotoxicity is not known. We will determine neurotoxicity of these Cu:Aβ complexes using a rapid neurotoxicity assay developed by Dr. Theresa Good. Correlation of neurotoxicity with Cu:Aβ structure will aid drug intervention strategies for AD.

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How Skin Ages: Exploring the Role of the Nuclear Receptor LXRbeta in the Skin

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The skin is essential for protection from dehydration and infection, and with age it becomes susceptible to damage and disease. As its proliferation diminishes and its cells become terminally differentiated the epidermis thins, leading to a decrease in barrier function. Here we examine the role of Liver X Receptorβ (LXRβ) in mouse epidermis, to help determine whether LXRβ is a therapeutic target for improving the integrity and function of aged skin. LXRβ is a nuclear receptor which is highly expressed in the skin, and when activated induces the expression of genes that are important for skin function. To use mouse skin as a model, we first asked whether the molecular changes observed in aged human skin are observed in the mouse. Since reduced cell proliferation and increased cell differentiation are characteristic of aged human skin, we used immunohistochemical staining to compare these processes in young and aged mice. To examine the role of LXRβ in the skin, its function was knocked out by targeted gene deletion in mice and epidermal skin was analyzed in a similar manner. Mice lacking LXRβ were found to have skin molecularly older than wild type, suggesting that LXR is a viable target for treating skin aging and warrants further investigation.

The Internet and Iranian Youth Culture

Yelena W. Dewald
Devin T. Hagerty, Associate Professor, Department of Political Science

This paper discusses the impact of the Internet on youth culture in Iran, with a special emphasis on the country's Persian and Shia traditions. Given Iran's role in the Middle East and the controversy over its nuclear ambitions, it is an increasingly important participant in global politics. A majority of Iran's population is less than 30 years old. This generation was born after the 1979 Islamic Revolution and has grown up with history's most open form of communication: the Internet. This paper discusses the role of the Internet in Iran, with a particular focus on the expansion of blogging. The Internet is typically used as a medium to convey everyday personal experiences, yet it gives Iranian youth the freedom to cover topics that are traditionally banned. "The Internet and Iranian Youth Culture" explores the interaction of government and society on the Web, focusing on the government's attempts to regulate internet activity, as well as various ideological and political sentiments expressed in cyberspace including highly religious, atheistic, pro-governmental and reformist viewpoints. Information was collected through research of secondary sources, such as novels, peer reviewed journals, articles, and other sources as well as through observation of Iranian blogs written in English. The general thesis of the paper is that the Internet has not caused the abandonment of Persian and Shia traditions; rather, for Iranian youth, the Internet is a method of expressing that heritage.

Regulation of the Antiviral Tumor Suppressor RNase-L by MicroRNAs

Nwamaka E. Dike, *Teresa Hsi, Heather Ezelle, Xiaoling Li, Bret Hassel*
Bret Hassel, Associate Professor, Department of Microbiology and Immunology

RNase-L is an interferon-regulated ribonuclease known to mediate important cellular functions, including antiviral and antimicrobial immune responses in addition to tumor suppressing activities. To date, little is known about how RNase-L expression is regulated. A recent study in our lab discovered that the 3'UTR of the RNase-L mRNA functioned in its negative regulation by decreasing its half-life. MicroRNAs (miRNAs) are small, usually 21-25 nucleotide-long, non-coding RNAs, that hybridize to the 3'UTR of target mRNAs with imperfect complementarity, inhibiting their translation and stimulating degradation. We hypothesized that miRNAs may target Rnase-L for degradation by binding its 3'UTR. Potential miRNA binding sites in the RNase-L 3'UTR sequence were identified using the microrna.org database. The analysis revealed candidate sites for miR17-5p and miR20a in the 3'UTR region that is necessary to destabilize the RNase-L mRNA. To determine if these miRNAs regulate RNase-L in cells, we inhibited their expression by transfecting siRNAs that are antisense to each candidate miRNA into HeLa cells. We predict that if these miRNAs do indeed regulate RNase-L, the antisense inhibition will lead to an increase in RNase-L in cells. Our control will measure the expression of an mRNA known to be a target of miR17-5p/20a, using the same antisense inhibition method. Experiments are in progress to test this hypothesis.

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Investigation of the Existence of a Possible RNA Long-Range Interaction in the 5´-Untranslated Region of the HIV-1 Genome

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Michael Summers, Howard Hughes Medical Institute Investigator, Department of Chemistry and Biochemistry, Howard Hughes Medical Institute

The human immunodeficiency virus type-1(HIV-1) is a lentivirus that infects about 0.6% of the world population and can lead to acquired immunodeficiency syndrome(AIDS). The replication and infectivity of HIV-1 is dependent on the folding of its RNA genome; however, its structure is not fully understood. Retrovirus genome packaging is mainly regulated by its highly conserved 5´-untranslated region(5´-UTR). Previous studies suggested that SL4 may form a long-range interaction with the U5 linker region. The aim of our project was to determine if SL4 forms such a long-distance interaction with the U5 linker region in the context of the full length 5´-UTR. We generated three mutations in the U5 linker region and synthesized ^{13}C labeled SL4. The unlabeled 5´-UTR (TAR-SL3, no SL4 region) was titrated into the labeled SL4 and the Nuclear Magnetic Resonance (NMR) Heteronuclear Multiple Quantum Coherence(HMQC) spectra were compared. The absence of a C5-H5 peak in some of the samples, which had previously appeared in the segmentally labeled TAR-SL4, supports that there is a long-range interaction between SL4 and U5 linker region. We are currently investigating the structure of this SL4-U5 linker complex. Our further analysis will demonstrate how mutations in the 5´-UTR will affect HIV-1 genome packaging mechanism.

This research was supported, in part, by the HHMI Undergraduate Scholars Program at UMBC and the Howard Hughes Medical Institute.

Effects of a Dipolar Polymer Host Matrix on the Poling Efficiency of Guest Chromophores

Joseph S. Dulny, III
L. Michael Hayden, Professor, Department of Physics

Electro-optic (EO) materials, which have many technological applications, are often produced by creating polar order in a collection of freely rotating chromophore molecules embedded in an amorphous host polymer matrix by electric-field poling. In this work, we study the effects of introducing the EO-chromophore guest into a dipolar, EO-polymer host. It has been shown that the EO coefficient of an EO-chromophore / EO-polymer mixture can be much higher than the EO coefficient of either an EO-chromophore in an amorphous polymer host or an EO-polymer individually. This guest-host cooperativity between the active, dipolar polymer host and chromophore dopant is the focus of our study. We create samples using various mixtures of the EO-polymer, DR-1 co-PMMA, with the EO-chromophore DCDHF-6-V. We explore the effect of these mixtures on the EO coefficient of the samples and compare them to the EO coefficient of the polymer and chromophore individually. This is accomplished by studying how the poling field strength affects the electro-optic coefficient (at a fixed chromophore/polymer ratio) and also by studying how the chromophore/polymer ratio affects the electro-optic coefficient (at a fixed poling voltage).

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Flute Lineage

Danielle Durbin
Lisa Cella, Professor, Department of Music

My research focused on the pedagogic history of two of the most influential flute players in America: William Kincaid and Marcel Moyse. Through examination of the literature and interviews with flautists that studied directly with one of these two, I compiled a set of teaching concepts and playing styles unique to each one. I then constructed a list of flautists that studied under each one, creating a kind of family tree. Using interviews, literature, and private lessons with accomplished flautists who are descendants from Moyse or Kincaid, I was able to examine how their concepts were passed down from teacher to student over the generations. I took the same three well known flute works to each lesson, recorded each lesson, and compared and contrasted each lesson to find an overall style of teaching that is unique to either Kincaid or Moyse. This detailed American flute lineage illuminates an interesting insight into the style and techniques of flautists in general.

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

***What's Inside a Rose?;* A Presentation of Dada and Surrealist Inspired Art**

Danielle N. Durbin, Jacob K. Jensen, Kimberly K. Patrick, Una D. Petrović
Anna Rubin, Professor, Department of Music

We have created a stimulating environment in which our artwork has been presented. The instillation incorporated mixed media art, designed to arouse each sense of the human body individually via music, sound recording, voice recording, photography, light projection, video, sculpture, and found objects. We researched Surrealist and Dada art as a basis for the construction of our project. We presented this with the purpose of creating a noticeable reaction in our audience. Our audience was exposed to familiar objects in an unfamiliar way. We created an installation that the audience walked through and was able view, touch, hear, smell, and taste. The space that we used was the west wing stairwell of the Fine Arts Building from the third floor to the fifth floor. Our audience viewed photography by Una Petrović and music by Danielle Durbin and Jacob Jensen recorded by Kim Patrick. Each landing of the stairwell acted as its own separate room targeting one of the senses. After the viewing, we asked our audience members to fill out a questionnaire about their reaction. We were interested in the relationship between the comfortable and the unexpected and between the real and the surreal. The viewer was completely engulfed by the abundance of random objects in each room, to create a state of confusion. The overall purpose of this collaboration was to bring a sense of uneasiness to the audience.

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

Investigation on the Creation of a More Efficient Wear Test Machine with Controlled Environments

Deanna C. Easley, *Celeste Poley*
Yared Amanuel, National Science Foundation BD Fellow Mechanical Engineering Graduate Program,
L.D. Timmie Topoleski, Professor, Department of Mechanical Engineering

It is difficult to efficiently test materials for use in the human body. Wear testing of these materials is very important because metal has been found throughout the bodies of people who have received metal parts, although the replacement was in one area of the body. We are working to create a mechanical device that tests the wear of metals. It is crucial to know how long it takes materials to break down. The wear test machine must reproduce body temperature, allow for a fluid that mimics synovial fluid to be used, and allow for the testing of various loadings without interfering with lateral movements. From the material wear, we can see how the friction coefficient changes and find the wear rate per cycle to analyze how that amount of wear will affect other parts of the body. Moreover, the new machine will allow for experimentation with various loads. One design was initiated, but there are some setbacks with that design that need to be addressed. We have begun gathering materials to build the wear machine as well as the beginning stages of ProE drawings that are drawn to scale. Aluminum wear samples were made to begin testing the machine.

A Biophysical Model of Synaptic Plasticity

Alison C. Ebaugh, *Jonathan Bell*
Jonathan Bell, Professor, Department of Mathematics and Statistics

The ability of synapses between neurons to modify their strength in response to various types of stimuli is thought to provide a cellular basis for memory formation and learning. We developed a biophysical model of a single glutamergic synapse in a lone spine. This single synapse is represented by one compartment for both the postsynaptic density and spine cytosol. Our model of AMPA and NMDA receptor currents is similar to that of Aberbanel, (Biol. Cybern. 89, 2003, 214), but we have a hypothesis that the strength of the synapse is directly associated with the number of phosphorylated receptors which is reflected in AMPA conductance. We also assumed calcium flow is dominated by the NMDA receptor current (Shouval, et al. PNAS 99, 2002, 10831), and additionally incorporated a biochemical switch mechanism to account for long-term synaptic changes. We sought a minimal dynamic model framework where both induction and maintenance of long-term facilitation and depression is taken into account rather than induction.
This model should account for proper synaptic response to various presynaptic spike trains, postsynaptic voltage clamping coupled with presynaptic spike train stimuli, spike timing dependent plasticity responses of Bi and Poo (Annu Rev Neurosci 24, 2001, 139), and other experiments.

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Irritant-Induced Proliferation of Presumed Solitary Chemosensory Cells in the Airway

Ejiofor Ezekwe*, Ramon Cabrera*
Weihong Lin, Assistant Professor, Department of Biological Sciences

The aim of this project is to study a relatively novel population of solitary chemosensory cells (SCCs) within the epithelium of the airway. SCCs in the anterior nasal cavity have been shown to respond to odorous irritants (Lin et al. 2008 J Neurophy 99:1451-1460). To determine whether irritant exposure may lead to increased SCC density in the nasal epithelia and the respiratory tract, we exposed mice to chitin and an odorant mixture daily. In some mice the right nostrils were occluded to prevent chemical stimulation to provide an internal control. In addition we injected mice with BrdU, a molecule that labels dividing cells to observe the proliferation of epithelial cells. Using immunohistochemistry and fluorescence microscopy, we performed quantitative cell counts and found region-dependent cell density in the respiratory tract. There is greater cell density toward the nasal cavity than towards the lungs for both control and exposed mice. In addition, there seems to be an increase in the number of cells in the respiratory tract of exposed mice as compared to the control group. This data will be used in further studies to determine any changes in overall number or proliferation patterns in these cells.

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Quantum Interference Effects with Multimode Fibers

Stephanie M. Ferrone
Todd B. Pittman, Associate Professor, Department of Physics

This research aims to determine the feasibility of simplifying quantum interference using multimode optical fibers. The idea of quantum interference effects is one that is central to the problems of quantum computing (using quantum physics principles to accelerate the speed and capabilities of computers) and quantum teleportation (using quantum physics to send information between non-connected locations), among other ideas at the forefront of scientific discovery. Of particular interest are quantum interference effects with entangled photons. Current work in this field is being done using the propagation of entangled photons in single mode fibers. However, the precision required to align single mode fibers prior to conducting any research is very high and thus takes great amounts of time to obtain and is easily disrupted. Therefore it would be greatly desirable to be able to replace single mode fibers in quantum research with multimode fibers. Before that is done, however, the properties of multimode fibers in photon entanglement experiments must be examined to determine how they compare to those of single mode fibers. The goal of this research, therefore, is to determine the comparative efficacy of multimode fibers with an eye to their replacement of single mode fibers in quantum research.

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Localization of Myo 1 in *Saccharomyces cerevisiae* Mutants with a Multi-budded Phenotype

Whitney C. Fields*, Janice Zengel, Lasse Lindahl*
Janice Zengel, Senior Research Scientist, Department of Biological Sciences

Evidence is beginning to accumulate suggesting that there is a connection between the cell cycle and ribosome biogenesis. The budding yeast *Saccharomyces cerevisiae* is an excellent model for understanding these highly conserved processes. During the yeast cell cycle, the newly forming cell appears as a bud on the mother cell and is released after mitosis and cytokinesis. It has been found that when the ribosomal protein L4 is depleted, an unusual multi-budded phenotype is observed. It is not known exactly when during G1/S phase these multiple buds form. The source of this defect can be determined by observing the localization of different proteins in the cell after ribosome biogenesis has stopped. One such protein, Myo1, is known to be localized to the future bud site during the G1/S phase in the normally growing yeast cells. By tagging Myo1 with GFP and tracking its migration using confocal microscopy, it can be determined whether it appears at just one site or at multiple sites in cells depleted for L4. If it appears in multiple sites, then the defect must be occurring during the G1/S phase. These observations will be useful in understanding the signals between the cell cycle and ribosome biogenesis.

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Increased Expression of SOCS1 by HIV-1 Transgenic Rats: A Mechanism for Dysregulated T Helper-1 Responses

Phillip J. Fitzgerald
William Reid, Assistant Professor, Institute of Human Virology of the University of Maryland School of Medicine; Department of Microbiology and Immunology, University of Maryland School of Medicine

T helper 1 (Th1) cells are a class of CD4+ T cells important in cell-mediated immunity. Th1 cells are characterized by their production of the cytokine interferon-γ (IFN- γ). Differentiation to and maintenance of Th1 cells is driven by both IFN-γ and the cytokine interleukin-12 (IL-12). Also necessary to Th1 differentiation and maintenance is the IFN-γ-induced transcription factor interferon regulatory factor 1 (IRF1), which has been shown to activate the gene encoding the IL-12 receptor β1 subunit (IL12Rβ1) in CD4+ T cells. It has been shown that Th1 responses are compromised in HIV-1 infected individuals, but the mechanisms are not fully understood. One possible mechanism is by dysregulation of suppressor of cytokine signaling-1 (SOCS1), a negative regulator of cytokine signaling. Using HIV-1 transgenic (Tg) rats, we show that following IFN-γ stimulation, Tg CD4+ T cells have elevated levels of SOCS1 mRNA expression and reduced levels of IRF1 mRNA expression compared to CD4+ T cells from non-Tg rats. We also show that Tg naïve CD4+ T cells polarized under Th1 conditions have reduced levels of IL-12Rβ1 mRNA expression, and that these cells produce reduced levels of IFN-γ protein when exposed to exogenous IL-12. These findings suggest a link between high levels of SOCS-1, defects in IL-12/ IFN-γ signal transduction, and dysregulation of adaptive Th1 responses in HIV-1 Tg rats.

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The Connection Between Abnormal Ribogenesis and the Cell Cycle

Tiffany C. Fleet, *Janice Zengel, Lasse Lindahl*
Janice Zengel, Assistant Professor, Department of Biological Sciences
Lasse Lindahl, Department Chair, Department of Biological Sciences

During cancer, important cellular functions can be deleted and altered. We hypothesize that one example of such modifications is in breakdown the linkage between the controls of cell cycle and ribogenesis. A model to study abnormal ribosome biogenesis was created in which the chromosomal ribosomal protein L4 genes of Saccharomyces cerevisiae were replaced with a single copy under galactrose control. Shifting this strain from galactose to glucose medium results in depletion of L4 protein. This deletion appeared to mimic a cell cycle defect; so to determine how the L4 depletion affects the cell cycle control cell, constructs will be made to tag cell cycle control proteins, such a Cdc14, with green fluorescent protein (GFP). This protein normally migrates from the nucleolus to the cytoplasm during anaphase. The tagged Cdc14 protein will therefore translocate in the cell during the cell cycle if anaphase progresses normally, but may remain in the nucleolus or nucleus if the cell cycle control is defective after L4 depletion. To form this construct that will tag cell cycle proteins, a selectable marker will be ligated to a vector with the GFP. After the construct is created, the proteins will be tagged and their location during the cell cycle will be monitored with confocal microscopy.

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"*The Real World*"

Glen R. Fortner
Fred Worden, Assistant Professor, Department of Visual Arts

The Real World uses dreamlike visuals to explore the ongoing conflict between the man-made world and the natural world. It is a movie that examines "reality" and "the surreal" simultaneously. This is achieved using a variety of digital techniques. One sequence starts with the image of a forest. Slowly, sections of the shot are replaced with the image of a building. This effect was achieved using a digital tool called "chroma keying." I selected the black areas of the building and superimposed them over the image of a forest. I then added the red bricks, and the blue windows creating a surreal visual that also raises the issue of deforestation. From the outset, I knew I wanted to explore environmental issues in a dreamlike way. I wrote a comprehensive script for the project, but several sequences were imagined during the filming. While improvisation can be very successful, I always write a script beforehand. The creative process is much more relaxed if I have a fallback plan. "The Real World" develops out of a collision between improvisation, careful pre-planning, dreams, and the study of environmental issues.

Using Court Records as Historical Sources: A Study of Infanticide in 18th-century London's Old Bailey Criminal Court

Teresa Bass Foster, Vicki M. Heath
Amy M. Froide, Associate Professor, Department of History

This research project consisted of an analysis of infanticide cases prosecuted in London's Old Bailey Court during the 18th century. In order to obtain information regarding the childbirth experiences of unmarried British women, data from 1700 to 1799 was collected and examined from court records accessed at Old Bailey Proceedings Online (http://www.oldbaileyonline.org). A total of 131 infanticide cases were reviewed, in which only 20 percent resulted in a guilty verdict. Infanticide, defined as the intentional murder of a child, resulted in shame, social stigma and criminal prosecution for unmarried women. Fearing the social ramifications of birthing a bastard child, unmarried pregnant women often attempted to conceal pregnancy, birth, and the death of an infant, but concealment was viewed as proof of guilt. Legal prosecution of infanticide burdened women with presumptive guilt, and without benefit of counsel, in the case of any birth unattended by a midwife or doctor. Research indicated unsatisfactory health conditions in 18th century London for working class pregnant unmarried women and their infants. Individual case study analysis revealed a consistent pattern of birth concealment prompted by social stigma and legal prosecution.

Impact of Cu(I) Binding to Amyloid-beta in Alzheimer's Disease

Monique N. Foster**,** *Veronika Szalai*
Veronika Szalai, Assistant Professor, Department of Chemistry and Biochemistry

Alzheimer's disease is a progressive brain disorder that affects more than five million Americans. In the brain, the protein amyloid beta (Aβ) self-associates to form species that kill neurons. The metal ion copper binds to Aβ and has been suggested to contribute to neuron death by cycling between its 2+ and 1+ oxidation states to produce harmful reactive oxygen species. For this mechanism to operate in vivo, Aβ must have a high affinity for both Cu^{2+} and Cu^{1+}. Based on our previous research, we hypothesize that Cu^{1+} binds to Aβ with a higher affinity than Cu^{2+}, but the affinity for Cu^{1+} for Aβ has not been determined. We are developing a fluorescence-based competitive chelation assay to measure the affinity for Cu^{1+}. The assay requires chelators with a range of affinities for Cu^{1+} as a means to detect Cu^{1+} binding to Aβ. We show that bathocuproine disulfonic acid (BC) and bicinchoninic acid (BCA) compete to bind Cu^{1+} and that BCA has a weaker affinity than BC for Cu^{1+}. Measurement of the affinity of Cu^{1+} for Aβ is underway. Knowledge of the affinity of Cu^{1+} for Aβ impacts our ideas about the chemistry in which Cu might participate when bound to Aβ.

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Negative Assortive Mating Based On Color In the Freshwater Platyfish *Xiphophorous maculatus* (Poeciliidae)

Tyler E. Frankel
Tamra Mendelson, Assistant Professor, Department of Biological Sciences

One of the fundamental questions in evolutionary biology is the maintenance of genetic variation. One of the ways in which variation is maintained in a population is through a negative assortive mating strategy. By this mechanism, individuals select mating partners that exhibit phenotypes contrasting with their own, thereby increasing variation within the population. The present research project was designed to investigate whether negative assortive mating based on coloration occurs in the freshwater platyfish Xiphophorous maculatus (Poeciliidae). Blue, red and gold color morphs were used to investigate whether X. maculatus females would preferentially select a different colored male when given a choice between a male of hers own color morph or one of the other color morphs. Results of this investigation suggest that blue and red females exhibited negative assortive mating, with selection for males of the alternate phenotypic expression being non-random ($p<.05$). This is in contrast to gold females, where mate selection was observed to be random ($p>.05$).

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Creating National Identity and Memory: The German Historical Museum

Kristina R. Gaddy
Susanne Sutton, Lecturer, Department of Modern Languages and Linguistics

This paper explores the Deutsches Historisches Museum (DHM), or German Historical Museum, and the creation of a definitive history for both East and West Germans. In 1987, Helmut Kohl, as the then Chancellor of West Germany, announced plans for the creation of a museum that would encompass all of 'German history.' The ensuing debate about what 'German history' included intensified after the two Germanys were reunified in 1990. The DHM gained the collection of the East German, communism-centric Museum for German History, and began planning how to create a museum that reflected German history in its entirety. My research addressed how museums try to build a national identity through what they present to the public and how they present it. I argued that after the reunification of the Federal Republic of Germany (West Germany) and the German Democratic Republic (East Germany), the DHM sought to present redefined common values of the reunified Germany. More specifically, I looked at the need for a common history for Germans after forty years of division and a crisis of German identity.

The Economic Feasibility of Algae as a Green Energy Resource

Mike S. German, ***Ashrith Mathias***, ***Olu Olayiwola***, ***Aileen P. Richards***, ***Benjamin Schultz***
Mariajose Castellanos, Assistant Professor, Department of Chemical Engineering

Recently, production of biofuels from algae has become important to the field of green energy. Algae is desirable as a starting material for the production of biodiesel and ethanol because it is fast growing, can be grown on land unsuitable for agriculture, is renewable, and is considered carbon-neutral. Basic chemical engineering principles were used to optimize the profit of a large-scale biodiesel and ethanol production facility. Although facilities which use algae to manufacture biofuels already exist, we are unaware of any functional facility which produces both ethanol and biodiesel from a single feedstock. Our current energy source, fossil fuels, is neither renewable nor environmentally friendly. Thus, the development of new and successful ways to manufacture energy is necessary, and current renewable sources have been criticized for their lack of efficiency and lack of compatibility with current infrastructure and technology. The current administration's apparent commitment to the research and development of green energy is supportive of algae-based energy initiatives; between tax breaks and investments, it has never been as better time to become involved in the green energy market. The algae fuels process is an example of environmental benefits and possible economic success.

ESI-FTICRMS Characterization of Deoxyribozymes Targeting Conserved Domains of the HIV-1 Packaging Signal

Michael S. German*, Kevin B. Turner*
Daniele Fabris, Associate Professor, Department of Chemistry and Biochemistry

Due to the rapid emergence of strains that are resistant to one or more of the active agents used in typical multidrug regimens targeting the human immunodeficiency virus type 1 (HIV-1), it is necessary to explore the development of novel antiretroviral therapies. As such, we evaluated deoxyribozymes (DZs) as possible therapeutic agents targeting specific, highly conserved domains of the HIV-1 packaging signal (□-RNA) utilizing electrospray ionization Fourier transform ion cyclotron resonance mass spectrometry. Our initial strategy targeted the single stranded linker of □-RNA in the absence and presence of HIV-1 nucleocapsid protein (NC), which clearly demonstrated the effectiveness of DZs at cleaving these regions *in vitro*. We have extended our approach to target stemloop 1 (SL1) of □-RNA, which contains the dimerization initiation site (DIS). While the targeted regions of SL1 are typically double stranded and not amenable to DZ cleavage, the chaperone activity of NC may create transient intermediates during the dimerization process. Consistent with our hypothesis, SL1 remains resistant to cleavage in the absence of NC, however in its presence becomes readily cleavable. DZs provide substantially more attractive candidates for antiviral applications as compared to their ribozyme counterparts due to their superior chemical stability, lower potential toxicity, and improved catalytic efficiency.

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

Gender Inequality and Issues in Ethiopia

Belen Getahun
Franc Nunoo-Quarcoo, Professor, Department of Visual Arts

Ethiopian woman are involved in all aspects of the social, political and cultural activities in their communities. Sadly, their contributions are hardly acknowledged in a male dominated and male identified social, political, economic and cultural environment. Conceptually, the poster will feature a teacup. The teacup is a metaphor for women. The contents of the teacup will be bold letterforms in different sizes and orientations all meant to represent and signify the variations important contributions to the betterment of their community. How can one define power by its weight and expect to gain a true result? A balance scale will be used to illustrate this statement. On one side will be something that is not physically heavy, but is vital to life and society. On the other side will be a large, heavy, but unimportant object. The scales will measure the weight of each object in importance, not in pounds.

Communism and Censorship: A Stunting of Albania's Literary Culture or the Birthing of a Unique National Movement?

Nikoletta Gjoni
Raphael Falco, Professor, Department of English

Censorship is often the antithesis of creativity, expression, and literary freedom. There are few places that exhibit this idea better than Albania. Communism in Albania, from 1944 to 1991, proved to have dramatic and often negative effects on those who challenged the government's authority through the written word. My research focused on three different aspects of the literary culture in Albania: published works whose authors submitted to government censorship for insurance of distribution to the masses, published works, primarily Ismail Kadare's, that broke outside of Albania's borders and are celebrated today as rebellious literature, and the unfortunate circumstances of those who circulated their work "underground." Through my research, I discovered that every major facet of Albania's publications, i.e., literary magazines, newspapers, novels etc., were at the government's mercy of being "approved" for the public. In many cases, the authors were punished severely if caught displaying anti-communist ideals. After interviewing Kadare and finding much evidence in primary sources such as newspapers and literary magazines, my original thesis of communism stunting literary growth altered a bit. I found that although this was evidently clear, immensely celebrated authors such as Kadare became so with their unique style of writing in "code" to protect themselves and their works.

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Stand-Off Chemical Detection Using Acoustic Beamforming and Photoacoustic Sensing

Aurelius L. Graninger
Fow-Sen Choa, Professor, Department of Computer Science and Electrical Engineering

In recent years good progress has been made in the area of gas detection, especially using Quantum Cascade Lasers (QCLs). However, most of the demonstrated methods of detection are localized techniques and require that the gas be contained in a chamber for testing and measurement. Here we propose an innovative method for standoff chemical detection using the techniques of photoacoustic sensing and acoustic beamforming. Photoacoustic sensing is a very effective spectroscopic method that can achieve parts-per-billion sensitivity. Acoustic beamforming is a technique that allows one to detect signals along a formed beam while rejecting surrounding noise. Similar to phased array antennas, we can form receiving beams with a 2-D microphone array. In our implementation we use two arrays to detect a signal from one remote point, and two QCLs are aimed at this location such that their crosspoint overlaps with that of the acoustic beams. By tuning the lasers and detecting the sound wave we can measure the absorption spectrum and identify the gas molecule. We can verify the location of the molecule by independently modulating the QCLs and observing both sound frequencies in the arrays. Here we present our theoretical model, experimental implementation, initial results, and future considerations.

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

Sex Differences in Pain Responses: Do Men and Women Experience Pain Differently?

Jessica M. Griffith, *Burel R. Goodin, Lynanne M. McGuire*
Lynanne M. McGuire, Assistant Professor, Department of Psychology

It is not uncommon for anecdotal reports to suggest that women are less sensitive to pain and can endure more pain then men. Yet studies have shown women report more frequent and intense pain than men. Psychosocial mechanisms may account, at least partially, for these sex differences in pain experience. The present study examined sex differences in gender role expectations of pain, fear of pain, and laboratory evoked acute pain outcomes. Participants (N = 150, 50% women) completed a series of standardized pain tasks which included a pressure pain task, followed by a cold pressor task (CPT). The Fear of Pain Questionnaire (FPQ-III) was completed before the pain tasks, while the Gender Role Expectations of Pain Questionnaire (GREP) and the Short Form-McGill Pain Questionnaire (SF-MPQ) were completed after the final pain task. Results showed that both men and women believe men are more sensitive to pain than women. Conversely, women reported more severe pain ratings than did men upon completion of the painful tasks. Additional analyses showed that fear of pain may account for sex differences in pain ratings. The results suggest that men and women experience pain differently; however, additional research is needed to determine why.

Mechanisms of Immune Suppression in Breast Cancer

Lydia Grmai, *Olesya Chornoguz, Suzanne Ostrand-Rosenberg*
Olesya Chornoguz, Ph.D. student, Department of Biological Sciences; Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

One in eleven women will have breast cancer in her lifetime. Although primary breast tumors are curable by surgery, tumor cells that metastasize to other sites are largely untreatable. Immunotherapy, activating a patient's immune system against their resident cancer cells, is a promising approach for metastatic breast cancer treatment. However, most breast cancer patients are immune-suppressed, rendering active immunotherapy approaches unsuccessful. Myeloid-derived suppressor cells (MDSC) inhibit activation of T-lymphocytes, the predominant effector cells that are activated by immunotherapy. This project will elucidate mechanisms by which breast cancer-induced MDSC prevent T-lymphocyte activation. To understand these mechanisms, we obtained MDSC from BALB/c mice with 4T1 mammary carcinoma cells, a mouse model closely resembling human breast cancer. To confirm suppressive activity MDSC were co-cultured with T-lymphocytes in variable ratios. Higher MDSC : T-lymphocyte ratios yielded more immune suppression in BALB/c mice. MDSC express proteins which contribute to defined signaling pathways, hundreds of which were revealed by mass spectrometry analysis. We are using bioinformatics tools to analyze these proteins and pathways to determine which could mediate MDSC function. We anticipate that these experiments will identify key proteins whose inactivation will block MDSC activity and promote immunotherapy in breast cancer patients.

Probabilistic Constrained Relational Clustering with an Application to Facebook

Roger P. Guseman, III
Marie desJardins, Associate Professor, Department of Computer Science and Electrical Engineering
Adam Anthony, Ph. D Candidate, Department of Computer Science and Electrical Engineering.

Clustering refers to the problem of partitioning a set of objects into groups or communities based on their similar attributes or on their relationships to each other. A constrained clustering algorithm can be guided to converge to a desirable clustering, which could not have otherwise been achieved, by making use of user-provided pair-wise constraints. Starting with a stochastic block model and the expectation-maximization algorithm, which uses a Bayesian approach to probabilistically place each object in its most likely cluster, we included constraints in the form of "must-link" and "cannot-link" relations. We incorporated these constraints into the statistical priors for our Bayesian probability calculations. Constrained clustering is important because it allows solutions that could never have been found otherwise to be reached. As a result, constrained clustering has applications for data analysis such as making improvements upon various friend recommendation algorithms employed by social networking websites like Facebook. The improvements to friend recommendation algorithms involve reducing the number of spurious recommendations by creating an accurate clustering of a person's social connections.

This research was funded by an NSF CAREER award #0545726.

Belize Valley Archaeological Reconnaissance: the Collapse of Baking Pot, a Classic Maya City

Ana L. Hageage
Esther Read, Lecturer, Department of Ancient Studies

The collapse of Classic Maya civilization has been a topic of great interest confounding archaeologists for many years. In an effort to understand the parameters of this demise, I participated in an archaeological field school focusing on settlement patterns of the Classic Maya in the capital city of Baking Pot located in the Upper Belize River Valley. Through the excavation of the epicenter and periphery house mounds, analysis of artifacts *in situ*, as well as the surveying of an area extending 5.8 square km from the site core, a pattern of occupation was established exceeding previous dates. Due to Baking Pot's proximity to the Belize River, and the presence of a substantial amount of foreign materials in the surface collections, it is believed to have played an important role in trade routes. Therefore, Baking Pot was able to hold a degree of political power due to its access and control over prized resources. While this season did not uncover concrete evidence as to the demise of the Maya civilization, it did yield relevant information regarding the strength of Baking Pot in relation to Naranjo, Tikal, Xunantunich, and Cahal Pech; powerful cities that experienced great turmoil around the same time period.

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

“Growth”: An Exploration in Digital Patterns

Jessica R. Hale
Fred Worden, Assistant Professor, Department of Visual Arts

“Growth” is an animated short which explores musical visualization through the use of two-dimensional patterns to represent a three dimensional space. This animation seeks to challenge the viewer’s conception of spatial representation by flattening images through the use of intricate patterning. The film utilizes Adobe After Effects, which allows for the depiction of two-dimensional and three-dimensional spaces simultaneously. The opening sequence involves the transition from a blank white screen to a simple hill against a blue sky, which is then filled in with complex patterns that move and change as they are completed. Utilizing the tools included in Adobe After Effects, such as the “Draw On” tool, which creates hand drawn lines that define the background, created these effects. The use of Beethoven’s “Moonlight Sonata,” a classic piano composition, allows for a gradual build up of imagery as the song grows more intricate. “Growth” represents the creative potential of music visualization using advanced software tools.

Applying Swarm Rule Abstraction to a Wireless Sensor Network Domain

Peter A. Hamilton
Marie desJardins, Associate Professor, Department of Computer Science and Electrical Engineering
Don Miner, Instructor and Ph.D. Student, Department of Computer Science and Electrical Engineering

The study and application of swarm rule abstraction (SRA) is important because it can yield simple and natural control schemes for swarm systems. In a swarm system, each agent follows a set of adjustably weighted low-level rules that governs its behavior. Resulting swarm-level behavior can appear coordinated and organized and is called emergent behavior (EB). However, it is hard to manually manipulate the low-level weights to produce desired EB. SRA, developed by Don Miner, is a framework that maps the relationships between weights and EB. The primary goals of my research were: (a) to determine the effectiveness of SRA in the process of planning the layout of a simple wireless sensor network (WSN) and (b) to develop the mapping between weights and behaviors in the WSN domain. To carry out my research, I implemented a network simulator that allowed the user to define network parameters, visualizing the network simulation while treating the set of network sensors as a virtual swarm. I specifically modeled three WSN characteristics – connectivity, coverage, and density – using four low-level rules. After conducting many experiments, relationships between the low-level weights and EB were observed, verifying the applicability of SRA and inspiring further work in the mapping process.

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“I am an African, That is my Religion”: Reproducing Africanness and Community in Baltimore

Chelsea E. Hayman
Bambi Chapin, Assistant Professor, Department of Sociology and Anthropology

This study explores how people in America, particularly those of African descent, perceive, discuss, and value “Africa” in their everyday lives. I conducted my ethnographic research through participant observation, interviews, and content analysis of a series of African-centered Christian organizations, businesses, and performing arts collectives in Baltimore, Maryland from 2008-2009. The discourses of these communities reflect an overarching emphasis on the reconciliation of a dislocated selfhood through the production of cultural authenticity. Through perpetuating African languages, art forms, and dance as valuable commodities, individuals are able to defend what they see as an “organic” mode of living against Western culture, which is configured as undesirable and immoral. These efforts at cultural preservation are premised on shared understandings of the dangers of assimilation and threats to the communal memory of Africans and African-Americans posed by Western culture. With the diversity of contemporary American society, these groups are finding space to create communities and produce a cultural paradigm that represents a form of escape from the West. My research will reveal how the continuity and borrowing of customs creates an overlapping set of cultural meanings among different African-descended populations.

This work was funded, in part, by the Department of Sociology and Anthropology at UMBC.

900,000: An Exploration of the International Human Trafficking Epidemic

Sean Heavey, *Adam Utapat*
Dr. Ilsa Lottes, Associate Professor, Department of Sociology and Anthropology

The trafficking of human beings into sex slavery and so-called “sex tourism” is an international problem affecting nearly a million women and children. Though organizations such as the United Nations, Interpol and even the United States government all have agencies and task forces working to rescue these victims and bring their captors to justice, there is relatively little being done to promote awareness about these crimes.
Through my poster and an accompanying informative pamphlet, we will employ our respective skills to research this problem and increase its public awareness. It is critical to welfare of America as well as the rest of the world that we curtail the trafficking of human beings both domestically and abroad, as well as provide support to the victims of this inhuman atrocity.

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HIV Dynamics: Infections Kinetics

Robert Henderson
Mariajose Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

This research uses a mathematical model developed by Piekarski *et al.* (unpublished work). His model describes the progression of HIV in humans using MatLab as the simulation tool. The model tests the differences between infection due to cell-to-cell or virus-to-cell transfer mechanism for HIV viral particles. This difference is still unknown as the cell-to-cell infection mechanism has not been completely defined. Although this model fit the data well, the extent of correctness was not determined. I modified this program to include cost functions that compare the model's data versus empirical data. This resulted in an improved model as the parameters' sensitivity analysis minimized the residuals between the experimental data and that of the model, resulting in more biological meaningful parameters. Additionally I have included the cell to cell transfer mechanism into a model (Bajaria *et al*) that describes a more realistic representation of the physiological nature of the body. This particular model includes the lymph system, the blood system, and the transfer between the two. This resulted in a better representation of the dynamics of HIV.

"Just Beyond the Bridge"

David Hernandez
Fred Worden, Assistant Professor, Department of Visual Arts

The film, "Just Beyond the Bridge," represents a major change for me as a director and there were two goals in making the film. The first goal was to work with 16mm film instead of video. The second goal was to remake an earlier work done on video. Working in 16mm has both its inherit limits as well as its own possibilities. Lighting is a key example. The lighting in video is extremely forgiving, compared to the potential exposure problems of 16mm. This is particularly true in *Just Beyond the Bridge* which is primarily set in the woods where the light source is rarely constant. Making a film from something previously created in video also presents artistic challenges. Things easily accomplished with a lightweight camcorder are much more challenging with the heavier 16mm Bolex. There were several shots in the video version done from high angles with swooping camera moves at the end of a monopod, something that could not possibly be done with the Bolex. The more complicated camera shots were either eliminated or simplified, and more abstract images, which were not in the original, were shot to break up some of the scenes. The end result is something that is hopefully beautiful, dark, original, and most of all entertaining.

“Aliens Love Cheerleaders”

Brendan Huza
Fred Worden, Assistant Professor, Department of Visual Arts

“Aliens Love Cheerleaders” is a throwback to silent film “monster movies,” such as “King Kong.” This film is a stop-motion animation using toy action figures. The research focuses on using modern technology to achieve the look of the older monster movies. The entire film was created using a laptop as the stage. Animations were created and displayed on my laptop’s screen as backdrops. The action figures were animated on a piece of form-core that was on top of my keyboard and the entire film was shot on top of a dryer in my family’s laundry room, because it made for the best lighting. The film was digitized at UMBC so sound effects, vocals and music could be added. My friends, Amber Fisher, did the voice of the cheerleader, and Jaron Lopez, created an original music score for the piece. My main goal with this film was to create something that would entertain in a humorous way. This was not easy to accomplish working with silent, 16mm film, but I believe that for the most part I succeeded.

The Baltimore Girl: An Experiment in Sustainable Living

Alexandra H. Hyland
Jason Loviglio, Associate Professor, Department of American Studies and Director of Media and Communications Studies

Baltimore, Maryland was ranked as the tenth “most sustainable” city in the United States, according to a SustainLane.com study. Its LEED-certified buildings, Office of Sustainability, and miles of parks and pathways counteracted its reputation as an old “rustbelt” city. To test this surprising claim, the research conducted investigated the feasibility and affordability for individuals in the Baltimore area to maintain everyday lives that are ‘sustainable’ and the results were posted on a pubic website. This was accomplished through the personal adoption of a lifestyle that corresponded with those behaviors traditionally associated with sustainable living. The project used Sustain Lane’s sixteen categories of sustainability as the foundation from which to construct lifestyle choices. For example, the category “local food and agriculture” was put to the test in my pursuit to live wholly dependent on food grown and sold at local markets and restaurants. In addition, I have challenged the “green” practices that seem hypocritical and counterproductive. The findings, obstacles, and challenges of this research have been published on my website and blog, located at HYPERLINK "http://thebaltimoregirl.com" http://thebaltimoregirl.com. The purpose of creating a website was to serve as a space to generate public awareness, and also to offer the opportunity for community input and commentary. The study’s findings demonstrated realistic methods of how to live a sustainable lifestyle, even in an environment that is not adequately suited to do so.

Development of an Algorithm to Allow Robots to Objectively Analyze Causally Relevant Objects in the Environment

Joseph M. Hyman, *Tim Oates*
Tim Oates, Associate Professor, Department of Computer Science and Electrical Engineering

The purpose of this research is to develop an algorithm that allows robots to explore environments autonomously, while interacting with surrounding objects that are causally relevant to the robot. Explicit variables affect the robot and how it exists in the environment, but are imperceptible by the robot. Robots have very poor, impoverished sensors that disable them from seeing and understanding aspects of the world around them, such as distance and heights. For example, humans have a comparable issue with gravity; gravity exists, and affects us, but we are unable to see it or completely describe it. An SRV-1 Robot with Laser Ranger Finders will be used in this research to explore the environment. Developing an algorithm for the robot utilizing the laser range finders, the robot will be able to sense upcoming or neighboring objects. Then, implementing another algorithm will allow the robot to objectively analyze its environment. The robot will be able to explore, interact with objects (i.e., go around, go past, back up, etc.), and gather accurate information about surrounding objects such as height, distance, and size. This research will allow robots to explore the world, objectively, and give the robot a better sense of the environment in visual detail.

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Self-Reporting Fluorescent Nanogels

Joy K. Ihekweazu
Lisa Kelly, Associate Professor, Department of Chemistry and Biochemistry

Nanoparticles are novel tools in the field of medicine that show promise for imaging, diagnosis, delivery, and therapy. Nanogels are a unique class of nanoparticles. Unlike many nanoparticles, nanogels are biologically safe. In addition, nanogels made from N-isopropylacrylamide (NIPAM) undergo a sharp phase transition at 32^{o} C. This thermal transition has utility in stimuli-responsive drug delivery and can be used as nanoscale valves in nanofluidics. Although the stimuli-responsive nanogels have utility in medical and engineering applications, there is currently no way to image the state or phase of the particle. In this work, we aim to synthesize fluorescently labeled nanogels that "self-report" their phase. N-(2-Aminoethyl)-1,8-Naphthalimide was synthesized and acrylamide-functionalized using acryloyl chloride. Core nanogels were synthesized by precipitation polymerization of NIPAM and N,N'-methylenebisacrylamide using sodium dodecyl sulfate and ammonium persulfate as the surfactant and initiator, respectively. A shell of NIPAM, acrylic acid, and the naphthalimide was then added to the core. The water-soluble nanogels exhibit strong fluorescence. The spectrum is red-shifted relative to the spectrum of the naphthalimide in THF, indicating that an excited-state dimer is present in the particles. The fluorescence of the labeled nanogels as a function of naphthalimide concentration and temperature will be presented.

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Production of an EMMPRIN Murine Immunoglobulin Fc Fusion Protein to Study Tumor Invasion

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Scott Strome, Professor, Department of Otorhinolaryngology

EMMPRIN (extra-cellular matrix metalloproteinase inducer) is a transmembrane protein, highly expressed on the surface of squamous cell carcinomas. In our laboratory, we are creating a fusion protein of the extracellular domain of EMMPRIN with the constant region of murine immunoglobulin. Starting with human EMMPRIN cDNA, we have sequenced and identified the open reading frame of EMMPRIN, engineered restriction sites onto its ends, and are currently subcloning to make the fusion protein. This fusion protein will then be used to immunize mice for the production of anti-EMMPRIN monoclonal antibodies. The production of these antibodies, in addition to the fusion protein, can be used to modulate interactions between EMMPRIN and its receptor. Once the binding receptor of EMMPRIN is identified, we can block its function *in vitro*. Blocking the activity of EMMPRIN, would prevent stromal cells from synthesizing matrix-metalloproteases which give cancer cells increased invasion capacity.

This investigation was supported, in part, by the HHMI Undergraduate Scholars Program at UMBC, the Howard Hughes Medical Institute, and by grant R01 A1063171 from the NIH/NIAID.

The Role of Prior Experience on Parasitoid Host Choice

Ruby I. Jackson-Atogi*, Theresa Delaney*, *Gina Hilton, Kate Laskowski, Jeff Leips*
Jeff Leips, Associate Professor, Department of Biological Sciences

Parasitoid wasps use the immature stages of other insects as hosts for offspring development. Because different species of potential hosts vary in their suitability for growth and development of larval wasps, traits that influence how females locate and discriminate among hosts should be under strong selection. In this study, we explore the role of prior experience with a host on future host choice preference, specifically testing the hypothesis that learning can influence host choice. To test this hypothesis we are using the parasitoid *Leptopilina clavipes* and three Drosophila host species: *D. melanogaster*, *D. simulans* and *D. affinis*. We show that host choice of *L. clavipes* is a plastic trait, and that they show higher attack rates on host species with which they have had previous experience. This result suggests host preference may involve learning, and we interpret our results in the context of optimal foraging theory. This study will increase our understanding of the evolution of host choice behavior.

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Investigating the B-cell Gene Therapy Approach to Alleviating Autoimmunity

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The immune system is responsible for protecting the body against infection. Occasionally, the mechanism that governs the immunological process malfunctions leading to autoimmunity, the identification a substance made by the body as "foreign" and the mounting of an immune response against said substance. Some years ago, a member of Scott lab pioneered a novel approach to alleviating autoimmune conditions. The gene for the self-antigen, self-made substance that causes autoimmunity, is inserted into a gene construct for Immunoglobulin G (IgG), one of the proteins used by the immune system to identify invading organism or substance. These constructs are inserted into B-cells, a subset of immune cells, and the cells are then injected into mice. When these mice are challenged with the self-antigen, the mice are tolerant, do not mount an immune response. To this end, a fellow Scott lab member created mutations of the antigen/IgG construct. Research with these mutations has shown that, unlike the wild-type construct, they are not able to stop the immune system from mounting a response to the self-antigen. The aim of my focus in Scott lab is to further investigate this B-cell gene therapy system using these mutations.

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3D Tour of an Urban Environmental Research Site Using Google Earth® and KML

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The Gwynns Falls is a heavily gauged urban watershed running through Baltimore City and County, terminating in the Patapsco River. Spatially explicit research across the watershed generally conducted by CUERE, the Baltimore Ecosystem Study, and USGS is carried out using mapping software like ArcMap, which is often inaccessible to the public, and requires significant training to grasp. Using a combination of ArcMap® and Google Earth®, a 3D tour of the Gwynns Falls was created to provide a more accessible depiction of the watershed and the monitoring stations throughout. Data layers provided by the USGS and CUERE were converted to KML and imported into Google Earth®. Place marks were inserted at gage locations with informative pop-ups including a photograph of the site, a long-term hydrograph, latitude and longitude coordinates, and a site description. A path was drawn moving down the watershed for the tour to follow, stopping briefly at each place mark for the information to display. The creation of this tour provides a new perspective of the Gwynns Falls, making it easier for researchers and visitors to the area to visualize the watershed and the activities throughout it.

Using Next Generation Solexa Sequencing to Identify Genes that Regulate Stem Cell Proliferation in the *Caenorhabditis elegans* Germline

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Multicellular organisms depend on cell-cell interactions to coordinate their development. In *C. elegans,* germline stem cell fate depends on the activity of the Notch receptor homolog, *glp-1*. The loss of *glp-1* function prevents germ cell proliferation and produces sterile hermaphrodites. To identify new genes that regulate germline proliferation, suppressors of the temperature sensitive allele *glp-1(q231)* have been isolated. These mutants, *sog* (suppressor of *glp-1*), rescue sterility of *q231* at 20°C. The *sog-1* gene was previously mapped to a 2 Mbp region on chrI. To identify the gene responsible for the *sog-1* phenotype, we used Solexa sequencing to re-sequence the entire genome of two independently isolated *sog-1* mutants. In the critical region, we identified 62 SNPs between the two strains and the reference genome. We performed RNAi screens of candidate genes to test whether they phenocopy *sog-1* suppression of *glp-1*. RNAi screens of *pbrm-1* displayed an embryonic lethal phenotype for all strains, while *unc-14* and *F57B10.3* potentially phenocopy the germline suppression of *q231* by *sog-1*. Screens of other potential candidates were negative. These results may help identify new genes in germline proliferation and determine if Solexa sequencing will be useful in identifying genes defined by mutation.

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Designing Culturally-Sensitive Curricula in Native American Reservation Schools: The Seminole Nation

Susan M. Kane
Kathy Scales Bryan, Lecturer, Department of American Studies

Longitudinal studies of Native American drop-outs associate the high rate with misconceptions surrounding Native American populations. Media that reinforces stereotypes distort public perceptions; therefore, curricula must not promote existing stereotypes or create new ones. The purpose of my research was to compare current lesson plans established by two educational authorities: the Bureau of Indian Education (BIE) and the federal Department of Education (ED). The BIE creates content based on Native American culture and considers each student to be a *whole* person developing their traditional tribal identity. In contrast, the ED promotes achievement in the content identified as necessary for global competitiveness. Through direct observation in two Seminole schools, I compared the curricula of both for cultural sensitivity. *Seminole High*, operated through the ED, is comparable to any public school with Seminole tradition offered as electives. The *Ahafachkee Day School*, operated through the BIE, teaches Seminole culture as the learning core. My analyses revealed significant variation between both schools in mainstream content AND Seminole culture. The conclusion of my research indicates opposing educational goals within a single Native American nation due to opposing ownership. Additional research to evaluate the impact of this variation as contributory to drop-out statistics would be beneficial.

Survey of UMBC Students Knowledge, Attitudes, and Beliefs about Seeking Care for Emotional and Mental Health Problems

Neal C. Karkhanis
Andrea L. Kalfoglou, Assistant Professor, Health Administration and Policy Program

Previous studies have found that factors such as culture, socio-economic status, gender, and race/ethnicity all play a significant role in students' knowledge, attitudes, and beliefs about seeking care for emotional and mental health problems. Because UMBC is ranked among the top schools in terms of diversity, we are interested in learning about barriers that may prevent students from seeking out mental health services, including the role that stigma plays. The Office of Information Technology randomly selected a sample of 2000 registered UMBC students, and these students were invited via e-mail to complete an online survey. This survey included demographic questions, the Center for Epidemiological Studies Short Depression Scale (CED-D 10), Fischer & Farina's Attitudes toward Seeking Professional Psychological (ATSPPH-S), and the Stigma Scale for Receiving Psychological Help (SSRPH). Pilot data reveals differences in rates of depression and rates of stigma towards psychological help seeking based on race/ethnicity, gender, and other factors. We expect to identify specific populations of students who are unaware of University Counseling Services. Knowledge about these groups, as well as causes of emotional problems and barriers towards help seeking for emotional and mental-health problems will aid University Counseling Services in their outreach efforts.

This work was funded through Dr. Kalfoglou's SRAIS grant.

Feasibility Study for Constructing an Aspartame Plant

Eric C. Borman, Anrrieth M. Gomes, Lawrence P. Hetzel, Amanda K. Karp, Daniel R. Kostick
Mariajose Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

For our senior Chemical Engineering Design course our group had the task of evaluating the feasibility of building a chemical plant which will produce Aspartame, a non-saccharide sweetener. Through the semester, our team of highly motivated individuals utilized knowledge and skills we developed through the Chemical Engineering curriculum. This project not only consisted of exhaustive analysis of peer-reviewed literature, designing synthesis mechanisms, analyzing the kinetics of the reactions, optimizing heat exchange, but has served as the capstone to our degree and emphasized the importance of teamwork and communication with peers as well as superiors. Additionally, many areas of construction as well as production have been taken under consideration such as sizing unit operations and determining how much product the plant could generate weekly. Profit was not the sole concern in this project. Our team also had to consider safety precautions during design as well as determining the carbon footprint the chemical plant would impose on the earth. It is beneficial that our group gains real world knowledge about these and many more very important concepts so we can be better prepared for the future.

PBMC from a Subpopulation of Celiac Patients Respond to Gliadin with Interleukin-8 Production That Is CXCR3-Dependent

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Alessio Fasano, Professor, Department of Pediatrics

Celiac disease is an immune-mediated enteropathy triggered by gliadin, a component of the grain protein gluten. Pepsin/trypsin digested gliadin (PTG) binds to the chemokine receptor, CXCR3, and induces a MyD88-dependant activation of the zonulin pathway and subsequent increase in intestinal permeability. In this study, peripheral blood mononuclear cells from 21 CD patients in remission and 10 healthy controls (HC) were incubated with PTG (1mg/ml) for 24 hours, in the presence or absence of a blocking anti-CXCR3 monoclonal antibody (10μg/ml). Supernatants were analyzed for their content in interleukin (IL)-6, IL-8, IL-10, tumor necrosis factor (TNF)-α, and interferon (IFN) –γ. All cytokines were produced at a higher level in CD patients compared to controls. PTG induced IL-8 production only in a subgroup of individuals (30% of HC, 42% of CD patients). Interestingly, the PTG-induced IL-8 secretion was abrogated when CXCR3 was blocked prior to PTG stimulation in the CD group, but not in the control group. The production of the other cytokines was not influenced by blocking of the receptor. Further characterization of the PTG-induced CXCR3-dependent IL-8 production could provide very useful insight in the pathogenesis of CD and other disease involving intestinal permeability.

This project was funded by the Center for Celiac Research.

Crotamine Interaction with Polysaccharides and Ternary Complex Formation

Sara G. Kibrom
Richard Karpel Professor, Department of Chemistry and Biochemistry

Crotamine, a toxin from the venom of the South American rattlesnake, can be used to deliver drugs into cells. Research has shown that crotamine-DNA complexes are taken up by actively proliferating cells. It was also shown that cell surface glycosaminoglycans (GAG) such as heparin sulphate proteoglycans play a critical role in the internalization of crotamine-DNA complexes. The main goal for this research is to characterize the crotamine-GAG interaction *in vitro*, and to demonstrate the formation of ternary complexes of crotamine with GAG and DNA. We determined the affinity of crotamine for heparin and other oligosaccharides using a fluorimeter. A decrease of fluorescence emission at 340nm is indicative of crotamine-heparin interaction. Fluorescence anisotropy methods and immobilized GAGs can also be used to explore the formation of ternary complexes. The addition of crotamine to an oligonucleotide labeled with a fluorophore is known to show a change in the anisotropy associated with the label because this property is mass dependent. Retention of DNA on heparin-agarose in the presence of crotamine would be an indication of ternary complex formation.

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

Developing Carbocyclic Nucleoside Fleximers as Novel Drug Tools to Combat Drug Resistance

***Nathaniel T. Kim**, Joshua M. Sadler*
Katherine L. Seley-Radtke, Associate Professor, Department of Chemistry and Biochemistry

Nucleosides are ubiquitous molecules that perform numerous functions in different biological systems. Consequently, they have become a primary target in the pursuit of new anticancer and antiviral therapeutic drugs. However, the primary problem facing medicinal chemists is the development of drug resistance to currently used drugs. Studies have shown that flexibility of inhibitors is critical for continued effectiveness at mutant enzymes. In synthesizing these 'reverse fleximers,' the nucleobase is split into its individual components, imparting a degree of flexibility while maintaining the elements needed for enzyme recognition. Another successful modification is the use of carbocyclic nucleosides, which have increased stability, in place of naturally occurring nucleosides. Herein, the design and synthesis of three new pyrimidine carbocyclic compounds are presented by modifying the nucleobase moiety, specifically, attaching a secondary residue to the 5-position. The carbocyclic reverse fleximers should result in novel drug candidates with improved activity and increased enzyme inhibition. The activities of these lead compounds will be tested by inhibition of S-adenosylhomocysteine hydrolase (SAHase), which has been implicated in the growth of cancer cells. This study will increase the potentiality of nucleoside fleximers as a powerful tool to combat the problem of increasing drug resistance in currently used therapeutics.

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An NMR Protocol for the High-Resolution Structure Determination of Large RNAs

***Benyam Z. Kinde**, Blanton Tolbert, Yasu Miyazaki*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

One hallmark of all retroviruses is that each virion contains a dimeric genome non-covalently linked at their 5'-end. A smaller fragment (~ 200 nucleotides) encompassing a sub-set of the stem loops has been shown to direct packaging of heterologous RNAs into virion-like particles and is referred to as the CES. We propose that applying a recently developed NMR technique will mitigate the technical challenges associated with NMR structural analysis of large RNAs. A series of NOESY (distance-only) and TROSY based HSQC spectra (global restraints) were recorded for each RNA construct tested. Quantitative analysis of the resulting spectra allowed the extraction of a healthy set of distance-only and two of the global restraints, RDCs and RCSAs. Molecular Dynamics calculations were then performed in three different stages to assess the improvement in the quality of refined structures: a) distance-only b) distance-only + RDC and c) distance-only + RDC + RCSA restraints. Our results demonstrate the improvement gained by incorporating the RDC and RCSA restraints in RNA structure refinement compared to just using distance-only restraints. In particular, we observed a difference in helix orientation for helix one of $SLC_{320-345}$ when the RDC + RCSA restraints were included.

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“passIoNate eMOTION”

Tania D. Knight
Doug Hamby, Associate Professor, Department of Dance

In this dance, “passIoNAte eMOTION,” I pushed myself to try new things that were out of the ordinary for me. I used a famous poem by Maya Angleou to separate the two drastically different pieces of music to allow the piece to flow. I worked with dancers that I never had the opportunity to work with before and I chose to use movement concepts that were not a part of my common vocabulary. The emotion from the piece flowed from the very beginning with a calm, solemn music with emotion-filled energy. As the piece continues, the passion radiated from the dancers into the audience and they move to the words of Maya Angelou and the upbeat drumming. A major technique that I chose to emerge myself in was how the dancers entered and exited the stage. I wanted to make each entrance and exit interesting. I hope that the audience finds them new and invigorating and sees that passIoNate eMOTION in each of the dancers.

Disproving the Existence of an Interaction between the Primer Binding Site and the SL4 Stemloop of the HIV-1 RNA Genome

Gowry Kulandaivel*, Bilguujin Dorjsuren, Kun Lu, Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

The structure and folding of the 5′-untranslated region (5′-UTR) of the HIV-1 RNA genome is responsible for genomic packaging, a critical component of the HIV-1 replication process. A previous study proposed that a long-range interaction occurs between the SL4 stemloop and both the U5 linker region and the Primer Binding Site (PBS) within the 5′-UTR. Here, we used a novel Nuclear Magnetic Resonance (NMR) spectroscopy approach of examining this interaction within the context of the whole 5′-UTR. To investigate the proposed interaction between the PBS and SL4, we mutated the PBS in a TAR-SL3 fragment so that it lost the ability to base pair with SL4. The mutant and native TAR-SL3 fragments were then titrated into labeled SL4. A comparative analysis of the NMR Heteronuclear Multiple Quantum Coherence (HMQC) spectra revealed that the Cytosine H5 peak that indicates an interaction did not appear in the mutated sample. Thus, we conclude that there is no interaction between the PBS and SL4 in the 5′-UTR. Furthermore, our conclusion implies that SL4 most likely interacts with the U5 linker region. Understanding the long-range interaction in the context of the large RNA will be critical for unveiling the HIV-1 virus genome packaging mechanism.

This research was supported by the NIAID Grant #R37AI30917 and the Howard Hughes Medical Institute at UMBC.

Training a Neural Network to Detect Binding Sites Based on Bendability and Curvature Information

Albert C. Kung
Ivan Erill, Assistant Professor, Department of Biological Sciences

Transcriptional regulation is mediated by transcription factors (TF), which bind to their target sites in promoter regions, thereby activating or repressing gene expression. Unlike genes, binding sites cannot be accurately located based solely on sequence information, as this yields a large number of false positives. Here we wanted to explore whether additional contextual information could help in classification of binding sites. A neural network, a computational model that processes information to find patterns in data, was adapted to account for some additional factors, such as bendability or the overall curvature of the DNA sequence. Implementation of these features relied heavily on converting past research and software for bendability and curvature analysis into a more accessible package to integrate with an already-developed neural network. Preliminary research with CRP sites on *Escherichia coli* shows that neither curvature nor bendability of binding sites alone can provide an accurate determination of binding sites, which is to be expected due to loss of information in converting DNA sequences to non-unique numerical values. This suggests that sequence and other sources of information, like curvature, must be complementary. Current research now focuses on training neural nets simultaneously with both sequence and curvature information.

Linguistic Norm Enforcement in Online Communities: Chatspeak in Forum Communities

Valerie C. Lagrome
Thomas Field, Professor, Department of Modern Languages and Linguistics

Most of the research available on Internet communities and Internet vernaculars has not been written by people who have actually been members of online communities. Because of this, the information available on the usage, the attitudes, and the enforcement of Internet vernaculars has been superficial and insufficiently detailed to allow us to compare in any real sense the vernacular developed and used online with those that are used in physical communities. In order to better understand how Internet vernacular functions within Internet communities (of practice), I have conducted observations on the usage of and publicly expressed attitudes toward chatspeak, one of the names for the Internet vernacular used on Gaia Online. In order to account for the patterns of usage that I observed I conducted four experiments to test how members are treated on the site based on gender, “social class” and language variety. Additionally, I collected survey information from members to measure their attitudes toward the two language varieties. I found that despite females having more usage variation on average, males might experience more linguistic norm enforcement based on the findings from the experiments.

Pain-Related Anxiety Correlates with Sensory Aspects of Pain

Elizabeth L. Lamontagne*, Noel B. Quinn*
Lynanne M. McGuire, Assistant Research Professor, Department of Psychology

Emotions have been shown to impact the sensation of pain, however, it is unclear how aspects of pain-related anxiety alter the pain experience. This study investigated participants' initial pain-related anxiety, and their subsequent ratings of pain following the Cold Pressor Task (CPT). Participants (N = 31, 16 females) completed the Pain Anxiety Symptoms Scale (PASS) before immersing their hand in the cold water bath. Following the CPT, participants completed the Short-Form McGill Pain Questionnaire (SF-MPQ) to assess their experiences of affective and sensory-related pain. Results showed that the PASS total score, and SF-MPQ pain ratings shared a significant positive association ($r = .47$, $p < .05$), such that greater pain anxiety was related to more severe ratings of pain. Additional analyses demonstrated that three of the four PASS subscales (Fear, Escape/Avoidance, and Cognitive), positively correlated with total MPQ pain ratings; however the Physiological subscale did not. Furthermore, the Fear, Escape/Avoidance, and Cognitive subscales of the PASS positively correlated with the sensory component of SF-MPQ pain ratings but not the affective component. These results suggest that the emotional and cognitive components of pain-related anxiety may predict a sensory-related pain experience, and may provide a useful target for pain-related interventions.

This work was funded by NIH (R21AT003250-01A1).

Re-evaluating Malaria Prevention Techniques in Zambia

Esther L. Lei
Danika Rockett, Instructor, Department of English

Malaria is a preventable and treatable infectious disease, nonetheless causing approximately one million deaths every year. Malaria is especially devastating in resource-poor countries, causing 20 percent of the child deaths in one of the Africa's poorest countries: Zambia. I used four criteria to compare and contrast three methods for malaria prevention already being implemented in Zambia: insecticide-treated bed nets, dichlorodiphenyltrichloroethane (DDT) as an indoor residual spray, and artemisinin combination therapies (ACTs) as an anti-malarial treatment. The cost-effectiveness of each solution was considered in context of Zambia's slow economic growth and high poverty rate, being 72.9% in 2000. The operational life-span of a solution was measured by how often it needed to be replaced, while the safety of a solution was determined by the extent of the adverse affects it has one's health and environment over time. And since these solutions are being re-evaluating, their past successes and failures were considered to determine their overall effectiveness and need for improvement. The use of insecticide-treated bed nets was concluded to be the most comprehensive and effective solution since it best met the standards of all four criteria. My research also includes recommendations to accompany the distribution of the nets, thus ensuring their most efficient implementation in Zambia.

Measuring General Relational Structure Using the Block Modularity Clustering Objective

Michael E. Lombardi
Marie desJardins, Associate Professor, Department of Computer Science and Electrical Engineering
Adam Anthony, Ph.D. Candidate, Department of Computer Science and Electrical Engineering

Graphs are an essential way to represent data, and quickly knowing whether a large graph is highly structured or random can aid researchers. We use a new function, which we call block modularity, to cluster vertices in the graph so that each vertex in a cluster shares relational characteristics with the other vertices in that cluster. We use the results of this clustering process to analyze whether a graph is *highly structured*. If the number of edges in a clustering pair is either very low or very high, relative to the expected number of edges, block modularity increases the score. If a graph is random or weakly structured, the number of edges should be close to the expected number of edges for most cluster pairs, resulting in a low score. The results of our tests support this hypothesis. The speed of block modularity allows it to be used as a preprocessing step; therefore, before running an expensive algorithm on a graph, one can test whether the graph has a meaningful structure. This can save researchers time and effort by quickly identifying graphs that are unlikely to produce interesting results.

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Design for Algae-Based Biodiesel and Ethanol Fuel Plant

Rob C. Low, Fellipe F. Balieiro, Timothy D. Courtney, Thomas C. Hsu, Khurram S. Mahmood
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Concerns about global warming and rising oil demand have led to a renewed interest in green, sustainable energy. Corn ethanol, while a step in the right direction, has caused a series of its own problems such as food shortages and fertilizer runoff. Fuels based on algae, so called third generation biofuels, do not require arable land or potable water and require significantly less overall land area than their terrestrial counterparts; therefore, many of the problems associated earlier generations of biofuels are mitigated. A preliminary design is presented here as a study on the feasibility of an industrial-scale, third generation biofuels plant. Algae is grown in open ponds supplemented with carbon dioxide waste from a nearby power plant. Oils are extracted from the algae and converted to biodiesel via methanolysis while sugars and starch are fermented to ethanol. Unused waste products include glycerol and leftover algae biomass. The former is being researched as a source of hydrogen gas and the latter may find use as feed for livestock, cell culture, or second generation biofuels. The plant design was found to return its capital cost in approximately five years making it an imminently viable investment.

It's Written All Over Your Face: Perceptions of Genetic Illnesses

Tahira C. Mahdi
Shawn M. Bediako, Assistant Professor, Department of Psychology

Research has shown that people often make judgments about the health status of others using little more than simple visual cues. In the current study, we examined the perceived likelihood that eight digital faces (created with FaceGen Modeller 3.3 software) would be judged as having one of two genetic illnesses: cystic fibrosis or sickle cell anemia. A 4 x 2 factorial design was used such that the faces varied on two dimensions: ethnicity (Black, White, East Indian, or South Asian) and physiognomic features (high versus low Afrocentric features). Participants were randomly assigned to either the cystic fibrosis or sickle cell anemia condition and exposed to cursory information about the respective illness. They were then shown the eight faces in random order and asked to indicate how likely they thought it was that each facial image represented a person with the genetic illness. Statistical analyses examined main effects and interactions among ethnicity and physiognomic features. It is expected that these data will allow us to evaluate whether perceivers use ethnicity or other facial cues when making judgments about genetic illnesses, especially those with high incidence in particular ethnic groups.

'Under the Colour of Religion': The Formation of Group Identity in Early Modern Ireland

Maureen C. Maselko
Amy M. Froide, Associate Professor, Department of History

The enduring strife in Ireland between Catholics and Protestants that has continued to the present day first assumed its familiar contours in the early seventeenth century. That period was a time of fluidity and uncertainty in the Irish sense of identity as groups that had not previously worked together congealed into unchangeable composite organisms that would remain consistent over several centuries. Despite the protests of wealthy Old English families, group identity in Ireland developed in large part along religious instead of solely ethnic lines. This research, conducted for my honors thesis, addresses the causes behind this confessional alignment by analyzing travel memoirs, pamphlets, and laws in addition to relevant secondary research. For the Old English, group identification in terms of religion was imposed from outside, particularly by the English government, and only gradually embraced on the ground. That the religious distinction previously existed cannot be argued, but the adopting of religion as the primary and sometimes exclusive component of identity resulted from governmental policies, and was only secondarily influenced by the religious antagonism and propaganda available in early modern Ireland. This research into the formation of adversarial religious identity illuminates contentious issues of religious sectarianism in the world today.

A Mathematical Model of the HPV Infection Mechanism

Paula McCusker
Mariajosé Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

Human Papillomavirus has infected an estimated 70-80% of the world's population. Cervical cancer, one possible result of unchecked HPV infection, has been shown to be one of the leading causes of death of women in developing countries. Variables governing the dynamics of the HPV infection mechanism are the subject of this study. In this work, a mathematical model will be generated based on similar viral models, incorporating parameters whose impact on infection rate have been shown in the literature. The model will focus primarily on genetic and cellular processes within the invaded cell, especially transcription of the HPV genome into polycistronic mRNAs, which appears to be a likely candidate for the rate-limiting step. The model will be developed using differential equations to describe each process in the infection mechanism. The work is expected to connect data about the effects of certain parameters on each step of the infection process in a way that will reveal new understandings about factors that most impact the overall progression of an HPV infection into a manifestation such as cervical cancer.

The Relationship between the Structure of the FIV Matrix Protein and its Ability to Target the Plasma Membrane

Jessica A. McGrath, *Cassiah Smith, Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

Feline Immunodeficiency virus (FIV) is a retrovirus that is distantly related to Human Immunodeficiency Virus (HIV) and Simian Immunodeficiency Virus (SIV). Gag is the major structural polyprotein that facilitates the assembly and budding of retroviruses, such as FIV. The interaction between the N-terminal Gag Matrix (MA) domain and the plasma membrane is a key process in viral maturation. The Gag MA must be co-translationally myristoylated to achieve this membrane interaction enabling the virus to mature and become infectious. We have isolated myristoylated and unmyristoylated FIV Matrix protein (FIV MA) to better understand how the myristoyl group targets the Gag protein to the membrane. FIV MA was isolated by amplifying and cloning it into a co-expression vector containing the yeast N-myristoyl transferase gene. After large scale protein growth and expression, binding assays were conducted. Our results show an interaction between cellular PI(4,5)P2, a membrane component, and FIV MA. This suggests that the PI(4,5)P2 MA interaction is important in the process of FIV viral assembly at the plasma membrane (PM). The novel three dimensional structure of FIV MA is being elucidated using high resolution nuclear magnetic resonance (NMR). From the structure we will be able to better understand the role of FIV MA in Gag assembly and how it targets the plasma membrane.

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The Effect of Toll-Like Receptors on Dendritic Cell Activity and T-Cell Activation

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This study investigated the activation properties of differentially activated dendritic cells, and how they affected the priming of naïve T-lymphocytes. Antigen presenting cells (APCs), most notably dendritic cells (DC), take up, process and display antigens for recognition by lymphocytes that generate adaptive immunity (T-cells). It has been shown that antigens are recognized by Toll-like receptors (TLRs) on DCs, and these intermediary cells secrete cytokines that influence the variety and magnitude of lymphocytes that become activated. It is not yet known how different TLR engagement on a DC affects its ability to activate naïve T-cells. Thus far, we have purified a DC population, which was cultured with specific TLR agonists to induce differential activation. The cultured DCs were harvested, fluorescently labeled with different antibodies and analyzed using flow cytometry to observe the surface expression of activation markers. Next, we used the activated DCs to activate T-cells and used an ELISPOT assay to analyze the primed T-cells based on their production of cytokines and chemokines associated with explicit activation pathways, which revealed a correlation between TLR engagement of DC and T-cell fate. This project has implication in exploring newer vaccine strategies that promote more specific and efficient immune responses.

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Volunteerism in the Aging Population

April M. Melton, Monica C. Talcott
Laura Ting, Assistant Professor, Department of Social Work

The purpose of this study was to increase our understanding of volunteerism among the aging population. Research has shown that volunteering is important and beneficial to a person's mental well being and physical health. However many retirees do not participate in volunteer activities. The goal and research question was to explore the motivation behind volunteering or not volunteering in the over-65 age group, as well as benefits and disincentives associated with volunteering. A qualitative study with a grounded study approach was conducted with 40 men and women over-65 from diverse racial, ethnic, economic, and educational backgrounds to explore any differences or similarities in their motivations. Data were collected, transcribed, and analyzed using line-by-line coding. Themes that emerged indicated personal barriers (ill health, family responsibilities, and disinterest) and structural barriers (transportation, finances, and agency organization) to volunteering. Reasons to volunteer included maintaining social connections and mental health, having choices, feeling obligated, and being personally rewarded. Clinical implications for practitioners working with the elderly will be discussed. Implications for future research and program planning including new policies and efforts to recruit and retain volunteers will be presented.

This research was funded by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Novel Site Directed Affinity Reagent for Cross-Linking Human Hemoglobin: A Tetra-Aldehyde Cross-Linking Reagent

Jessica Michaels
Ramachandra Hosmane, Professor, Department of Chemistry and Biochemistry

The advantages of a blood substitute continue to grow as disease and viruses proliferate with mutations and the need for blood donations rise, especially in other countries where risks for receiving transfused blood are much greater than in the U.S. Currently, two types of blood substitutes exist, volume expanders and oxygen therapeutics. The project aims to develop an oxygen therapeutic because it uses real hemoglobin to deliver oxygen. In the project scheme we set forth to create a cross-linking molecule through a series of organic synthetic reactions forming a ten-carbon backbone compound affixed with four aldehyde moieties. This allows two or four cell-free hemoglobin molecules to be attached, facilitating efficient oxygen delivery without hemoglobin diffusion into tissues. The first reaction combines 1,10-diiododecane with tris(cyanoethyl)-phosphate then we subject the product to organic reactions forming a tetra-diol followed by a tetra-aldehyde. The aldehyde group provides a connection to the hemoglobin molecule. Preliminary work has attempted the tetra-diol product and the current results suggest that the molecules are possible. The next step requires the development of the tetra-aldehyde and then reaction with amines.

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Autonomy Development, Support, and Future Orientation in Adolescent Mothers

***Scott Murdock**, Kelly Sheperd, Charissa S. L. Cheah*
Charissa S. L. Cheah, Associate Professor, Department of Psychology

Adolescent mothers are at risk for low educational and occupational attainment. Thus, it is important to understand how support for their autonomy may influence the adolescent's thoughts regarding their future career aspirations or prospects. In the present study, we aimed to assess the relation between level of autonomy and future orientation among 106 adolescent mothers residing in a high risk urban context. We also examined if this relation was moderated by the adolescents' perceived received support for autonomy development. Level of autonomy was positively related to future orientation at average levels of support. However, a negative quadratic relation between autonomy and future orientation for mothers with high support, and a positive quadratic effect for mothers with low support were found. Thus, adolescent mothers with high levels of support may have less positive ideas about their future careers because they are more realistic about future possibilities. Conversely, mothers with low support may not be as aware of the challenges they may face regarding their future careers. These results provide insight into what level of support is most beneficial in encouraging autonomous development in adolescent mothers.

This work was funded by the Culture, Child and Adolescent Development Laboratory at UMBC.

Ellipsometric Measurements of the Electro-Optic Coefficient

Ian L. Nolen
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An ellipsometer was designed and built to make measurements of the electro-optic effect in poled polymer films. Characterization of such polymer films is an important step in the creation of terahertz sensors and emitters. Polymer film technology is an alternative to the expensive current practice which utilizes inorganic electro-optic crystals. Electro-optic devices are used in a variety of fields such as spectroscopy, medicine, sensors, and telecommunications. Methods of evaluating the electro-optic coefficient in thin polymers films are fraught with complications, however. Thin poled polymer films of organic electro-optic materials are normally characterized using a reflection method. However, due to their multi-layered structure, reflections at each interface in the layered stack of dielectrics lead to interference effects that must be precisely accounted for when determining the film's electro-optic coefficient. An ellipsometer was constructed that allowed the measurements of the reflected intensity from the multi-layered stack at several angles of reflection. Nonlinear curve fitting and singular value decomposition methods were employed to extract parameters from the multiple angle reflection data set that, in turn, were used to calculate the electro-optic coefficient of the device under test. A manual was developed to educate new researchers in the operation of the ellipsometer.

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

GTPases Mathematical Framework Dynamics

Oluwaseun D. Olayiwola
Mariajose Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

Rho GTPases act as molecular switches that regulate various extracellular signals that bind to specific target cells in biological systems. Rho proteins including Rho, Rac, and Cdc42 are targets of bacterial virulence factors that alter the temporal and spatial regulation of the proteins. We have constructed mathematical models that include sequential activity, interactions, and cascades of cross talk between the proteins network. We have tested the models to express the extent of interactions of the proteins family. Updated models include the activation of G proteins due to the stimulation by ligand binding to the cell receptors, the pathogens' invasive exoplasmic concentration, early stage of pathogens' endocytosis, rate of survival after the immune system response, and the expression of phagocytotic cells due to the activation by G-proteins and pathogens. We hypothesized that the rate of pathogenic survival due to the hijacking mechanism and modulating effects of virulence factors. We are testing our models based on our hypothesis and as an effort to unravel the features of Rho GTPases in relation to the altered enzymes by the virulence factors.

The Utilization of TAT Fusion Protein for Tolerance Induction in the EAE Model

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Experimental autoimmune encephalomyelitis (EAE) serves as a mouse model for multiple sclerosis; this study proposes one method of treating EAE. EAE presents after injection of myelin oligodendrocyte glycoprotein (MOG) into mice. Immune tolerance to MOG can be induced by retrovirally transducing activated B cells to express MOG coupled to an immunoglobulin heavy chain (MOG-IgG) on their cell surface, followed by injection of the MOG-presenting B cells into mice. As an alternative to retroviral transduction, we wished to test TAT fusion proteins for expression into potentially "tolerogenic" B cells. TAT is a nine amino acid residue of trans-activator of transcription (TAT), and is known to transduce plasma membranes. TAT-MOG-IgG was used to deliver MOG-IgG into activated B cells. TAT-fusion proteins could be observed to be expressed by fluorescence microscopy. Blood serum taken from mice immunized for EAE contained antibodies against TAT-MOG-IgG, indicating that the correct immunogenic epitopes were targeted. Transduced B cells were then transferred into EAE-prone mice. However, in our first experiment, disease severity in the TAT-MOG-IgG group was not abated. Therefore, modifications to the transduction procedure will be made in order to increase the likelihood of tolerance induction. This TAT-peptide delivery system may be extended to other autoimmune diseases.

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Creating a Mathematical Model of *Chlamydomonas reinhardtii* Metabolism

Michael S. Pacella*, Goncalo Maia, Jonathan Bollinger, Michael German*
Mariajose Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

Our research focused on the development and implementation of a mathematical model of metabolism within a specific species of algae (*Chlamydomonas Reinhardtii*) to predict levels of lipid production within algae based on various constraints (nutrient supply, metabolic enzyme concentrations, etc.) Our model can be used to determine a set of optimized conditions for maximizing lipid production within algae, potentially making biodiesel synthesis from algal lipids a more economically feasible process. The model was developed by using a complete list of metabolic reaction pathways along with kinetic information on pathway enzymes (taken from genetic and enzyme databases) to develop a system of differential equations describing the mass flux balance for a single cell. Substantial programming was necessary to provide methods of handling the enormous quantities of stoichiometric and kinetic data necessary to construct our flux balance equations. Testing our model's predictions against empirical data from published data has provided verification of its accuracy.

Industrial Production of Aspartame: Economic Feasibility Study on Entering the Market

Ryan Park, Ryan Connor, Benjamin Link, Joel Gwinn
Mariajose Castellanos, Assistant Professor, Department of Chemical Engineering

Despite the growing popularity of other low-caloric sweeteners, aspartame retains a large part of the market, with over 44,000 metric tons being produced annually. An investigation was made into the process of producing aspartame, to gauge the feasibility of entering and capturing three percent of the aspartame market. Aspartame is the methylated ester of two peptides, comprised of phenylalanine and aspartic acid. Phenylalanine is synthesized through bacterial fermentation, while aspartic acid is enzymatically converted from its precursor, fumarate. In current industrial production, fumarate is synthesized petrochemically, but with rising oil prices synthesis through bacterial fermentation becomes feasible. Due to possible side reactions, aspartic acid is protected with a formyl group before being reacted with phenylalanine. This study will model the entire industrial process of aspartame production based on existing data in patents and papers. In addition, sensitivity analyses based on economic parameters are performed to determine which factors will impact production significantly. Finally, a comprehensive review of economic considerations including labor, capital and operating costs will constitute the recommendations at the conclusion of this study.

PKCI/HINT1 Involvement in the Learning and Behavior of the Morris Water Maze Test Using Proximal Cues

Nicole A. Parker, *Elisabeth Barbier, Jia Bei Wang*
Jia Bei Wang, Professor, School of Pharmacy UMB

Protein Kinase-C Interacting Protein/Histidine Triad Nucleotide Binding Protein 1 (PKCI/HINT1) is broadly expressed in various areas of the brain. Its function in the Central Nervous System remains unknown but PKCI/HINT 1 seems to be closely related with mental disease. The expression of its gene is down regulated in the cerebral cortex of schizophrenic patients and mice lacking the PKCI/HINT1 expression present positive symptoms of animal models of schizophrenia. Mental disorders, like schizophrenia, are often associated with cognitive impairment such as memory loss. With this, we hypothesize that PKCI/HINT1 is involved in cognition, specifically memory. In the study Knock Out PKCI/HINT1 -/- (KO) mice and their wild type (WT) littermates were used in a proximal landmark Morris water maze experiment. In that test used to assess cortical function, the mice depended on three cues located directly in the pool to find the hidden platform. We compared the learning capacity and retention and assessed behaviors associated with anxiety and depression traits as parameters of acquisition between KO and WT. The KO mice learned significantly faster over the training days compared to the WT by displaying shorter latencies to the platform. Our results demonstrate that PKCI/HINT1 might play a part with cognition involving the cerebral cortex.

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A Model for Iron K Absorption in the Low-Mass X-ray Binary GX 13+1

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The binary star system GX 13+1 is a low-mass X-ray binary (LMXB), which has a neutron star as its compact object. Observations from the Rossi Timing Explorer (RXTE) satellite's All-Sky Monitor and K-band photometry previously confirmed a period of 24.065 ± 0.018 days (Corbet et al., 2009). We present the results from modeling the energy spectra (1.5-25 keV) of GX 13+1 using observations obtained by the RXTE Proportional Counter Array (PCA) during 05/17/98-10/10/98. We used the FTOOLS software package to reduce the data and XSPEC to model the iron K absorption line and edge in GX 13+1 across its periodic modulation. The fitted model consisted of (i) photoelectric absorption, (ii) thermal Comptonization, (iii) Gaussian line profile, and (iv) absorption edge components. Using these results, we constructed light curves in the 1.5-5 keV, 5-12 keV, and 12-25 keV energy ranges, as well as folded light curves and hardness ratios in the 1.5-5 keV and 5-12 keV energy bands. We also analyzed the change in the model's parameters across its periodicity. Our results will be used to understand the periodic modulation of GX 13+1 observed in the X-ray light curves and the phase shift in the 1.5-5 keV and 5-12 keV energies (Corbet, 2003).

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Synthesis of Potential Inhibitors of Thymidylate Synthase Based on Quinazoline Structural Skeleton

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Cancer is a group of diseases that causes about 13 percent of all deaths in the world, estimated at 7.6 million in 2007 alone. My research aims to create a set of drugs to inhibit an enzyme in the body fundamental to the out-of-control growth that cancer cells exhibit. This enzyme, Thymidylate Synthase (TS), catalyzes the conversion of Uracil Monophosphate to Thymidine Monophosphate using N^5,N^{10}-methylenetetrahydrofolate (THF) as a methyl donor. Cancerous cells need Thymidine to replicate, and therefore proliferate quickly in a TS rich environment. The compounds we propose are potential competitive inhibitor analogs of THF. Already, the necessary intermediates to the final six different THF analogs have been synthesized by condensation of commercially available carboxaldehydes and 1-ethoxy-3-methyl malonate to give UMR-150 (a-f) in 51 percent yield. Subsequent dehydration and decarboxylation of UMR-150 (a-f) with sodium ethoxide in ethanol formed the mono-ester product NP-001 in 63 percent yield. Both compounds have been verified through the use of ^{1}H and ^{13}C nuclear magnetic resonance spectroscopy. A variety of approaches to ring closure of NP-001 have been unsuccessful, but we suspect that benzyl protection could resolve the issue. Once the final analogues are synthesized, we plan to carry out enzyme assays to determine their inhibitory properties.

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The Effect of Corticosterone and trkB Receptor Downregulation on Dendritic Spine Density

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What effect does stress have on our ability to process information? Chronic stress elevates the stress hormone corticosterone and leads to a number of anatomical changes in hippocampal neurons that could adversely affect cognition, including dendritic spine loss. How corticosterone affects neuronal structure remains unknown. Hippocampal neurons also express high levels of the neurotrophin receptor, trkB, which regulates their morphology. We hypothesized that stress hormones reduce the density of dendritic spines in hippocampal neurons by downregulating the trkB receptor. To test this hypothesis, organotypic hippocampal slice cultures were prepared from mutant mice whose neurons express green fluorescent protein, which we use to visualize spines, and pharmacologically blockable trkB receptors. Cultures were treated with corticosterone or an inhibitor of the mutant trkB receptor, 1NMPP1. Average spine densities were decreased by 22.3% by corticosterone, compared to untreated controls. This decrease was comparable to the 14.1% decrease produced by inactivating trkB receptors. As an extension of the hypothesis, we predicted that addition of activator of trkB receptors, neurotrophin 4/5, would alleviate the effects of corticosterone. Preliminary data suggest that neurotrophin 4/5 attenuates the effect of corticosterone. We conclude that corticosterone causes synapse loss by decreasing trkB – neurotrophin signaling, and thereby impairs cognitive function.

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The Effects of Age Differences in Preschool Children on Help-Seeking Behaviors During Easy and Difficult Puzzle Tasks

Alexandra M. Psihogios, *Emily F. Law*
Lynnda M. Dahlquist, Professor, Department of Psychology

Past studies have found that helplessness in middle to late grade school age children is associated with a perception of ability as a fixed trait. Since this conception of ability does not typically develop until nine years of age, it has been argued that younger children are invulnerable to the feeling of helplessness (Dweck and Elliot, 1983). However, more recent research by Dweck and her colleagues (1991, 1992, 1993, and 1995) has found that younger and older demonstrate helpless behaviors. These studies propose that young children attribute failure to a global self-concept rather than attributing failure to a specific ability. Covington (1984) suggests that younger children protect their self-concept by reducing their effort and procrastinating. Forty-eight families participated in a university-based research study evaluating the interactions between parents and preschool age children while completing easy and difficult puzzles. University undergraduate and graduate students coded the children's help-seeking behaviors during the puzzles. I hypothesize that younger children (i.e., 3-4 year olds) will ask for more help than older children (i.e., 5-6 year olds) as a way to protect their self-concept. Differences in help-seeking behaviors in children can provide insight to how age can affect children's ability to cope with poor performance.

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The Caste System and its Prevalence in Contemporary Indian Society

Sharanya Ravichandran
Devin Hagerty, Chair, Department of Political Science

The research on the Indian caste system has simply illuminated the facts of the system and the reforms put in place by the Indian government to remedy this. My research addressed the prevalence of the caste system in contemporary Indian society, both cities and rural villages. By examining the extent to which this system is still present in one of the world's most rapidly modernizing nations, we can see how much the system impedes the growth of this nation. We can see how much the lives of the citizens of India would improve if this system was not present in any shape or form in contemporary Indian society. I will examine the origins and the practices of the caste system, showing that even though the system has a distinctly religious origin, its practices over the decades had nothing to do with religion. I will also examine how, as the country has rapidly progressed, the rural, cruel practices of the system still exist in both modern cities and traditional villages to this day.

Parallel Performance Studies for a Numerical Simulator of Atomic Layer Deposition

Michael J. Reid
Matthias K. Gobbert, Associate Professor, Department of Mathematics and Statistics

During the manufacture of integrated circuits, a process called atomic layer deposition (ALD) is used to deposit a uniform seed layer of solid material on the surface of a silicon wafer. ALD can be modeled on the molecular level by a system of linear Boltzmann equations as transport model, coupled with a general, non-linear surface reaction model.
To affect a numerical solution, each linear Boltzmann equation is approximated by discretizing the velocity space, giving a system of transient hyperbolic conservation laws that only involve the position vector and time as independent variables. The latter system can be posed in standard form, allowing for the solution by a program, DG, which implements the discontinuous Galerkin method. Because of the large number of equations and variables involved, solving this type of problem, even on a modern desktop computer, would take an exorbitant amount of time, on the order of hundreds of hours. To reduce the amount of computation time needed, we utilize the power of parallel computing, which involves distributing the work done from one processor to multiple processors which communicate with one another during the solution process. The results of this research will teach us how to run this code most efficiently on UMBC's distributed-memory cluster, hpc.

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

Ethical Issues Unique to Facial Transplantation

Mary A. Rhee
Andrea Kalfoglou, Assistant Professor, Department of Sociology/Anthropology

This study examined the ethical issues of facial transplantations through the application of the *Principles of Biomedical Ethics*. The principle of respect for persons connotes that physicians must provide patients with information, but allow patients to make their own decisions regarding care. The principle of beneficence argues that physicians have a moral obligation to act in the best interest of their patients. In the case of facial transplantation, these two principles seem to conflict. Though facial transplantation may restore functionality to a patient's face and improve appearance, it comes at the cost of shortened life expectancy because of the use of immune-suppressing drugs to prevent rejection of the transplant. What is better for the patient? Is it the quantity or quality of life? Like other experimental treatments, it also creates a difficult dilemma of who is in the best position to make a decision that could have such profound consequences? If the transplant fails, the patient could be much worse off than he or she was prior to the surgery. On the other hand, the patient may believe that facial reconstruction is the only way he or she will be able to have a reasonable quality of life.

“Letters from Jane: A Tribute to Jane Austen”

Mary H. Rzasa
Douglas Hamby, Associate Professor, Department of Dance

The life and novels of author Jane Austen have found frequent portrayal through film adaptations and television programs, but have rarely been depicted through a predominantly dance medium. In response to this, I sought to briefly explore the personal history of Austen through dance on film, focusing primarily on the deep relationship and correspondence existing between Austen and her elder sister, Cassandra. Relying heavily on the Austen family’s surviving letters and Austen’s literary works, I also sought to portray Jane Austen’s life without the biographical falsifications or embellishments noticeable in recent film productions concerning her. A visit to Hampshire, England enabled me to collaborate on the video project with Elena Consoli, a UMBC Alumna and graduate of Film Studies from the University of Southampton. Over the course of a week, we developed sequences of choreography and filmed on location at several now-historical sites throughout Hampshire which were familiar to Austen during her lifetime. Using iMovie and Final Cut Pro, we were able to edit over three hours of raw footage taken in England into a twenty-minute video. A vocal narrative of excerpts from the Austens’ letters and a series of musical selections were likewise incorporated. *Letters from Jane* in its completed form seeks to pay homage to Jane Austen and provide further insight into her life and humanity.

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

“Enraptured”

Mary H. Rzasa
Douglas Hamby, Associate Professor, Department of Dance

The belief in an afterlife has been repeatedly disputed and examined in an artistic context, but has not always been portrayed from an optimistic point of view. “Enraptured” serves as an investigation and depiction of this belief from a more hopeful perspective. Through contemporary dance, I sought to explore the spiritual transition from earthly existence to eternal life as both a communal and individual experience. In generating choreography for *Enraptured*, I initially drew from my personal responses to musical settings and their potential to convey a spiritual situation. I also took the abilities of the dancers into careful consideration, and strove to implement styles and patterns of movement that would best demonstrate the strengths –technical and qualitative– of each dancer. Using various spatial patterns, staging formations, and contrasts in music and movement quality, I arranged the choreographic ideas into a loose narrative structure. From a narrative standpoint, I attempted to trace the initial uncertainty and disorientation of human souls removed from their earthly habitations, followed by their interaction with other souls, their ecstatic pursuit of spiritual advancement, and their eventual passage into eternity. *Enraptured* offers an encouraging perspective on the afterlife, and ideally can be viewed and appreciated for its aesthetic attributes as well as its spiritual meaning.

Ending the Cycle of Violence: The Role of a Truth Commission

H. Saeed
Jeffrey Davis, Associate Professor, Department of Political Science
Simon Stacey, Associate Director, The Honors College

This study explored whether a truth commission (TC) can play a role as a feasible mechanism of transitional justice in Afghanistan's overall transition to democracy. A comparative method was adopted to first asses the success of TC in South Africa and El Salvador based on five criteria: acknowledgment of truth, accountability, rule of law, reparation, and national reconciliation. For the Afghanistan section, forty people were interviewed in Kabul. They were representatives from the Afghan civil society, family members of victims, international officials, and a representative from the Afghan government. Interview themes, identified based on the five criteria, suggest that, due to security issues, a lack of political will and other challenges, the establishment of an Afghan TC will not serve as a practical mechanism of transitional justice in the current situation. Ethnic composition of the Afghan society was identified as a major obstacle in efforts towards this issue. The analysis in the study lead to six recommendations to policy makers, civil society members, and the international community.

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

Exploiting *acd6-1* in Dissection of Defense Signaling Networks in Arabidopsis

Sasan Salimian**,** *Timley Swift*
Hua Lu, Assistant Professor, Department of Biological Sciences

Knowledge of Arabidopsis defense signaling networks is critical to the understanding the mechanisms of disease resistance. However, these networks have been a challenge to elucidate. The Arabidopsis mutant *accelerated cell death 6-1 (acd6-1),* a tiny plant with a size phenotype inversely related to defense levels, provides a powerful tool that allows us to genetically dissect the interactions among different defense components. We have crossed seven known defense mutants into *acd6-1* background and obtained corresponding double mutants. Consistent with their roles in plant defense, these mutants suppressed *acd6-1*-conferred constitutive defense and also its dwarfism. To study the interactions among these defense components, we made triple mutants consisting of every combination of the seven defense genes in *acd6-1* background, totaling twenty-eight triple mutants. Based on whether a triple mutant grows larger or similar in size to its two respective double mutants, we can place the two corresponding defense genes in the same or independent pathways. Currently, we have already isolated homozygous triple mutants for all twenty-eight combinations. These triple mutants will be further confirmed for their genotype and scored for their size and defense-related phenotypes to determine the pair-wise genetic interactions of the seven genes. Together, this systematic genetic analysis will provide novel insights into Arabidopsis defense networks with a fine resolution.

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IL- 21 is Increased in $CD4^+$ T Cells and Serum of Patients with SLE

Christelle K. Samen, *Violeta Rus*
Violeta Rus, Assistant Professor of Medicine, Division of Rheumatology and Clinical Immunology, University of Maryland Baltimore, School of Medicine

Systemic lupus erythematosus (SLE) is a disease characterized by immune abnormalities leading to the production of autoantibodies and organ damage. IL-21 is a recently described cytokine that plays an important role in $CD4^+$ T and B cell proliferation, IgG1 antibody production and the development of autoimmunity. Studies in animal models of lupus have reported increased production of IL-21 in two models of murine lupus and attenuation of autoimmune features in mice treated with IL-21 blocking agents. Using the chronic graft versus host disease model of lupus we found decreased IgG1 anti-DNA antibody production that parallels decreased levels of IL-21. To assess the role of IL-21 in human lupus, we determined IL-21 levels in serum samples from 28 lupus patients, eight disease and 16 healthy controls by ELISA. Mean level of IL-21 was significantly higher in SLE patients with active disease compared to those with inactive disease and normal controls. In addition, IL-21 mRNA expression was seven fold higher in lupus $CD4^+$ T cells. In conclusion, elevated levels of IL-21 in lupus patients may promote auto-reactive $CD4^+$ T cells proliferation as well as B cell proliferation and differentiation, thus contributing to the generation of T cell dependent autoreactive B cell responses.

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

Development of Intuitive Fluorescent Biosensor for Glucose

Melissa Santos, *Dr. Leah Tolosa, Karuna Sri, Hung Lam, Archana Sriram*
Dr. Leah Tolosa, Research Assistant Professor, Department of Chemical Engineering

Diabetes is a chronic disease characterized by the body's inability to produce insulin, resulting in uninhibited levels of glucose in the blood. A more intuitive fluorescent biosensor for glucose measurement is currently being developed. The focus is on GBP, or Glucose Binding Protein, which responds and binds to glucose. The *E. coli* strains M182C and M152 and their characteristics and their response to glucose when fluorescently labeled has been extensively studied in the past. This experiment concentrated on the M182C and the His-tagged protein extracted from the His-tagged strain of M182C. The protein extracted from the His-tagged strain of M182C of *E. Coli* was labeled with various fluorescent dyes Badan, DSEMP, and Acrylodan. The labeled proteins were then tested with to determine the response to glucose. The fact that His-tagged proteins were used helped to create a viable protein, however the M182C His-tagged proteins did not show any response to glucose after being labeled with the fluorescent dyes. Testing with the M152 strain is being pursued currently.

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

Getting a *Handel* on Bells: Designing a Summer Music Camp that 'Rings True' with Music Education Theories

Barbara J. Scheffter
Airi Yoshioka, Assistant Professor, Department of Music; Linda Dusman, Professor, Department of Music

As our public schools struggle to meet complex educational needs with shrinking budgets, local churches can help by offering supplemental instruction, particularly in the area of music. This summer Mount Airy Presbyterian Church, where I serve as choir director, will offer a "Singing and Ringing" camp designed to teach music fundamentals to children in an engaging way, using melody bells, choir chimes, handbells, and singing. How to best design the camp's curriculum has been the focus of my study. Through attendance at the Early Childhood Music and Movement Association Convention in July, 2008, I began to explore the methodologies and music learning theories of Zoltán Kodály, Carl Orff, and Edwin E. Gordon. Also, while attending the American Guild of English Handbell Ringers National Convention last August, I learned much about proper handbell ringing technique. The curriculum I have developed is shaped by these learning experiences and the subsequent research they inspired. The goal of the "Singing and Ringing" Camp is to help students become 'musically literate' – able to hear and understand music internally, able to sing and play bells or chimes, and able to enjoy all that music can bring them for the rest of their lives.

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

Knowledge-Supported Evolutionary Computation in Financial Investing

Matthew A. Schultz
Roy Rada, Professor, Department of Information Systems

Where to best invest money in order to maximize returns is an open problem. Our hypothesis is that financial knowledge can be incorporated into an investing system which improves itself through evolutionary computation. We have created an Intelligent Investing System in Microsoft Excel's Visual Basic for Applications which uses financial data from Standard and Poor's Compustat database. This system utilizes a neural network and genetic algorithm in an attempt to map this financial data onto a profitable portfolio. As the neural network and genetic algorithm attempts to learn from the processing of our financial statement data we desire to see gradual improvement. The goal is for the system to make financial decisions for the future and to determine its fitness by how much money it made or lost. To test the system we let a past date represent the future. This presentation will show the impact of stock analysis when industry categories are considered versus when they are not.

This work was supported by the UMBC Undergraduate Research Assistantship Support (URAS) program.

Using Phylogenetic Differences between Species to Estimate Geological Timing

Alexandria C. Scott, *Tamra Mendelson*
Tamra Mendelson, Assistant Professor, Department of Biological Sciences

Through time, the rate at which species evolve has proven to be a varying factor, contingent upon variables affecting mutation rates in a specific species. For many species, these mutation rates are known, allowing researchers to use genetic differences as estimates for the amount of time two species have been diverging. Such estimates can then be applied to questions of geological timing. We are focusing on six different populations of Western Cutthroat Trout from the Clearwater River of western Washington State. Two of these populations live upstream in distinct waterfalls thought to have arisen with the emergence of the Clearwater Basin. Our goal is to use genetic distances between these two populations to estimate divergence times, and to use these divergence times to corroborate geological estimates of the timing of the emergence of the basin. To accomplish this, we have amplified cytochrome B and the control region (mitochondrial DNA) which have been used in several phylogenetic studies making them considerably dependable for estimates of evolutionary rates. We also used nuclear markers (AFLPs) to estimate genetic divergence. Our results suggest the drainage is too young for detectable variation in cytochrome B; however, AFLPs demonstrate the two waterfall populations are distantly related.
*This work was funded, in part, by the NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and the Howard Hughes Medical Institute.*

"Path to Perception"

Raychyl A.M. Segovia
Cathy Cook, Associate Professor, Department of Visual Arts

Path to Perception is an experimental film that explores psychological responses to unexpected tragic events. The film tells the story of a character who is forced to confront and deal with the hallucinations that torment him as a result of the startling death of his brother. The film evolved from my personal experience of loss. I tried to use the film to express my journey from feelings of pain and helplessness to an eventual acceptance of death and its lasting impacts on those who survive. I believe this is a universal story that all people can understand at some level. The drama of the film revolves around how the main character attempts to protect his mind and heart in the face of his loss. During the course of the film, the character is seen experiencing positive memories of his brother while at other times he is confused by the sudden absence of his brother and overwhelmed by crippling emotions associated with his brother's death. To create a credible and involving narrative depiction of this difficult but common human situation was the main challenge of my film. I worked hard to find audiovisual ways to represent interior human thoughts and emotions.

“Constructed Landscapes”

Alexandra K. Seley
Lynn Cazabon, Associate Professor, Department of Visual Arts

For my exhibit, I have explored constructed landscapes shot inside of a studio environment. A previous project involved taking a famous image, Ansel Adams' *Bridalveil Falls*, and constructing the waterfall and surrounding landscape out of chocolate, coffee grounds, icing, and flour. I was interested in depicting a very convincing and natural looking landscape out of materials that start out natural but during the course of their time, become far from natural through being altered and manufactured into something other than their original state. For this project, this idea is continued by selecting various landscape paintings from different styles such as the Hudson River School to Expressionism, constructing them out of nontraditional sculpting materials and photographing them with a large format camera in a manner that will trick the eye. The prints will be at least eleven by fourteen inches; approximately ten prints will be made for the final product. The goal behind the project is to encourage the viewer to consider different subjects such as the environment, the lack of an ideal landscape at this time, and the altered state of “natural” materials.

Probing the Counterion to the Protonated Schiff Base in Melanopsin

Tanu Sharma, *Marquis T. Walker*
Phyllis R. Robinson, Professor, Department of Biological Sciences

Melanopsin is a member of the opsin family of G-protein coupled receptors (GPCR). In mammals, melanopsin is expressed in intrinsically photosensitive retinal ganglion cells (ipRGC’s). Like other visual opsins, melanopsin is made up of seven alpha transmembrane helices and can bind a retinaldehyde chromophore through a protonated Schiff base. Although a vertebrate opsin, melanopsin shares a greater sequence homology with invertebrate rhabdomeric opsins than with any other vertebrate opsins. Therefore, glutamic acid at position 213 (E213) in melanopsin is the putative counterion. In order to determine whether or not E213 is the counterion, a mutation was made in the wild type mouse melanopsin gene. The glutamic acid at position 213 was changed to a glutamine (Q). The wild type mouse melanopsin and the melanopsin mutant E213Q were over-expressed using a tetracycline-inducible heterologous expression system. Once we obtain this mutant protein, it will be assayed for constitutive activity in a G-protein activation assay.

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Structural Development of *Streptococcus oralis* YC1 Polysaccharide through NMR Spectroscopy

Nirav Shelat
C. Allen Bush, Professor, Department of Biochemistry

This research project centers upon discovering the true structure of a polysaccharide on the cellular surface of the *Streptococcus oralis* YC1 strain. This strain is a mutant from the *Streptococcus oralis* C104 strain and its polysaccharide coat contains four beta galactoses, one alpha galactose and one ribitol. The YC1 strain was created by exchanging the *Streptococcus oralis* C104 UDP-galactose glycosyl transferase gene with that of the *Streptococcus pneumoniae* 10F's through the use of restriction enzymes. The sugar chain that was created on the surface of these bacteria due to this change is proposed to be an exact replica of the *Strep. oralis* C104 except for the linkage position between the alpha galactose and ribitol. The C104 polysaccharide has a linkage of (1,1) while the YC1 is hypothesized to be different. To test this hypothesize, an array of two dimensional NMR spectra prove to be extremely useful. By collecting and analyzing different types of spectra such as COSY, TOCSY, NOESY, HSQC and HMBC, we will determine the structure of the YC1 polysaccharide. This will provide us with a confirmed linkage position between the alpha galactose and ribitol. Ultimately, our findings may result in a better understanding of the biochemistry involved between the polysaccharides of microbes and their environment. It could also possibly lead to the creation of new vaccines that use non-pathogenic bacteria to faciliate immunization against harmful pathogens.

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

Analysis of DNA Binding Amino Acids of Gene 32 Protein and Crotamine by Mass Spectroscopy

Daniel J. Shook*, Yuanyuan Liu, Alberto Berton*
Richard Karpel, Professor, Department of Chemistry and Biochemistry

The goal of our project is to discover the DNA binding locations of the protein crotamine. We began this process by analyzing gene 32 protein (gp32), for which there is a large body of research literature concerned with its DNA binding properties. We demonstrated that lysine residues on gp32 can be protected by single-stranded DNA in the presence of acetylating agents. We subsequently analyzed the DNA protected and unprotected proteins by mass spectroscopy to discover the locations of amino acids involved. Mass spectroscopy analysis utilized enzymatic cleavage of the protein and reverse phase HPLC prior to analysis. After demonstration that this method was proven for gp32, we moved on to performing similar experiments with crotamine. Crotamine is a potent poison present in snake venom that can rapidly gain entry to human cells and nuclei. This research about protein structure may allow future proteins to be created that have the same accessibility to cells and nuclei without the toxic side effects.

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

Prefrontal Cortex Deficits in a Delay Odor Discrimination Task in a Rat Model of Schizophrenia

***Igor Shusterman**, Aaron Gruber[1], Matt Roesch[1], Patricio O'Donnell[1,2]*
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Patricio O'Donnell, Professor, Department of Anatomy and Neurobiology and Psychiatry

The prefrontal cortex (PFC) is a brain structure important for cognitive processing and decision making, particularly when behavioral flexibility is needed or when outcomes are delayed. PFC deficits can manifest behavioral and electrophysiological abnormalities that resemble some aspects of schizophrenia, a brain disease associated with disorganized decision making and hyperactivity in regions responsible for higher order processing. Interneurons, a subpopulation of neurons responsible for inhibition in cortex, are thought to be dysfunctional and disorganized. Here, we used neural recordings in rats with neonatal ventral hippocampal lesions that alter PFC interneuron function to test if disorganized PFC interneurons affect decision making in a delayed odor discrimination task. Rats were trained to make odor-cued choices between two reward wells that delivered unequal amounts of sucrose reward after a delay. Once animals attained proficiency, individual neurons and local field potentials were recorded from PFC in lesioned and control animals. Lesioned rats demonstrated decreased behavioral flexibility, altered neuronal signaling, and difficulties adapting to differences in reward size. We tested the effectiveness of a next-generation pharmacological agent that targets inhibitory mechanisms in repairing PFC circuitry and behavior problems. The data indicated PFC interneuron deficits like those seen in schizophrenia correlate with altered decision making processes.

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Dual Identity Development Among Adolescent Mothers

Sadaf Siddiqi, Elizabeth A. Fitzgerald
Charissa S.L. Cheah, Associate Professor, Department of Psychology

The present research examined the process of dual identity formation among adolescent mothers. Young mothers are inherently vulnerable to negative psychosocial outcomes such as depression, social isolation, and welfare dependence due to the multiple stressors associated with becoming a parent during this period of self identity development. Thus, it is crucial to understand the successful transition to motherhood in order to help young mothers prepare for these challenges. Participants in this research were 103 primaparious adolescent mothers who resided in the Baltimore metropolitan area. Selected measures assessed the participants' self and maternal identities, psychological well-being, stress, and relationships. Participants were organized into four distinct categories, based on their commitment to their self and maternal identities. Results revealed that mothers who committed more strongly to their self identity reported higher well-being than other groups. Conversely, those mothers who did not report a strong commitment to either identity fared worse than those who associated with at least one identity. Although both positive psychological and social adjustment were most strongly related to a strong self identity, the results suggest that commitment to either role is better than a lack of a stable identity. Implications for interventions and future research will also be discussed.

This work was funded by the UMBC Special Research Initiative Support.

The Relation Between Pediatric Food Allergy Severity, Peer Interactions and Report of Child Behavioral Problems

Elizabeth A. Silberholz*, Emily Law, Linda Herbert, Soumitri Sil*
Lynnda M. Dahlquist, Professor, Department of Psychology

Approximately six to eight percent of the pediatric population is diagnosed with a food allergy (Sampson, 2005). Past studies found that pediatric food allergy has great psychological impact on the child, as well as parents. However, no research has associated parental perceptions of food allergy severity with the socialization and behavior of food-allergic children. Thirty-one mothers of food-allergic children from a university-based allergy practice completed two questionnaires: one that rated their child's food allergy severity and another that assessed the child's peer interactions. The child's behavior was also assessed by their mother and teacher. The data indicated that mothers, on average, who viewed the food allergy as severe had children who participated in fewer types of activities than children of mothers who believed the food allergy or allergies to be less severe. However, analyses revealed that there were no significant differences between the child's internalizing behavior at home and at school and their peer interactions. Further study with an expanded data set should be conducted in order to determine if these results still hold true.

This work was funded in part by a grant from the Department of Human Development at Washington State University.

If You Can Talk, You Can Sing

Marcus A. Simmons
David W. Smith, Assistant Professor, Department of Music

The qualities of vocal freedom, spontaneity, and musicality are highly sought after singing qualities. The purpose of this study was to develop a technique that will produce these qualities in the voice of a singer who uses it. We experimented with the notion that talkers are also singers. The speaking voice and the singing voice are both musical; they have pitch and resonant qualities. We perceive a gap between the two. Our goal was bridging the gap without losing the communicative nature of both music and language when performed at their respective highest levels. In July and August of 2008, I went to Orvieto and Citta della Pieve, Italy and worked as an intern with the International Opera Theater. Guided by "Master Vocal Coaches," we experimented with vocal modalities that utilize the intrinsic properties of the human voice and employ natural inflection. Everyone with a voice talks; only a few of those who speak sing; only a few who sing truly communicate. We learned ways to preserve the natural qualities of speech while singing. The voice carries a message and the techniques we developed expand the versatility of the voice allowing anyone who hears it to understand and be touched.

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

Stop Child Brides Now

Samantha E. Song
Franc Nunoo-Quarcoo, Professor, Department of Visual Arts

The objective of this poster is to communicate the urgent need to stop children from being sold as brides. After understanding the child bride problem, it became clear to me that my mission was to raise awareness through the use of graphic design. I created a poster that would grab attention and communicate the desperate emotions of these children. The bold image of an empty swing set begs for attention while letting the viewer know that someone is missing. In drawing the child's silhouette, I followed Beggarstaffs' poster for Kassama Corn Flour, 1894. The Beggarstaff poster used an image of a girl without facial features, which allowed viewers to project their own emotions. Similarly, this work is designed to allow the viewers to see in the silhouette an image of a girl familiar to them; a girl they would not want to become a child bride. It is intended that the viewers feel a personal need to help the silhouetted girl and others like her. The image was hand painted to give it a humanistic touch and then digitized for poster production. Placing the girl upside down was intended to create tension, and her running movement is to be interpreted according to the viewer's state of emotion. The factual content represented in this poster was developed by Zennia Phillips.

Identifying Novel Cell Cycle Regulators in Budding Yeast

Tesia N. Stephenson, *Paula Fearon*[1]
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Orna Cohen-Fix, Senior Investigator, Laboratory of Molecular and Cellular Biology

The spindle assembly checkpoint allows for the bipolar attachment of microtubules to sister chromatids. Apq12p, an endoplasmic reticulum protein, is implicated in the spindle checkpoint based on its genetic interactions with known spindle checkpoint components. Previous studies show Apq12p has a synthetic lethal interaction with Bub3p (binds to kinetochores not attached to microtubules), suggesting an additional role for Apq12p in the spindle assembly checkpoint. The aim of this study was to determine the role of Apq12p in the spindle checkpoint pathway. A plasmid-based multi-copy suppressor screen was used to identify genes that when over expressed would suppress the lethality of *apq12*Δ*bub3*Δ. To determine which gene on the plasmid was rescuing the *apq12*Δ*bub3*Δ synthetic lethality, an *in vitro* transposition reaction was used during which a transposable element was randomly inserted into the plasmid. The mutagenized plasmids unable to suppress were sequenced to identify the gene disrupted by the transposon. Results show that high copy of ALY2, TAX4, IML2SKT5, YEL1, YBL059C-A, YBL059W, and SHP1 suppress the lethality of *apq12*Δ*bub3*Δ. These results suggest these genes could be involved in regulating chromosome segregation. The suppressor screen will be repeated until saturation and verification experiments conducted.

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Assessment of Hippocampal Integrity in Development of Specific Anti-mitotic Lesion Model

Sara L. Stockman
Greg I. Elmer, Associate Professor, Department of Psychiatry, Maryland Psychiatric Research Center, Univ. of Maryland Medical School

Schizophrenia is a psychological disorder, which few effective animal models can fully represent. A promising model is the anti-mitotic lesion model, which is based on the hypothesis that damages to the developing nervous system correspond to the etiology of schizophrenia. In the model, anti-mitotic drug administered at specific stages of nervous system maturation results in alteration of brain development producing symptoms of schizophrenia. This experiment sought to evaluate disruption of neurogenesis induced through an anti-mitotic lesion at different development ages in order to suggest a model that provides optimal construct validity for analysis of abnormal behavior relevant to schizophrenia. Pregnant Sprague Dawley female rats were injected with cytosine arabinoside (AraC, 30mg/kg) or saline on embryonic days 19 and 20 or postnatal day 0 and 1. Subjects were tested for spatial navigation capacity in the Morris Water Maze (MWM). Treatment of AraC to pregnant mothers on embryonic days 19 and 20 produced significant impairments in terms of latency to learn platform location across days ($P=0.0081$) and mean distance from the platform ($P=0.0326$). Other endpoints also confirmed impairments. Treatment of the drug on postnatal days 0 and 1 yielded insults, which confounded behavior. The results provide evidence that treatment of AraC to pregnant mothers on embryonic days 19 and 20 produce hippocampal-based behavioral deficits and may produce a valuable model to assess abnormal behavior characteristic of schizophrenia.

"*Blue Duck*"

Matthew J. Szychowski
Fred Worden, Assistant Professor, Department of Visual Arts

"Blue Duck" began as an improvisational performance of an absurd story involving a man lying on his psychiatrist's couch explaining the series of odd occurrences that brought him there. Blue Duck develops this story into a slightly surreal narrative video. The process included conceptual drawings of the characters. The setting was a dorm room transformed into a psychiatrist's office. It was a challenge to make the film visually interesting despite the fact that almost all of the action takes place on a single set, the psychiatrist's office. This was solved through flashback scenes in which the patient confesses many disturbing things about his past. These stories of the patient's past become mini-scenarios, providing a range of additional scenes, characters, and dramatic situations to inter-cut with the scenes in the psychiatrist's office. A cross cutting editorial strategy was used to integrate this variety of material.

"*Cold Lady*"

Matthew J. Szychowski
Fred Worden, Assistant Professor, Department of Visual Arts

The short story "Cold Lady" tells the story of a man who learns the price for breaking a promise. The film uses the style of a fable from an old storybook. A challenge in adapting this story to animation was creating a style that parallels the style of the story. Conceptual drawings of the characters and the scenery were used to get a sense of this unique style before progressing to animating. Hand drawn animation was chosen as the medium to achieve the visual characteristics of a folktale storybook. The software program After Effects was used to accomplish some of the effects. One challenge was to make use of this advanced software program without undermining the hand drawn style that defines the animation.

"*Escape from Ping Island*"

Matthew J. Szychowski
Fred Worden, Assistant Professor, Department of Visual Arts

The song "Ping Island" by Mark Mothersbaugh suggested to me a film revolving around a chase scene. This song inspired both the story and visuals for "Escape from Ping Island." The decision was made early in the process that the animation would have a cartoon-like style with the chase scene playing as a comedy. This was accomplished by outfitting the main character's car with crazy gadgets that he uses to help himself during the course of the chase. When his car falls off a cliff, for instance, a parachute automatically opens out of the trunk. When the car lands in the water it turns into a boat. These kinds of impossible transformations have a long history in animated cartooning.

Delegated to Represent? Exploring the Racial and Gender Differences in Delegate Demographics at the 2008 Democratic National Convention

Priya Tiwari, Gillian Yeadon, Betty Irungu, Tim Gruber, Katie Papagjika
Tyson King-Meadows, Assistant Professor, Department of Political Science

The distribution of delegates aligned with Illinois Senator Barack Obama and New York Senator Hillary Clinton at the 2008 Democratic National Convention, where the party's presidential nominee is chosen, reflected the social and political rifts within the party. In this regard, the southern region is of particular interest due to two claims; (a) that contemporary Democratic presidential candidates cannot win southern states; and (b) that Democrats need to appeal to white southern voters. In recognition of these claims, we chose ten southern states which we believe most represent the internal and external pressures on delegates and the party with regard to building coalitions across racial and social divides. We analyzed the differences in delegate demographics by examining variables such as age, race, gender, education, family status, and political experience to determine the divide and support for these two candidates within the Democratic Party. In our attempt to overcome the lack of comprehensive data on delegate demographics, we built a unique data set limiting the scope to delegates whose political experience or office led to a designation of "Honorable" by the party. For parsimony and brevity, alternate delegates were also eliminated. In the end, we explored the implications of these divisions for the 2008 presidential election.

An Ethnographic Study of an Iraqi Refugee Community in Baltimore City

Fatima Touma
Seth D. Messinger, Assistant Professor, Department of Sociology and Anthropology

This project focuses on the experiences of Iraqi refugees that have recently arrived to Baltimore City. The increase in the number of Iraqi refugees to the US due to the recent changes in policy requires an examination of their experiences in order to develop an understanding of the challenges they face. To gather the data, I conducted an ethnographic study involving Iraqi refugees arriving to Baltimore City in the summer of 2008. Along with participant observation, a series of interviews were conducted to gain an insight into how the Iraqi refugees were adjusting to their new environment, especially focusing on issues of identity and community. The interactions among the refugees give insight into their created identity. Further these interactions construct a community that fosters and maintains cultural ideals. Examining these interactions in context of the reality Iraqi refugees face will assist in programs that strive to assist in their social integration.

This work was funded, in part, by the Department of Sociology and Anthropology at UMBC.

Characterization of SUP3 Homologues in Arabidopsis defense

Margarita Tsionsky, *Guoying Wang*
Hua Lu, Assistant Professor, Department of Biological Sciences

Plant diseases have devastating effects on world agriculture. Effective control of plant diseases depends on a thorough understanding of disease resistance mechanisms. It remains challenging to identify genes controlling plant defense and characterize the functions of these genes. The *acd6-1 SUPPRESSOR 3* (SUP3) gene was identified in a large genetic screen aimed to uncover novel defense genes. SUP3 belongs to a small protein family previously shown to have anion transporter (ANTR) activities. There are six members in the SUP3 family; however, physiological functions of these members have not been well understood. We found that *SUP3*, previously designated as ANTR1, was a negative regulator acting in the key defense signaling pathway mediated by salicylic acid. To begin to understand functions of other members in the SUP3 family in plant defense, we used a reverse genetic approach to identify mutants for all five SUP3 homologues (designated ANTR2-5). So far we have identified mutants in four of the five *antr* genes. Preliminary data indicated that some of the *ANTR* mutants were compromised to the infection of *Pseudomonas syringae*. We will further assess the defense phenotypes conferred by these mutants. Our work will reveal if members of the *SUP3* family regulate plant innate immunity.

This work was funded by the NSF RIG award and UMBC start-up funds to Hua Lu.

Myo1 Localization's Effect on Multi-Budded Phenotype in *Saccharomyces cerivisiae*

Steven Tuyishime, *Janice Zengel, Lasse Lindahl*
Janice Zengel, Senior Research Scientist, Department of Biological Sciences

A link between bud formation and ribosome biogenesis has been posited and using *Saccharomyces cerivisiae,* this experiment aims to further elucidate this connection. The budding yeast *S. cerivisiae* reproduces by bud formation which is an occurrence of the yeast cell division cycle. Budding is an asexual form of reproduction involving daughter cell formation, in the form of a bud, on the parent cell. This is later followed by separation from the parent cell and a new cell is produced. Previous research has shown that depletion of the ribosomal protein L4 yields a multi-budded phenotype. In order to understand at what point during the cell cycle the aforementioned phenotype occurs, the localization of Myo1, a protein which is known to be localized to the site where the new bud forms during the G1/S phase, will be observed through tagging with a GFP. This way, the movement of Myo1 will be followed through the use of confocal microscopy and we will be able to determine whether or not the defect leading to the multi-budded phenotype occurs in G1/S phase or elsewhere.

This work was funded, in part, by NSF grant MCB-03449443, the HHMI Undergraduate Scholars Program at UMBC and the Howard Hughes Medical Institute.

Female Genital Cutting

Jenna Ullrich, Sarah Fry
Franc Nunoo-Quarcoo, Professor, Department of Visual Arts

Female genital cutting remains a current human and sexual rights issue in several parts of the world, though the general public has little exposure to the severity of this controversial practice. In order to appropriately represent the topic, we researched female symbolism in art. Through this research we decided on using a flower, which often symbolizes a woman's fertility and reproductive organs. The flower is white signifying purity and innocence, reflecting the innocence of the mistreated women. The white flower is shown mutilated, due to being cut and then sewn together with red string in a new way, directly referencing the particular operation. The red string was chosen to symbolize blood and pain. The placement of the flower in the dirt conveys the inhumanity of the practice and the degradation of the women. The centered flower composition is to mimic the female anatomy and visually confront the viewer as the predominate focus. The words conveyed in the poster were interpreted from the research of student Sandra Currie. Through critiques with Professor Nunoo-Quarcoo and fellow design students, this poster was successfully developed into a powerful piece of art and design. As this poster was intended for public display, much care was taken in presenting the subject of female genital cutting in the most pertinent yet compelling way.

"In Bed"

Jesse S. Vaughan
Lynn Cazabon, Associate Professor, Department of Visual Arts

The bedroom is very personal, however it is still a space that is decorated and put on display along with the other rooms of a house. The actual bed is a completely different story. A bed is traditionally an environment shared by husbands and wives, couples, maybe best friends. The thought of offering a complete stranger the opportunity to share space with you in your bed or in his/her bed is almost absurd. This project photographically explores the relationship between two strangers and the bed. I chose subjects that did not know each other, placed them in a bed lit by studio lights and photographed them with a 4x5 large format camera. I chose to keep the setting constant with white sheets and shoot from above the bed looking down to give the series a sense of intimacy and focus on the subjects. However when you look at the expressions and body language of each person you can tell that these aren't normal portraits. I wanted these prints to seem oddly and awkwardly affectionate, but with a surprise element that serves as a social commentary on how we, as a society, feel towards people we do not know at all.

Rape

Jesse Vaughan
Franc Nunoo-Quarcoo, Professor, Department of Visual Arts

For this poster design project I decided to let the facts speak for themselves while creating a visually eye-catching design utilizing scale, color, juxtaposition and tension to inform and at the same time engage the viewer with the difficult topic of rape. Using basic geometrical elements and a simple color palette, the issue is highlighted, but not over-produced. I believe rape is a topic that shouldn't be brushed into the corner and ignored or left alone to solve itself, so I wanted the design to be very engaging to the viewer, reflecting how everyone should be involved in the process of ending rape. I incorporated elements that grab a viewer's attention from a distance, but I also used a large amount of white space and small paragraph text so the viewer can interact with the content on a personal level. This combination resulted in a poster that is visually interesting both up close and from a distance and handles the sensitive content in a very respectful manner. Rape is a very delicate issue that demands attention and discussion. This poster is designed to generate attention and start discussion. The factual content represented in this poster was developed by Emma Rava.

Design and Synthesis of Flexible 2'-Deoxy Nucleoside Analogs ("Fleximers") As Potential Chemotherapeutic Agents

Melvin S. Velasquez*, Orrette R. Wauchope, Katherine L. Seley-Radtke*
Katherine L. Seley-Radtke, Associate Professor, Department of Chemistry and Biochemistry

The onset of resistance has limited the arsenal of chemotherapeutic agents that are available to treat bacterial, viral, and parasitic infections, as well as cancer. Consequently, there is an unmet medical need for the development of drugs that can remain potent despite the development of resistance that renders current therapeutics useless. One aspect of our research focuses on the development of novel inhibitors that can overcome "escape" mutations, the most common cause of resistance. In that regard, we have designed a series of flexible nucleoside analogues that have strategically split the purine heterocyclic ring into its respective imidazole and pyrimidine components however keeping them connected by a single bond between C4 and C5. This modification should allow the nucleoside to engage secondary amino acid residues in an enzymatic binding site not previously involved with the mechanism of action, while still retaining the requisite hydrogen bonding elements necessary for recognition. This modification will circumvent escape mutations to allow retention of biological activity. Synthesis of the targets involves state of the art bioorganic chemistry and rigorous structural characterization by NMR, mass spectroscopy, and elemental analysis. The efforts to realize the proximal xanthosine, guanosine, and diaminopyrimidine 2'-deoxy fleximers are described herein.

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Analysis of the Sampoong Department Store Collapse from an Engineering Ethics Perspective

Jason R. VerHoef, Brian A. Steele, Yakubu Wanka
Richard L. Wilson, Lecturer, Departments of Philosophy and CMSC/EE

We conducted an analysis of the Sampoong Department Store collapse from an engineering perspective. The analysis focused on social, ethical, and legal issues inherent to engineering design and focused on some of the incentives and trade-offs involved in the case. For example, a legal issue arose when Lee Joon (the chairman of the building) decided to remove key supports in order to make room for escalators, thus sacrificing the building's structural integrity for expected economic gain. The stakeholders involved (those who had a legitimate interest in the situation) and the questionable decisions made by Lee Joon and his peers were identified. The ethical principles of virtue ethics and deontology, as well as the National Society of Professional Engineers (NSPE) Code of Ethics were used to analyze the case. Virtue ethics determines the morality of decisions based on one's character. Conversely, deontology emphasizes one's moral duties as well as the rightness or wrongness of one's decisions. Recommendations were made based on analyses using each of these ethical principles in addition to the NSPE Code of Ethics, which provides ethical guidelines that professional engineers are required to follow. This information is critical because it is important that ethics and standards are upheld in the workplace and that we analyze the mistakes of the past to learn from their causes and consequences.

Same Sex Union Laws

Terry Von Hagel
Franc Nunoo-Quarcoo, Professor, Department of Visual Arts

The Declaration of Independence decrees that we are entitled to certain inalienable rights including "life, liberty, and the pursuit of happiness." The poster poses the question–if the law grants us these rights, then why are the gay, lesbian and transsexual members of our society denied these same rights? With a background resembling the Declaration, contrasting colonial script and 1960s fonts will be used to express the rights we have been granted. Visual symbols including gender and the peace symbol popular during the sixties (love, peace and harmony) will communicate the message of the three societal groups. Contrasting small and large type will help create emphasis and at the same time blend to bring across the message that we are all in this life together. Repetition of color and specific fonts are used to unify and strengthen the overall poster. The goal of the poster is to give the viewer pause to consider why this group is excluded from some of our country's basic rights.

This research was conducted by Jasmine Mitchell during her First Year Seminar class, Sexuality, Health and Human Rights, taught by Dr. Ilsa Lottes.

Examining the Barriers and Facilitators to Breastfeeding in Women Attending a Post-Secondary Educational Institution

Samantha C. Watts
Tiffany Baffour, Assistant Professor, Department of Social Work

Previous research has shown that breast feeding children during infancy confers significant health and economic benefits to mothers, employers and the wider society in general. This study examined the barriers and facilitators that women experience breastfeeding while attending a post-secondary educational institution. Qualitative interviews were collected from mothers who have breastfed while attending a university in the Baltimore area. A content analysis was conducted to ascertain key themes from the transcribed interview data. This research can provide expanded evidence regarding barriers and facilitators to breastfeeding among university students who are particularly vulnerable when returning to study while breastfeeding and caring for a very young infant. The results of this study support health equity by informing future lactation policy for this group.

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

"Movement"

Jonathan P. Widmer
Frederic Worden, Assistant Professor, Department of Visual Arts

This project researches the use of jump cuts as an aesthetic choice in making a non-narrative film. Jump cuts are normally considered errors because they disrupt the smooth flow of narrative information. I began by researching the use of jump cuts in experimental film history and then developed a concept for a film of my own design. I then had to learn to shoot and edit silent, 16mm black-and-white film. I knew from my research that some experimental filmmakers had deliberately made use of the jump cut's ability to draw attention to itself. One such filmmaker was Bruce Conner, who made extensive use of jump cuts synchronized to music in his film, *Breakaway*. Connor's film became my main inspiration for the rhythmic use of jump cuts. As my project entered the editing phase, it became apparent that I would need to develop my own strategies for achieving the desired results. I did not have many of the tools and technologies Conner had used in making *Breakaway*. My 16mm film stock was digitized and edited using Final Cut Pro. Though *Breakaway* inspired my project, *Movement* stands alone as a separate example of the use of jump cuts in the art of film.

Explorations in Game Development: Creating 2D and 3D Worlds

UMBC Game Developer's Club: Officers: ***Lesa Wilcox, Joel Bowers, Taylor Evans, Luis Rivera*** Programming: ***Jonathan Moriarty, Alex Lacey, Alex Brindley, Brian Caine, Shawn Marsden, David Hack, Matt Song, Matthew Kalkbrenner, Jonathan Merkle, Gini Bailey, Colin Taylor, Jan Zheng, Joshua Tunzi, Kevin Markey, Daniel Hogberg, Alex Evers, Ben Harris, Jurrell Brown, Greg Aring, James Weaver*** Art: ***Jonathan Pack, Eve Addison, Tommy Truong, Wallace Brown, Scott Stevens, Richard Lee, Isaac Sohn, Cody Pearson, Jon Schubbe, Donovan Hall*** Sound: ***Gavin O'Leary, Erin Terwilliger, Danny Hollis***
Marc Olano, Assistant Professor, Department of CSEE
Charles Lohr, Graduate Res Assistant, Department of CSEE
David Chapman, Graduate Res Assistant, Department of CSEE

The Game Developer's club has set out this year to produce two projects, one 2D game and one 3D game. All of our projects require creativity and ingenuity from members with art and computer science backgrounds, as well as various other disciplines like music and design. These projects are intended to embody our member's technical and artistic achievement. All of our projects are year long projects that involve multiple members of the club. Each of our projects require different skills and talents. In **Cryo and Pyro**, a 2D multiplayer platformer, our artists needed to produce sprites for every asset in game and programmers needed to learn how to use Microsoft's XNA so that the game could be played on an Xbox 360 as well as Windows. **Gunther**, a 3D hack and slash, required the artists to work with 3D modeling and programmers needed to work with Mercury, a game engine club members have been developing over several years. **Mercury Game Engine** is a comprehensive multi-platform game engine developed over the course of four years by GDC members.

Pharmacokinetics of D3 Receptor Analogs

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[1]Department of Pharmaceutical Sciences, School of Pharmacy, University of Maryland
Natalie D. Eddington, Dean, Department of Pharmaceutical Sciences, UM School of Pharmacy

Cocaine's action in the brain is to block the dopamine re-uptake transporter, which allows this neurotransmitter to reside in the synapse longer and its euphoric effects to persist. Dopamine D3 receptors are located in the nucleus accumbens and are involved in mediating the neurobiological effects of dopamine. Behavioral studies in a rat model of addiction indicate that the D3 receptors may attenuate some effects associated with repeated administration of cocaine. The dopamine D3 analogs have the potential to lower cocaine abuse due to their selectivity for D3 receptor. The hypothesis of this work is that the blood brain barrier transport and pharmacokinetics of D3 receptor analogs is dependent on their structural modifications and physiochemical properties. To test this hypothesis we investigated the metabolism, pharmacokinetics, and brain uptake of dopamine D3 receptor analogs in rats. The Pgp transporter protein limits drug accumulation in the brain. Thus, an *in vitro* ATPase assay was used to evaluate the affinity of these compounds for Pgp. In addition pharmacokinetic and brain distribution studi for these analogs were conducted in rats. These studies will provide more information about the pharmacokinetics characteristics of these compounds as they are assessed for suitability for future therapeutic use in humans.

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Effect of Nutrient Conditions on *Staphylococcus aureus* Biofilm Formation

Hannah K. Wilson, *Patrick Ymele-Leki*
Julia M. Ross, Professor and Chair, Chemical and Biochemical Engineering

Staphyloccocus aureus infection poses a serious public health threat in both healthcare and community settings. Persistent infection results from the formation of bacterial biofilms, which allow evasion from the host immune response and antibiotic treatment. Biofilms may grow under a wide range of nutrient conditions in the vasculature. This study quantified static biofilm formation in tryptic soy broth (TSB), in TSB + glucose, and in TSB + sodium metaperiodate ($INaO_4$). Glucose enhances biofilm formation, whereas $INaO_4$ has been shown to detach biofilms from their associated surface. Adherent bacteria were grown in collagen-coated 96 -well plates at 37^{o}C for 24 hours. Biofilm formation was quantified using UV spectrophotometry, and additional experiments were carried out to determine whether these conditions are nutrient-limiting. Preliminary results indicated that biofilm growth is proportional to media concentration, and that those bacteria grown with 10 mM $INaO_4$ showed negligible growth. Isolating the effect of nutrient concentration on biofilm growth will help elucidate the process of *S. aureus* biofilm formation. Ultimately, this understanding could lead to new therapeutic strategies for the treatment of *S. aureus* infections.

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Investigating the Secondary Structure of the Mouse Melanopsin Carboxy-Tail

Katherine C. Woronowicz, *Joseph R. Blasic*
Phyllis R. Robinson, Professor, Department of Biological Sciences

The goal of this project is to determine the secondary structure of the mouse melanopsin Carboxy-terminal tail through the use of circular dichroism. Melanopsin is a relatively new discovery in the field of vision science. Research has shown that it is a non-image forming, vertebrate photopigment found in retinal ganglion cells which innervate the brain regions responsible for photoentrainment and the pupillary light response. Melanopsin has an exceptionally long C-terminal tail for a G-protein coupled receptor. However, little is known about its structure. Through a process called “stitching by overlap extension,” or SOEing, a protease site was successfully incorporated into the mouse melanopsin gene at the junction between the tail and transmembrane regions. Using the protease which targets the inserted site, Factor Xa, C-terminal tails were successfully cleaved from their transmembrane protein. In the future, if we can understand the structure and the function of the C-tail, treatments may be developed to assist people who struggle with maintaining a healthy circadian rhythm.

This research was funded by NSF IOB 0615569.

Moderating and Mediating Factors in the Association Between Maternal Psychological Control and Child Aggression in Chinese Immigrants

Rebecca Zia, *Christy Y.Y. Leung, Charissa S.L. Cheah*
Charissa S. L. Cheah, Associate Professor, Department of Psychology

Kinship support is crucial for the adjustment of Chinese immigrants (Short & Johnston, 1997). Emotional support from families in home and host countries helps immigrants develop a sense of mastery in the new environment, and enhances their psychological well-being (Wong & Song, 2006). With emotional support, immigrant parents report higher self-efficacy and utilize less control towards their children (Izzo et al., 2000). Although parental psychological control has been consistently shown to be predictive of youth internalizing and externalizing problems and a negative parent-child relationship (Cassas et al., 2006; Nelson et al., 2006, Shek, 2007), research on the underlying mechanism mainly focused on Chinese adolescents (Shek, 2008). This study aimed to examine the: (1) moderating role of emotional support from kin in the relation between maternal sense of mastery and use of psychological control; and (2) mediating role of mother-child conflict in the relation between maternal use of psychological control and preschoolers' aggression among Chinese immigrants. Results showed that maternal sense of mastery in American society was effective in decreasing psychological control among Chinese immigrant mothers only when emotional support was available. Also, maternal use of psychological control predicted teacher report of boys' aggression through increased mother-child verbal conflict.

This work was funding by the Foundation for Child Development.

Visual Symphony: "Try to Believe"

Megan L. Zlock, *Andrej Bevec, Timothy Brosius, Christian Brown, Evan Devine, Ivy Flores, Ernest Powell, Tommy Truong, Robert Yu, Helen Zhang*
Eric Dyer, Assistant Professor, Department of Visual Arts

In Spring 2008, the UMBC Imaging Research Center Fellows set out to create an animated video to accompany Randall Woolf's modern musical composition, "Try to Believe," without relying on the digital processes that have taken over the animation medium. Instead, the ten students, under the guidance of Assistant Professor Eric Dyer, began to explore the stylistic possibilities of the cinetrope (sculptures based on the concept of the zoetrope, a pre-cinema optical toy). Over twenty-eight paper, foam core, and mixed media cinetropes were created, spun on motors, and shot on video to make the dizzying, surreal images seen in the final piece. The visual content loosely follows a modern-day "Alice" through a nightmarish then dream-like landscape: a narrative that, like Woolf's music, is a balance between abstraction and the familiar. The project was also expanded into a live animation performance in which the students choreographed a complicated exchange of the twenty-eight zoetropes on five spinning motors, while output from three video cameras was mixed and displayed to an audience in real time. Those associated with the project have already had the honor of presenting the pre-rendered video at a performance of the Brooklyn Philharmonic in New York and the live animation was performed at the Baltimore Creative Alliance last May, 2008.

This work was funded, in part, by the UMBC Imaging Research Center.