URCAD 2010
Student Abstracts

In Alphabetical Order by Presenting Author

How to read the abstracts

Title of Presentation

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

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

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

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

We encourage you to visit the students' presentations throughout the day. Presentation times and locations can be found in the Program section of this booklet.

Bioinformatics Study of Cancer Mutations: Using Protein Domains to Link Diseases and Mutations

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

Numerous breakthroughs in our ability to study the human genome have had a significant impact on the way in which cancer research is carried out. In-depth studies of cancer genetics have been essential in predicting an individual's susceptibility towards developing a certain cancer. Similarly, research into conserved protein domains has provided a greater understanding of the structural and functional effects of mutations. Using these domains, we examine connections between the genetic bases of cancers and those of other serious illnesses. We hypothesize that cancer and another disease could be related at the molecular level when they are caused by functionally related mutations. Using human protein sequences obtained from publicly available databases, we applied an amino acid sequence alignment based on known domain sequences in order to derive the positions of every domain located on every human protein. After obtaining mutation data from public databases, we mapped these mutations to their respective domains based on their positional and functional information. We compared breast and prostate cancer mutations to other mutations found to be deleterious in other diseases and found connections between cancer and over 200 other non-cancer diseases. These matches, which are based on function and position in the domains, suggest that the cancerous mutations have similar molecular pathways and interactions as other diseases that are also highly researched.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and by the National Institutes of Health (NIH) [1K22CA143148 to M.G.K. (PI); R01LM009722 to M.G.K.(collaborator)]*.

Slug

Eve L. Addison, Robert J. Donahue, Mary I. Lewis, Stephen A. Steinbach, Nathaniel Wise
Neal McDonald, Assistant Professor, Department of Visual Arts

Many video games depend on violence or competition as their primary motivation. We created a game based pm a different philosophy. The player controls a cute, cartoon-like slug as she attempts to cross dangerous terrain. Slug does not actually hurt any of the adversaries she meets. She simply tries to dodge and jump from one end of the two-dimensional level to the other while avoiding obstacles and unfriendly animals. We wrote the game code in ActionScript 3.0. We created the art and animation assets using Adobe Flash CS4. We implemented basic physics and used various mathematical formulas to simulate an attractively cartoon-like yet surprisingly realistic environment. The combination of cute, high-quality graphics and realistic behaviors completes the feel of the game. Many different kinds of people will enjoy *Slug*, and it offers an enjoyable alternative to more aggressive games.

Parental Sense of Competence at Two Years of Age and Child Internalizing and Externalizing Behavior Problems at Age Four

Angelica R. Alexander, *Laura A. Scaletti[1], Maureen M. Black[1]*
[1]University of Maryland School of Medicine, Department of Pediatrics: Growth and Nutrition Division
Laura A. Scaletti, Lecturer, Department of Psychology

Past research has linked a parent's sense of competence to child behavior problems in toddlerhood. The present study hypothesized that parental sense of competence at 24 months of age was negatively associated with child internalizing and externalizing behavior problems at 48 months of age. Participants were selected, based on available data, from a longitudinal study that examined the effects of prenatal drug exposure on child development (N=173). Preliminary analyses revealed a negative association between total parental competence and 48 month behavior problems (internalizing, $r(107)=-0.26$, $p<.01$, and externalizing, $r(107)=-0.39$, $p<.001$). Specifically, the more competent a parent felt when his/her child was 24 months of age, the less likely they were to report that their child displayed externalizing and internalizing behavior problems at 48 months of age. In addition, a parent's satisfaction in his/her parental role (another factor associated with parental sense of competence) was negatively associated with internalizing, $r(107)=-0.29$, $p<.01$, and externalizing, $r(107)=-0.41$, $p<.001$, behavior problems at 48 months of age. Multiple regression analyses will be conducted to further examine these relations and any possible covariates.

This work was funded by a grant to the third author (NIDA RO1 DA021059).

Microsatellite Analysis to Improve the Measurement of Efficacy of Sulfadoxine-Pyrimethamine for the Treatment of Malaria

Anissa N. Alexander*, Malathi Vadla[1], Fraction K. Dzinjalamala[2], Miriam K. Laufer[1], Christopher V. Plowe[1]*
[1]Howard Hughes Medical Institute, University of Maryland School of Medicine
[2]Blantyre Malaria Project, University of Malawi College of Medicine
Christopher V. Plowe, Professor, Howard Hughes Medical Institute and Center for Vaccine Development, University of Maryland School of Medicine

Sulfadoxine-pyrimethamine (SP) is used to treat malaria, a mosquito-borne parasite that plagues residents of tropical areas. In 1993, the Central African nation of Malawi introduced SP for the treatment of malaria. We hypothesized that SP resistance would spread after SP use started on a large scale. Filter paper specimens were collected from children with uncomplicated malaria who were treated with SP and followed for 28 days. In participants whose malaria parasites disappeared from the blood initially but re-appeared in 14 to 28 days, we wished to determine if the recurrent infection was due to recrudescence of the initial infection or to a new malaria infection. We used hemi-nested polymerase chain reaction to amplify six highly polymorphic microsatellites and used capillary electrophoresis to compare their sizes in pre- and post-treatment infections. The presence of the same genotype was interpreted as indicating that SP drug failure caused a recrudescence, while the presence of new alleles indicated a new infection. Only true recrudescences will be considered treatment failures, improving the accuracy of the efficacy estimate. SP efficacy results adjusted to exclude new infections will be presented.

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

The Art of Biology

Sara E. Allen*, Margaret Kott, Chris Ng*
Preminda Jacob, Associate Professor, Department of Visual Arts
May Chang, Head of IT Services, Albin O. Kuhn Library

The goal of this project was to curate a virtual art museum. I worked with two of my peers in the class to identify and define a theme for our exhibition and to formulate a thesis for the display. By using the Active Worlds program we were able to create a virtual prototype of our concept for the museum. Our exhibit portrays how science can be incorporated into the field of art. We create a visual display of photographs to show that biology can be beautiful. This goal of our exhibit was to demonstrate that art and science are interchangeable. The organic structure of the museum parallels the essence of the subject matter contained within the gallery. The museum takes on a spiral form so that the viewer seems to be proceeding in a snail shell. The first works portray more complex biological forms such as animal and plant organisms. As the viewer travels down the coiled path, the forms simplify to bacteria and viruses. Many do not see that art and biology are interrelated; the purpose of this exhibit is to illustrate their relationship and the beauty of science.

Investigation of Evolutionary Relationships of the RRP2 Gene

Yohance M. Allette*, Lasse Lindahl*
Lasse Lindahl, Professor, Department of Biological Sciences

With each biochemical molecule in the living world, one basic tenet is observed: structure determines function, and the composition of the molecule controls structure. Theory suggests that the evolution of these biochemical molecules can be determined by comparing the individual structure or composition. RNase P and RNase MRP are two enzymes that are integral to biosynthesis of necessary cellular machinery responsible for protein synthesis. These enzymes both share the presence of a sub-structure, the P4 helix, located in close proximity to the enzymes' catalytic center. When the P4 helix is transplanted from RNase P to RNase MRP, the enzyme inhibits growth of the organism, unless it occurs in the presence of a specific base pair change, which acts as a suppressor for the negative effects. We are interested in identifying other suppressors of the inhibiting effects in regards to the original genetic sequence. We are testing the growth and development of the model organism *Saccharomyces cerevisiae*, yeast, after it has been subcloned with several different plasmids containing various mutations in comparison to the wild type sequence in order to identify other suppressors and better elucidate the evolutionary process.

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

The Relation of the Response Distribution to Self-Report Questionnaires and Cognitive Ability among Children

Anu J. Aluvathingal
Laura Stapleton, Associate Professor, Department of Psychology

Because educational program evaluations and field trials often use child self-report as outcome measures and sometimes determine implementation fidelity using those outcomes, evaluation of the validity of the use of such measures with school-aged children is important. Given that Rebok et al. (2001) found that younger children tended to use extreme values on scales using questions about health, this research was conducted to examine if the same behavior could be yielded from self-report questionnaires about school experiences. The relation between the cognitive age of the respondent and the likelihood of selecting certain response options was studied using a correlational research design. Extant data from two sources were used in the study: one from a national probability sample, PIRLS and one collected within a health management data collection system, COMC. The reading ability and response choice were the variables of interest from PIRLS data, while age and response choice of the children were studied from COMC data. Results from PIRLS showed a significant relation between reading ability and Likert scale items. But for COMC data, no significant relation was found between age and frequency scale items.

Nuns and Sex

Jessica Baker
Alan Kreizenbeck, Associate Professor, Department of Theatre

Religion and theatre have always had a complex relationship. Catholicism in particular has been both a strong opponent of theatre and an implementer of performance. Catholicism has appeared in various guises on the stage. Two plays from the last fifty years, *Agnes of God* and *Doubt*, deal with a very controversial issue within the church – sex. In *Agnes of God*, a dead baby is discovered in a young nun's trashcan. An ex-Catholic psychiatrist is called in to investigate, but she finds many more questions than answers. In *Doubt*, a nun suspects that the head priest of a school is having an inappropriate relationship with a male student. Using a scene from each play, I examined the theatrical condemnation of Catholicism for its rigid policy towards sexual behavior, and how the Church's doctrine does not allow an open discussion of sexual behavior, even at the cost of the health and well-being of its followers.

Edwin and His Associates

Jessica Baker, Omar Said
Alan Kreizenbeck, Associate Professor, Department of Theatre

When *Edwin and His Associates* was first written, it was an extended monologue by a down-and-out detective who was reminiscing on his life and his work. As the piece evolved, it grew into a multi-scene one-man show, still focusing on the main character, Edwin, but creating a storyline for him to follow. It also developed a film-noir feeling, leading us to coin the term "stage-noir." As *Edwin* developed in plot and story, the character of Edwin also grew into a fully-realized character, with facets of Omar, the playwright, but also composed of different people around him. The play itself is ultimately an examination of society and its members through the lens of entertainment options and moral choices and dilemmas.

Confirmation of a Long-Range Interaction in the HIV-1 5'-UTR and its Effect on Dimerization

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

The Human Immunodeficiency Virus type-1 (HIV-1) RNA genome contains the highly conserved 5′-untranslated region (5′-UTR), which is a vital component responsible for essential processes that lead to genomic packaging and eventual budding of the viral particle. Within the 5′-UTR, critical elements are contained which include the trans-acting responsive element (TAR), the Poly-Adenylation signal, primer binding site (PBS), the dimer initiation site (DIS), splice donor site, SL3 and the initiation site of the GAG polyprotein translation. Previous studies to determine the critical genome packaging signal in this region have produced conflicting results. Understanding the intact 5′-UTR conformation under physiological conditions is critical for understanding the HIV-1 viral replication mechanism. In contrast to previous chemical/enzyme mapping and free-energy based secondary structure prediction approaches, we employed the segmental labeling technique to directly investigate the intact, unmodified HIV-1 5′-UTR structures. Data obtained from various Nuclear Magnetic Resonance (NMR) experiments allowed us to produce a working model of the interactions that exist within the 5′-UTR. We are in the process of producing three-dimensional structures of both conformations of the 5'-UTR found in HIV-1that may lead to discovery of possible drug binding sites that may inhibit dimerization and the development of a mature viral particle.

This research was funded, in part, by the NIAID Grant #R37AI30917 and the Howard Hughes Medical Institute at the University of Maryland, Baltimore County.

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. However, 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 harbor mutations in novel defense genes. Among the genes identified was *SUP3*, encoding a phosphate transporter widely conserved in plants. 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. Interestingly, when introduced into *acd6-1sid2-1* background, one copy of *sup3-1* allele dominantly suppresses *acd6-1sid2-1* morphology. Thus *acd6-1sid2-1* can be conveniently 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 resulting from this work will be further tested in wild type for disease resistance. This study will reveal the functional domain of SUP3 that regulates plant defense and help us to further understand the mechanism of SUP3 action.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC, an NSF RIG award and UMBC start-up funds to H. L. and an Undergraduate Research Award from the UMBC Office of Undergraduate Education.*

Low-Income Women's Perceptions of the Quality of Their Infant Care: Supports and Barriers

Maria N. Beckford
Ilsa Lottes, Associate Professor, Department of Sociology and Anthropology

As women continue to enter corporate America and other working environments, it is crucial for companies to accommodate the female employees in regards to maternity leave guidelines. Although the U.S Department of Labor requires some employers to grant their employees 12 weeks unpaid leave to care for newborns, it remains undetermined if three months is enough time. Neurophysiological evidence supports the need of touch for proper brain development in early infants. Due to the infant brain's high plasticity, neuron differentiation occurs via the five senses. Most research focuses on face and voice communication, but touch is also important. Touch and play are just two of the important requirements of a healthy upbringing for the very young. In this study, low-socioeconomic mothers were interviewed in order to better understand the stresses and problems, as well as positive experiences they had during their child's first two years of life. Findings are discussed with respect to how to increase support and alleviate barriers for quality care.

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

Optimization of Drug Nanocarriers via the Construction of a Stealth Dendron

Maria Bednarek
Marie-Christine Daniel, Assistant Professor, Department of Chemistry and Biochemistry

Several challenges need to be overcome in chemotherapy to markedly increase its efficiency against cancer. Although intense research is being conducted on combined therapy and tumor targeting, the simultaneous targeting of different therapeutic entities to the cancer cells is still an area of research to be developed. One possibility has been to generate a potent multifunctional drug nanocarrier for the chemotherapy of specific cancers by attaching dendron units with distinct functionalities (chemotherapeutic drugs, targeting ligands, and imaging enhancers) around a central anchoring gold nanoparticle. My project consisted of the synthesis of a "stealth dendron" that will contribute to such a nanovector through its combination with dendrons displaying the aforementioned functionalities around a central gold nanoparticle. This "stealth dendron" will help further elongate the blood circulation time of the nanovectors, and most importantly avoid non-specific entry of the nanovectors into healthy cells in order to maximize the targeting. Each of the specific goals of my project was completed, including the synthesis of the backbone dendron, its modification with the "stealth" function, and its attachment to a spacer that will allow its anchoring onto the gold nanoparticles. *In vitro* testing of the obtained gold nanoparticles will later assess their stealth properties.

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

Developmental Occurrence of Solitary Chemosensory Cells in the Airway of Mice

Mikhael Bekkerman
Weihong Lin, Assistant Professor, Department of Biological Sciences

Solitary Chemosensory Cells (SCCs) have been speculated to play a role in signaling environmental stimuli and evoking protective reflexes, such as coughing and sneezing to flush foreign particles from the body. Recent studies from our lab demonstrated that solitary chemosensory cells, specifically those expressing the transient receptor potential channel M5(TRPM5), are involved in sensing chemical irritants. Our current study aims to reveal the developmental occurrence of TRPM5 expressing cells in nasal epithelium. Using transgenic mice, in which the TRPM5 promoter drives the expression of a green fluorescent protein (GFP) to visualize the TRPM5-expressing solitary chemosensory cells, we monitor the number and density of the GFP positive cells in epithelial tissue sections of newborn, adolescent and adult mice. Preliminarily, we found that tissue gathered from newborn mice already contained fair numbers of SCCs in the olfactory and respiratory epithelium. In completion of the experiment, we will understand the points in time when mice begin reacting to noxious odorants.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and an NIH/NIDCD grant to Weihong Lin.

The Business of Marketing Preimplantation Genetic Screening

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

Preimplantation Genetic Screening (PGS) is a reproductive technology that is often marketed to infertile couples to improve chances of pregnancy by transferring only viable embryos to the womb, but there is evidence showing that it may not be effective. In some clinics, PGS is offered to older women, those with repeated IVF failure, and those with recurrent pregnancy loss, but many clinics believe that PGS should be used to screen all IVF embryos. In 2007, the Practice Committee of the American Society for Reproductive Medicine (ASRM) published a review of PGS studies and concluded that available evidence from studies of pregnancy outcomes does not support the use of PGS for any of the conditions discussed above. Other studies found that it may hurt chances of pregnancy. This could be due to any number of factors. Based on a comprehensive literature review and comparison to the basic principles of bioethics, I will argue that, until PGS is proven effective, it should only be offered in clinical trials where patients are not expected to pay for the experimental screening. Until then, there should be greater efforts to inform both patients and clinicians about the experimental nature and lack of efficacy of PGS.

Implication of Ribosomal Protein on Tubulin Formation

Ashleigh C. Bouchelion*, Mamata Thapa*
Lasse Lindahl, Professor, Department of Biological Sciences

The 80S ribosome is composed of one-third r-proteins and two-thirds rRNA, respectively by mass. Eukaryotic ribosome biogenesis is a complex pathway that requires approximately two hundred trans-acting accessory factors to form the mature ribosome. Depletion of ribosomal proteins has shown to cause defects in rRNA processing. Recent studies have shown that repression of r-proteins also has an effect on cell cycle, suggesting that the ribosome biogenesis and cell cycle are coordinated processes. The lab has shown that in Saccharomyces cerevisiae, depletion of the 60S subunit proteins, Rpl17 and Rpl4, lead to defects in cell morphology. We also want to study is there are defects in other cellular processes, such as tubulin formation. Tubulin is required for proper segregation of chromosomal DNA into daughter cells. With an integrative plasmid containing GFP tagged tubulin, I am able to study tubulin formation in cells when depleted of large or small subunit r-proteins. I want to investigate what other roles r-proteins have in the cell, aside from their importance in ribosome biogenesis.

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

Reclaiming Maryland: Confederate Nationalism in Popular Print Culture

Abigail Bratcher
Anne S. Rubin, Associate Professor, Department of History

During the Civil War, Maryland occupied a unique position as a divided state in a divided nation. President Lincoln needed to keep Maryland in the Union because otherwise Washington, D.C. would have been surrounded, and the industrial powerhouse of Baltimore would have fallen to the South. At the same time, Confederates claimed Maryland as their own, using Maryland's plight as a powerful symbol of national aspiration. For my research, I focused particularly on the southern reaction to Maryland's position as seen in broadsides printed in southern newspapers and pamphlets. Rather than conducting a literary analysis of these artifacts on the micro-level, I researched how these broadsides reflected Confederate nationalist propaganda on the macro-level. Wake Forest University has the Confederate Broadside Collection of 250 poems published on the internet—I focused on the 58 that pertain specifically to Maryland. An analysis of these broadsides contributes to an understanding of the civil culture of nationalism in the Confederacy, and how confederate ideals permeated beyond military or political actions. Understanding how these broadsides functioned in Confederate states reveals how nineteenth century Americans consciously viewed their powers of persuasion.

An Investigation of Domestic Violence in Gay Male Couples

Avery L. R. Brow
Ilsa Lottes, Associate Professor, Department of Sociology and Anthropology

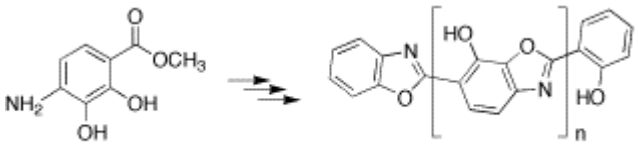
There is a lack of research about gay male domestic violence, and previous research is both out of date and insufficient in the breadth of its coverage. The study examined rates of domestic violence in a convenience sample of more than 80 gay men. The men responded from cities around the world, including those in France, Canada, Germany, Switzerland and several major US cities. In-depth interviews were conducted, and will be continuing, with a subset of the survey respondents who identified themselves as either perpetrators or victims of domestic violence. Topics to be examined in the interviews include: length of abuse, perception of factors related to abuse, extent of existing support systems, methods of coping with the abuse, negative and positive impacts of the abuse for both perpetrator and victim and specific concerns about an HIV diagnosis on domestic violence within a relationship. The findings are discussed in terms of an analysis of prevalence rates and proposed risk factors as well as with respect to future avenues of research.

This work was funded, in part, by a Distinguished Undergraduate Education Research award provided by the Department of Sociology and Anthropology and through a travel award from the UMBC Office of Undergraduate Education.

Polymers for Long-Range Photo-induced Proton Transfer

Richard P. Brown
Paul Smith, Associate Professor, Department of Chemistry and Biochemistry

Photonics and the development of molecular electronic devices are two exciting fields at the interface of modern chemistry and material science. Our objective is the creation of a polymer that, upon absorption of light, will propagate proton transfer over long distances. The resulting photo-induced proton transfer would ultimately be used to transfer protons across membranes, thereby establishing a proton gradient and an electrochemical potential. The specific aim of this work was to synthesize the monomer **1** (methyl 4-amino-2,3-dihydroxybenzoate), to use this to synthesize oligomeric benzoxazoles **2** and **3**, and to examine their proton transfer properties indirectly by evaluating their photochemical behaviour. In particular, we hoped to find that elongation of the oligomeric chain will cause nonlinear variation of absorbance or fluorescence, indicating that the individual chromophores/proton transfer units are acting in a coordinated fashion. The next step would be to implant these oligomers into a membrane and examine proton transfer behaviour. Progress towards these aims will be reported.



1 **2,3** n=1,2

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

IRC Fellows iPhone Strategy Game

Timothy Bubb, Bradley Tinney, Rachel Kreutzinger, Maxwell Hathaway, Jenna Ullrich, Shane Logue, Daniel Frick, Elena Debold, Alex Ehrensberger, Abbey Salvo
Neal McDonald, Assistant Professor, Department of Visual Arts

Relatively inexpensive, one-click downloadable mobile games are taking the video game industry by storm. Add to that our culture's current infatuation with touch screen gaming, and a new field of research has opened itself up to curious visual arts students. The UMBC Imaging Research Center's Fellowship program provides exceptional visual arts students with an opportunity to push boundaries and experiment with new technologies. This semester, the Fellows have delved into the contemporary world of mobile gaming by designing and producing a strategy game for Apple's iPhone and iPod Touch. The game's experimentation and subsequent capitalization on the device's state-of-the-art GPS navigational system allow for a fusion of the virtual and physical realities, whilst experiencing the fun of a strategy war game. Players will be required to travel around campus to gather resources, set up defenses and order troop movements—effectively turning the world into a virtual battle zone. The Fellows also spent countless hours producing valuable marketing material for the web to generate interest in their pioneering video game experience.

This work was funded by the UMBC Imaging Research Center.

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

Destiney D. Buelto*, Laundette P. Jones*[1]
[1]Department of Pharmacology and Experimental Therapeutics, University of Maryland, Baltimore
Laundette P. Jones, Associate Professor, Department of Pharmacology and Experimental Therapeutics, University of Maryland, Baltimore

Insulin-like Growth Factor I (IGF1) can increase mammary epithelial cell proliferation. Brown adipose tissue (BAT) is an IGF1 target tissue which may also secrete this factor. We hypothesize that BAT can secrete IGF1 into the MG and cause mammary epithelial cell proliferation. We examined whether BAT played a role in mammary tumorigenesis in a mouse model of Brca1-associated breast cancer. Mammary gland (MG) whole mounts and hematoxylin- & eosin-stained (H&E) slides were prepared to qualitatively examine BAT. Uncoupling Protein 1 (UCP1), a widely-used marker for BAT, and IGF1 protein and mRNA were quantitatively examined using immunohistochemistry (IHC) and real-time PCR, respectively. We found a 46-fold increase in mRNA levels of UCP1 in the MG of Brca1 mutant adult mice compared to wildtype mice. Future research will be conducted to examine IGF1 levels in the MG by IHC and to isolate and incubate BAT to determine other secreted factors which may contribute to MG tumorigenesis.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and NIH K12HD043489-06 to UMB.*

Small Molecule Inhibitor of Anti-Apoptotic Proteins, ABT-737, in Glioblastoma Multiforme Stem Cells

Priyanka Bushana
Gary Gallia, Assistant Professor, Department of Neurosurgery, Johns Hopkins University; Avadhut Joshi, Post-Doctoral Fellow, Department of Neurosurgery, Johns Hopkins University

Glioblastoma Multiforme (GBM) is the most common and aggressive form of intracranial malignancies. Median patient survival remains at less than 15 months despite aggressive surgical, chemotherapeutic, and radiotherapeutic treatments. In this study, we hypothesized that part of GBMs' resistance to chemotherapeutics can be attributed to their high expression of anti-apoptotic proteins of the Bcl-2 family; therefore, targeting Bcl-2 would increase sensitivity of GBM cells to chemotherapy. To follow up on this hypothesis, we assessed the levels of Bcl-2 family proteins in GBM cell lines. We were able to conclude that Bcl-2 family proteins were significantly increased in GBMs grown as oncospheres as opposed to adherent serum-grown cell lines. Based on these results, we measured the efficacy of ABT-737, a small molecule inhibitor of these proteins. In addition, we tested the effects of ABT-737 in combination with receptor tyrosine kinase (RTK) inhibitors. The results were in accordance with our observations, as the ABT-737 treatment inhibited the GBM stem cells, but had little effect on the adherent cell lines. Furthermore, combination therapy demonstrated that sunitinib and ABT-737 synergistically inhibited GBM stem cells. These observations suggest that Bcl-2 can be targeted in GBM stem cells and warrants further investigation of ABT-737 in preclinical animal models.

This work was funded by Dr. Gregory Riggins of the Johns Hopkins University.

Analyzing and Expressing the Visual Pigment Genes of the *Astyanax mexicanus*

***Erwin Cabrera**, Joseph Blasic, Megan Porter*
Phyllis Robinson, Professor, Department of Biological Sciences

The *Astyanax mexicanus*, commonly known as the Mexian Tetra has two forms; the surface dwelling form as well as a blind cave form. This study is concentrating on visual pigments of the blind cave form. These visual pigments, known as opsins are G-Protein Coupled Receptors (GPCR's). GPCR's comprise a family of heptahelical transmembrane proteins and are the largest family of proteins with thousands of members predicted in several genomes. One of earliest differences between the two forms of the species is the loss of functional eyes. It is important to establish evolutionarily whether or not these opsins are expressed within the organism, as well as if the proteins are fully functional. This will be achieved by measuring the absorbance spectrum of the heterologously expressed photopigment. The genes coding for the opsins were isolated by PCR from both the surface and cave isoforms and cloned into a mammalian expression vector. We will then express these genes and spectrally measure their absorbance spectrum. In this way we will be able to determine if the genes from the cave isoform are different from the surface species and how these genes are changing in the absence of selection pressure.

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

Analysis of Polymorphonuclear Leukocyte Penetration in Staphylococcus aureus Biofilms

***Keisha M. Carr**, Mutsa Kambarami, Julia Ross*
Julia Ross, Professor and Chair, Department of Chemical Engineering

Each year, hundreds of thousands of people develop infections from Staphylococcus aureus (S. aureus); even with treatment, signs of a staphylococcus infection may remain in the body for the rest of the patient's life. The persistence of these infections may be due to the formation of biofilms, a complex community of bacteria adhered to a surface. Previous research shows that polymorphonuclear leukocytes (PMNs), white blood cells that are part of the immune system, are able to penetrate S. aureus biofilms but are unable to fully eradicate the biofilm. The goal of this project is to examine how PMNs adhere to S. aureus biofilms to better understand why biofilms are persistent. To investigate this phenomenon, we have grown S. aureus biofilms in conditions that mimic the human body. The biofilms were grown for 24 hours at 37°C under flow conditions similar to blood's movement in a vessel. The next step is to quantify PMN adhesion to the biofilm. By staining the PMNs and the biofilm cells, viewing under a confocal microscope and noting the location and number of the PMNs relative to the biofilm, we hope to better understand how PMNs interact with S. aureus biofilms.

This work was funded, in part, by NIH/NIAID R01AI059369, the HHMI Undergraduate Scholars Program at UMBC and the Howard Hughes Medical Institute.

Infant Nutrition and Risk of Celiac Disease

***Patricia C. Castillo**, Maria Sellitto[1], Alessio Fasano[1]*
[1]University of Maryland, School of Medicine
Alessio Fasano, Professor, Departments of Pediatrics, Medicine, and Physiology, University of Maryland, School of Medicine

Unlike other autoimmune diseases, there is a known environmental factor that can trigger the onset of Celiac Disease (CD)—gluten. In addition to this environmental pressure, we postulated that the enteric bacteria ecosystem (defined as microbiome) also plays a role in CD development as it is vital in the general upkeep of the immune system. To explore this hypothesis, we conducted a translational study that investigated the efficiency of primary prevention of early-onset CD in at-risk infants. Two test groups were given two different patterns of gluten introduction into their diet (early vs. late). The groups were monitored over time for antibody and disease development. Analysis of the composition of the intestinal microbiota allowed us to observe the microbial colonization process in at-risk newborns, identifying differences from healthy infants and alterations over time that may act as biomarkers for loss of gluten tolerance. Preliminary results have shown that early exposure to gluten is potentially connected to the onset of the disease. Also, differences in microbiota composition and stability between at-risk and healthy infants have been observed. Overall, manipulation of gluten introduction partnered with a deeper understanding of the microbiome composition can lead to preventative measures against CD development in at-risk infants.

These studies have been partially supported by the National Institutes of Health, grant R21DK078699.

Effects of Zinc Sulfate Intranasal Irrigation on Semiochemical Detection in Mice

Stephanie C. Chan, Asante I. Hatcher*, Lana Zhang, Kurt Krosnowski, Wangmei Luo*
Weihong Lin, Assistant Professor, Department of Biological Sciences

The mammalian olfactory epithelium has the ability to sense a large number of odor stimuli and instigate neural processes in the olfactory bulb that affect an organism's perception and behavior. Previous studies have shown that both the main olfactory epithelium (MOE) and the vomeronasal organ, an olfactory sensory organ, take in complex natural stimuli, causing neural impulses to be sent to the olfactory bulb for signal processing. These natural stimuli contain both semiochemicals and volatile odorants. We sought to determine whether intranasal zinc sulfate injections, which destroy the olfactory sensory neurons of the MOE, would alter semiochemical sensing. Successful intranasal zinc sulfate irrigation would destroy all the olfactory sensory neurons, resulting in anosmic mice with an inability to smell. After injecting zinc sulfate into the nasal cavity of wild type mice, we conducted behavioral tests to observe whether the zinc sulfate treatment was effective. The preliminary results show that most zinc sulfate treated mice showed altered behavioral actions to semiochemicals and odorants.

This work was funded by NIH grants to Dr. Weihong Lin.

Ashkenazi Young Adults' Knowledge, Attitudes, and Beliefs about Carrier Testing

Melissa Chapman
Andrea Kalfoglou, Assistant Professor, Department of Sociology and Anthropology

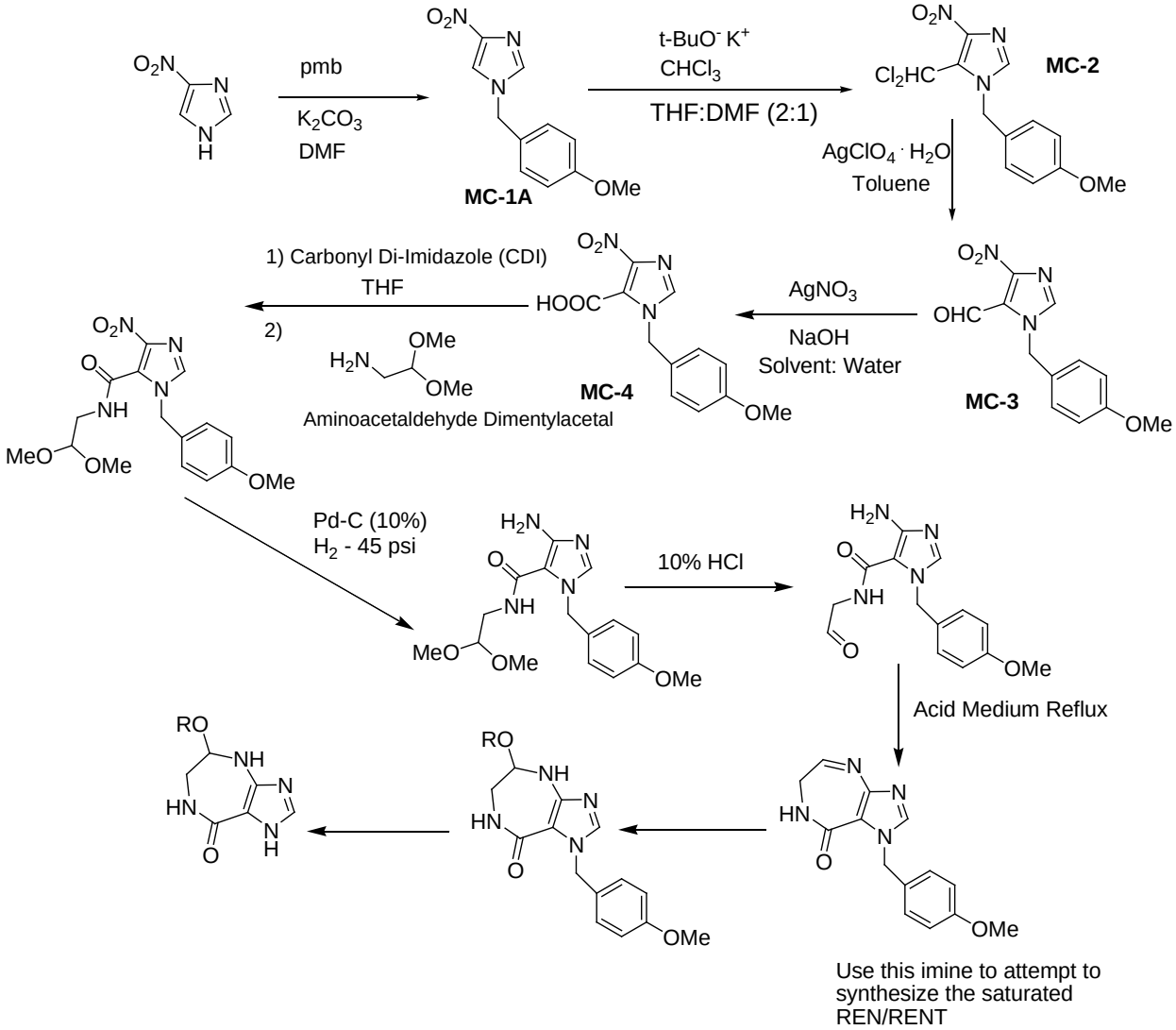
There are two models for Jewish carrier testing. Dor Yeshorim tests young adults and keeps the results in a private database. When a couple starts dating, they contact Dor Yeshorim and provide unique identifiers. If both are carriers for the same genetic disease, they are advised not to pursue the relationship. Test results are not provided. Alternatively, individuals can be tested by a laboratory and receive their results. Diseases on the panel vary in terms of frequency in the population, severity of disease, penetrance of genetic mutation, and age of onset. There is controversy about what diseases ought to be on the panel. Little is known about how young adults feel about testing, whether they are receiving adequate informed consent, why they choose to test, or how they decide between the two models. We conducted eight focus groups with young adults in the Baltimore area. Groups were divided by sex, religiosity, and testing status. None of the groups that had received testing gave much thought to the specific diseases on the panel. Reasons for testing, choice of testing approach, attitudes about informed consent, and thoughts on which diseases ought to be on the panel will be discussed highlighting differences between the sexes, religiosity, and testing status.

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

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

Mohsan M. Chaudhry
Ramachandra Hosmane, Professor, Department of Chemistry and Biochemistry

Cancer and viral infection are the predominant factors for high mortality rates around the globe. 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. 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. My project is aimed at synthesizing the appropriate heterocyclic precursors to the ultimate target RENs/RENTs. The synthesis was started by converting commercially available 4-nitroimidazole to an acetal, which was hydrolyzed to an aldehyde. The aldehyde will then be converted to an imine, followed by reduction of the imine double bond and the removal of the carbonyl group will afford the target product.



This work was funded, in part, by the National Institute of General Medical Sciences of the National Institutes of Health and the Undergraduate Research Award (URA) from the Office of Undergraduate Education.

Beyond the Sophistication of Advanced Statistical Procedures in Psychology

David F. Chen
Anne E. Brodsky, Associate Professor, Department of Psychology

In recent decades, psychology has grown in its ability to address status quo problems. Yet there remains a demand in today's society for faster, statistically reliable, quantifiable results, which has led to ever more advanced statistical software. This presents a paradox as ethical questions regarding the generalizability of psychology cross-culturally sometimes clash with psychology's attempt to advance as a "pure science." Paul Rozin (University of Pennsylvania), in *Social Psychology and Science: Some Lessons From Solomon Asch (2001)*, an article assigned in History and Systems of Psychology at UMBC, discusses this paradox and issues a "plea for balance." Community psychology is one subfield that answers this plea by blending attention to contemporary social problems and cultural diversity, with qualitative and quantitative data collection techniques, driven by research questions, not technology. This poster aims to highlight this under-recognized subfield of psychology as a prime example of the blending of sophisticated software, when appropriate, with utilization of basic, time-tested data collection methods, like observations and interviews. The first author draws together his experience in class and in research team to explore this balance, utilizing examples from a qualitative data set collected by the second author, focusing on Afghan women's resilience and community.

Impact of Images in Advertisements on Older Adults

Danielle Chestang
Judah Ronch, Professor, Erickson School

The effects of the media on adults aged sixty-five and older has been primarily discussed in the context of the devaluing of older women, gender disparities, and images of disability and dependency found in advertisements geared to the needs of the older population. To better understand the age specific media's impact on the older adult population, a questionnaire was distributed to determine if variables such as health status, gender, and ethnic group have a bearing on how mature adults perceive advertisements. A total of sixty residents from a low-income independent living community were surveyed using Kogen's Attitude Assessment that measures self-esteem and self rated health status. In comparison of the preliminary questionnaire and the final questionnaire, we found that most of the female participants' self-esteem and reported self-rated health status increased while the men's self-esteem and reported self-rated health status dropped after viewing advertisements. Due to these results, we conclude that factors such as gender and mobility are paramount in determining how advertisements influence older adults.

This work was funded, in part, by the Summer Research Institute from UMBC's Ronald E. McNair Scholars Program.

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 yet is not well understood. The lamprey is a model system for studying vertebrate locomotion because its spinal cord contains the same types of neurons as its human counterpart, except in smaller quantities. Biological experiments have revealed that the lamprey's swimming motion is modulated by input to the spinal cord from edge cells, sensory organs that measure the body's curvature. The primary goal of our research is to develop and evaluate a mathematical model of the lamprey's central pattern generator of locomotion, implemented as a chain of coupled oscillators, in order to better understand the role of edge cells. We simulated this sensory input by forcing the chain at various positions, one at a time. Using numerical computation techniques, we determined the range of forcing frequencies for which the electrical activity along the spinal cord oscillates with the same uniform and constant frequency as the forcer. Our results have helped us to better understand the effect of chain length, forcing position, and forcing connection strength on entrainment.

This work was initially supported by NSF DMS-0840009 and NSF DMS-0802971 and currently supported by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Effect of Protein Kinase CK2 Blockade on Prostate Cancer Progression in a Mouse Model

Elisia M. Clark*, Gretchen K. Hubbard, Laura N. Mutton*
Charles J. Bieberich, Professor, Department of Biological Sciences

Prostate cancer is a disease of the male reproductive system and typically affects men over the age of fifty. It is the second leading cause of cancer death in men leading to approximately thirty thousand deaths per year in the United States alone. CK2 is a protein kinase that is up regulated in many forms of cancer including prostate cancer, and has been implicated in malignant transformation and aggressive tumor behavior. Protein kinases such as CK2 have been recognized as therapeutic targets for cancer. The goal of this project is to determine the effects of a small molecule CK2 inhibitor on the progression of prostate cancer in the HiMYC mouse model. In a kinase inhibitor trial, cohorts of ten experimental and control mice were treated on a five day on, two day off schedule with a one hundred mg per kg, twice daily regimen for eight weeks. Phenotypic analysis is being done to determine the extent of prostate cancer present in treated and controlled cohorts to determine if CK2 is a viable drug target in prostate cancer. Currently in-gel kinase assays are being performed to determine the level CK2 activity in HiMYC prostate adenocarcinoma.

This research was supported, in part, by a grant from the HHMI Foundation, the HHMI Undergraduate Scholars Program at UMBC.

Determination of Planetary Boundary Layer for Air Quality Forecasting

Jaime C. Compton*, Ruben Delgado, Raymond M. Hoff*
Ruben Delgado, Faculty Research Assistant, Joint Center for Earth Systems Technology

Air quality forecasts rely upon semi-empirical parameterizations within numerical models for the description of dispersion, formation and fate of pollutants influenced by the spatial and temporal distribution of emissions in cities, topography, and weather. The particulate matter (PM) mass measured at the ground level is a common way to quantify the amount of aerosol particles in the atmosphere and is the standard used to evaluate air quality. Remote sensing of atmospheric aerosols in the lower troposphere that affect air quality is done at UMBC, by the Atmospheric Lidar Group. Lidar measurements provide insight into the planetary boundary layer (PBL) temporal structure, height and variability. Regarding air quality, the PBL height determines the volume available for pollutant dispersion and the resulting concentrations and is therefore one of the fundamental parameters in dispersion models. The covariance wavelet technique (CWT) was used to objectively determine the PBL height from the lidar measurements. The results of the CWT were compared to meteorological data from radiosondes to demonstrate the versatility of lidar aerosol profiles to monitor the real-time variation of the PBL. Accurate determination of the PBL using the CWT will allow improved air quality forecasting and understanding of regional pollution dynamics into PM forecasting.

This work was funded, in part, by the Maryland Department of the Environment (Contract Number U00P7201032) and the Joint Center for Earth Systems Technology (NASA Grant NNH04ZY0010C and the 2009 Summer Interns Program).

Modeling the Impact of CNS-derived HIV-1 in the Emergence of Anti-retroviral Drug Resistance

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

The Acquired Immunodeficiency Syndrome, responsible for approximately 2 million deaths each year and caused by the Human Immunodeficiency Virus (HIV), infects an estimated 33 million people with as many as 2.7 million new infections occurring per year. Although there has been much progress in the management HIV, the emergence of drug resistance still poses a major challenge to treatment. To better understand the source of the viral mutants, studies to investigate the emergence drug resistant strains of virus derived from the Central Nervous System (CNS) have been carried out. To this end, we are carrying out computer modeling of HIV infection using a two-compartment model consisting of CNS located virus and systemic virus. We have found that, in a single compartment, the use of three therapeutics is highly effective at reducing the likelihood of drug resistance emerging and that the effect adding a second therapeutic is more significant than that of a third, as is seen in a clinical setting. However, if not all drugs are present at their optimal concentrations triple-resistance becomes highly likely. Ongoing work is expected to show a strong relationship between the degree of drug heterogeneity between compartments and the likelihood of drug resistance emerging.

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

Computational Methods for the Masking of Transcription Factor Binding Sites in Genomic Sequences

Joseph P. Cornish
Ivan Erill, Assistant Professor, Department of Biological Sciences

The ability to identify transcription factors in genomic sequence data is an important step in the improvement of our understanding of transcriptional regulation. Artificial neural networks are strongly suited to this task due to their advantages over more traditional approaches. Neural nets make few initial assumptions about the nature of the data, such as positional independence, and are also able to sample from non-uniform backgrounds, as well as the use of abstract data types derived from sequence data. Neural nets must first be trained by the presentation of positive i.e., “is” and negative i.e., “is not” training sets. In this case, the negative training set contains all genomic data except any known binding sites present in that sequence. The challenge lies in developing methods to remove these sites without disrupting or biasing local attributes of the genomic sequence in the process. To do this, three methods were designed here: a random swap method, a stochastic-information based swapping method, and a greedy information content based algorithm. The efficiency among these three methods and their underlying caveats are discussed here.

Driving Forces behind Himalayan Glacial Melt

Brandon G. Cottom
Ali Tokay, Department of Geography and Environmental Systems

In this study we take a look at the driving forces behind glacial melt in the Himalayas, through the use of a simple model that is driven by atmospheric remote sensing data. There are many uncertainties associated with the measurements including low spatial resolution and possible backscatter of the highly mountainous region. We have shown that a 10 percent change in albedo has a large impact on glacial melt. Also interannual precipitation changes have little effect on the magnitude of glacial melt. Although there is still much work to be done accounting for refreezing factors and latent heat transfer, gathering improved data of direct mass balance measurements as well as surface albedo. This is important to the billions of people living in river catchments sourced in the Himalayas, as well people living in the mountains who could be affected by glacial melt.

This work was funded in part, by the Goddard Earth Sciences and Technology Center.

Development and Optimization of an Iso-octene Production Scheme

Jonathan A. Bollinger, Brian P. Cottrell, Benjamin D. D'Alessio, Akanksha W. Raja, Amy Tsai
Mariajosé Castellanos, Associate Professor, Department of Chemical and Biochemical Engineering

Iso-octene is a high-octane gasoline blending product that is an appealing product for oil refineries to produce, since iso-octene is produced by using excess Methyl tert-Butyl Ether (MTBE), which would otherwise be viewed as a waste product in the refinery process. We conducted an economic feasibility study for expanding an existing MTBE-production facility with an output of 3500 Bbl/day of MTBE to generate 3000 Bbl/day of iso-octene, a more value-added product than MTBE. The process design involved six unit operations (two reactive and four separation units) and was modeled using ASPEN Plus. Of particular interest was the accurate determination of two reactive unit efficiencies, which were modeled in two dimensions, accounting for concentration and temperature gradients. Also studied was the use of water, as opposed to more expensive traditional additives, as a selectivity enhancer in the dimerization of isobutene to iso-octene (isobutene is a product of MTBE decomposition). Based on the ASPEN model results, the optimized system produces highly pure 98.5 percent by weight iso-octene and methanol products for a capital investment of less than $12M and a payback period of less than six years.

Titan Climber

Chris Cromwell, Michael Marcellino, Dale Case, Kevin Kohri, Alex Pol
Neal McDonald, Assistant Professor, Department of Visual Arts

Titan Climber is a game created in Adobe Flash CS4. In it, a Spartan-like character tries to climb a mythical Titan and kill it. The character will avoid and destroy obstacles, kill attacking creatures, and hurt the monster at certain critical points before reaching the top, where he can then attempt to finally slay the beast. Titan Climber imagery is drawn from Greek Mythology; monster design incorporates themes from alchemy and other ancient natural philosophies. In its animations, the game mixes well-drawn realistic movement and environments that interact with the player and cartoonish creatures. We wanted to design a short game that could be played at any time. While a storyline may be implemented, the base theme for game play will remain the same. Overall, Titan Climber is made to be a memorable adventure that any person can embrace and enjoy!

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. Atomic force microscopy, electron paramagnetic resonance spectroscopy, and a fibril-sensitive dye-binding assay have been used to monitor the structural evolution of the Cu:Aβ species. Our data indicate slow beta-sheet formation kinetics in copper containing samples in addition to a difference in morphology between Cu-containing and metal-free Aβ. The effect of these structural changes on neurotoxicity is not known. We will determine neurotoxicity of these Cu:Aβ complexes. Correlation of neurotoxicity with Cu:Aβ structure will aid drug intervention strategies for AD.

*This work was funded, in part, by the Alzheimer's Association (IIRG-07-58211 to V.A.S.), an Undergraduate Research Award from the UMBC Office of Undergraduate Education and NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC.*

Development of an Assay to Determine the Affinity of the Snake Venom Protein Crotamine for Heparin

Thomas Dakermanji, Maria Vitery*, Richard Karpel*
Richard Karpel, Professor, Department of Chemistry

The protein crotamine is a toxin from the venom of the South American rattlesnake (*Crotalus durissus terrificus*). It is a nucleic acid binding protein with a number of functions, including promoting necrosis of muscle cells. It has the ability to deliver DNA into cells, as well as a unique cell-penetrating property that causes it to localize in the nucleus, giving it the potential to be utilized as a drug delivery device. Cell penetration is believed to follow interaction of crotamine with cell surface heparan sulfate proteoglycans. Our experiments focus on the binding of crotamine with heparin, a highly-sulfated carbohydrate chain. In order to determine the affinity of crotamine for heparin, a substance which has minimal spectroscopic properties, we have utilized the dye azure A, a probe for free heparin concentration. Upon binding to heparin, the visible absorbance spectrum of azure A changes. In the presence of crotamine however, heparin will preferentially bind to crotamine and thus become unavailable for binding with azure A. Our assay utilizes the difference in absorbance of azure A when crotamine is present and absent to determine the concentration of free heparin in solution, and subsequently calculate affinities.

The Role of Interferon Gamma on the Induction and Suppressive Activity of Myeloid-Derived Suppressor Cells

Kimberly M. Daniels*, Chinonyerem Okoro, Pratima Sinha, Suzanne Ostrand-Rosenberg*
Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

Myeloid-derived suppressor cells (MDSC) are in most patients and mice with cancer and suppress their immune system by producing nitric oxide (NO) and arginase. It has been proposed that IFNG is required for activation of these molecules. To determine if IFNG is essential, $IFNGR^{-/-}$, $IFNG^{-/-}$, and wild type BALB/c mice were inoculated with 4T1 cells. Tumor progression, MDSC accumulation, T cell suppression, and MDSC-macrophage cross-talk were measured. Tumors grew more rapidly in $IFNGR^{-/-}$ and $IFNG^{-/-}$ mice vs. wild type BALB/c mice. MDSC from $IFNGR^{-/-}$ mice, $IFNG^{-/-}$ mice, and from wild type mice equally suppressed T cell activation. MDSC suppress innate immunity through their production of IL-10 which is up-regulated by cross-talk with macrophages, and through their down-regulation of IL-12 production by macrophages. IL-10 and IL-12 production by MDSC and macrophages, respectively, was similar regardless of the presence of IFNG, demonstrating that cross talk between MDSC and macrophages is not dependent on IFNG. These findings demonstrate that IFNG is not required for the generation or suppressive activity of MDSC and suggest that IFNG limits tumor growth by activating immune effector cells including $CD8^{+}$ T cells and macrophages.

This work was funded in part by NIH RO1CA115880 and RO1CA84232.

Developing an Intelligent Tutoring System for CS1 Students

Robert T. Deloatch, Amy Ciavolino, Eliana Feasley, Iris Kwok, Mary Lewis, Christopher Mai*, David Walser*
Marie desJardins, Associate Professor, Department of Computer Science and Electrical Engineering

Intelligent tutoring systems (ITSs) are automated pedagogical programs that provide students with a one-on-one tutor, allowing them to spend more time on their weaker areas of the subject matter. We are developing an ITS that uses RUR-PLE, a computer programming virtual environment, to teach CS1 students the concept of iteration in Python and be presented with a visualization of that same code. Current ITSs provide insufficient feedback for an incorrect answer by only explaining the proper solution for a given problem. Our system diagnoses why the student made a mistake, identifies the gap in the student's knowledge, and presents them with a detailed explanation of why the submitted solution does not solve the given problem. We are developiing a student model that adjusts itself to provide each student with unique problems to stress particular areas of weakness. Our ITS aids the learning of introductory level computer science students through the RUR-PLE interface and machine learning algorithms and contributes to the improvement of computer science education.

This work was funded, in part, by NSF CAREER #0545726.

Identifying Components of the AMPK Pathway in *C. elegans*

Anupama Divakaruni, University of Maryland Baltimore County
Dr. Katherine Cunningham, Post Doctoral Fellow, Department of Physiology, University of California San Francisco; Dr. Kaveh Ashrafi, Associate Professor, Department of Physiology, University of California San Francisco

AMP-activated protein kinase (AMPK) is a key sensor and regulator of energy balance, shutting down energy consuming processes and turning on energy generating processes when ATP levels are low. Indirect activation of this kinase complex is thought to mediate the beneficial effects of metformin, a commonly prescribed drug for type 2 diabetes. The molecular mechanisms through which metformin activates AMPK and AMPK targets are not fully understood. Here, we take advantage of the genetic amenability of *C. elegans* and the observation that it is responsive to phenformin, a metformin derivative, to analyze these mechanisms. We noted that AMPK deficient *C. elegans* are hypersensitive to the effects of phenformin in that they go into growth arrest while wild type animals manage to continue growth, albeit slowly. We speculate that the growth arrest is because AMPK deficient animals cannot bypass the energy deficit that is caused by disruption of mitochondrial membrane potential by phenformin. Using RNAi to inactivate genes, we are systematically searching for other genes, which when inactivated, similarly sensitize animals to the effects of phenformin and may thus define molecular components that link phenformin to AMPK and its targets.

HIV-1 Packaging is Regulated by Long-Range Interaction between the U5 and AUG Regions and its Effect on NC Binding Sites

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

The Human Immunodeficiency Virus (HIV) is a retrovirus that can develop into Acquired Immunodeficiency Syndrome (AIDS), a rapidly spreading epidemic. Our lab's overall interest is to understand how the virus selectively assembles and packages its unspliced RNA genome against the host cellular RNA pool. and biological studies suggest that the 5’ untranslated region (5’UTR) serves as a *cis* acting packaging signal by interacting with the nucleocapsid protein (NC) domain of the*gag* to mediate genome recognition and encapsidation. The specific structure of the 5'UTR is believed to play a key role during genome packaging. Our lab has direct Nuclear Magnetic Resonance (NMR) spectroscopy evidence showing that the AUG region sits in equilibrium between forming a stemloop (SL4) and forming a long-range interaction with the upstream U5 region. To study these two conformations of the 5'UTR, we did mutagenesis work in the AUG region to either stabilize the stemloop structure thus inhibiting long-range interaction or to stabilize the U5-AUG long-range interaction. We then performed various assays to characterize these conformers. Our results indicate that the U5-AUG long-range interaction promotes dimerization of the 5'UTR and thereby acts as a control of HIV-1 genome control and dimeric packaging.

This research is supported, in part, by NIH grant No. 3R37AI30917-19 and the Howard Hughes Medical Institute.

"*The Humane Metropolis*:" Using Environmental Initiatives to Benefit Urban Neighborhoods

Katie L. Dix
Nicole King, Assistant Professor, Department of American Studies
Edward Orser, Professor, Department of American Studies

Environmental and sustainability issues have recently generated more interest from the mass public, even in urban areas where there are many social and economic challenges. Some city neighborhoods are making a conscious effort to "go green" by implementing environmental programs and initiatives within their communities, thus creating what William H. Whyte referred to as a "humane metropolis." Whyte's concept of the humane metropolis extends beyond solving the environmental issues of a society, utilizing such solutions as ways to improve other aspects of community life. The Reservoir Hill Improvement Council and the Druid Hill Community Development Corporation are among many Baltimore organizations that have designed and implemented programs in an attempt to cure some of the social ills associated with obesity, poverty, and violence that may be linked to poor air quality, pollution, noise and lack of recreational space in their neighborhoods. This study evaluates the strategies, resources, and goals of these groups and analyzes how greening projects are implemented in order to produce both environmental and social solutions. Through environmental programs and greening initiatives, urban communities can address both social and environmental justice issues, including health, recreation, employment and education.

Computer Visualization of Optical Network Behavior

Han Dong
Yung-Jui (Ray) Chen, Professor, Department of Computer Science and Electrical Engineering

Today's optical communication networks are based on wavelength-division multiplexing (WDM), in which multiple wavelengths of signals are transported in each fiber. The network topology is mesh, in which multiple fibers intersect at a node and WDM signals are switched at each node to the proper destination. The methods to intelligently optimize network resource allocation are an important research topic in optical network management. My research involves the designing and coding of a visualization application that will be utilized to study optical network behavior under the Generalized Multi-protocol Label Switching (GMPLS) management model. The GMPLS management model uses a set of control parameters to optimize the processes to yield the most efficient operation of the network. The network research is to study and identify the proper management model and control parameters. The intention of the visualization program is to show how traffic is distributed and travelling through the network. It will provide much insight on how the control parameters perform and can suggest how to adjust the parameters to achieve improved traffic engineering.

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

Production of Styrene from the Dehydrogenation of Ethylbenzene

Jenny R. Donoghue, Michael K. Boone-Felder, Jerry A. Flynn, Kirbi M. Hawkins, Robert M. Henderson
Mariajose Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

We have conducted a feasibility study for the production of 600 million pounds of Styrene monomer per year. It is proposed that Styrene monomer will be produced by the dehydrogenation of Ethylbenzene using the Smart Process created by UOP Lummus. This process dehydrogenates Ethylbenzene in the presence of steam and uses the addition of oxygen to help drive the reaction towards the products to reach maximum conversion. The Smart process was chosen for its efficacy, high selectivity of Styrene monomer, and high yield with a conversion between 95 and 99 percent. The feasibility study was accomplished through computer-aided modeling, process development, and analysis of both process equipment and operation costs. In order to combat the decline for Polystyrene in the United States, other markets and production locations were considered. It is expected that two reactors, one boiler, two heat exchangers, one gas compression chamber, and three distillation columns will be used to meet the target production. The final design shows optimizations that will minimize operating and capital cost while producing high quality Styrene monomer.

Semi-Automatic Method for Mutation Extraction of Cancer Mutations from the Literature

Emily K. Doughty*, Attila Kertesz-Farkas, Olivier Bodenreider*[1]*, Gary Thompson, Asa Adadey, Maricel G. Kann*
[1]National Library of Medicine
Maricel G. Kann, Assistant Professor, Department of Biological Sciences

Associating mutations with disease phenotypes is fundamental for developing novel tools for diagnosis and prognosis of cancer. Most of the mutation-phenotype relationships are buried in large biomedical literature databases such as PubMed and their access is complicated by the exponential growth of these databases. Several easy to retrieve and classified mutational databases (such as OMIM and SWISS-PROT) are currently obtained manually, a slow process resulting in a limited number of cancer mutations in such databases. Here, we propose to develop fast computational methods to effectively extract these mutations from biomedical literature. We introduce “Extractor of MUtations” tool, EMU, an automatic text-mining tool to extract disease mutations from PubMed abstracts and applied to find all breast cancer mutations. After manual curation we confirmed that EMU correctly identified 157 unique mutations related to breast cancer with 63 percent of precision. Eighty-three of these mutations were not in the current manually constructed disease mutations databases and we are now making them publicly available from our website (bioinf.umbc.edu/dmdm). To improve precision, we propose a semi-automated method combining EMU with manual curation that increases the speed of curation in orders of magnitude with perfect precision.

This work was supported by the National Institutes of Health (NIH) [1K22CA143148 to M.G.K (PI); R01LM009722 to M.G.K(collaborator)]; by an appointment to the Research Fellowship Program for the Centre for Devices and Radiological Health administrated by the Oak Ridge Associated Universities through a contact with the U.S. Food and Drug Administration; and in part by the Intramural Research Program of the NIH, National Library of Medicine.

Influence of Adhesive Ligand on Mechanical Properties of Polyethylene glycol Hydrogels

Rohan G. Durbal, *Silviya P. Zustiak*
Jennie B. Leach, Assistant Professor, Department of Chemical and Biochemical Engineering

Polyethylene glycol (PEG) hydrogels are an excellent choice for tissue scaffold applications because they are inert to non-specific protein adsorption, biocompatible, and hydrophilic. However, since the hydrogels are inert, compounds such as adhesive ligands in the form of short peptide sequences or whole proteins must be added to the hydrogels to allow for cell attachment, growth, and proliferation. To date, it has been broadly assumed that the addition of a small amount of ligands does not interfere with the bulk physical properties of the scaffold. However, in this work, we showed for the first time that the covalent incorporation of certain adhesive ligands can alter the mechanical and transport properties of the PEG hydrogels and that the extent of the alteration would depend on the ligand type and concentration. The mechanical properties of the hydrogel studied were swelling ratio, mesh size, and storage modulus, the transport property was diffusion. The investigation involved the most widely used ligands in tissue engineering applications, namely RGDS, YIGSR, and IKVAV. Overall, hydrogels with covalently incorporated adhesive ligands had lower swelling ratios and mesh sizes, a higher storage modulus and a lower diffusion coefficient than hydrogels without adhesive ligands.

This work was funded, in part, by the Henry Luce Foundation, UMBC and NIH-NINDS (R01NS065205) grant.

Analysis of the Formation, Stability and Toxicity of Myoglobin Amyloid Fibrils

Brittany J. Earnest
Theresa Good, Professor, Biochemical and Chemical Engineering Department

In over twenty diseases, human proteins are found to fold abnormally into amyloid fibrils. These structures tend to be accompanied by toxicity *in vivo*. We hypothesized that structure and stability of these proteins correlates with their toxicity. By examining this relationship we hoped to uncover strategies to prevent amyloid protein toxicity and eventually treat disease. This project focuses on one model amyloid protein, apomyoglobin. Congo red binding, TEM and circular dichroism measurements were used to determine the amount of amyloid fibril structures formed under varying conditions. Optimum fibril formation conditions were determined. Fibrils were unfolded completely at approximately 1.5M guanidine hydrochloride at 65^{0}C. MTT stain was used to assess the toxicity of apomyoglobin (AMb) fibril species. SY5Y cells treated with 4mg/mL AMb fibrils were approximately 40% less viable than cells treated with PBS and medium alone. While this relatively unstable species has demonstrated to be toxic, further experiments are required to determine if correlation exists between toxicity, instability, and fibril formation of both myoglobin and other amyloid proteins. These results could contribute to drug discovery efforts for Alzheimer's, Parkinson's, Transmissible Spongiform Encephalopathies and other amyloid diseases.

This work was funded by NSF CBET O828009.

NMR Structure of the Core Packaging Signal of HIV-1

Kedy Edme, *Xiao Heng*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

When the Human Immunodeficiency Virus (HIV-1) assembles in a host cell, two copies of its genome are packaged by the Nucleocapsid (NC) domains of the Gag polyproteins. More specifically, the packaging process is mediated by the interaction of NC protein with a highly conserved 5'untranslated region (5'-UTR). Research has shown that the dimerization of the viral genome is required for effective packaging for exposure of the NC biding sites. Current efforts are guided towards using Nuclear Magnetic Resonance (NMR) to solve the structure of the packaging signal in order to gain more insight into the packaging mechanism. However, the size of the 5'-UTR makes it difficult to interpret its NMR spectra. Based on our knowledge of the 5'-UTR, we have decided to dissect it into two smaller constructs, core 1 and core 2. We believe that core 1 is a possible structured three-way junction that promotes long-range interactions within the RNA. Using deuterium-labeling strategy, we have synthesized H^1-Adenine, deuterium-labeled Cytosine, Uracil, Guanine and fully protonated Core1 RNA samples. High quality NMR data have been obtained. Analysis of these data will allow us to better understand the packaging mechanism of HIV-1.

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

Afro-Porteño Identity Today

Vivian O. Ekey
Sara Poggio, Professor, Department of Modern Languages and Linguistics

What is Afro-Argentine Identity? To address this question, one must first consider the mysterious history of people of African descent in Argentina. The city of Buenos Aires offers important historical statistics. In 1806 the Afro-Argentinean population seems to have been at its peak, at 30.1 percent. By 1887, this population had dwindled to only 1.8 percent. Today, Argentina's census has no category to account for people of African descent. Existing research has brought to light two key facts. First, there are living Afro-Argentines descendants of the original slaves brought to the Rio de la Plata Region (Argentina, Paraguay and Uruguay). Secondly, these descendants are actively seeking social and political recognition. Apart from the colonial-descendant group of Afro-Argentines, there also exist populations of Afro-descendant immigrants in Buenos Aires. My research has an exploratory design which includes participant and non participant observation of Afro-Argentine cultural events as well as personal interviews with Afro-Argentine leaders. Taking into account the population of colonial-descendant Afro-Argentines, as well as immigrant groups of African descendants, my research identifies factors which unite and divide these groups – making a collective identity difficult to define. My conclusions bring light difficulties that Afro-Argentine leaders may face when speaking on behalf of a diverse population.

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

Characterizing Fracture Force of Hyoid Bone: Investigation of Suicides and Homicides

Oluwatimilehin O. Fadiran, *Ozell Sanders, L.D. Timmie Topoleski*
L.D. Timmie Topoleski, Associate Professor, Department of Mechanical Engineering

The fracture of the human hyoid bone may occur due to excessive forces to the neck region. This may be why fracture of the hyoid bone is seen more often in strangulation cases than in suicides from hanging. In a previous study conducted at UMBC, dissected hyoid and thyroid bones were tested in bending, and effects of specimen age and loading rate on fracture were determined. This study showed the slower loading rates resulted in larger stress to failure and older specimens required greater fracture force due to calcification. Further testing is required and hyoid and thyroid bone specimen from cadavers will be obtained from The Office of the Chief Medical Examiner for the State of Maryland. Once the hyoid/thyroid bone specimens are obtained, they will be fractured initially by hand. These fractured bones will be imaged with a Micro-Computed Tomography (MircoCT) scanner, before and after fracture to determine the likely location of failure in these specimens. With this determined, a protocol will be created to perform bending tests on these specimen to quantify the fracture force.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR P34 08663 National Research Service Award to UMBC.*

The Megaron at Pylos: A New Interpretation

Jarrett L. Farmer
Michael F. Lane, Adjunct Assistant Professor, Department of Ancient Studies

The Late Bronze Age (1500-1100 BCE) Greek Palace of Nestor at Pylos contains a room at its core with a central hearth, a vestibule, and a porch, to which archaeologists give the Homeric label “megaron,” that is consistently described as a “throne room.” Closer attention opens this label and implicit interpretation to question. During field school last summer, I visited the Palace of Nestor and related museum, and I noticed the close attention that archaeologists had paid to the palace’s other rooms. In contrast, the “throne room” idiom implies an uncritically assumed vision of kingship that does not explain the functioning of social power on the basis of archaeological evidence. In order to correct this fundamental error in method I conducted a detailed study of the Pylos megaron, paying close attention to its features and associated finds, and to other areas in the palace, and compared them with contemporary megara at Tiryns and Mycenae. In the process, I demonstrated how the archaeological record warrants quite different interpretations of the megaron, and by extension, certain models of power in Mycenaean society. In doing so, I hope to have shown that Mycenaean society was more complex than has so far been assumed.

This work was funded, in part, by the Christopher Sherwin Award from the UMBC Department of Ancient Studies, and through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Investigation of Structure-function Relationship of HIV-1 Reverse Transcriptions by Mass Spectrometry

Laurette Femnou, *Joshua Wilhide*
Daniele Fabris, Professor, Department of Chemistry and Biochemistry

Reverse Transcriptase (RT) is an important enzyme in the HIV-1 life cycle, which converts the virus' RNA genome into DNA. DNA then enters the nucleus and integrates itself into the genome. Understanding the mechanism of this enzyme is crucial to support the design of inhibitors capable of blocking reverse transcription and consequently viral replication. In this direction, my group is developing mass spectrometry (MS)-based approaches to investigate the structure-function relationship of HIV-1 RT. One of the requirements for MS analysis is that samples must be devoid of any non-volatile salts, such as those containing sodium and potassium. For this reason, my project consists of desalting any reagent necessary for the study, including commercially available RT. Samples were cleaned up either by ultra centrifugation or by high performance liquid chromatography (HPLC). The next step of the experiment will consist of performing a reverse transcription reaction in NH_4AcO buffer. Direct MS analysis of the reaction mixture will be expected to enable the observation of the RT complex with the substrate. This assay will constitute a new tool for screening the activity of candidate RT inhibitors and will provide us with new insights into the mechanism of action of this critical viral enzyme.

This work was funded through the National Institute of Health (2R01GM064328) and the National Science Foundation (CHE-0439067).

Genome Wide Association Tests for Age-Specific Immunocompetence in *Drosophila*

Christopher H. Ferguson, ***Arunkumar Junuthula***, ***Sameen Raza***, ***Michael Topper***, ***Won Woo***, *Nebyat Yonas*
Jeff W. Leips, Associate Professor, Department of Biological Sciences

While both genetic and environmental influences are known to affect this decline, the genetic basis of natural variation in age-specific immunosenescence, the age related decline in immune system function, is unknown. In this project we report the results of genome wide association tests to identify natural polymorphisms influencing the age-specific ability to clear infection, using 40 lines of the Drosophila Genetic Reference Panel. We tested the ability of virgin males and females from each of the 40 inbred lines to clear infection at one and four weeks of age. Individual flies were microinjected with a standard concentration of streptomycin resistant strain of *Escherichia coli* at each age. Flies were given 24 hours to mount an immune response to the infection. The surviving flies were homogenized and plated on streptomycin plates and the colonies were counted after 24 hours of incubation. The colony count enables us to assess the ability of the *Drosophila* to clear the infection. So far, the analysis of one week genome wide association tests has provided fifteen significant SNPs. We compare these results with those from four week old flies to test the hypothesis that the genetic basis of variation in immunocompetence changes with age. Due to the high conservation in genes known to regulate innate immunity in flies and humans, our results have potential medical applications.

Inflammation Induces Myeloid-Derived Suppressor Cells in the C57BL/6 Mouse Model

Phillip J. Fitzgerald*, Daniel W. Beury, Suzanne Ostrand-Rosenberg*
Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

Inflammation contributes to tumorigenesis and promotes tumor progression through various mechanisms. One of these mechanisms involves preventing the host's immune system from recognizing and eliminating transformed and malignant cells. Myeloid-derived suppressor cells (MDSC) constitute a major cell type that blocks anti-tumor immunity. MDSC are a heterogeneous population of immature myeloid cells that are induced by tumor-secreted factors. MDSC contribute to tumor progression by suppressing both innate and adaptive immunity through various mechanisms. Inflammatory conditions have been shown to increase MDSC in BALB/c mice with mammary carcinoma. Because different MDSC populations are induced in different strains of mice, we are determining if inflammation has the same inducing effect in tumor-bearing C57BL/6 mice. Here, C57BL/6-derived melanoma cells (B78H1) and mammary carcinoma cells (AT3) were transfected with a plasmid containing the gene for the pro-inflammatory cytokine interleukin-1β (IL-1β). In the future, these cells will be assayed by enzyme-linked immunosorbent assay (ELISA) for IL-1β expression. Additionally, C57BL/6 mice will be challenged with either IL-1β-tranfected tumor cells or corresponding non-transfected tumor cells, and tumor progression and MDSC accumulation will be analyzed. If inflammation does promote tumor progression, then mice bearing IL-1β-expressing tumors will exhibit increased tumor progression and MDSC accumulation relative to mice bearing control tumors.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC, NIH R01 CA 115880, and NIH R01 CA84232.*

"Water and Ruins"

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

"Water and Ruins" is a nature film that lets nature speak for itself. Unlike traditional documentaries, no human subjects are filmed and no narrator is used. The film offers an escape from a man-made world that has become largely inescapable. In "Water and Ruins," only traces of human civilization remain. Two dilapidated structures are seen as they disintegrate into the woods around them. This is paired with shots of waterfalls, streams, and lakes. To avoid monotony, filmmaking techniques are used to stimulate the viewer's senses. In one sequence, the camera tilts to follow a river as it cascades down Swallow Falls. In a slow motion shot, water swirls through rapids and spatters against a jagged boulder. At the onset, I wanted to portray the impermanence of human civilizations. I sought to film a visual representation of my ideas. In several sequences, the images of ruins are slowly replaced by images of flowing water. The land is being cleansed of man-made dwellings. The world is returning to its original pristine state. My hope is that viewers will see "Water and Ruins" as the re-birth of the natural world.

Computational Modeling of Atomic Force Microscopy Tip Loading and Unloading of a Biological Cell

Joshua J. François, *Ihab Sraj*
Charles Eggleton, Professor, Department of Mechanical Engineering

Atomic Force Microscopy (AFM) is a research instrument used to study the mechanical properties of biological cells. The tool consists of a cantilever beam with a specified tip. A laser beam detection system measures the deflection of the cantilever beam after AFM tip indentation and unloading. The load experienced by the AFM tip, and hence the cell, is plotted as a function of AFM tip position. This indentation curve provides insight on the mechanical properties of the cell. This data can then be used to identify diseased cells. A model is used to analyze the effects of cellular adhesion to a substrate on the AFM tip indentation curve. Adhesion of a cell to a substrate has been modeled. A steady state shape for the cell is being determined. Current results suggest that a steady state shape can be found with the existing model. After this determination, an AFM tip will be included in the model as an applied force over a specific region of the cell. Simulations will then be performed with an AFM tip and various cell parameters and conditions. This work offers the potential to significantly improve the accuracy of cellular property measurements for medical diagnoses.

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

Game Development Club’s Games

UMBC Game Developer's Club
Neal McDonald, Professor, Department of Animation & Interactive Media

The UMBC Game Developer's Club has created two video games this year. One of the video games is in three dimensions and the other is in two dimensions. Every year since the club formed, members have created video games for the purpose of educating themselves in the game development process. The students employ a variety of coding methods and engines. This year the 3-D team used an engine worked on by Elizabeth Baumel and coded in XNA. Elizabeth is the 3-D project lead for this year. The game she and her team created is called World Weaver. The game involves collecting particles and creating worlds and stars with the particles. Jonathan Moriarity is the 2-D project lead for this year; his game is One Hit Wonder. One Hit Wonder is coded using a game engine, GWAIN. This engine was worked on by past members of the Game Developer's Club. In One Hit the main character, Wonder, has a fist that can take out bad guys with one hit.

A Review of Educational Materials for Parents of Food Allergic Children

Wendy M. Gaultney, *Amy Hahn, Linda Jones Herbert*
Lynnda M. Dahlquist, Professor, Department of Psychology

The purpose of this project was to identify the information that physicians recommend that parents of children with food allergy should know. Food allergies affect approximately six to eight percent of children in the United States (Sampson, 2005). Parents of food allergic children often are responsible for avoiding allergens in an effort to prevent potentially life-threatening allergic reactions such as anaphylaxis. Consequently, it is crucial that parents understand the illness and its treatment. However, there are no comprehensive tests of food allergy knowledge. This study is the first step in constructing such a measure. Existing food allergy educational materials designed for parents, including books, informational websites, and pamphlets, were reviewed in order to identify the most commonly addressed topics. The resulting comprehensive list of information was organized into the following domains: Diagnosis, Diet, Cross-Contamination, Reading Labels, Treatment, Anaphylaxis, Epinephrine (e.g., Epipen), Away from Home and Course of Illness. Four pediatric allergists will rate each informational item in terms of how important it is for parents to understand, using a four-point Likert scale. The information determined to be of the greatest clinical importance will serve as the content for the future construction of a food allergy knowledge test for parents.

Cultural Effects on the Gay Male Lexicon

G. Scott Gautney
Thomas T. Field, Professor, Department of Modern Languages and Linguistics

There is only a rudimentary understanding of the ways in which sexuality and culture interact in structuring spoken discourse. This study is an exploration in qualitative sociolinguistics which focuses on homosexual men in France and America. An interview was designed to elicit lexical (or word-based) responses, specifically the lexicon of these men as relates to sexuality itself. As such, certain questions were designed to evoke the words that homosexual men in these two cultures use to talk about male sexuality. In addition, each participant discussed his attitudes towards these words. The results are compared cross-culturally so as to determine whether there is a difference between French and American speakers as regards the type of words used and their attached significance and whether or not any differences could be correlated to culture. The linguistic problems addressed in this study reflect continuing and evolving sociopolitical issues in these two countries.

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

Gender and Sexual Identity in the Pursuit of Asylum

JoAnna M. Gavigan
Carole McCann, Associate Professor, Department of Gender and Women's Studies

The *Matter of Toboso-Alfonso*, made precedent by Attorney General Janet Reno in 1994, allowed homosexuals to apply for asylum as members of a particular social group. As a result of this decision, thousands of LGBT immigrants have applied for asylum in the United States to avoid facing persecution in their home countries. In order to be granted asylum on the basis of sexual orientation, however, applicants are required to establish proof of their sexuality. This process is problematic as decisions in these cases often rely on stereotypical understandings of both sexual and gender identity. This research analyzes both asylum judges' decisions and the literature that informed these decisions, paying particular attention to the ways in which sexuality and gender are constructed. Appeals of asylum decisions brought by lawyers and advocacy groups are examined to contrast the courts' understandings of homosexuality with those of advocacy groups. By contrasting the two frameworks from which these groups are working, this research examines how the asylum process can misconstrue the gender and sexual identity of applicants.

Variations in Perceptions of Sexual Misconduct by Gender

Erick S. Geil
Dr. Ilsa Lottes, Associate Professor, Department of Sociology and Anthropology

A sample of 1,400 students were given surveys and asked to rate eight different vignettes depicting possible sexual misconduct between two individuals. Four versions of the survey controlled for all possible gender pairings in the scenarios. Only one vignette failed to show a significant difference between male and female responses, and only one other failed to show a significant difference between the interaction types (based on gender of the actor and subject of the vignette). All but three vignettes demonstrated significance in the interaction between gender of the respondents and gender of the actor/subject at the $p<.05$ level. Findings are discussed with respect to implications for double standards relating to both gender and sexual orientation, limitations of the study, and the need for future research investigating questions raised.

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

Promoting Healthy Eating Among Children

Shellon George, Stephanie Gituku, Phillip-Alexander Downie
Andrea L. Kalfoglou, Assistant Professor, Department of Sociology/Anthropology

Childhood obesity is a growing concern in the United States. Obesity in childhood contributes to adulthood chronic diseases such as heart disease and diabetes. New methods must be developed to change children's eating and exercise habits. We developed an interactive health exhibit where children and their parents were introduced to the food pyramid and healthy foods. Children were asked to place pictures of various foods in the correct category and were also asked to create a healthy lunch by choosing from a variety of foods. Parents were provided with a pamphlet on the problem of child obesity and proper diet and exercise information for children. This exhibit was presented in March 2010 at Port Discovery Children's Museum during its monthly Healthy First Saturday health fair. The intervention was evaluated by the children, their parents, museum staff, and a public health faculty member from UMBC. Constructive criticism and suggestions for improvement were integrated into the intervention before it was presented again in April 2010. Information learned from this intervention may be used to improve school-based and museum-based obesity prevention programs.

Cloud-CubeSat: Designing a Picosatellite

James Gerity, Tyler Schmitz
J. Vanderlei Martins, Associate Professor, Department of Physics

At this time, 3D measurements of cloud structure and thermodynamic properties (vertical distribution of droplet sizes, thermodynamic phase, etc.) are difficult to obtain. Generally, these data are collected during *in situ* aircraft experiments, which typically last several hours. The picture they provide is therefore inaccurate; the structure of the cloud has changed by the time the measurements are completed. However, these data can be indirectly obtained by measuring optical properties of the cloud; taking a 'picture' of the cloud from a satellite in space allows for a complete view of the cloud at an instant, from which the desired properties can be retrieved and studied using conventional methods. The cost of designing, launching and operating a full-scale satellite is extremely high. With this work we show that these measurements can be performed from a much smaller satellite with the proper sensors. We have created the specifications for a 10x10x30cm 'CubeSat', conforming to guidelines for picosatellites set forth by California Polytechnic with the intent of minimizing the cost of a satellite mission. The UMBC Laboratory for Aerosols, Clouds, and Optics (LACO) has purchased many of the necessary components for this satellite, and performed several tests confirming the feasibility of such a mission.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, as well as funds from NASA Goddard.

Structure Elucidation of the HIV-1 5'-UTR using MS3D

Phillip A. Geter, *Sonnet Davis*
Daniele Fabris, Professor, Department of Chemistry and Biochemistry

In this lab we specifically investigate the structure of the 5'-untranslated region of the HIV-1 genome, which contains critical signals mediating different steps of the virus lifecycle. Using a combination of chemical cross-linking and mass spectrometric analysis, which has been termed MS3D, we plan to elucidate the spatial organization of the different domains that make up the 5'-UTR structure. This will help us gain an understanding of the RNA molecule's interactions with the nucleocapsid (NC) domain of the Gag polyprotein and provide information about genome encapsidation. Currently, we are developing a new method of synthesizing the RNA substrates of interest, which will save time and use fewer materials. With this new method, we should be able to synthesize, cross-link, and analyze our RNA samples in half the amount of time that it currently takes. Preliminary results suggest that this new method can fully replace older methods and be used in both small and large-scale RNA isolations and purifications. We anticipate that the information obtained from these experiments will provide the key for developing novel inhibitors aimed at disrupting the functions mediated by 5'-UTR.

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

Development of an Isolation Protocol for *in vivo* Transcription and Recovery of RNA

Kimeya F. Ghaderi, *Sonnet Davis, Joshua A. Wilhide*
Daniele Fabris, Professor, Department of Chemistry and Biochemistry

The process of obtaining nucleic acid samples from cells and viruses has been a constant challenge in molecular biology. However, with current developments of magnetic particles, researchers have been able to isolate nucleic acids in a quick and adaptable protocol. We are exploring the utilization of magnetized beads to isolate chemically-modified RNA obtained by *in vivo* application of structural probes. The mass spectrometry community has developed powerful ionization techniques that allow for the analysis of large biomolecules. Our laboratory has been developing approaches that combine such techniques with structural probing to investigate the structure of the 5'-untranslated region (5'-UTR) of the HIV-1 genome, which mediates critical functions of the virus. Once the structure of the 5'-UTR has been elucidated, specific targets will then be identified to develop strategies for inhibiting the virus. We are currently developing an isolation procedure designed to allow for *in vivo* transcription and crosslinking of the RNA. This procedure involves a magnetic bead and a labeled DNA tag designed to "pull down" the RNA. Once isolated, the sample will be digested and analyzed by electrospray ionization Fourier Transform Ion Cyclotron Resonance (ESI-FTICR) mass spectrometry. The results will provide spatial constraints, which will allow for molecular modeling.

This work was funded, in part, by the National Institutes of Health (2R01GM064328) and the National Science Foundation (CHE-0439067).

Exploring Students' Knowledge and Perceptions of Sexual Assault Resources On-Campus

Sabah Q. Ghulamali
Sarah E. Chard, Assistant Professor, Department of Sociology and Anthropology

American universities commonly provide counseling and other resources to students who are victims of sexual assault, but limited research has been conducted on students' knowledge and opinions of these resources; such information is critical for ensuring the effectiveness of programs. To help address the gap in understanding of students' perspectives on college sexual assault policies and services, I conducted a quantitative and qualitative study on UMBC students' views of the university's sexual assault resources. The first step was to analyze UMBC's sexual assault policy to determine the university's services. Then, a survey was developed that explores students' knowledge of and attitudes towards UMBC's policies and services. Students in a range of general education classes completed the questionnaire. Finally, to explore students' perceptions of programs and services in more detail, small focus groups were conducted with undergraduates on issues of campus safety, UMBC policies and sexual assault resources, campus stereotypes regarding resources, and the strengths and weaknesses of current programs. Through discussion on perceptions of policies and programs, students offered suggestions for enhancing services. The findings of the survey and focus groups provide insight into students' perspectives of UMBC's sexual assault policies and programs and suggestions for improving services.

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

Diet Coke: America on a Diet

Cara E. Gibson
Warren Belasco, Professor, Department of American Studies

This research analyzes the marketing strategies used by Diet Coke that have determined its major success as a product within the U.S. and the implications of this success on both its consumer base and the wider American audience. Focusing my analysis on Diet Coke advertisements, I examined the persuasive advertising strategies used to target the female consumer through the manipulation of common gender stereotypes and social ideals of feminine beauty, which are closely linked to weight and self control. In addition, I focused on Diet Coke's more recent shift to promoting the product as a "health" beverage through their launch of Diet Coke *Plus* and through their recent partnership with the National Heart, Lung and Blood Institute. Here too, I reflected on how these marketing strategies are centered on the female consumer. Ironically, Diet Coke and the larger diet industry remain a booming market despite its failure to produce thin and "healthy" consumers. I determined Diet Coke's success to be attributed to both its strong female following, and its ultimate failure as a weight loss product thereby keeping the consumer ever returning for more.

The Global Women's Health Action: Putting Intersectionality into Practice

Abigail Granger, Jennifer Keeter
Jodi Kelber-Kaye, Lecturer, Gender and Women's Studies Program

This presentation will describe a week-long campus Global Women's Health Action, organized by members of Women Involved in Learning and Leadership (WILL) in the Spring of 2009. Through highly interactive table displays and games, WILL engaged people in conversations that empowered them to critically examine and take action on global women's health care issues. In keeping with WILL's feminist-based mission to create learning communities that interrogate gender issues through feminist grassroots activism, WILL used the Action as an opportunity to apply aspects of feminist organizing that were researched by WILL members as part of the academic requirements for a course required for Gender and Women's Studies students. This presentation will replicate WILL's panel presentation at the National Women's Studies Association's annual conference. The co-presenters will describe the organizing process and the Action itself, with particular attention paid to the application of gender and women's studies scholarship which focuses on feminist organizing principles, how to build partnerships and coalitions, and best practices for leading participants from awareness to political action. They will also evaluate how the Action demonstrated the value of an intersectional analysis to women's health by addressing differentiations based on race, class, sexual orientation, physical ability, and nation.

This work was funded through a travel award from the UMBC Office of Undergraduate Education and a grant from Americans for Informed Democracy.

Effect of Inflammation on Apoptosis in Myeloid-Derived Suppressor Cells (MDSC) in Breast Cancer

Lydia Grmai, *Olesya Chornoguz*
Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

Myeloid-derived suppressor cells (MDSC) are a major cause of immune suppression in cancer patients by inhibition of T-lymphocyte activation. Transfection of 4T1 mammary carcinoma cells with interleukin-1β (an inflammatory cytokine) leads to induction of more aggressive and higher levels of MDSC. Pathway analyses of the proteins expressed by MDSC induced by these two tumors highlighted numerous pathways that differ between 4T1 and 4T1/IL-1β-induced MDSC, including the extrinsic apoptotic pathway activated through Fas. To determine if this pathway contributed to the enhanced survival of 4T1/IL-1β-induced MDSC, we treated MDSC with Jo2, an agonist antibody for Fas. Apoptosis of the treated cells was measured by flow cytometry using antibodies to activated caspase-3, a molecule that is upregulated in apoptotic cells. 4T1/IL-1β-induced MDSC contained more activated caspase-3 than 4T1-induced MDSC, although the two MDSC populations expressed similar levels of Fas. Results are being confirmed by presence of FAF-1, a Fas-associated protein that can enhance Fas-mediated apoptosis. These results suggest that 4T1/IL-1β-induced tumors may attribute their aggressiveness to the resistance of MDSC to Fas-mediated apoptosis. Upregulating apoptosis in MDSC may reduce their accumulation and promote immunotherapy in cancer patients.

*This work was funded in part by NIH/HIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and NIH, National Cancer Institute RO1CA84232.*

Identifying the Role of Microglia in Sexual Differentiation of the Brain

Rachana Haliyur, *Bridget Nugent[1], Margaret M. McCarthy[1,2]*
[1]Program in Neuroscience, University of Maryland School of Medicine
[2]Departments of Physiology and Psychiatry, University of Maryland School of Medicine
Margaret M. McCarthy, Professor, Departments of Physiology and Psychiatry

Permanent sex differences in the brain are established neonatally. These traits are necessary for sex-specific behavior in adulthood and underlie gender differences in the morbidity of many psychological and neurological disorders. In the laboratory rodent, the inflammatory molecule prostaglandin E_2 (PGE_2) mediates steroid-induced masculinization of the preoptic area (POA), a brain region with neuronal morphology critical for male sex behavior. Microglia are the immune cells of the brain and are both activated by and release PGE_2, suggesting an unexpected role for microglia in sexual differentiation of the brain. To explore this possibility, we examined sex differences in microglia activation in the developing POA. Using immunocytochemistry, we counted both the total (resting + activated) and activated microglia in neonatal males and females treated with either vehicle or PGE_2. Preliminary results indicate an increased number of total microglia in the developing male POA compared to females. Additionally, treating neonatal females with PGE_2 significantly increased the total number of POA microglia. Future studies will determine if activation of microglia is necessary for neuronal and behavioral masculinization. Identifying a role for microglia in sexual differentiation of the brain would expand our understanding of this essential developmental process to include a previously unidentified role for the immune system.

This work was funded by R01 MH52716-010.

Peer Interactions and Social Competence of Young Food-Allergic Children

Lauren A. Hall, *Linda Jones Herbert*
Lynnda M. Dahlquist, Professor, Department of Psychology

Food allergy, an adverse immunological response to a food protein, has been argued by some to be the epidemic of the current century. Prevalence estimates of food allergy for young children range from two to eight percent. Children with a food allergy may have social restrictions placed on them by their parents because of their condition and the possibility of life-threatening reactions. Social restrictions, such as limited peer interactions, may affect the development of social competence in children. The current study examined the peer interactions, peer network, and social competence of healthy children (N=18) and children diagnosed with one or multiple food allergies (N=29) between the ages of three and six. Participants' mothers completed the Social Competence and Behavior Evaluation Scale (SCBE) and also provided information in an interview format for the Peer Interaction Record (PIR). The pattern of findings was in the predicted direction. Children with a food allergy had a lower mean for all variables when compared to healthy children. Correlational analyses and independent sample t-tests however, were not significant. These results may be a product of small sample size and indicate the need for further data collection. With further data collection, results may begin to approach significance.

This study was supported by Grant No 1R03HD057313-01A1 from NIH.

Extending the IP_3 Receptor Model to Include Competition with Partial Agonists

Gregory A. Handy
Bradford Peercy, Assistant Professor, Department of Mathematics

The Inositol Trisphosphate (IP_3) receptor is a Ca^{2+} channel located in the endoplasmic reticulum and is regulated by IP_3 and Ca^{2+}. In 1992, DeYoung and Keizer created an eight-state, nine-variable model of this system. In their model, they accounted for three binding sites, a site for IP_3, activating Ca^{2+} and deactivating Ca^{2+}. The receptor is only open if IP_3 and activating Ca^{2+} is bound. Li and Rinzel followed up this paper in 1994 by introducing a reduction that made it into a two variable system. A recent publication by Rossi in 2009 studied the effect of introducing IP_3- like molecules, referred to as partial agonists, into the cell. Initial results suggest a competitive model, where IP_3 and partial agonists fight for the same binding site. I extended the original eight-state model into a twelve-state model in order to illustrate this competition, and perform a similar reduction to that of Li and Rinzel. Using this reduction I solved for the equilibrium open probability of the model. I then replicated graphs provided by the Rossi paper, and find that while the model misses some of the quantitative measures it captures key qualitative characteristics.

"Harlem at its Best": Popular Culture, Nightlife Venues and Emergence of a Queer Subculture during the Harlem Renaissance

Megan M. Hardy
Michelle R. Scott, Associate Professor, Department of History

Few people know that in addition to becoming one of the most populous black communities in the United States, 1920's Harlem also fostered the growth of a queer subculture during the period known as the Harlem Renaissance. This growth was fueled by a combination of factors: twentieth century freedom of sexual expression, popular entertainment, community monetary interests and white pleasure seekers, all of which spawned the emergence of sexualized nightlife venues with a laissez-faire attitude. In Harlem, the upsurge of rent parties, cabarets and Blues music provided a space for the emerging queer community to openly discourse and publically socialize that may not have existed without the heightened sexualized environment. The formation of this distinctive queer community is most evident in the transition of queer socialization patterns; from mingling alongside heterosexuals at mainstream nightlife entertainment venues, to the usurpation and transformation of dominate culture practices into their own organized functions. While conducting this research, I examined numerous primary sources including: invitations, short stories, period novels, personal essays, four period newspapers and magazines, blues lyrics, and popular art. I also supplemented primary source findings with research from ten historical monographs and five academic journal articles.

Iso-octene Production through MTBE Decomposition and Isobutene Dimerization

Neil Agarwal, J. Colin Haser, Colin Kelly, Kevin Poff, Zach Vonder Haar
Mariajose Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

In recent years, the use of methyl-*tert*-butyl-ether (MTBE) as a gasoline additive has ended. Companies that produce MTBE have been changing their production lines to produce different chemicals. We have developed a feasibility study that evaluates the engineering design, operation and costs/finances associated with the additional unit operations needed to produce iso-octene, an alternative gasoline additive. The market for iso-octene was at 138,000 barrels per day in 2003 and has been expanding. We have designed a process that will convert 5100 barrels of MTBE to 2600 barrels of iso-octene and 1600 barrels of methanol. We have designed a fixed-bed reactor to decompose MTBE over a solid acid catalyst into methanol and isobutene. These components will then be separated, with the methanol sold as a by-product, having a positive effect on the company's revenues. The isobutene stream will be purified and sent to another packed-bed reactor where it will be dimerized over an ion exchange catalyst to produce iso-octene. Sensitivity analyses have been performed using ASPEN software on both the decomposition and dimerization reactors, as well as the separation processes to determine the most efficient and economical design.

Role of Ribosomal Protein rps9B in Translational Accuracy

Irma N. Hashmi
Philip J. Farabaugh, Professor, Department of Biological Sciences

Ribosomes are organelles that synthesize proteins for an organism by translating messenger RNA (mRNA). Ribosomes are composed of ribosomal RNA and ribosomal proteins. How a mutation in a structural protein influences how the ribosome reads mRNA remains largely a mystery. It is important to study this to understand how certain bacteria such as *Escherichia coli* can develop resistance to antibiotic treatment. The organism studied for this project is *Saccharomyces cerevisiae* (*S. cerevisiae*), a eukaryotic organism and a species of budding yeast. The goal of this project is to analyze how the ribosome reads mRNA when a mutated rps9B gene (which codes for a ribosomal protein) is incorporated into the ribosome. To create novel mutant forms of the rps9B gene, we first cloned a copy of the gene into the yeast shuttle vector pYES2. The mutated gene was introduced into a strain lacking both rps9A and rps9B genes; this double mutation is normally lethal but the presence of the rps9B on the plasmid will maintain viability. Quick-change mutagenesis, or the insertion of mutations at specific bases of rsp9B, will allow us to study the effect of a mutated ribosomal protein on translational misreading.

This work was funded, in part, by Research Project Grant 1R01GM029480-25 from the National Institute for General Medical Sciences of the National Institutes of Health, and Special Research Assistantship/Initiative Support at UMBC.

Consensus and Legitimacy in Supreme Court Opinions

Wayne Heavener
Jeffrey Davis, Associate Professor, Department of Political Science

This paper investigates whether consensus in a Supreme Court opinion results in a more legitimate legal rule and more durable precedent. Throughout the history of the United States, many Chief Justices have sought unanimous Court majorities. The reasons for doing so have been based on the assumption that unanimity in an opinion makes the rule of law contained within it more legitimate. Using the Lexis Nexus *Shepard's Citations* service in conjunction with the Supreme Court Database, I have used quantitative analysis to examine the relationship between unanimity and legitimacy. Legitimacy, for the purposes of this research, is determined based on the frequency that subsequent court opinions uphold or distinguish a case's legal precedent. These subsequent citations extend to not only the Supreme Court, but the rest of the judiciary as well. By cross-referencing the two databases, synthesizing and analyzing the information gathered, I have found little correlation exists between unanimity and legitimacy. The data suggests that unanimity yields less legitimacy in the rule of law than has been previously assumed.

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

Virtual Museum: Glass: The Transparent Connection between Art and Science

Benjamin D. Hong*, Sarah Carney, Elizabeth Plum*
Preminda S. Jacob, Associate Professor, Department of Visual Arts
May Chang, Head of IT Services, Albin O. Kuhn Library

The purpose of this project was to design and curate a virtual art museum. We worked as a team to utilize *Active Worlds* to realize our art exhibition. Designing and executing even a single exhibit in *Active Worlds* is a complicated, time-intensive process. Many details, including lighting, color, exhibit flow, and information placement must be given careful attention and further complicate the process of exhibition design. With *Active Worlds,* we were able to test various designs to achieve our desired results. Our hypothetical museum is focused on how the medium of glass is used to create magnificent art. The museum aims to facilitate learning about the characteristics of glass, and how science influences artistic creations. The architecture consists of a circular structure. The first floor utilizes a color wheel design, where visitors move from section to section seeing and learning about varying colored glass pieces. The second floor of the museum is more interactive, with an actual glass-blowing studio as well as other activities that engage and inform visitors about glass and the scientific process of its pigmentation. Overall, the use of *Active Worlds* is a magnificent tool that allows students to fully express themselves without any material or monetary restriction.

Genetic Controls of Age-Related Phagocytic Ability in *Drosophila melanogaster*

Lucas A. Horn
Jeff Leips, Associate Professor, Department of Biological Sciences
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences

Most multicellular organisms exhibit immunosenescence, a decline in the ability of the immune system to fight infections with age; however, the rate of decline varies among individuals in natural populations. Very little is known about the genetic basis of these changes. I tested the hypothesis that genetically based differences in immunosenescence result from differences among genotypes in the ability of blood cells to phagocytose (engulf) bacteria. The immune response of *Drosophila* has two main components, clearance of bacteria by phagocytic blood cells and production of antimicrobial proteins. Age-related changes in either or both of these components could contribute to immunosenescence. We developed a method to quantify the phagocytic ability of individual blood cells in adult *Drosophila* to test if this ability declined with age. We injected fluorescently labelled bacteria into four different genotypes of adult flies at one and five weeks of age, and 90 minutes after infection, stained the blood cells to count the number of phagocytic events per cell. Our results revealed genetically based differences in phagocytic ability and demonstrate that this declines with age. This project contributes to our understanding of the mechanism and genetic basis of immunosenescence in *Drosophila* and potentially other organisms, including humans.

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

Temperature Elevations in Extracted Teeth Induced by a System B Heating Catheter

Jessandra F Hough
Liang Zhu, Associate Professor, Department of Mechanical Engineering

Heating has been proposed to clean and eliminate bacteria for root canal procedures. In this study, six root-canal prepared teeth are placed in a temperature-controlled tissue-equivalent agarose gel that simulates the thermal environment of a mouth. We use a System B heating catheter to elevate temperatures in the root dentin via heat conduction from the root canal surface. Root dentin heating is induced from the heated catheter maintaining a pre-set temperature between 100°C and 200°C. Thermocouples are used to measure temperatures at several locations at the outer surface of the teeth and one additional thermocouple is inserted inside the root canal to monitor temperature elevation at various heating durations and intensities. At an applied catheter temperature of 200°C, the internal thermocouple experienced a temperature elevation of 54.0 ±15.1°C. A non-uniform temperature field on the outer surface with the apical location recording the maximal elevations was also observed. The measured temperature elevations at the outer root surface for the heating duration were all lower than 9.5°C, which is below the threshold temperature rise of 10°C to induce significant thermal damage to the supporting structures. This study is considered the first step to designing optimized heating protocols for endodontic treatments.

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

Butt-Slapping and Towel-Snapping: Gender, Homophobia and Homoerotic Touching in U.S. Team Sports

Jessica P. Hyman
Kris Weller, Instructor, Department of Gender and Women's Studies
April Householder, Instructor, Department of Gender and Women's Studies

Using textual analyses of college and professional athletes' personal narratives, advertisements, and film, this study explored sport as a symbol of hegemonic masculinity, and its relationship to homoerotic touching among athletes in high status, team sports in the United States. It was proposed that the policing of heterosexist and racialized notions of masculinity and femininity dictate divergent same-sex touching norms for male and female athletes. Findings produced knowledge regarding the ways in which sexism and homophobia inform practices within sport. Such knowledge is important, considering the international cultural significance of U.S. team sports, widespread veneration of professional athletes, and the high revenue production of sports.

Evolutionary Patterns of Ultraviolet Reflectance in the genus Etheostoma

Chioma E. Ihekweazu*, Jennifer Gumm, Tamra Mendelson*
Tamra Mendelson, Assistant Professor, Department of Biological Sciences

Ultraviolet (UV) reflectance is prevalent among animals and is used for mating communication and signaling within species of fish. Darters (genus Etheostoma) are colorful freshwater fishes and coloration is thought to play a role in speciation in this group. However, the role of UV reflectance is unknown. Spectral reflectance has been quantified in seventeen species of darters, and all species exhibited colors with UV components. We hypothesize that different species of darters exhibit different UV coloration. I will analyze the UV portions of the spectral reflectance in a monophyletic subgenus of darters (Ulocentra). The peak position of UV reflectance in each species will be averaged and compared among species. The peak UV reflectance of each species will be mapped onto the phylogeny to infer evolutionary patterns of UV coloration. Our results will help us make a prediction about how UV coloration affects the mating patterns of fishes and if UV coloration plays a role in speciation in this group.

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

An Analysis of Ethnic Identity in the 2007 Kenyan General Election

Betty W. Irungu
Tyson King-Meadows, Assistant Professor, Department of Political Science

The purpose of this project was to analyze opinions on democracy and civil society in Nairobi, Kenya as well as to analyze the December 2007 Kenyan general election and the subsequent spurts of election-related violence. The study evaluated support for democracy and the role of regional identity politics in Kenyan society and the support for multiethnic political parties by employing an analysis of original focus group data and a secondary analysis of survey data and election results. Specifically, it investigated whether and how Kenyan political culture may favor regional and tribal stratification and how ethnic and regional identities influence political behavior and attitudes. This study was a case-specific application of theories found in treatments of democratic theory and in ethnic identity politics in Africa. The project was divided into three components: focus group discussions of targeted citizen stake-holders to analyze support for democracy; content analysis of Kenyan newspapers; and analysis of public opinion survey data from the 2005 Kenyan Afrobarometer. The data indicated support for accountability and transparency in government and stratification of a stronger national identity. This project contributes to literature addressing the current role of political and social institutions on democratic politics on the African continent.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and through a 2009 Summer Research Scholarship from the Honors College at UMBC.

Translating a Medieval Will for Modern Readers

Allison D. Isberg
Gail Orgelfinger, Senior Lecturer, Department of English

This study was designed to explore the process of translating a medieval document for a modern audience. Medieval wills are particularly suited to introducing an audience to the medieval world, since they reveal details of people's families and positions in society. This past summer, I explored different methodologies involved in handling and translating medieval texts, as well as different theories on translation. This included learning not only to translate late Medieval Latin but also how to read the distinctive script used by late medieval English secretaries. In the fall, I traveled to the Borthwick Institute for Archives in York, England, where I researched a will held in the collection and produced a transcription and translation as part of a Study Abroad experience. My presentation will be oriented towards demonstrating the identification, transcription and translation of the document to an audience that is not familiar with these processes.

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

Umami and Bitter Taste Perception in Acetylcholine Receptor M3 Knockout Mice

Ammar M. Jaber, *Weihong Lin, Tatsuya Ogura*
Tatsuya Ogura, Research Assistant Professor, Department of Biological Sciences

Acetylcholine (ACh) plays an important role in modulating physiological responses of the sensory and nervous systems. Previous studies have shown that ACh receptors (AChRs) are present in taste buds. In URCAD2008, we showed that sour, salty, and sweet taste perception in AChR knockout (KO) mice is similar to the wild type (WT). In this study, we further examined if AChRs play a role in bitter and umami taste perception. To examine if dysfunction of the M3 subtype of AChR perturbs the taste perception, we compared taste preference in AChR M3 subtype KO (M3AChRKO), WT, and heterozygous mice using a two-bottle taste test. During the test, mice were allowed to choose between two drinking bottles, one containing control solution (water) and the other containing the test solution. The amount of liquid consumed was measured every twenty-four hours and preference was calculated using a ratio of volume of test solution consumed vs. total volume consumed. Various tastants including: denatonium, quinine, monosodium gulamate, and inosine monophosphate were tested. We found that heterozygous and KO mice had a lower preference ratio than WT mice which indicates that M3AChR might modulate umami and bitter perception. Results will facilitate the understanding of modulation of taste perception.

This research is supported, in part, by UMBC SRIS grant (TO), NIH grants DC 006828, 009269 and UMBC start up fund (WL).

The Effect of Prior Experience on Host Foraging Behaviors of a Drosophila Parasitoid

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

Parasitoids are insects that use the immature stages of other insects as hosts to complete their life cycle. Foraging is the series of behaviors performed by the female that lead her to parasitize a host. Because foraging determines how successfully a female produces offspring, foraging is an important fitness trait. For parasitoids to maximize their fitness, they must adapt their foraging strategies to the conditions specific to their environment. Our question is if changes in foraging can be learned, where an individual parasitoid changes her strategies based on previous host experiences. We observed the effect of prior host experience on two foraging behaviors (host search/handling efficiency and host selection) using the Drosophila parasitoid, *Leptopilina clavipes* and three Drosophila host species: *D. melanogaster*, *D. simulans* and *D. affinis*. Both foraging behaviors were observed and compared among inexperienced females, females experienced on *D. melanogaster*, and females experienced on *D. affinis*. The results show that prior experience with a host improves search/handling efficiency of that host. However prior experience with a host did not affect overall host selection. Thus, foraging in parasitoids combines both learned and innate elements. This study provides insight into the role of learning in the evolution of host choice.

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

Knowledge-guided Crossover in Portfolio Optimization

Matt Jancasz
Roy Rada, Professor, Department of Information Systems

The research problem is how domain knowledge can be added to evolutionary computation. The method for exploring this problem was to take the problem of financial portfolio optimization and to pursue solving this problem with a modified evolutionary computation approach. An organism was viewed as a string of stock ticker symbols each with an associated fraction that would indicate what fraction of the capital of that organism would be invested in that stock. For the control case, the ticker symbols were sorted in alphabetical order. For the test case, the ticker symbols were sorted by the industry category into which each stock belonged. The hypothesis was that by sorting them by industry that the symbols would form into more useful building blocks than when sorted alphabetically. A program was implemented in Microsoft Excel VBA to perform this experiment. The results support the hypothesis that domain knowledge could improve evolutionary performance. Further work in this direction will help indicate how domain knowledge can be incorporated in evolutionary computation so as to form a more powerful, hybrid problem solver. This approach could be applied to problems across many domains.

This work was funded, in part, through a grant from the Undergraduate Research Assistantship program.

Racial Disparities in Hypertension Awareness and Management

Michael L. Jenkins, Jr.*, Roland J. Thorpe, Jr., John Jackson*[1]*, Thomas A. LaVeist*
[1]Department of Epidemiology, Harvard University School of Public Health
Roland J. Thorpe, Jr., Assistant Scientist, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health
Thomas A. LaVeist, Professor, Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health
Andrea Kalfoglou, Assistant Professor, Department of Sociology and Anthropology

Little is known about race differences in hypertension management in adults residing in similar social and environmental conditions with access to the same healthcare market. We examined the nature of disparities in hypertension management within a sample of 975 hypertensive Blacks and Whites aged 18 and older using data from the Exploring Health Disparities in Integrated Communities-Southwest Baltimore (EHDIC-SWB) Study. Hypertension awareness was defined as being told by a doctor that they have hypertension or that they are taking anti-hypertensive medications. Among hypertensives aware of their condition, those taking anti-hypertensive medications were considered as treated. Among the treated, those with a systolic BP $\leq$140 mmHg and diastolic BP $\leq$90 mmHg were considered to be controlled. Multivariate logistic regression models were conducted to estimate the association between race and hypertension management. After accounting for the similar social and environmental conditions, and access to a similar health care market, Blacks relative to Whites had a greater awareness of their hypertension, were similar with regard to the treatment of their hypertension, and had poorer control of their hypertension independent of potential confounders. Among those living in an integrated low income urban community, residential segregation accounts for racial disparities in the treatment of hypertension.

This work was funded, in part, by grant# P60MD000214-01 from the National Center on Minority Health and Health Disparities (NCMHD) of the NIH and a grant from Pfizer Incorporated.

Hand Washing for Children

Desiree Johnson, *Janiki Gondalia, Cristina Happel, Sarah Haynie, Anthony Hynes, Shiketa Jenkins*
Andrea Kalfoglou, Assistant Professor, Department of Sociology and Anthropology

Teaching children how to properly wash their hands is an essential disease prevention strategy. A group of students from HAPP 354 Community and Public Health prepared an age-appropriate interactive intervention to encourage children to properly wash their hands. This included giving the children the opportunity to play in sand with glitter and then having them sing a song while they washed to ensure they spent enough time washing. We tested this intervention during Port Discovery Children's Museum *Healthy First Saturdays* on March 6th. We assessed the intervention by observing the children, asking their parents about the effectiveness of the intervention, and feedback provided by the Port Discovery staff. The intervention was repeated on April 3rd, 2010 incorporating suggested changes. We conclude that our intervention is an effective strategy for reinforcing what children are taught in school and at home about handwashing.

Design and Synthesis of Unnatural DNA Containing Expanded Purine Analogues

Cameron D. Johnson*, Orrette Wauchope, Katherine Seley-Radtke*
Katherine Seley-Radtke, Associate Professor, Department of Chemistry and Biochemistry

As an extension of Nelson Leonard's work on benzene-expanded purine nucleosides, one focus for our research has been aimed at utilizing a series of heteroaromatic expanded purine nucleosides to investigate nucleic acid structure and function. Strategically altering the structure of the natural nucleobases allows for greater diversity in their biological interactions. Insertion of a five membered heterocyclic spacer ring into the purine scaffold results in an expanded nucleoside that has greater base stacking capabilities as well as an additional hydrogen bonding functionality. These analogues will allow us to examine the role of electrostatics, base stacking and stability within the DNA helix as well as enzyme recognition. The structure and purity of the target nucleoside analogues will be confirmed by NMR, HRMS and elemental analysis. Preliminary results of this study are described herein.

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

The Development of a Biological Antioxidant Capacity Assay Using Green Fluorescent *E. coli*

***Phillip H. Kang**, Leah Tolosa*
Leah Tolosa, Research Associate Professor, Department of Chemical and Biochemical Engineering

Oxidative stress in biological systems can lead to numerous disorders, including Alzheimer's disease, cancer, and heart disease. Antioxidants in food, such as Vitamin C, minimize and prevent the effects of oxidizers. Therefore, it is important to determine antioxidant amounts in supplements and food through antioxidant capacity assays. Current methodologies utilize chemical assays that may not reflect bodily responses. Many organisms battle oxidants through inducible responses, such as the SoxRS regulon in *E. coli*. In this study, cell-based assays were designed by fusing genes within the SoxRS regulon (*sodA*, *soxS*) with the green fluorescent protein (GFP) gene in order to quantify antioxidant capacity through fluorescence inhibition at different oxidant and antioxidant concentrations. It was hypothesized that as antioxidant concentration increased, fluorescence would decrease but different genes would not respond identically. The results showed that, at higher antioxidant concentrations and a fixed oxidant concentration, fluorescence inhibition increased for both *sodA::gfp* and *soxS::gfp*. Also, the *sodA::gfp* system supported previous research that it is the most responsive in the SoxRS regulon, and suggests that different genes respond differently to specific antioxidants. Through future research, it may be possible to categorize antioxidants and allow diseases to be treated in a more specific and effective manner.

This work was funded, in part, by the US Army (Award #W81XWH-04-10781) and the National Institute of Health (Award #DK062990 and #DK072465).

Gliadin is a Chemo-Attractant Factor for Neutrophils

***Sunaina Khandelwal**, Marcelo Chieppa[1], Mirkka Janka-Junttila[2], Karen Lammers[3], Vincenzo Casolaro[3,4], Alessio Fasano[3]*
[1]Labaratory of Immunulogy, Lymphocyte Biology Section, National Institute of Allergy and Infectious Diseases, National Institutes of Health
[2]Labaratory of Cellular and Molecular Biology, National Cancer Institute
[3]University of Maryland School of Medicine, Mucosal Biology Research Center
[4]Johns Hopkins University School of Medicine, Asthma and Allergy Center
Alessio Fasano, Professor, Department of Pediatrics, University of Maryland School of Medicine, Mucosal Biology Research Center

Celiac Disease of (CD) is triggered by the ingestion of gliadin, an immunogenic component of gluten-containing grains. We have shown that gliadin increases intestinal permeability through zonulin, allowing gliadin to enter the lamina propria and initiate the host immune process. The aim of the here presented study was to determine whether gliadin in itself can be a chemo-attractant factor for neutrophils. In order to do that, Lys-GFP mice were given gliadin or PBS by gavage, and neutrophil recruitment was monitored *in vivo* by intravital microscopy technique for two hours. In parallel, neutrophils were isolated from bone marrow of C57BL/6 mice, and applied in the so-called taxi-scan assay, an *in vitro* model that allows monitoring neutrophil chemotaxis. Gliadin, and, as a positive control, N-Formyl-Methionyl-Leucyl-Phenylalanine (fMLP), were applied to this model. Gliadin exposure to murine gut induced a rapid and massive influx of neutrophils as observed by intravital technique. This observation was confirmed with the taxi-scan assay. Gliadin and fMLP had similar

chemo-attractant potential. The results show that gliadin is a chemo-attractant factor for neutrophils and the chemotactic response could be a crucial step in CD pathogenesis.

Ternary Complexes of Crotamine

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

Crotamine, a small cell-penetrating peptide found in snake venom, can be used as a drug delivery vehicle. Crotamine-DNA complex interaction with actively proliferating (AP) cells might be due to crotamine's unique interaction with cell surface glycosamioglycans (GAG) such as heparin sulphate proteoglycans (HSPG). The main goal of this research is to characterize ternary complexes of crotamine with GAG and DNA. Analyzing this will help us determine how crotamine delivers DNA into AP cells, such as cancerous cells. Heparin-agarose columns were used to study the formation of the ternary complex. Free DNA and crotamine-DNA complexes were applied to the column. The retention of DNA on the column in the presence of crotamine indicated the formation of ternary complex. Fluorescence anisotropy will also be used to test the formation of ternary complexes since fluorescence anisotropy is mass dependent. The formation of ternary complexes is shown by a change in anisotropy after the addition of crotamine and oligosaccharides to a labeled oligonucleotide.

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

Extended Pyrimidine Nucleoside Analogues: Investigations into DNA Structure and Function

Nathaniel T. Kim*, Kartik Temburnikar*
Katherine Seley-Radtke, Associate Professor, Department of Chemistry and Biochemistry

Watson and Crick's model of DNA is based on shape and hydrogen bonding complementarity and thereby limits deviation from the natural genetic alphabet, however the possibility of additional "letters" could prove beneficial for a variety of reasons. In conjunction with our studies of heteroexpanded purine analogues, we have introduced a heteroaromatic ring extension to the pyrimidine base, thereby increasing the aromatic surface area and polarizability, and subsequently, increasing stacking effects. The normal hydrogen bonding motifs necessary for recognition and minor groove interactions are retained. Moreover, the heterocyclic extensions possess additional hydrogen bonding elements for exploring other helix interactions, which can provide further advantages for studying DNA structure and function. The DNA analogues were evaluated by incorporating them into oligonucleotides and monitoring their melting temperatures and florescence. More specifically, the extended pyrimidines offer enhanced characteristics for recognition by enzymes, making them interesting candidates to probe DNA and viral polymerases. In that regard, the synthesis and preliminary biological studies of these novel analogues will be presented herein.

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

Insights into the Molecular Mechanisms of Circadian Rhythm

Benyam Z. Kinde, *Jenna Montgomery*[1]
[1]Department of Physiology, University of Maryland, Baltimore
Andrea L. Meredith, Assistant Professor, Department of Physiology

Circadian rhythm is maintained by the suprachiasmatic nuclei (SCN), the central pacemaker located within the hypothalamus, through frequency oscillations of spontaneous action potential firing (SAPF) in SCN neurons. Previous work has shed light onto a major player in circadian rhythms: the Ca2+-activated K+ (BK) ion channel. The rhythmically expressed BK channel regulates circadian rhythm by suppressing SAPF in SCN neurons. We utilized multi-electrode array recordings from organotypic slice cultures and analyzed SAPF over three or more days to determine whether BK is sufficient or necessary for the rhythmic oscillations in the frequency of SAPF. Organotypic slices were dissected from four-day old pups that contained: 1) endogenous BK expressed normally (where BK expression is anti-phase with SAPF), 2) a transgene encoding a hyperactive BK (R207Q) expressed under a Per1 promoter (where BK expression is predicted to be in-phase with SAPF) in the presence, or 3) the absence of endogenous BK. Preliminary data indicate that mutations in BK lead to a lower percentage of rhythmic recording channels within the SCN (notably, group 2). This suggests the Per1:R207Q transgene disrupts the generation of circadian rhythms in SCN neurons, and further supports BK as a critical regulator of circadian timing.

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

Women's Representation in sub-Saharan Africa

Christa K. Kizito
Carolyn Forestiere, Assistant Professor, Department of Political Science

Over the last two decades, parties and parliaments in sub-Saharan African countries have responded to national and international pressures to increase women's representation in politics by introducing formal political institutions such as electoral and quota systems. Electoral systems are categorized as either plurality or proportional representation systems while quota systems are categorized as legal or party quota systems. This paper analyzes the effectiveness of these institutions in bringing more women into government and argues that PR systems yield greater female representation than plurality systems. Subsequently, it evaluates the effectiveness of increased women's representation in bringing about reductions in social gender inequality and concludes that there is a distinct difference between a numerical increase in women's representation and their participation in government decision-making and influence on society. Increased women's representation does not automatically alter the attitudes of society or reprioritize the agenda of the country's legislature to reflect the needs of women and children because of preexisting entrenched cultural resistance to political and social gender equality within society.

Bartleby 2010: Image Joins the Written Word in a Convergence of Creative Writing and Art

Kant Klingenstein, Jamyla Williams
Sally Shivnan, Senior Lecturer, Director of Writing and Rhetoric, Department of English
Guenet Abraham, Associate Professor, Department of Visual Arts

This exhibition will showcase the collaboration of UMBC's student poets, fiction writers, and essayists with its most talented graphic design students, by displaying the design students' visual interpretations of the written works in the 2010 issue of *Bartleby*, UMBC's creative arts journal. Each design student will produce an image for a single poem, story, or essay, incorporating some or all of the text in the image; each image will be the artist's own interpretation, but also influenced by discussion with the author involving questions such as "what ideas or experiences led to this work?" and "what would you like the reader to take away from this work?" One or more of the visual interpretations will feature screen-based sound and motion. The text of each written work will appear beneath the visual image. This project celebrates the release of *Bartleby* 2010 and the work of its staff—an interdisciplinary effort involving students from across many majors, who bring together writing and art from students across the university community.

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

The Development and Purification of Isotopically Enriched NTPs for Structure Elucidation via Mass Spectrometry

Nyonsuatee Kollue*, Joshua Wilhide, Daniel Fabris*
Daniel Fabris, Professor, Department of Chemistry and Biochemistry

Isotopically enriched triphosphonucleotides (NTPs) can be used to perform polymerase chain reactions (PCRs) on biologically relevant nucleic acids to enable the implementation of new mass spectrometric (MS) approaches to identify polymorphism between cell lines. Observed differences can ultimately shed light onto the possible roles of the target substrate in the cell lifecycle. Although enriched NTPs have been investigated for some time, their production still requires a labor intensive process that involves growing *E. coli* cells in enriched media, lysising the cells, extracting the nuclecic acids, hydrolyzing them to monophosphonucleotides (NMPs), and finally converting NMPs to NTPs through an organic synthesis involving carbonyldiimidazole. This report describes the synthesis of isotopically enriched NTPs and the utlization of strong anion exchange (SAX) chromatography to separate product mixtures into individual bases to make them usable in separate PCR experiments.

Sequencing of *Callinectes sapidus* Opsins

Margaret Kott, Mike Bok
Thomas Cronin, Professor, Department of Biological Sciences

The visual system of the blue crab, *Callinectes sapidus,* a decapod crustacean of the family Portunidae, was studied using molecular methods in order to futher current understanding of arthropod and crustacean opsin protein evolution. Visual systems are based upon visual pigments, light-absorbing molecules composed of an opsin protein and a vitamin A-derived chromophore covalently bound to the opsin. Previous studies have presented evidence that crustaceans possess multiple visual pigments. Researchers have obtained full sequences of two middle-wavelength (green absorbing) opsin proteins from the brachyuran crab *Hemigrapsus sanguineus*, and physiological evidence for a third short-wavelength (violet-blue absorbing) opsin exists but the gene has not yet been sequenced. It is hypothesized that the visual system of *C. sapidus*, therefore, possesses at least two middle-wavelength visual pigments as well. In this study, the primary structure of a middle-wavelength opsin protein from the compound eye of *C. sapidus* was deduced from cDNA nucleotide sequences. The deduced sequence contains amino acid residues that are highly conserved in opsins of other arthropod species.

This work was funded, in part, by The National Science Foundation, Grant # IOS 0721608 and The Air Force Office of Scientific Research, Grant # FA9550-09-1-0149.

Investigating the HIV-1 5´-UTR Structure via Nuclear Magnetic Resonance

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 5´-UTR of the HIV-1 RNA genome is a conserved region whose structure is responsible for processes essential to HIV-1 replication. To examine the entire 5'-UTR, we used segmental labeling, a novel NMR spectroscopy approach that enables us to bypass the severe signal overlap that occurs with large molecules. The AUG region was ^{13}C labeled and then ligated to the unlabeled remainder of the 5'-UTR. The HMQC spectra revealed that the AUG region alternates between two conformations in equilibrium. By alternately stabilizing or destabilizing the AUG stem structure, we were able to control the conformation the RNA adopted in solution, yielding clearer spectra to facilitate the creation of a physical model of its tertiary structure. Supplementary gel electrophoresis studies on various mutants were performed to ascertain the function associated with the conformations' structures. Although the observed dimer and monomer formation supports the conclusion that the long-range AUG conformation leads to dimerization and packaging, more investigation is necessary to confirm that the stemloop AUG conformation promotes translation. Understanding how the structure of the HIV-1 RNA genome correlates to its translation and packaging mechanisms will be critical to the development of drugs which target the virus' replication and thus its potency.

*This investigation was sponsored, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Awards to UMBC, the NIAID Grant #R37AI30917 and HHMI at UMBC.*

Adolescent Father's Parenting: Effects of the Mother-Father and Mother-Grandmother Relationships

Areej H. Kuraishi, *Kelly Sheperd, Charissa S. L. Cheah*
Charissa S. L. Cheah, Associate Professor, Department of Psychology

There is limited research on the effects of relationships in three-generational households on adolescent father involvement and parenting. The purpose of the present research was to examine the relations between the (a) mother-grandmother (of the baby) relationship, (b) mother-father relationship, and (c) adolescent mother's perceptions of the baby's father's parenting. Participants included 69 adolescent mothers (14-20 years old) with 1-8 month old infants who completed measures of demographic information, relationship quality with the grandmother and baby's father, and positive parenting practices. Participants were predominantly African American and in continued relationships with the baby's father. Results revealed that a higher quality relationship with the father was positively related to the young mother's perceptions of his involvement and parenting. Importantly, the mother-grandmother relationship was only associated with more positive perceptions of the father's parenting when the mother and father also had a positive relationship. These findings suggest that promoting a secure relationship between adolescent parents may in turn promote positive parenting behaviors. Further, the grandmother may serve as a source of support for this relationship and in turn foster positive parenting. Examination of these variables may ultimately guide community efforts to encourage father involvement by promoting positive relationships within three-generational households.

This work was funded, in part, through an Undergraduate Research Award and travel award from the UMBC Office of Undergraduate Education and the Department of Psychology at UMBC.

Promoting Sun Safety among Today's Youth

Areej Kuraishi, Mary Kearns, Philips Khuu, Thy Ma*, LaJuan McAteer, Alpana Kaushiva, Mary Kearns*
Andrea L. Kalfoglou, Assistant Professor, Department of Sociology and Anthropology

Children between the ages of two and 10 years of age are frequently outdoors, especially in the spring and summer seasons. Excessive sun exposure can lead to detrimental health effects, such as melanoma, premature aging, and potential eye damage. Therefore, it is important for children to engage in safe skin protection practices in order to prevent burns and potential cancers. To encourage safe skin protection practices, we developed an interactive intervention that we pilot-tested in March and April 2010 during Port Discovery Children's Museum's *Healthy First Saturday*. Children were invited to decorate sun visors while we discussed the use of sun screen and protective clothing with them. Our intervention was evaluated by the children, their parents, museum staff, and our faculty advisor. Suggestions for improving the intervention were incorporated into the intervention when it was repeated in April. The URCAD presentation will demonstrate the intervention and include photos of the intervention in action.

Learning the Essence of German Lieder and introducing it to the UMBC Community

Michal Levitas
David Smith, Professor, Department of Music

This research project focuses on the art of nineteenth-century German art song and poetry. Specifically, I studied Franz Schubert's "Heidenroslein," and Hugo Wolfe's "Das Verlassene Magdlein." One great challenge I confronted in these pieces was the connection of the music to the poetry, in particular the way the accentuation, form, and other aspects of the poem's language is set to music by the composer. In order to explore this, I examined the sound and shape of the poetry as language through recitation and then as song. I experimented with performing these pieces in Graz, Austria, one of the places where they were first performed, during my studies there at the American Institute of Musical Studies. Specifically, I performed in two Liederabends and in other concerts in the Meerscheinschloss, a small Hapsburg palace and home to various concerts of the nineteenth century. To have the opportunity to research this connection of music and poetry in the area where they were written gave me a greater scope of knowledge and context about the works as a whole.

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

"Getting over Tom"

Ellen J. Line
Lynn Watson, Associate Professor, Department of Theatre

Human relationships are psychologically and emotionally complex, providing endless opportunity for artistic examination and interpretation. Theatre is well-suited for this type of examination because of the immediate and physically present nature of the work. "Getting over Tom," a monologue written and originally performed by Lenora Champagne, examines one woman's journey of self-discovery after the end of a long-term relationship. The piece explores what it means to "get over" someone: What is the process of recovery? What discoveries (of self and otherwise) are necessary to move on after a break up? The physical and psychological portrayal of the character was informed by research of French Canadian culture, especially dance and music, and the locations and events integral to the piece. The character's physical and vocal characteristics were developed to create a realistic portrayal of a person with this history. Personal imagination and introspection enlivened the character's history and emotional journey. Examination of Ms. Champagne's other work and artistic beliefs lent essential understanding to the style of the text. Analysis of the story arc and language, in order to identify the most important moments and words, was essential to an honest and immediate retelling the character's story.

Heinrich Schliemann: Odyssey of the Mind

Steven Shane Logue
Cathy Cook, Associate Professor, Department of Visual Arts

Heinrich Schliemann was a controversial figure in the area of archaeology around the turn of the nineteenth century. Schliemann was an advocate of the historical reality of places mentioned in the literary works of Homer, namely the Iliad. My fascination with such locations sparked this research project. The Undergraduate Research Award allowed me to travel to Greece and Turkey during the summer of 2009 and document my travels with video. I visited the National Archaeological Museum of Athens, which houses the 'Mask of Agamemnon', discovered by Schliemann and Hissarlik in Turkey, the actual site of Homer's Troy. Through my research I learned Schliemann was successful in fostering public interest in antiquity just as earlier researchers had in their discovery of Pompeii. I also discovered that archaeologist Frank Calvert was instrumental in Schliemann's discoveries at Troy. I will present my findings during URCAD in the form of a short documentary film.

This work was funded, in part by, an Undergraduate Research Award from the UMBC Office of Undergraduate Education and a Arcadia University Scholarship.

Effects of Exposing Rats to Types of Radiations Encountered in Space on Cognitive Performance

Lauren V. Long, *Kirsty Carrihill-Knoll*
Bernard Rabin, Professor, Department of Psychology

N.A.S.A. predicts that, during a three-year exploratory trip to Mars, astronauts will be exposed to various types of cosmic radiation, specifically high-charge and high-energy (HZE) particles. Exposure to HZE particles results in subcellular damage and is considered to be carcinogenic, as well as producing changes in central nervous system function and in cognitive behaviors. Exposure to the HZE particle iron-56 has been shown to also cause effects similar to those of aging in exposed rats. These studies produce new questions: Is there a floor effect in relation to effective dose amount, regardless of age, and is there an interaction between the age of the subject and a lower dose limit? The current study tested radiated rats in operant chambers, an elevated plus maze, and an original experiment designed to investigate recognition of novel objects. The results show differences between rats which were radiated with iron as opposed to oxygen. Despite these results, and the age of radiation acting as a confounding variable with the age of testing, there is evidence to suggest that performance is modified by a function of age. The information gained from this experiment may lead to improved methods of protection against cosmic radiation.

Funding information is provided by NASA Grants NAG9-1529, NNJ06HD93G, and NNX08AM66G.

The Challenged Identities of Speakers of World Englishes: Identity Validation as a Strategy to Encourage Bidialectalism

Elizabeth A. Lynch
Mary Hickernell, Editor/Instructor, Department of English

The spread of English as a global medium of communication has resulted in an increase of native English speakers around the world. These speakers of World Englishes claim English as their home language, but their dialects may be considered "non-standard" by United States academicians in areas such as grammar and word choice. Although linguists believe all dialects to be equally useful, this attitude is rarely observed in the classroom where deviations from the written standard are discouraged. However, language is believed to comprise a significant portion of identity. Challenging a student's ability to use his or her home language effectively can be seen as a challenge to that individual's cultural identity. When cultural identity is challenged, the often lengthy and difficult process of identity renegotiation begins. My initial review of the literature on World Englishes and intercultural communication demonstrates that this is an area in need of attention from the academic community. Additionally, I suggest that UMBC writing tutors seek to validate students' identities by demonstrating acceptance of each student as a unique individual. This strategy creates a safe place where students may explore strategies such as bidialectalism to protect their cultural identities while successfully communicating with their new communities.

The Affinity of Cu^{1+} for the Amyloid-β Peptide of Alzheimer's Disease

Richard C. Maduka*, Heather Feaga, Veronica Szalai*
Veronika Szalai, Associate Professor, Department of Chemistry and Biochemistry

Alzheimer's disease is a fatal neurodegenerative disorder. Extracellular plaques hypothesized to be the cause of dementia, develop in the brains of Alzheimer patients. These plaques are mainly made of the amyloid-β (Aβ) peptide. The Aβ plaques contain redox-active metal cations, including copper, which generate oxidative stress that kills neurons. In order for copper ions to participate in oxidative stress, both the low (Cu^{1+}) and high (Cu^{2+}) oxidation state forms must bind to Aβ with high affinity. The goal of my research is to determine the affinity and coordination environment of Cu^{1+} when it is bound to the Aβ peptide. We hypothesize that the two histidines that bind Cu^{+1} in a linear bis-histidine coordination environment (as demonstrated by previous work in the Szalai lab) are at positions 13 and 14 in the Aβ peptide sequence. To test this idea, competitive chelation experiments of Cu^{+1} were performed between Aβ16 (wild-type, H6A, H13A, and H14A) and disodium bathocuproine disulfonic acid. We have gathered data for the wild-type protein and my results for the mutants show that there is no significant difference between them. These data increase our knowledge of the copper-Aβ complex and could ultimately influence drug design and targeting.

This work was funded, in part, by the HHMI Undergraduate Scholars Program at UMBC, the Howard Hughes Medical Institute, and the Alzheimer's Association (IIRG-07-5821 to V.A.S.).

Deconstructing the Nerd: Visual Acuity and Need for Cognition in Adults

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

The classic definition of a "nerd" is very consistent with what psychologists suggest are characteristics of a person who is high in *need for cognition* – an enjoyment of and participation in effortful cognitive activities. For example, people who wear glasses or conspicuous corrective lenses fit the stereotype of such individuals who have been portrayed in popular media as conscientious and prone to engage in esoteric pursuits. However, there is very little research examining the relation between personality traits (e.g., "nerdiness") and physical characteristics (e.g., quality of vision). In the current study, a sample of 80 adults varying in age, educational background, and quality of vision, completed a brief demographic survey, the Need for Cognition Scale, a measure of visual acuity, and two perceptual tasks. We examined the relationship between visual acuity and need for cognition and explored whether this relationship was mediated by age or level of education. We expected that individuals who were nearsighted would possess a higher need for cognition compared to those who were not. The results of this study hold several implications for educational settings and may also yield evidence that personality traits are uniquely related to physical characteristics.

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

Simulation Software for the Chromatic Mineral Identification and Surface Texture (CMIST) Instrument

David Mason
Zaven Arzoumanian, Research Scientist, CRESST/NASA Goddard Space Flight Center
Keith C. Gendreau, Astrophysicist, NASA Goddard Space Flight Center

The ability to perform in situ mineral analysis has been limited by the size, power, and sample preparation requirements of traditional X-ray diffraction techniques. Upon completion, CMIST will be a low-power, portable device capable of X-ray diffraction (XRD), X-ray fluorescence (XRF), and optical imaging. By using state-of-the-art X-ray CCDs and novel data analysis techniques, CMIST will open up new possibilities for field research, including possible applications in remote or manned planetary science expeditions on the Moon and Mars. As part of CMIST development, it is necessary to have an accurate simulation of instrument response for use in data analysis and normalization. This software must simulate the X-ray source spectrum, sample interactions (XRD/XRF), and detection by the CCD. As part of this ongoing development, I have written software that can generate a sample batch of photons from the source, account for their attenuation across air gaps and vacuum windows, and produce a final energy distribution of detected photons, assuming 100% diffraction from a particular set of crystal lattice planes. In its final form, the software will be able to simulate instrument response to any combination of mineral compositions or elemental traces.

This work was funded by the CRESST/NASA Goddard Space Flight Center.

The Correlation between S100β Protein and Cellular Damage

Gabrielle J. McRae, *Kira Gianni*[1], *Paul Wilder*[1]
[1]Department of Biochemistry and Molecular Biology, University of Maryland, Baltimore
David Weber, Professor, Department of Biochemistry and Molecular Biology, University of Maryland School of Medicine, University of Maryland, Baltimore.

This study investigated the intercellular and intracellular presence of S100β protein concentrations in mammalian cells at different stages of confluency of tissue culture. S100β is a calcium-binding protein that has been shown to regulate intracellular processes, such as ubiquitination and the assembly of cytoskeletal components, and act as a secretory protein to mediate cellular interactions. It has been shown that S100β concentrations can indicate cellular damage or dysfunction. Although S100β concentrations can be used to indicate damage qualitatively, there is no current explanation as to why the protein is excreted, nor is there a quantitative system in place to assess the level of damage. Thus far, we have cultured various cell lines derived from cells with markedly high concentrations of S100β, including melanoma cells and cerebrospinal fluid. The cultured cells were harvested, lysed and analyzed using an enzyme-linked immunosorbent assay to observe intracellular and intercellular S100β levels as the cells transform from healthy, growing populations to dense, overpopulated growths. Next, we used these results to correlate S100β concentrations to different levels of cellular stress and damage. This project will serve to edify the practice of using S100β as a biomarker in order to engender precise and efficient forms of diagnosis.

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

Archival and Analysis of Sea Ice Thickness in the Arctic Ocean Based on On-Ice in Situ Historical Measurements

Katherine A. Melocik, *Benjamin Holt*[1]
[1]Bejamin Holt, Jet Propulsion Laboratory (JPL)
Eugene P. (Sandy) Parker, Associate Professor, Department of Geography and Environmental Systems

The Arctic sea ice cover has undergone profound changes, including reductions in extent and mean thickness, related to recent shifts in climate patterns over past decades. Less well known are related changes in sea ice mass balance and thickness distribution. Observations of extent and thickness come from a variety of sources. The objective of this project is to improve the understanding of changes in Arctic sea ice thickness and related changes in ice mass balance of the entire Arctic basin, by including analysis of ice thickness records that primarily extend outside the central Arctic region to the coastlines. My portion of this project was to compile a largely unexplored sea ice data record that consisted of in situ thickness measurements derived from drill holes, cores, gauges, thermistor strings, and surface electromagnetic induction. From journal articles, reports, on-line databases, and direct contact with sea ice investigators, I have assembled measurements from many types of expeditions with the earliest data from 1928 to the most recent from 2007. I will discuss the preliminary analysis of these records, as a means to improving the understanding of thickness changes in relation to climate change.

This research was funded by the NASA Undergraduate Research Program (Spring 2009) and by a Summer 2009 Internship funded by a NASA Space Grant to JPL/Caltec. The work was presented at the

American Geophysical Union Fall Meeting in San Francisco funded through a travel award from the UMBC Office of Undergraduate Education.

Brink of Reality: A Power Defense Game

***Jonathan Merkle**, Matthew Song, Kevin Kemp, Justin Wall*
Neal McDonald, Assistant Professor, Department of Visual Arts

Our game, Brink of Reality, is an attempt to address concerns about two current trends in video games. The first trend is that of the skill palettes in Massively Multiplayer Online Role-Playing Games, in which players collect an arsenal of up to roughly 30 skills with varying tactical advantages. The downside of this system is that since the player can access them all at any time, it encourages "mashing", a mindless all-out assault. The other trend is the lack of innovation in the Tower Defense games. This relatively new genre involves placing different varieties of immobile AI controlled "towers" to defeat enemies that follow a set route. However, the towers essentially last forever, and the player has little input once the enemies appear on screen. Our goal is to resolve these two very different problems in a *Power Defense game*, which involves a rather small palette of short-lived abilities that must be used tactically to defeat waves of enemies. Here, the planning stage is on customizing the ability palette between rounds according to preferred play style. The available abilities are severely limited and the next enemy unknown, so the emphasis is on split-second decision making and thinking ahead.

The Role of Altered Omentin Expression in the Mesothelial Cell Inflammatory Response

***Sonia Metangmo,** John McLenithan*
John McLenithan, Assistant Professor, Departments of Medicine and Physiology, University of Maryland School of Medicine

Omentin 1 and 2 are found in visceral adipose tissue and lung mesothelial cells. These cells are involved in the innate immune system and participate in the regulation of the inflammatory response. Omentin 1 is the major isoform and increases insulin-stimulated glucose transport. Omentin is decreased in obesity-dependent insulin resistance. Data from the McLenithan lab indicates that omentin is regulated by inflammatory cytokines but may also be involved in the regulation of the inflammatory response. Our objective is to find the role of omentin in the inflammatory response and its effect on insulin resistance in obesity. We hypothesize that mesothelial cells' inflammatory response is amplified in obese individuals and thus resulting in a reduction of omentin. We will alter omentin expression in lung and adipose mesothelial cells by siRNA knockdown and adenoviral over expression to evaluate the omentin-dependent changes in the inflammatory response. This will be assessed through western blots, quantitative RT-PCR, and LPS-induced cytokine expression measured by ELISA. If omentin is shown to be anti-inflammatory, obesity-dependent decreases in omentin should contribute to even greater systemic inflammation in obesity. Therefore, altering omentin levels may represent a novel therapeutic intervention for systemic inflammation that accompanies the obese insulin-resistant state.

This work was funded by the Nutrition Obesity Research Center of Maryland NIH NORC P30 DK072488-04.

Creative Teaching with Virtual Environments and Tools

Kenneth R. Miner
May Chang, Head of Library IT Services, Albin O. Kuhn Library and Gallery

In the art curatorship class in Fall 2009, we introduced a virtual world as a tool for modeling 3D environments. After noting that other virtual world classes were generally taught inside that world, we decided it was more appropriate to teach and use the virtual world as a tool to develop student projects instead. As this is the first time we are directly involved with teaching the lab sessions, we needed to systematically analyze and study its use and value. We created a tutorial inside the virtual world to exercise previously learned skills and to be a readily accessible reference source. The first session was taught in a standard lab format with reference worksheets and leading the class through various new concepts; the next involved teaching more complex spatial and building skills. In between sessions, we tweaked our teaching methods to be more effective for following classes, and analyzed the efficiency of our methods. Many students attributed their success to the effective teaching in class sessions as well as the ease of use and navigation in the virtual world. Our experience indicated that persistent teaching materials and ready availability of teaching staff led to enabled and motivated students.

Combinatorial Software Testing

Menal G. Modha
Richard D. Kuhn, Computer Scientist, Information Technology Laboratory, National Institute for Standards and Technology

Software developers frequently encounter failures that occur only as the result of an interaction between two or more components or variables. Testers often use pairwise testing – all pairs of parameter values – to detect such interactions. However, many errors are triggered by a combination of three or more parameters. If all faults in a system can be triggered by a combination of *n* or fewer parameters, then testing all *n*-way combinations of parameters can provide high confidence that nearly all faults have been discovered. My research group received error logs of spacecraft testing from a research laboratory (undisclosed because of proprietary reasons). One of my tasks was to analyze the reports and determine what combination of factors caused failures in the spacecraft software. I also worked on extending the fault isolation program. The program counts how many times a combination in a failing test also occurs in the set of passing tests. The code already existed for two way to four way combination testing. I extended the code to work for five way and six way combination.

The funding for this work was provided by the National Institute of Standard and Technology's Summer Undergraduate Research Fellowship (SURF), grant number: 70NANB9H9108.

The Rise of China and India: What do Possible New Superpowers mean for the United States?

Victory D. Mohamed
Devin Hagerty, Professor, Department of Political Science

Since the fall of the Soviet Union, our world has been shaped by an American/Western order: a liberal political and economic system led by the United States. Two decades later, however, the premier status of this system is being challenged by new, rising powers. With an extensive look at the years 1990-2010, my research (1) analyzes the instances in which rising powers, specifically China and India, have chosen to challenge the United States and (2) explores the ways they have worked to integrate themselves into the world as dominant players. To best answer whether or not they will be able to replace the United States as the world leader and to quell the fears of the American/Western order, this research finds that the American system is too engrained with the rest of world to be easily surpassed and thus rising powers will find it exceptionally difficult to defeat the preexisting system. Although their economies may surpass that of the United States by 2050, China and India would find it much more beneficial to assimilate into the current system instead of trying to create their own and risking the loss of international support.

Design of an Ethylbenzene Production Scheme of a Styrene Chemical Plant by Innobox Engineering, Inc.

Phil A. Cutler, Rohan G. Durbal, Imhotep Jackson, Dominique T. Monteil, Hannah K. Wilson, Hanna Worku
Mariajose Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

Styrene is a chemical used predominantly in producing polystyrene, a material used in packaging, disposable cups, and disposable cutlery. This study evaluates the feasibility of manufacturing styrene from benzene and ethylene compared with purchasing it at market rates. The study encompasses two scenarios of 600 or 800 million pounds of styrene per year. Specifically, our team focuses on the first component of styrene production: alkylation of benzene with ethylene to produce ethylbenzene in excess of 99.8% purity by weight. The alkylation process produces several byproducts which decrease the purity of the product and reduce the yield. Chemical engineering principles are applied to determine optimal reactor conditions and separate desired products from waste and viable recycle streams. Energy conservation is also a priority and heat integration is employed throughout. The proposed design provides a safe, reliable, efficient, and environmentally responsible alternative for ethylbenzene production. The economic viability of the project is evaluated in combination with other teams' results for the latter portion of the styrene production process and in the context of projected market conditions.

Conquering Visual Perceptions: An Exploration in Effective Media Literacy Strategies for Pre-Adolescents

Rebecca Mullan
Diane Alonso, Program Director, Department of Psychology at USG

There is no question that children today are facing many adverse effects from exposure to sensationalized messages presented in the media. Given the extreme increase of media usage on a daily basis, these negative repercussions have a greater impact and call for further exploration. This study was designed to gather information on the dominance of modality (visual versus auditory) in media presentations. After presenting two forms of opposing information (two slide shows with conflicting soundtracks), and by measuring which stimulus had a greater influence, children's perceptions of the presentation were analyzed. The participants for this study included approximately sixty pre-adolescents, between the ages of ten and twelve from three elementary and middle school classes. The preadolescent population was chosen specifically because of its frequent targeting by the media and susceptibility to influence. The findings gathered might help to create effective methods for educating both parents and children on healthy media viewing strategies.

Apontic, a Novel Regulator of the JAK/STAT Pathway in *Drosophila* Testis

Archana Murali
Michelle Starz-Gaiano, Assistant Professor, Department of Biological Sciences

Adult stem cells maintain their undifferentiated state through signaling networks present in their niche, and understanding these complex regulatory mechanisms will provide a major advancement in the field of stem cell research. The *Drosophila* testis supports two stem cell populations, the germline stem cells (GSCs) and the cyst progenitor cells (CPCs). The GSCs undergo asymmetric divisions to produce the sperm. The GSCs and CPCs surround a cluster of somatic cells called the hub, which acts as the niche. The hub secrets a ligand, Unpaired, that activates the JAK/STAT pathway, which is responsible for maintaining both stem cell populations until they move away from the niche and begin differentiation. In previous research, we identified a novel regulator of the STAT pathway, Apontic *(*APT*)*, in *Drosophila* ovaries and demonstrated that STAT turns on *apt*, which feeds back to inhibit STAT activity. In this study, we are testing whether this mechanism also occurs in testis. Consistent with our predictions, we have found that *apt* is expressed in the hub in high levels. Determination of whether *apt* is required for stem cell maintenance and if so, whether it acts independently or through one/more co-regulators such as SOCS, another negative regulator of STAT present in testis, is underway.

This work was funded, in part, by UMBC SRAIS grant.

Which Blackbirds Are Black? The Evolution of Countershading and Temperate Breeding

Matthew J. Murphy
Kevin E. Omland, Associate Professor, Department of Biological Sciences

Countershading is a form of camouflage employed in strongly directional light environments that decreases the contrast between an organism and its background. There are several species of blackbird in which females have gained countershaded plumage. Evolution of this form of sexual dichromatism is strongly correlated with migration and temperate breeding in New World orioles. The purpose of my investigation was to determine whether gains in female countershading were significantly correlated with a transition from tropical to temperate breeding in the grackles. I reconstructed the ancestral states of both countershading and breeding latitude using the computer program Mesquite. I used another program, MacClade, to perform a "Concentrated Changes Test", which tests for correlated evolution between two binary characters. Changes from solid to countershaded plumage were not significantly concentrated on branches containing temperate-breeding species. The loss of elaborate plumage in female blackbirds is not as strongly correlated with temperate breeding as it is in female orioles, despite the trend among temperate-breeding blackbirds to have countershaded plumage.

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

Growth Inhibitory Effect of Zoledronic Acid on Breast Cancer Cell Lines

Brandon E. Nemieboka*, Amanda J. Graner*[1]*, Angela H. Brodie*[1]*,*
Angela H. Brodie, Professor, Department of Pharmacology and Experimental Therapeutics
[1]University of Maryland, Baltimore

Zoledronic acid has been shown to exhibit antitumor and antimetastatic activity *in vitro* and in premenopausal women with early stage breast cancer, significantly improving clinical outcomes. Part of a class of drugs known as bisphosphonates, zoledronic acid is typically used to prevent skeletal fractures in cancer patients as well as patients with osteoporosis. Various studies have shown that women taking zoledronic acid have a much lower risk for breast cancer recurrence than those not taking the drug. Our laboratory is interested in the mechanism of action of this drug within breast cancer cells. Through growth inhibitory assays, we have shown the IC_{50} to be 0.954 μM. Originally, we hypothesized that zoledronic acid inhibited the enzyme aromatase because breast cancer cells treated with the drug showed a decrease in aromatase activity. Enzyme preparation studies however, show that zoledronic acid has no significant effect on the activity of aromatase indicating that the drug acts upstream of the enzyme. To further understand the mechanism of action, we plan on conducting studies to examine its effect on cell survival pathways such as the MAP kinase cascade.

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

Integration of GFP into the Chromosome of *E. coli* Bacteria

***Olivia N. Nwankwo**, Wensheng Luo, Michael Donnenberg*
Michael Donnenberg, Division of Infectious Diseases, University of Maryland School of Medicine

Pathogenic strains of *E. coli* bacteria are among the leading causes of diarrhea and urinary tract infections in humans. Consumer products contaminated with these bacteria have been linked to outbreaks of both serious and mild illness. This lab uses mutant and wild type strains of pathogenic *E. coli* bacteria to study the molecular and cellular basis of these infections. An innovative way to image bacteria during these studies is by using Green Fluorescent Protein (GFP). By introducing a gene expressing GFP into a defective transposon (a DNA element that can insert into foreign DNA), it is possible to integrate the *gfp* gene into the genome of the bacterial strain of interest. Thereafter, we can visualize the location of cells expressing that gene using fluorescence microscopy. We can compare the behavior of wild type bacteria to mutants unable to produce the retractable pilus that attaches to the host cell, or to mutants defective in the formation of the pore on the host cell used by the bacteria to inject proteins into the cell. Thus far, we have been able to create GFP-expressing versions of two such mutants. Along with a previously created GFP-expressing wild type strain, these mutants will be used to study the distribution of protein components of the pilus and the components of the pore.

This work is funded, in part, by R01 AI 37606 and R01 AI 32074 from the National Institutes of Health.

Synthesis of new Heterocyclic Inhibitors of the Helicase of Hepatitis C Virus

***Kevin W. O'Malley**, Dawn Ward*
Paul J. Smith, Associate Professor, Department of Chemistry and Biochemistry

Infection by the Hepatitis C virus (HCV) leads to chronic disease that often results in liver failure. Since the only approved HCV treatment is moderately effective there is a strong need for the development of new therapeutic compounds. Novel heterocycles based on the natural product UK-1 were synthesized that show HCV helicase inhibition and action against HCV via a HCV replicon assay. Our goal was to determine what the active form of the compound is and to create more potent and bioavailable analogs. Several variations of the lead compound were synthesized, characterized, and sent for biological testing. The results will provide an understanding of the compound's mechanism of action as well as guide the synthesis of better inhibitors.

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

Nightingales

Christopher M. O'Reilly
Simon Stacey, Associate Director, The Honors College

This study undertook a reexamination of the "best life" for man concluding that it is ataraxia, freedom from worry. In a world influenced by Nietzsche and Schopenhauer, who sought to dethrone the gods, transcendent sources of meaning and purpose lose potency in justifying suffering. It becomes mans responsibility to counter the intrinsic suffering of life, most profitably by eliminating it rather than ameliorating it, and this is best achieved by an infusoria of "base" pleasure so total that man is propelled to a state where the concept of being evaporates. Two examples from literature serve as points of discussion: *Brave New World* by Aldous Huxley and *Anthem* by Ayn Rand. Huxley's vision of a sterilized world of total administrative control, although presented as dystopic, closely approaches our goal of abolishing human suffering. In *Anthem* one man's search for independence, apparently valuable, only compounds the problem of suffering in an incomplete and unhappy world. As the course of society is pertinent to everyone, and the conquest of suffering is even more so, it is argued that Huxley's world is the admirable one, not Rand's.

Genetic Basis of Natural Variation in a Novel Phenotype in *Drosophila melanogaster*

Willis O. Ochieng, Xin Ma, *Mary F. Durham*
Jeff W. Leips, Associate Professor, Department of Biological Sciences

Although *Drosophila melanogaster* has been extensively studied in laboratory environments since the early 1900's, relatively little is known about its natural history. In previous studies we observed large circular spots resembling *Drosophila* eyes on the anterior corners of the thorax in a set of lines derived from nature. These lines are from the *Drosophila* Genome Reference Panel (DGRP), a community-wide resource of genetically sequenced inbred lines used to identify candidate genes for phenotypes through genome-wide association. To our knowledge, "eyespots" have never been described in *Drosophila*; however, similar markings on wings of other insects are used as either warning or camouflage patterns. In this study we examined the genetic basis of natural variation in eyespots by screening flies from a subset of the DGRP and using genome-wide association to identify candidate genes involved in this phenotype. Preliminary observations indicated that like many insect color patterns, *Drosophila* eyespots may be influenced by diet, so we characterized the plastic response to diet by rearing adults on two diets differing only in protein (yeast) content. Our results set the groundwork for future study on this novel *Drosophila* phenotype and provided insight into the genetic basis of eyespots in the insect world.

Effect of Substrate Patterning on *S. aureus* Biofilm Formation

Evelyn O. Ojo*, M. Acosta, M. Kambarami*
Julia M. Ross, Professor, Department of Chemical and Biochemical Engineering
Jennie B. Leach, Assistant Professor, Department of Chemical and Biochemical Engineering

Staphylococcus aureus is a Gram-positive bacterium that causes diseases such as pneumonia and meningitis. Infections by *S. aureus* can currently be treated with antibiotics. However, resistant strains to the various antibiotics have evolved and new methods for combating this bacterium must be developed. A characteristic of *S. aureus* infection is the forming of biofilm which acts as a shield against medication. In order to gain a better understanding of biofilm formation, we are investigating the effect of size, shape, and spacing of bacteria colonies on biofilm growth. We are utilizing soft lithography to create silicone stamps to print patterns of collagen onto culture plates. The patterns are lines and circles that have dimensions on the order of the size of one cell or a small cluster of cells and will allow us to initiate specific patterns of bacteria hypothesized to affect biofilm formation. This work will provide a basic understanding of how biofilms form and will provide a new tool for investigating *S. aureus* biology, drug efficacy, and infection-resistant biomaterials.

This research was funded by the NIH and the Henry Luce foundation.

Carbocyclic Fleximers as Anti-Trypanosomal Agents

Chikezie O. Okoro, *Sarah Zimmerman, Katherine L. Seley-Radtke*
Katherine L. Seley-Radtke, Associate Professor, Department of Chemistry and Biochemistry

African trypanosomiasis, or sleeping sickness, affects many people living in sub-Saharan Africa, yet it is not a significant focus of major pharmaceutical companies. Current therapeutics are expensive and are mainly unavailable to those living in developing countries. Also, there are undesirable side effects and the developing resistance to currently used therapeutics rendering these drugs ineffective. Our flexible nucleosides, or “fleximers”, have the potential to adapt to mutations in active sites of enzymes involved in parasite replication, thereby retaining effectiveness. A critical factor in parasite replication requires methylation of several nucleotides on the mRNA “cap four” structure. Inhibition of S-adenosylhomocysteine hydrolase (SAHase) has been found to prevent these methyl transfers which lead to an incomplete mRNA incapable of functioning for trypanosomal development, thus making SAHase inhibitors potential anti-trypanosomal drugs. In that regard, carbocyclic nucleosides are potent inhibitors of SAHase. Moreover, a fleximer from our laboratory has shown inhibition against SAHase. Combining these leads, carbocyclic fleximers should result in a synergistic increase in SAHase inhibition and potency against trypanosomiasis. Their inherent flexibility should prove beneficial when faced with binding site mutations in SAHase. Once synthesized and characterized, the analogues will be assayed. Synthetic progress towards realizing these novel nucleosides are reported herein.

The Effect of Molecular Characteristics on Sugar Recovery Using *in vitro* Microdialysis

***Daryl O. Omire-Mayor**, Sarah Wassink, Andrea Gray, William R. LaCourse*
William R. LaCourse, Professor, Department of Chemistry and Biochemistry

Quantitation of biomarkers in physiological fluids is significant in clinical endocrinology. *In-vivo* microdialysis (MD) is a sampling technique that involves the diffusion of small molecules across a semi-permeable membrane by passing a perfusate liquid through a dialysis probe which is placed in the area of interest for sampling. Currently, *in-vivo* microdialysis studies on carbohydrate-based biomarkers assume that most sugars of equivalent size behave similarly. In this investigation, the sampling recovery of sugars of various size and/or charge is studied using *in-vitro* microdialysis. After *in-vitro* microdialysis sampling, the sugars are separated by high performance anion exchange chromatography (HPAEC) using a mobile phase of 70milliMolar (mM) sodium acetate and 100mM sodium hydroxide at a flow rate of 0.25mL/min. Upon analyte(s) separation, pulsed electrochemical detection (PED) detects these polar aliphatic compounds without derivatization. HPAEC-PED allows for the detection of multiple sugars from one sample using one system. The *in-vitro* microdialysis sugars' recoveries are examined by an internal standard method, using cellobiose as the internal standard. Assessment of the sugars' recoveries following MD-HPAEC-PED show whether size and/or charge make any difference in a sugar's recovery. These studies will lead to better analytical methods for carbohydrate-based biomarkers and a deeper understanding of microdialysis separation mechanisms.

This work was funded, in part, by the NIH/NIDDK Short-term Education Program for Underrepresented Persons (STEP-UP).

The Utilization of CD20-Specific Lentiviruses for Tolerance Induction

***Nana K. Owusu-Boaitey**, Ai-Hong Zhang*[1],
[1]Center for Vascular and Inflammatory Diseases, University of Maryland School of Medicine
David W. Scott, Professor of Surgery and of Microbiology and Immunology, Center for Vascular and Inflammatory Diseases, University of Maryland School of Medicine

Autoimmune disease often result from immune cells recognizing host peptides as foreign, leading to immunogenic responses such as the destruction of peptide-expressing host cells. Tolerance to these self-peptides may be induced by retrovirally infecting naïve B cells *in vitro* with the peptide coupled to an immunoglobulin heavy chain (IgG), allowing the B cells to present the peptide via MHC class II molecules, and infusion of peptide-presenting B cells prior to disease onset. An alternative method involves infecting B cells *in vivo* with CD20-specific lentiviruses that express the peptide-IgG. Since CD20 is expressed predominantly on B cells, the virus will almost exclusively infect B cells when injected into the body. This study involves the use of lentiviruses for induction of tolerance by this means. The lentivirus utilized has been shown to infect CD20-expressing Raji cell line but not another CD20-deficient cell line. Lentivirus plasmids coding for two different peptide-IgG have been constructed and are currently being sequenced. Current results suggest that these plasmids may be able to infect mice that express human CD20; these peptide-IgG lentiviruses will then be used to induce tolerance in mouse models of human autoimmune conditions.

*This research was supported, in part, by the HHMI Undergraduate Scholars Program at UMBC, the Howard Hughes Medical Institute, along with grant R01 AI035622 from the NIH, the NMSS Pilot Award, NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC.*

Production of Styrene Monomer from Ethylene and Benzene

Fabiola Rincon, Chijioke Irrechukwu, Brooke Leibforth, Jason Loiland, Michael Pacella
Mariajosé Castellanos, Assistant Professor, Department of Chemical & Biochemical Engineering

This feasibility study of the production of the styrene monomer from ethylbenzene, along with the dehydrogenation of styrene, will be applied to the manufacturing of polystyrene resin. This study assesses and optimizes the chemical, mechanical, and economical aspects of the styrene process. Polystyrene resin is a major component of the plastics industry. Currently, the client purchases the raw styrene from outside suppliers, but is interested in expanding to produce its own supply. Voyager Engineering has created an optimum plan design implementing technology to produce styrene. In this method, ethylene and benzene are alkylated to produce ethylbenzene, which is then dehydrogenated to produce the styrene. The design feasibility depends on the efficiency and the cost of the process. Voyager Engineering will optimize production yield by assessing the effects of various catalysts, raw material ratios, reaction conditions, recycling techniques, and energy consumption rates. Product market supply and demand trends will be analyzed to forecast the economic situation; including feedstock, operational, and production costs, as well as revenue. Voyager Engineering will balance the physical efficiency and the financial feasibility of the process to determine the ideal design scheme.

Influence of Sociodemographics on Voting Behavior of Maryland State Legislators on Proposed Abortion Legislation

Kathryn Papagjika
Thomas Schaller, Associate Professor, Political Science Department

This thesis explored the many factors that influence why Maryland State legislators vote a particular way on controversial abortion legislation. There are several theories and debates surrounding the issue of why legislators vote a particular way on abortion legislation. Sociodemographic characteristics of policy makers have been key in the support or opposition of proposed abortion policy. Using three sets of roll call votes on abortion bills, I explore how the sociodemographic characteristics of Maryland State Senators and Maryland State Delegates influence their vote on these three pieces of abortion legislation. These characteristics included the age, race, sex, religion, political party identification, county district, and congressional district of each state legislator. After analyzing the characteristics and the final roll call votes of the policy, the role that sociodemographic characteristics play in the policy making process becomes clear. I found that it can be argued that all of the characteristics studied play a role in the policy making process by influencing voting behavior. They shape the ideals, opinions, and beliefs of the policy makers and thus influence their voting choices and preferences. This in turn affects their general voting behavior in creating abortion policy.

Back to Bach: A Historically-Informed Interpretation of a Gavotte

Sarah M. Paquette
Airi S. Yoshioka, Associate Professor, Department of Music

The stylistic features of the Romantic and Contemporary periods have influenced how modern violinists interpret music of the Baroque period. While these interpretative changes over the past 250 years are a natural course of development, they can interfere with authentic performance practice since violins and bows were constructed differently and musical aesthetics and styles have dramatically evolved. The constructional modifications (smaller violin, shorter and curved bow, lack of chin rest, etc.) have altered what types of ornamentations and articulations are possible. In Bach's Partita No. 3 Gavotte en Rondeau, many violinists and pedagogues have developed interpretations that stray from the period-informed style. Contemporary performers overuse ornamentations such as trills and vibrato unlike Baroque players who use them sparingly for highlighting repeated passages. On a weekly basis, I presented an aspect of Baroque performance practice in MUSC112 (Violin Repertory) and shared my research with violin performance majors. On my personal journey with Gavotte en Rondeau, I developed historically-informed interpretations and performed the work multiple times at UMBC and in the outer-communities.

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

PKCI/HINT1 Involvement in Morphine Addiction Using Conditioned Place Preference Test

Nicole A. Parker, *Elisabeth Barbier, Helen Xing, Jessica Kim, Yio Lee, Jia Bei Wang*
Jia Bei Wang, Professor, School of Pharmacy, University of Maryland, Baltimore

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/HINT1 was found to interact with the mu opioid receptor and modulate its function. Clinical and behavioral studies place it as a candidate molecule in the pathology of mental diseases. Indeed, its gene expression is down regulated in the cerebral cortex of schizophrenic and bipolar patients, and mice deficient for PKCI/HINT1 exhibit positive symptoms of animal models of schizophrenia as well as behavioral and endocrine features that might relate to the mania phase of bipolar disorder. As mental disorders are comorbid with drug addiction we assessed whether deficiency for PKCI/HINT1 will result in stronger addiction. PKCI/HINT1 knockout (KO) mice and their wild type (WT) littermate were tested in the morphine-induced conditioned place preference paradigm. Both WT and KO mice developed a place preference at a dose of 10mk/kg of morphine with no difference between the genotypes. Our results indicate that deficiency in PKCI/HINT1 protein does not affect morphine-induced place preference in mice.

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

A Thematic Analysis of Stephen Schwartz' "Children of Eden"

Shane M. Parks
Anna Rubin, Associate Professor, Department of Music
Susan McCully, Lecturer, Department of Theatre

While musical theatre is acknowledged as an American entertainment staple, the genre is still quite young. The most prominent composers of musical theatre are continually experimenting with different ways of composing, structuring, and presenting their art. One device used in musical theatre today is the leitmotif, a mechanism that attaches repeated events, moods, or characters to musical themes. Stephen Schwartz, known for his widely successful scores for "Pippin," "Godspell," and "Wicked," uses this tool in the show "Children of Eden." The work, despite having never been on Broadway, is consistently on Musical Theatre International's "Top 20 licensed works." My research explores the way in which Schwartz creates a cohesive dramatic and musical work through his use of leitmotifs. The artistry displayed in this piece helps the audience connect parallel plot lines and recall past action with relative ease. I will explain how the themes create layers of subtext that greatly enrich the show. "Children of Eden" is a work that can be appreciated both on a scholarly level and as a work of entertainment. Through the research of Schwartz' play, I hope to expand recognition of musical theatre as a subject that deserves scholarly attention and analysis.

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

New Perspectives on Old Views

Katherine Bentz, Catherine Pasqualoni, Christina Ross, *Sarah Carney*
Richard S. Mason, Lecturer, Department of Ancient Studies

Most research in the field of Ancient Studies focuses on the monument or artifact in question in specific context to the ancient world. While this is, of course, extremely important, there is so much more to be learned from the object. Our research explores five temples of ancient Athens, analyzing nineteenth century photographs of them, all of which are the property of UMBC Special Collections, and comparing them to modern photographs taken by Ancient Studies students and faculty during their travels. Central to our study were legal and ethical issues involved in the fields of curation and conservation, as well as a deep investigation into the reasons for which nineteenth century photographers, modern day tourists, and archaeologists and museum curators throughout history ever bothered to look at such monuments. By studying these monuments, we learn much about the people who built them, and the people who either destroyed or preserved them. Through a deeper understanding of them, we come to gain a deeper understanding of ourselves.

Friction Testing of Materials Used in Artificial Joints

Anand M. Patel
L. D. Timmie Topoleski, Professor, Department of Mechanical Engineering

Arthritis is a disease in which one or more damaged joints results in pain, swelling or limited movement. Implanting an artificial joint to replace the damaged one is one way of treating arthritis. Every year, more than 120,000 people undergo hip replacement surgery in the US. The wear in artificial joints is the prime factor for prosthesis loosening and initiating osteolysis – the destruction of bone surrounding the prosthesis. Examining the wear behavior of the surfaces can be a vital factor in developing breakthroughs leading to 'ideal' bio-materials and failure-free artificial joints. The purpose of this research was to study the wear behavior of materials used in artificial joints by designing a coefficient of friction (CoF) measuring device that would allow one to calculate the CoF values for these materials. Inclined plane friction determination concept was used to calculate the coefficient of friction. The hypothesis to be tested was that the use of modified micro-textured surfaces (carbide coated CoCrMo) on metal surface in artificial joints will result in less wear of the surfaces compared to the non-textured surfaces, or surfaces that have not been modified. Standard materials (example steel on aluminum) were tested to validate the testing system and the results obtained were analogous to those found in engineering journals. The micro-textured samples would be tested on metal surfaces and the results would be compared to the non-textured surfaces or surfaces that have not been modified.

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

Dead Fall

John Perry, ***Alex Ehrensberger***
Neal McDonald, Assistant Professor, Department of Visual Arts

Dead Fall is a video game that focuses on fast-paced action, in which the player must fend off enemies running at him or her from both sides. Dead Fall's development focused heavily on complexity, with multiple levels and enemy types, forcing the player to alter tactics on the fly. This project was drawn and animated entirely in Adobe Flash CS4, and programming was done with Action Script 3.0. A tile-based system was created in Flash, as well as the collision detection used in the game. Work on the project was split into three distinct work types, so each group member could be effectively independent, and allow for integration of individual elements of the game as they were created. There were some concerns with keeping artistic style consistent, however they were remedied by using an original concept for templates that were tweaked for variation in the game. For now, Dead Fall will remain Flash-based, for wide availability, although we hope to port it to XBox.

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

Nicholas K. Pinkin*, Ravi Ujjinamatada, William Motel*
Ramachandra Hosmane, Professor, Department of Chemistry and Biochemistry

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 intermediate to the final THF analogue (d) has been synthesized using commercially available thiophene carboxaldehyde and ethylacetoacetate to give **UMR-150** 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.

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

Aggregation of Potential Drug Delivery Vehicle

Elizabeth G.M. Plum
Richard Karpel, Professor, Department of Biochemistry

Rattlesnakes are well known for their poisonous bites but surprisingly, the venom of the South American rattlesnake *Crotalus durissus terricus* possesses a potentially valuable protein called crotamine. This 42-residue polypeptide is a cell penetrating protein (CPP) and also a transporter, able to carry molecules or even entire genes into cells. Crotamine specifically enters only actively proliferating (AP) cells through an interaction with heparin-glycosaminoglycans (GAG). It thus must form ternary complexes with these GAGs and DNA. Crotamine is able to bind to negatively charged DNA because it is highly basic. Crotamine-DNA complexes then enter the cell by endocytosis and localize in the nucleus. Past experiments have shown that heparin can break up these aggregates. Since crotamine carries DNA into the cell in aggregated form, these complexes have been characterized through dynamic light scattering (DLS). These complexes had a uniform size dependent on the type of DNA used. The size of this aggregate varied with time - the longer the crotamine was incubated with the DNA, the larger the hydrodynamic radius. In line with previous experiments, DLS and electrophoretic measurements showed that heparin breaks apart crotamine-DNA aggregates in a time-dependent manner.

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

TrkB Receptor Downregulation Contributes to Dendritic Spine Density Decrease due to Chronic Elevation of Corticosterone

Dina V. Popovkina*, Scott M. Thompson*
Scott M. Thompson, Professor, Department of Physiology, University of Maryland School of Medicine

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 percent by corticosterone, compared to untreated controls. This decrease was comparable to the 14.1 percent decrease produced by inactivating trkB receptors. Preliminary experiments using western blotting indicate that corticosterone treatment *in vitro* decreases trkB phosphorylation, thus presumably disrupting downstream signaling cascades initiated by neurotrophin binding. We conclude that corticosterone causes synapse loss by decreasing trkB – neurotrophin signaling, and thereby impairs cognitive function.

*This investigation was funded, in part, by the NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and the UMBC HHMI Undergraduate Scholars Program through the Howard Hughes Medical Institute to DVP as well as grants from the National Institute of Mental Health to SMT.*

Justice Sotomayor and the Legitimacy of the Supreme Court

David K. Pourshoushtari
Tyson King-Meadows, Assistant Professor, Department of Political Science

This paper examines public perceptions of Supreme Court Justice Sonia Sotomayor after the first series of oral arguments of the 2009-2010 term, Citizens United v. Federal Election Commission. Using national survey data to examine public attitudes toward Justice Sotomayor, we examined affect, perception of her impact and attentiveness to her inaugural activities. It revealed that not only do conservative respondents generally hold unfavorable views of Sotomayor, but that they also had a tendency to believe she would likely have a more liberal impact on the Supreme Court. The study also revealed that conservative respondents paid less attention to Sotomayor's performance than did liberal respondents. These findings suggest that affect towards Sotomayor amongst conservatives remains relatively low, and that conservatives still believe Sotomayor will shift the court in a more liberal direction, despite her succeeding a liberal judge in David Souter. As a result, Justice Sotomayor may indeed weaken the otherwise consistent legitimacy the overall public affords the Supreme Court.

This work was supported, in part, through a travel award from the UMBC Office of Undergraduate Education.

Polyethylene glycol Hydrogels as an *in-vitro* Model for Neural Tissue Engineering

Stephanie Pubill*, Silviya P. Zustiak*
Jennie B. Leach, Assistant Professor, Department of Chemical and Biochemical Engineering

The overall goal of this work is to contribute to a deeper understanding of the dynamic interactions between neuronal cells and their three-dimensional (3D) surroundings by implementing tissue engineering principles to study neuronal behaviors associated with regenerating nerve tissue. Specifically, my project involves the use of cross-linked degradable polyethylene-glycol (PEG) hydrogels as a 3D *in-vitro* model to test cell-matrix interactions. Towards that goal this study investigates the utility of PEG gels to be used as a 3D scaffold for neural stem cells, primary dorsal root ganglia neurons as well as PC12 cell culture. My work specifically involves characterization of the cell viability and morphology after seeding the cells in the 3D PEG gels. My work involved varing gel mechanical parameters such as porosity and stiffness represented by polymer molecular weight or density as well as biochemical parameters such as number of cell attachment sites represented by adhesive ligand concentration, in order to pinpoint the optimal conditions for cell growth and proliferation. The research indicates that neural cell viability and morphology were sensitive to both biochemical and mechanical stimuli. This knowledge allows us to propose gel properties that will yield optimal cell growth and proliferation, which is the focus of my ongoing research.

Funding for this project was provided by the Henry Luce Foundation, UMBC and NIH-NINDS (R01NS065205) grant.

Isolation and Characterization of Mutations in Ribosomal Proteins L4 and L22 that Confer Ketolide Resistance

Asmara Qamar
Janice M. Zengel, Senior Research Scientist, Department of Biological Sciences

Extended domains of ribosomal proteins L4 and L22 penetrate into the core of the large ribosomal subunit and contribute to the narrowest region of the peptide exit tunnel. Several types of antibiotics, including macrolides and ketolides, interact with the tunnel, and mutations in L4 and L22 have been shown to confer resistance to these antibiotics. The novel ketolide antibiotic Cethromycin is currently undergoing development for the treatment of community-acquired pneumonia and biodefense pathogens, and is considered more potent than macrolides, possibly because it makes more contact points: in addition to 23S rRNA domain V, it also makes contacts with domains II and IV. This study aims to isolate and characterize *E. coli* strains with mutations in L4 and L22 by selecting for growth on Cethromycin. Currently, eight mutants have been isolated, six of which are novel; three of the latter display out-of-frame deletions that are predicted to eliminate a majority of the L22 protein. Additional mutants are also being generated through QuikChange mutagenesis. The growth rate and degree of antibiotic resistance of these mutants will be assayed, as well as the mutant ribosome's binding affinity to Cethromycin. By characterizing antibiotic resistant mutants, this project hopes to shed additional light on mechanisms of ribosomal protein-mediated antibiotic resistance.

This work was funded by National Science Foundation Grant MCB 0920578.

Parental Depression in Toddlerhood and Child Growth from Two to Four Years of Age

Anna L. Ramirez, *Laura A. Scaletti*[1]*, Maureen M. Black*[1]
[1]University of Maryland School of Medicine, Department of Pediatrics: Growth and Nutrition Division
Laura A. Scaletti, Lecturer, Department of Psychology

Past research has found that family dysfunction may affect a child's weight. This study investigated the relation between parental depression and a child's growth from 24 to 48 months of age. The data was part of a larger longitudinal study that examined prenatally drug exposed children from birth through adolescence (N=276). When children were 24, 36, and 48 months of age, parents filled out the Center for Epidemiological Study's self-report depression scale (CES-D); at these same time points, parents were asked to provide the height and weight of their child from his/her last well-visit. Participants were selected based on available data. Higher CES-D scores at 36 months of age were associated with a decrease in the child's weight percentile from 24 to 36 months, $r(94)=-0.35$, $p<.001$, and higher CES-D scores at 48 months of age were associated with a decrease in the child's weight percentile from 36 to 48 months of age, $r(119)=-0.25$, $p<.01$. It is unclear whether these percentile changes were harmful or beneficial to the children (*e.g.*, in the case of an obese child). Additional analyses will be conducted in order to probe the nature of these associations.

This work was funded by a grant to the third author (NIDA RO1 DA021059).

Spatial Dynamics of the Eastern Mud Turtle *Kinosternon subrubrum* in a Freshwater Tidal Marsh

Rebecca A. Reeves*, Christopher Swarth*[1]
[1]*Christopher Swarth, Sanctuary Director, Jug Bay Wetlands Sanctuary*
Christopher M. Swan, Associate Professor, Department of Environmental Science

The Eastern Mud Turtle (*Kinosternon subrubrum*) is a small, semi-aquatic turtle native to the Eastern United States. Relatively little is known about the movement patterns or home ranges of these turtles. Previous studies have focused on seasonal movements or have studied home ranges in space-limited environments, such as small farm ponds. This study examined Mud Turtle home ranges in a large, freshwater tidal marsh using radio telemetry data from two consecutive activity seasons to determine whether or not home range size is a function of habitat availability. Our findings, using the minimum convex polygon analysis, indicated that the average home range size for mud turtles in this environment was well over the previously published estimate of 0.05 hectares. Males have a larger average home range size than females, however there were no statistically significant differences in male and female home range size. Males also tended to disperse farther from their winter hibernacula, in riparian meadows and forests, than females did to reach their activity season home ranges. More study is necessary to clarify these trends and to reduce variation in the data since this information will be of value in future conservation and land-use decisions.

This work was funded by the Friends of Jug Bay.

The Cyclical Nature of Obsolescence

Patrick K. Rife
Steve Bradley, Associate Professor, Department of Visual Arts

Every day people are presented with new devices and mediums to improve and enhance their lives. The MP3 player that shoved the CD player aside is only the most recent evolution of obsolescence. As a worldwide collective culture we seek to always be on the verge of the next big thing but spend little time looking at the detritus that lies in our wake. This project focuses on what happens with materials, specifically vinyl records, after they have fallen from vogue. This research seeks to find the ways that old materials could be re-purposed for a second life. Although my initial intent was to build a sculpture created from vinyl records, that first concept flowered into a multitude of different aspects for me to investigate, bringing together my interests in visual and sound. Through this research I have been able to compose music, develop a series of boutique style releases to document the compositions, and use the audio materials for performance in addition to completing the sculpture. I also documented the work through a blog dedicated to the project, including several short video documentaries.

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

Creation and Screening of Second-Generation Peptide Library Targeting HIV-1 Packaging Signal

Joseph D. Ring, *Kevin B. Turner*
Daniele Fabris, Professor, Department of Chemistry

Human immunodeficiency virus (HIV) has killed over 25 million people worldwide since its discovery in 1981, with almost three million people being infected in 2007 alone. The goal of this project is to ultimately identify lead compounds, which can specifically target the packaging signal (Ψ-RNA) of HIV-1. This region plays vital roles in several steps of the viral life cycle and presents with a highly conserved sequence, making it an ideal antiviral target. Initially, we obtained a synthetic peptide library containing ~16,000 unique peptide sequences, which was designed to promote favorable interactions with Ψ-RNA. After initial library screening, we created a second generation library by chemically modifying the C- and N- termini of the peptides in order to increase affinity and specificity for the target substrates. Toward this direction, we first modified the C- terminal carboxylic acid moiety, which presents an unfavorable charge-charge interaction with the Ψ-RNA, by converting it to a charge neutral ester. Additionally, we added a large hydrophobic group to the N- terminus, which is capable of intercalating between the base pairs of the target substrate. Screening of the second-generation library indicated these two modifications combined promote more favorable interactions with the target.

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

Akisakio

Juan Carlos Rivera*, John Cservek, Derek Ragos, Teresa Oswals*
Neal McDonald, Assistant Professor, Department of Visual Arts
Akisakio is a platform video game set in a land of fairytale stories. Each level has a different artistic style. The goal of the game is to help the hero to save the fairytales from destruction by finding a sword and going through portals that take him to different parts of the fairytale. The team developed this game for the iPhone/iTouch platform. The controls for the game are based on the touch screen capabilities of the iPhone, which will allow the user to move the character left to right and back and forth and jump up and down.

An Isotachophoretic Method for the Separation and Concentration of DNA and RNA in Food Matrices

Kaitlyn N. Sadtler*, Charles Young*[1]*, Emily Seay*[1]*, Alex Proescher*[1]
[1]Johns Hopkins University Applied Physics Laboratory
Charles C. Young, Section Supervisor, Applied Biology Section, Johns Hopkins University Applied Physics Lab

In this study, we integrated a dual buffer separation approach with simultaneous size exclusion to purify and separate bacterial genomic DNA and viral RNA. 2-Hydroxy-N-(tris(hydroxymethyl)methyl)-3-aminopropanesulfonic acid (TAPSO) and 4-(2-hydroxyethyl)-1-piperazineethanesulfonic acid (HEPES) were evaluated as isotachophoresis anode buffers to separate and concentrate DNA and RNA. In combination with varying agarose concentrations, it was possible to further regulate the separation by size. These parameters were optimized to separate *Bacillus atrophaeus* DNA and murine norovirus RNA. Nucleic acids were extracted and evaluated by PCR. Simple, rapid sample preparation methods remain a critical need for current and future biological detection systems in order to remove interfering compounds found in many foods. This research provides an inexpensive method for concentrating and purifying PCR amplifiable microbial nucleic acids from foods while simultaneously separating bacterial and viral genomes for use with next generation molecular diagnostic systems. Through the use of a dual buffer isotachophoresis method, nucleic acids were separated and concentrated based on charge; varying cross-linking grouped nucleic acids by size. When combined, separation of genomic DNA and viral RNA was observed. The ultimate goal is to develop a modular, universal sample preparation device capable of simultaneously concentrating and purifying nucleic acids and proteins from food matrices.

This work was funded, in part, by the Department of Homeland Security: National Center for Food Protection and Defense.

IL-21/IL-21R Interactions on Host B Cells, not Donor CD4 Cells, Is Critical for Development of Autoimmune Features in cGVHD

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

Studies in murine models of lupus indicate increased production of IL-21 and attenuation of autoimmune features following IL-21 blockade. IL-21 exerts an autocrine effect on T follicular B helper cells (TFH), stimulates B cell proliferation, plasma cell (PC) differentiation and germinal center (GC) expansion. To determine whether IL-21 promotes systemic lupus through effects on TFH cells or B cells, we assessed the effect of IL-21/IL-21R signaling on B cells independent from the effect on CD4 T helper cells using IL-21R-/- or IL-21R+/+ mice as donor or hosts in the Bm12-into-B6 models of cGVHD. CGVHD induced by injection of IL-21R-/- CD4 cells from B6 mice into B6D2F1 hosts was characterized by a decrease in the expansion of donor CD4, TFH and GC cells. Other parameters of cGVHD did not differ between groups. Contrastingly, when cGVHD was induced by injecting Bm12 spleen cells into IL-21R-/- B6 mice, parameters of cGVHD were markedly attenuated compared to IL-21R+/+ hosts. Specifically, PC differentiation decreased by 66 percent, GC cells by 60 percent and anti-ssDNA antibody levels by 81 percent. These results suggest that IL-21R signaling on host B cells, but not on Ag-specific CD4 T cells, is critical for the initiation and progression of systemic autoimmunity in cGVHD.

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

Identifying Differences in Murine TLR Stimulation between *H. pylori* and *H. felis*

Lael C. Scarborough, *Tom Blanchard*
Tom Blanchard, Associate Professor of Pediatrics, Division of Gastroenterology, University of Maryland School of Medicine

Helicobacter pylori (*H. pylori*) induces inflammation in the human stomach, but demonstrates this effect only slightly in mice. However, when a related bacterium , *H. felis*, infects mice, it induces significant inflammation. It has been found that bacteria stimulates inflammatory responses when macromolecules like flagellin, LPS, peptidoglycan, or other microbial products bind to Toll-like Receptors (TLR) on the surface of host cells. There are over eleven TLRs and six recognized bacterial products. Our goal was to determine differences in the TLRs activated by *H. pylori* and *H. felis* and see the sensitivity of the TLRS to bacterial products. This was tested by transfecting HEK-293 cells *in vitro* lacking TLRs. They were transfected with plasmids carrying genes for TLR2, TLR4, TLR5, TLR6, TLR9, TLR1 and combinations, and with a plasmid carrying a gene for a phosphatase under the influence of NF □B promoter-inducible promoter. The cells were incubated with bacterial extracts from *H. pylori* or *H. felis*. The phophatase produced was measured by transferring cell culture supernatant to substrate solution that turned blue as the substrate was cleaved by the phosphatase. This was done to identify which TLRs were stimulated and how much bacterial product was required to stimulate them. Results will determine why *H. pylori* and *H. felis* induce different responses in mice.

This work was funded, in part, by NIH grants AI055710 and DK046461.

The Effect of Nationalism on Czech Design

Elizabeth S. Scott
Joseph Coates, Assistant Professor, Department of Visual Arts

Graphic design allows for an analysis of how a culture has been impacted by major events and shifts in leadership. I was able to gain more understanding of the Czech Republic by analyzing different designs from 1989 to the present. I looked for relationship between major Czech events, leadership changes, and changes in public art and corporate design. By analyzing and comparing Czech graphic design with the political upheavals and changes since the collapse of Communism and the later disintegration of Czechoslovakia, I gained a better understanding of the political and cultural mechanisms employed by contemporary Czech graphic design in both public and corporate design. I analyzed how the country's history and central geographical location in Europe further affected design work. By exploring Czech history through design, I have developed insights into how the Czech identity may be a model for understanding how nationalism figures into an increasing integrated Europe.

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

Estimating Phylogentic Divergence Time between Populations of Western Cutthroat Trout

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

We are estimating the phylogenetic divergence time between populations of Western Cutthroat Trout species, Oncorhycus clarki in relation to the spatial and temporal variation of two waterfalls which have been geographically separated through time due to geological processes. Several populations of Western Cutthroat trout occupy isolated areas both upstream and downstream of the waterfall region. We are primarily concerned with the genetic variation amongst the two populations residing at the head of the two waterfalls of interest. We expected the genetic variation existing amongst the two populations occupying the head of the waterfall to coincide with the data gathered from the rock dating of the waterfall. In order to estimate the phylogenic divergence between the various populations in the region, we used three genetic markers, Amplified Fragment Length Polymorphisms (AFLP's), Cytochrome B, and the Control Region. Our preliminary results show that mitochondrial DNA markers, cytochrome B and the control region, have not shown any significant phylogentic variation between the trout populations. Currently data gathered from the AFLP's illustrate the greatest amount of genetic variation between both populations of interest.

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

Examining Parental Acculturation, Socialization Goals, and the Development of Korean Immigrant Children

Annah Seo
Charissa S. L. Cheah, Associate Professor, Department of Psychology

In 2000, there were 1,077,000 Koreans in the U.S.; they were the fifth largest Asian-American ethnic group. However, there is limited research on Korean-American parents and children. This project examined the associations among Korean immigrant mothers' acculturation, parenting socialization goals, and their children's social, emotional, and behavioral outcomes. Ninety-seven Korean immigrant mothers with three- to six-year-old children participated. Mothers were interviewed regarding their long-term socialization goals for their children and completed questionnaires regarding their behavioral and psychological acculturation levels. The children's teachers also rated their social, emotional, and behavioral development in the classroom. Results revealed that Korean-immigrant mothers valued self-maximization, self-control, decency, lovingness, and proper demeanor goals, in that order. More behaviorally Americanized mothers reported less physical well-being and more personal-integrity child-socialization goals. Mothers who reported socialization goals focusing on personal and economic potential were less likely to have children with conduct and peer relationship problems, whereas children with mothers who reported socialization goals focusing on religious values were less likely to be pro-social. Korean families' immigration experiences, and these findings' potential to inform future research and policies to promote the successful adaptation of Korean immigrant children and their parents, will be discussed.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, a grant from the Undergraduate Research Assistantship program, and the Foundation for Child Development.

An Apical Sodium Bile Acid Transporter Targeted Prodrug Design for Sustained Release of Niacin

Onajite Shemi, *Xiaowan Zheng, James Polli*
James Polli, Professor, Department of Pharmaceutical Sciences, University of Maryland, Baltimore

The purpose of this study was to synthesize potential prodrug of niacin that targets the human apical sodium-dependent bile acid transporter (ASBT) to achieve sustained release. Niacin, a B vitamin that is indicated to lower cholesterol and treat atherosclerosis, is water-soluble and is rapidly eliminated from the body. A prodrug was designed via conjugation with the naturally occurring bile acid chenodeoxycholic acid (CDCA) using lysine as a linker. The prodrug was designed to be a substrate of ASBT. Our hypothesis is that niacin will be released slowly through enzymatic hydrolysis of the prodrug while the prodrug undergoes enterohepatic circulation cycles. For the synthesis of the prodrug, CDCA was activated with HBTU before introducing the lysine linker. CDCA-OBt was coupled with H-Lys(Z)-OBzl·HCl and then the benzyl and CBZ groups were removed through catalytic hydrogenation. The product was then coupled with nicotinoyl chloride hydrochloride (i.e. activated niacin) to produce the prodrug. Mass spectroscopy (MS) showed that conjugated prodrug CDCA-lysine-niacin was successfully synthesized. MS and TLC showed high level of purity. The potential prodrug will be evaluated in future *in vitro* and *in vivo* studies.

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

Prefrontal Cortex Deficits in a Value-based Odor-discrimination Task in a Rat Model of Schizophrenia

Igor Shusterman*, Gwendolyn Calhoon[1], Aaron Gruber[1], Matt Roesch[1], Geoffrey Schoenbaum[1,2], Patricio O'Donnell[1,2]*
[1]Department of Anatomy and Neurobiology, University of Maryland, Baltimore
[2]Department of Psychiatry, University of Maryland, Baltimore
Patricio O'Donnell, Professor, Department of Anatomy and Neurobiology and Psychiatry

Schizophrenia is a debilitating disorder affecting 1% of the US population. The disease is characterized by symptoms such as hallucinations, social withdrawal, and cognitive deficits. A lack of inhibition in the prefrontal cortex (PFC) is thought to underlie the cognitive deficits associated with schizophrenia. Through the use of a neonatal ventral hippocampal lesion (NVHL) model, we disrupted the maturation of GABA interneurons, a subpopulation of neurons responsible for inhibition in the PFC, so behavioral deficits that mimic symptoms of the disease emerge in late adolescence, a temporal course similar to the disease. In this experiment, animals were trained in a task previously shown to engage interneurons to make odor-cued reward choices to wells delivering different amounts of reward in forced and free choice trials. Using behavioral and electrophysiological recordings, we demonstrated that lesioned animals demonstrated lack of behavioral flexibility in adapting to reward size changes, and altered neuronal firing patterns suggested loss of inhibition observed in PFC neurons. We then tested our model using novel drugs (a glutamate 2/3 metabotropic mGlur 2/3 agonist) attempting to repair deficits in both behavior and neuronal firing patterns. Lesioned animals that recieved mGlur 2/3 agonist had fewer mistakes on forced choice trials and increased response to the larger rewarding well on free-choice trials.

*This work was funded, in part, by NIH MH57683, NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC, and the HHMI Undergraduate Scholars Program at UMBC.*

The Tunisian Paradox: the Exceptional Case of Stability in the Middle East and North African Region

Sonia S. Siddiqui
Brigid Starkey, Lecturer, Department of Political Science

Tunisia is an island of apparent stability in a sea of political turmoil. It has an open economy, but restricted media; a repressive regime, but acquiescent civil society; restricted freedom of expression, but responsive social programs. I looked for variable that demonstrated the balance and stability that Zine El Abedine Ben Ali has been able to establish and sustain during his years in power. I explored Tunisia's economic success (relative to neighboring states), its social welfare infrastructure, and strict social policies. Data include GDP figures and other indicators of economic prosperity, and a breakdown of laws in Tunisia that govern society. A content analysis was conducted of Ben Ali's 7th November (the day of Ben Ali's succession, a national holiday) speeches to allow analysis of his regime's mixture of repressive and responsive social policies. Contrary to many recent writings on Tunisia, notably the article by John Entelis "The Democratic Imperative vs. The Authoritarian Impulse", Tunisia does not possess a society that is ripe for mass mobilization towards demanding greater freedoms. The relative economic prosperity that the regime has achieved, combined with the population's acquiescence to the strict social policies, indicates stability being valued more than pluralism in contemporary Tunisia. This is a preliminary exploration of this Tunisian Model. Tunisia could be seen as an example for future progress; an alternative to the desire to establish democracies in the region.

Investigation of the Long-Range Interaction between the U5' and AUG Regions of the HIV-2 5'UTR

Rashmi P. Singh, Venkateswaran Ramakrishnan*, Yuanyuan Liu, and Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

HIV-2, a lentivirus, is a less common strain of HIV with lower viral infectivity *in vivo* than HIV-1. The HIV-2 genome forms a dimer, composed of two single strands of RNA linked via intermolecular cross-kissing interactions. HIV-2 utilizes the Gag polyprotein in genome packaging and virion budding. The two zinc fingers of the Nucleocapsid (NC) domain of Gag directly binds tightly to the unspliced, dimerized, RNA genome. Our project investigated the role of the long-range interaction between the U5' and AUG regions of the HIV-2 5' untranslated region (UTR) M15390. It has been proposed that a long-range interaction between the U5' and AUG regions sequesters the Dimerization Initiation Site (DIS) region and inhibits the dimerization of the two viral RNA strands. However, in HIV-1 this same long-range interaction exposes the DIS region and leads to HIV-1 dimerization. We plan to confirm the long-range interaction between AUG and U5' in HIV-2 by testing different RNA constructs for dimerization capability. We also plan to investigate the role of the NC protein of the Gag polyprotein complex in RNA dimerization through Isothermal Calorimetry (ITC) and Nuclear Magnetic Resonance (NMR).

This work was funded, in part, by NIH/NIGMS grant 3R37AI30917-19, the Howard Hughes Medical Institute Undergraduate Scholars Program at UMBC and a grant from the HHMI Foundation.

No Development without Girls: Gender, Development and Youth Associations in Mali

Sarah B. Solomon
Gloria Chuku, Associate Professor, Department of Africana Studies

Feminist and development scholars have not adequately addressed the implications of youth activism in West Africa. Changing gender dynamics among Malian youth are generated and navigated in the context of youth associations. Girls in Mali are beginning to join and act as leaders in Malian youth associations. This phenomenon has multiple implications for gender dynamics in Mali, and it is contributing to increased numbers of women in leadership and income-generation activities. The study is an attempt to represent the experiences of girls who participate in Malian youth associations, and to extrapolate the significance of these experiences. Thirty-one interviews were conducted with members of ten youth associations. Interviewees were mostly young Malian women who are currently engaged in youth associations or had participated in the past. Youth associations in Mali are shaping future leaders, mobilizing youth to be active in public life, income-generation activities and in raising awareness about vital issues facing the country. Focusing attention on Malian youth associations reveals how gender and youth activism are both relevant within development discourse.

This work was funded, in part, by the Sondheim Public Affairs Scholars Program and through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Medieval and Renaissance Shawms: An Exploration of Embouchure

Meghan Sommers
Joseph Morin, Lecturer, Department of Music

Modern oboes trace their lineage back to shawms, double-reed instruments seen in Europe as far back as the twelfth century. Whereas present-day oboes are played with the double reed between the lips so that the lips can control reed placement, aperture, and a variety of other variables, for shawms the mechanism and degree of lip-control, called *embouchure,* is not clear. Despite prolific use during the thirteenth through seventeenth centuries, a lack of surviving instruments complete with reeds and pirouettes hampers our understanding of the European medieval and Renaissance shawm. As such, significant disagreement exists among scholars and performers as to the amount of lip control historically employed to play pirouette-bearing instruments. This study includes evaluation and critique of modern texts about shawm-playing in light of consultation with original historical documents, art work, and measurements of surviving original instruments. Consideration is also given to shawms from other parts of the world to see how their performance technique might provide clearer understanding of European shawms. Understanding the historical performance practices of music is essential to the very music itself, as well as the nuanced role that music and musicians played in their respective contemporary societies.

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

NMR Analysis of the Conserved Bulge in the Core Encapsidation Signal of Type-C Gammaretroviruses

Patrice S. Starck*, Trevor Mathias, Sabrina Ngo, Yasuyuki Miyazaki, Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry and Investigator, Howard Hughes Medical Institute

All known Type-C gammaretroviruses have two stemloops (SL-C and SL-D) harboring a GACG tetraloop and a uni-stemloop bulge in the 5'-untranslated region. SL-C is of particular interest because it is know to promote dimerization, which is necessary for genome packaging. The consistency with which the buldge occurs implicates its structural importance. The Moloney Murine Leukemia Virus (MMLV) and the Mouse Endogenous Virus (MEV) have different bulges on SL-C: a GGAA bulge, and GUA respectively. Interestingly, the Gibbon Ape Leukemia Virus (GALV) does not have a significant bulge on SL-C. Instead, it has a GUA bulge on the 5' side of SL-D. Previous nuclear magnetic resonace (NMR) analysis revealed that the second and third bases (G339 and A340) of the Moloney Murine Leukemia Virus's bulge form a syn conformation. Current NMR analysis also suggests a syn conformation for the bulges of GALV and MEV, which has a significant effect on structure, as well as multiple conformations of the stemloops.

This work is supported by NIH grant R01GM042561-19 (M.F.SUMMERS) and Howard Hughes Medical Institute at UMBC.

Toddler Temperament and Parental Depression: Predictors of Poor Emotional functioning at Age Seven

Carrie L. Strachan, *Laura A. Scaletti*[1]*, Maureen M. Black*[1]
[1]University of Maryland School of Medicine, Department of Pediatrics: Growth and Nutrition Division
Laura A. Scaletti, Lecturer, Department of Psychology

This study investigated the relations between toddler temperament, parental depression, and child depression in a sample of prenatally drug exposed children. The participants for this study were 173 prenatally drug exposed children and their caregivers. When the children were 18 months of age, the caregivers' perceptions of their infants' temperament were assessed via the parent-report Infant Characteristics Questionnaire (ICQ). The caregivers' depression was assessed when the children were six and seven years of age using the Center for Epidemiologic Studies Depression Scale (CES-D). Lastly, the children filled out the Child Depression Inventory (CDI) when they were nine and 11 years of age. Preliminary analysis revealed a significant association between the children's *unstoppable* temperament factor and their CDI scores, $r(20)=.48$, $p<.05$. In addition, the children's depression at nine years of age was significantly related to parental depression at six, $r(119)=.26$, $p<.01$, and seven, $r(20)=.29$, $p<.001$, years of age. These findings could lead us to believe some of these temperament issues in toddlerhood are related to depression in late childhood. Additional analyses will investigate these relations further; multiple regression analyses will be used to test the ability of parental depression to moderate the relation between infant temperament factors and childhood depression.

This work was funded by a grant to the third author (NIDA RO1 DA021059).

Development of a Food Quality Indicating Sensor

Cristina R. Teixeira, *Aristotle G. Kalivretenos, William R. LaCourse*
William R. LaCourse, Professor, Department of Chemistry and Biochemistry
Aristotle G. Kalivretenos, Adjunct Associate Professor, Department of Chemistry and Biochemistry

This project involved the production of an industry compatible food quality indicator. The consumption of fish that contains elevated levels of scrombotoxin (histamine) causes scromboid poisoning, a particularly severe form of food poisoning. The histamine is not removed or destroyed upon cooking, nor volatile, leaving no odor on the fish, and therefore, making it particularly difficult to detect accurately at actionable levels. A detecting dye has been developed to detect the presence of histamine and other amines in aqueous solutions. The primary mode of action is via reaction of amines generated during spoilage with a colored-reagent within the device to form stable dye/amine adducts. These adducts have visible color, and upon reaction diffuse to the outer surface of the device. Overall, the device acts as a dosimeter to determine the total amount of amines generated as a result of fish spoilage. When compared to a calibrated color gradient, the color change is indicative of amine levels, which shows when food is no longer safe for consumption. This dye has already been validated as a reliable reagent for primary and secondary amines. The various sensor layers of the indicator have been established through experimentation.

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

Mouse Olfactory Bulb Activation Evoked by Ferret Odors

Christy Q. Thai*, Wangmei Luo, Kurt Krosnowski*
Weihong Lin, Assistant Professor, Department of Biology

Odors are essential for human-life; odors are able to act as warning signals for danger, or as a way to elicit behavior. The olfactory system is capable of detecting various odors to guide animal behaviors. These odors are detected by the olfactory sensory neurons located in the nasal cavity, which send sensory signals to the olfactory bulb. An olfactory bulb is responsible for identifying and discriminating numerous odors from the external environment. The olfactory bulb contains numerous glomeruli, which are functional units to process sensory input. We monitored glomerular activation in mice olfactory bulb induced by ferret odors. We exposed the mice to soiled bedding of ferret and used immunolabeling of olfactory bulb sections to visualize the activated glomeruli. We found that numerous glomeruli were activated. Future experiments will be needed to determine whether this activation would result in behavior indicative of fear.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, and by the NIH Grant to Weihong Lin.

An Improved Approach to Extracting Disease-Related Mutations from Biomedical Literature

***Gary Thompson**, Attila Kertesz-Farkas, Asa Adadey, Olivier Bodenreider[1], Emily Doughty, Maricel G. Kann*
[1] National Library of Medicine
Maricel G. Kann, Associate Professor, Department of Biological Sciences

A major goal of biomedical research towards personalized medicine is to find relationships between mutations in the human genome and their corresponding disease phenotypes. Currently, there is no fully comprehensive database which records all of these mutations, requiring researchers to search the current literature each time a mutation is identified. The current baseline method for identifying mutations within abstracts is the text mining program Mutation Finder. However, Mutation Finder is not designed to identify disease associations or gene information. Our approach, called Extractor of MUtations (EMU), is a text-mining method developed to include gene and disease information with the mutation. When run on a manually curated gold standard of prostate cancer, EMU had comparable results of recall and precision to Mutation Finder when searching for any mutation. When adding the gene and disease identifiers, EMU had a precision of 65 percent, and reported 90 unique mutations, of which 57 were not documented in any current mutation databases. There are currently 94 mutations in existing databases related to prostate cancer. Our findings represent an increase in current mutation/phenotype association knowledge by 61 percent. Further research will be focused towards further improving the precision of the gene association.

This work was supported by the National Institutes of Health (NIH) [1K22CA143148 to M.G.K (PI); R01LM009722 to M.G.K(collaborator)]; by an appointment to the Research Fellowship Program for the Centre for Devices and Radiological Health administrated by the Oak Ridge Associated Universities through a contact with the U.S. Food and Drug Administration; and in part by the Intramural Research Program of the NIH, National Library of Medicine.

Caregiver Negative Life Events and Coping with Stress in Children

***Monica Tith,** Laura A. Scaletti[1], Maureen M. Black[1]*
[1]University of Maryland School of Medicine, Department of Pediatrics: Growth and Nutrition Division
Laura A. Scaletti, Lecturer, Department of Psychology

Past research has found that stress, life events, and anxiety in children and adolescents are interrelated. The goal of this study was to investigate whether or not stressful life events moderate the relation between a child's ability to handle stress at 6.5 and 13 years of age. The present study utilized an archival, longitudinal dataset of that examined the effects of prenatal drug exposure on child development. Participants were selected (N =58) based on available data; specifically, the Child Response to Stress Inventory at 6.5 years, and the Life Events Questionnaire and Child Behavior Checklist when the children were seven. Preliminary analyses revealed a significant association between a child's response to stress at 6.5 years and his/her ability to regulate his/her behaviors at 13 years of age, $r(57)=.54$, $p<.001$; *i.e.*, the more difficultly a child had responding to stress at 6.5 years, the more difficult it was for him/her to regulate his/her behaviors at 13 years. In addition, a child's response to stress at 6.5 years was significantly related to his/her working memory, $r(57)=.40$, $p<.05$, planning/organizing ability, $r(57)=.32$, $p<.05$, and his/her emotional control, $r(57)=.52$, $p<.001$, at 13 years of age. Additional analyses will be conducted in order investigate whether or not negative life events moderates these relations.

This work was funded by a grant to the third author (NIDA RO1 DA021059).

Comparing Cognitive Writing Processes in the International Community

Stephanie E. Tkaczyk
Lucille McCarthy, Professor, Department of English

The cognitive writing process is a procedure that is unique to every individual writer, and often varies depending on the type of composition the writer is performing. Whether a writer engages in a pre-writing process or a revision process may depend on whether the writer is composing reflexively or extensively. To observe how cognitive writing processes vary according to the type of writing, as well as geographical and personal backgrounds, I observed 4 international students from 3 countries in a summer study program at Middlesex University in the United Kingdom. I had students respond to two prompts, one reflexive and one extensive, while composing their thinking processes aloud to me. Composing aloud while writing is a method set forth by researcher Janet Emig, and consists of participants writing as they would normally, while simultaneously explaining their writing process aloud, i.e. what they were thinking before, during, and after writing. I had my participants respond to the two prompts, and then engage in an interview with me, where they provided me with their writing backgrounds and learning styles. From my observations and interviews, I can conclude that learned writing styles carry over into both reflexive and extensive writing.

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

Virtual Museum: Life as a Dance

Franki L. Trout, Danielle Viens-Payne*, Kelly-Lynne Russell*
Preminda S. Jacob, Associate Professor, Department of Visual Arts
May Chang, Head of IT Services, Albin O. Kuhn Library

The goal of this project was to apply the skills and techniques of a museum curator to create and install an art exhibition in a virtual space. We used the program *Active Worlds*, which allowed us to construct the museum we envisioned without being limited by materials or budget. Thus, the resulting exhibition shows the implementation of our complete vision. Our exhibition explores the idea that dance is something in which everyone participates every moment of every day and not just formal performance. The museum space is designed to resemble a dance studio with hardwood flooring, ballet barres, and floor length mirrors. Upon entering the vast room, visitors are placed in a space stereotypically reserved for only those individuals trained as “dancers.” The lines between who is a dancer and who is not continue to blur as visitors must strain, bend, and stretch their bodies in different positions in order to view the various works of art placed throughout the exhibition. By placing this museum online, people from all over the world may visit our virtual exhibition and experience the concepts we present. Such virtual art museums make art and the artistic experience more globally accessible.

Characterization of SUP3 Homologues in Arabidopsis Defense

Margarita Tsionsky
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, 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). We 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 have created double mutants and 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 through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

Public Understanding, Use and Support for Emergency Medical Services

Margarita Tsionsky
Kurt Krumperman, Clinical Assistant Professor, Emergency Health Service Department

Accurate understanding, perceptions and expectations are critically important to generate the public support needed to expand and improve emergency medical services (EMS) systems. Data were taken from the 2007 Motor Vehicle Occupant Safety Survey (MVOSS), a national population-based telephone survey administered by the National Highway Traffic Safety Administration (NHTSA), which contained an EMS module and was administered to 6,010 people aged 16 years and older. Survey results indicate that 94 percent of respondents value EMS as or more highly than police and fire protection services. Sixty-six point eight percent of the total population are very confident and 29 percent are somewhat confident in EMS providers. Confidence in emergency workers remains high among respondents with personal experience with EMS and respondents who have called 911 are more confident in emergency workers than those how have not. However public understanding of the EMS is not nearly as strong: 57.9 percent don't know what the acronym EMS stands for. The public expectations of ambulance arrival times are unreasonable, based on industry recommendations. Nearly half of the respondents expected the ambulance to arrive within five minutes of the 911 call being placed. Expected arrival times do not become more accurate amongst people who have dealt with EMS before nor those with higher education.

This work was funded through a travel award from the UMBC Office of Undergraduate Education.

The Development of a Phospho-null Melanopsin Mutant

Devyani T. Ujla*, Joseph Blasic*
Phyllis Robinson, Professor, Department of Biological Sciences

Our research focuses on the deactivation response of the vertebrate photopigment, melanopsin. Photopigments are specialized G-protein coupled receptors (GPCR) that mediate light responses. Specifically, melanopsin is located in a small subset of photosensitive retinal ganglion cells that regulate circadian rhythmicity, melatonin synthesis, sleep, and the pupillary light reflex. GPCR deactivation begins with a G-protein coupled receptor kinases phosphorylating the C-tail. This phosphorylation dampens receptor signaling and serves as a signal for arrestin binding. Once bound, arrestin inhibits signaling molecules from associating with the receptor, effectively terminating the response. We are studying the effect of a mutating all phosphorylatable sites in the C-tail on melanopsin's deactivation response. Our hypothesis is that the phospho-null mutant will show a delayed deactivation response because there should be no arrestin binding in the absence of phosphorylation. The phospho-null construct was created using site directed mutagenesis and PCR. It was then expressed in a mammalian heterologous expression system and its response to light was measured using kinetic calcium imaging. Our findings showed no deactivation response in the time course of the experiment. Therefore, this research provides insight into melanopsin's deactivation cascade and could give a better understanding of the processes it regulates.

This work was funded in part by the 1RO1EY 19053 and NSF 615569.

Optimizing Escherichia coli Expression and Solubility of Mammalian Soluble Guanylate Cyclase Constructs

Regina Y. Ulis*, Jane A. Macdonald*
Elsa D. Garcin, Assistant Professor, Department of Chemistry and Biochemistry

The enzyme soluble guanylate cyclase (sGC) is a heterodimeric hemoprotein which catalyzes the formation of cyclic guanosine-3'5'-monophosphate (cGMP) from guanosine-5'-triphosphate (GTP). A 200-fold increase in sGC activity is achieved through the binding of nitric oxide (NO) to the sGC heme moiety. Impaired NO bioavailability or reduced sGC activity lead to cardiovascular diseases and hypertension. Current therapies utilize NO-releasing compounds, but toxicity remains a negative side effect. An alternative therapy involves molecules known as sGC activators. However, their binding site is still a mystery. In order to elucidate details of the sGC catalysis and activation mechanism, we aim to determine the molecular structure of the enzyme active site. To facilitate our structural studies, we currently express and purify various truncated sGC constructs, encompassing different enzyme domains. One of these constructs is β385, which we have expressed in bacterial cells and purified. However, preliminary characterizations have revealed that this construct shows a tendency to aggregate, preventing further structural studies. To obtain high yield of non-aggregated protein, we are testing cell growth and induction conditions. Once the optimal conditions are determined, we will use crystallization and other techniques to elucidate the structure of the construct, coming closer to proposing an alternative therapy.

This work was funded, in part, through a grant from the Undergraduate Research Assistantship program and UMBC DRIF.

An iKiosk System Using Windows7 and a Touch-screen Monitor

Amar H. Vadalia*, Jon J. Schubbe*
May Chang, Head of Library IT Services, A.O.K. Library and Gallery

In today's fast-paced world, it is often essential to deliver information on time and in real time. An information kiosk (iKiosk) system enables this and is used in many public areas including bookstores and hotels. It can provide interactive features for consumers to access information beyond just viewing the display but a commercial system can be expensive. We have developed a prototype iKiosk system for the A.O.K. Library that is visually engaging and more cost effective. This is done using the Windows7 operating system, a touch screen monitor, and a Flash application for display and interactivity. Some knowledge of gaming technology and design were also applied in its development. The system will be located in the library atrium where users can walk up to the display and easily find information on computer availability, services and resources, and news and alerts. Such a system can also be modified and used at other campus locations to provide local building-specific information. Through our prototype, we have found that it is possible to develop a creative and cost-effective iKiosk system to deliver current information at point of need.

Effects of Environment Dimensionality on Sensory Neurons Process Outgrowth: 3D Better Mimics *in vivo* Features

Shelby L. Vargo, *Andreia Ribeiro*
Jennie B. Leach, Clare Boothe Luce Assistant Professor, Department of Chemical and Biochemical Engineering

The purpose of this study was to determine the effect of environment dimensionality (i.e., 2D culture substrates vs 3D “tissue-like” scaffolds) on neuronal development and process outgrowth. It is widely recognized that cells cultured in 3D scaffolds exhibit more physiological growth, gene expression, and differentiation; nevertheless biology studies focused on nerve regeneration still rely in the culture of neurons in rigid, 2D substrates. However, efforts focused on developing improved methods to repair nerves have been limited by the lack of knowledge of how neurons interact with their 3D environment. For this study we cultured sensory neurons on 2D and within 3D collagen substrates, stained the neurons for phenotypic markers using immunohistochemistry, and then used confocal microscopy and image analysis to quantify cell viability and morphology. We observed that dimensionality plays a major role in neuronal branching, growth cone morphology, and outgrowth mechanisms. Neurons sense the three-dimensionality of their environment and respond by extending longer neurites, branching more, and adapting a morphology that better mimics neurons *in vivo* than those cultured in 2D environments. Our work challenges the use of traditional 2D culture substrates for understanding the *in vivo* structure of neurons and the mechanisms involved in neuronal behavior in 3D environments.

This work was funded, in part, by NIH-NINDS R01NS065205 (JBL), the Henry-Luce Foundation (JBL), and Wyeth Fellowship at UMBC (AR).

Developing a New Class of Chemotherapeutic Drugs: 2`Deoxy Proximal Flexible Nucleosides

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 available to combat bacterial, viral or parasitic infections as well as cancers. As a possible solution, we have designed a series of flexible nucleoside analogues, where the purine ring system has been split into its imidazole and pyrimidine components, remaining attached by a single bond between C4 and C5. This modification strategically endows the nucleoside with the ability to change conformation when confronted with a binding site mutation, without losing critical hydrogen bonding elements necessary for enzymatic recognition. Consequently, the possibility for circumventing mutations and the ability to sample better interactions increases, resulting in more powerful medicinal agents. Recent reports that Etravirine and Tenofovir, flexible HIV reverse transcriptase inhibitors could overcome mutations in viral HIV resistant strains have provided additional impetus for our approach. In that regard, the syntheses for several 2`deoxy proximal fleximer analogues (xanthosine, guanosine, adenosine, and inosine) are reported herein.

*This work has been funded by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC.*

Analysis of Oxygen Levels within *S. aureus* Biofilms using Fluorescent Microparticles

Melissa Velasquez*, Miguel A. Acosta, Mutsa Kambarami*
Julia M. Ross, Professor, Department of Chemical and Biochemical Engineering; Jennie B. Leach, Assistant Professor, Department of Chemical and Biochemical Engineering

Staphylococcus aureus is a gram-positive pathogen known to cause nosocomial infections by attaching itself onto surfaces and aggregating in hydrated polymeric matrices known as biofilms. Since *S. aureus* biofilms have become increasingly resistant to antimicrobial agents, understanding these bacterial communities is necessary in order to devise new strategies to control such bacterial infections. Studies have shown that carbon and oxygen concentrations affect the process of biofilm removal; however, the presence of oxygen or oxygen gradients within the biofilms has not been fully studied. Oxygen plays an essential role in cell culture and tissue engineering, since it is vital for cell metabolism. Our objective is to evaluate non-cytotoxic fluorescent microparticles as versatile oxygen-sensing technology to study the oxygen levels within *S. aureus* biofilms. In this study, we created silica spheres that contained oxygen-sensitive luminophore and oxygen-insensitive fluorophore. *S. aureus* biofilms will be grown on collagen type I gels containing the microparticles for six hours. Image analysis will be performed using confocal microscopy, and oxygen content calibrated using an adapted version of the conventional Stern-Volmer model. Preliminary results will quantify fluorescence as a function of position in the biofilm, and thereby allow us to spatially assess oxygen levels in the 3D structure.

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

Crossing Boundaries: Foreign Language Learning for Learning-Disabled Students

Danielle N. Viens-Payne
Thomas T. Field, Professor, Department of Modern Languages, Linguistics, and Intercultural Communication
Ana R. Oskoz, Associate Professor, Department of Modern Languages, Linguistics, and Intercultural Communication

Foreign languages can be daunting for many people, especially for those who suffer from severe learning disabilities. For these students, who may have difficulties reading and/or writing in their native language, being required by their school to take foreign language classes may seem like a near impossible obstacle on their paths to graduation. Yet, what other option do they have besides muscling through the coursework? Since the level of severity of learning disabilities ranges so greatly from person to person, educational institutions have found it hard to implement a general rule or protocol for learning disabled students in the area of foreign language requirements. Unfortunately, there is little research published on this interdisciplinary topic. This study reviews U.S. laws, Maryland state laws, and local educational policies and requirements which address such concerns and juxtaposes them with the experiences of a range of teachers and learning specialists, whom I have interviewed. I have come to the conclusion that a wider array of options is necessary for these students, and I will propose innovative solutions which may balance the importance of foreign language requirements with the importance of helping these students succeed in school and in life.

Some Observations on Titan's Fluvial Networks and Channel/valley Delineation Using Cassini Radar Imagery

Donna Viola*, Devon M. Burr[1], Cynthia B. Phillips[2]*
[1]Devon M. Burr, Department of Earth and Planetary Sciences, University of Tennessee Knoxville
[2]Cynthia B. Phillips, SETI Institute

NASA's Cassini Titan Radar Mapper has revealed networks of fluvial features on Titan, the largest moon of Saturn. Titan is often viewed as an analog of the early Earth, and better understanding this world can help us gain perspective on the history of life on our own planet. Synthetic aperture radar (SAR) images have been used to study fluvial network patterns and the effect of the radar illumination direction on the interpretation of surface features. Fluvial networks were delineated on processed SAR images, and a network classification algorithm was used to determine whether the largest networks were dendritic, rectangular, parallel, or other. Each classification provides information about the processes and geology associated with the network's formation. Two network types were identified in different regions of Titan. We also compared the delineations of the same networks in overlapping SAR swaths which observed the features from different directions. The largest differences were noted, and attributed to human delineation error, poor effective resolution, or the direction of radar illumination. Though there were many localized instances of delineation differences, they did not affect the overall network classification.

This work was funded in part by a National Science Foundation Research Experience for Undergraduates grant AST - 0852095 to the SETI Institute, the NASA Astrobiology Institute, and through a travel award from the UMBC Office of Undergraduate Education.

A Mathematical Model of Vulnerable Plaque Growth and Rupture

Alexandria V. Volkening
Jonathan Bell, Professor, Department of Mathematics and Statistics

Atherosclerosis, the hardening and narrowing of one's arteries over time as a result of the accumulation of plaques within the blood vessels, is one of the leading causes of death in industrialized countries. Although many arterial plaques are completely harmless, a special subset of *atheromata*, generally referred to as *vulnerable plaques*, may grow to the point of rupture, resulting in thrombosis and myocardial infarction (heart attack). Thus, it is of considerable importance to the public that researchers obtain a better understanding of what makes a plaque vulnerable. In the hopes of contributing to this goal, our research made use of mathematical modeling and computational methods to create a set of equations describing the mechanical and biological processes leading up to plaque rupture. Our aim was to create a comprehensive mathematical picture that could be used to simulate the growth of a vulnerable plaque in relationship to the changes in its composition and cap thickness, which is implicated in the risk of rupture.

This work was funded, in part, through a grant from the Undergraduate Research Assistantship program.

Should I Take My Meds or Not?: Pregnant Women's Decision Making About the Use of Antidepressant Drugs

Sana Waheed
Andrea L. Kalfoglou, Assistant Professor, Department of Sociology and Anthropology

Eight to 20 percent of pregnant women experience depression, and the majority is sub-optimally treated or untreated. Women who discontinue antidepressant drugs at conception have a 68 to 75 percent risk of relapse. Anecdotal evidence suggests that women discontinue antidepressant therapy out of fears about risks to the fetus that are, in fact, unfounded. We conducted a pilot interview study with a convenience sample of 20 women who were taking antidepressants prior to planning or initiating a pregnancy to understand why women chose to discontinue treatment. Interviews were audio taped, transcribed and analyzed. Participants were mostly Caucasian, highly-educated women who were currently employed. All of the women who discontinued medication experienced a depressive relapse. Relapses ranged from unpleasant to incapacitating. Most believed that they needed to just deal with their depression in order to protect their baby from exposure to medication. Discontinuers who consulted medical professionals were encouraged to stop medication or felt their health-care providers were unwilling to participate in the decision. Women who continued taking their medication reported they had supportive health-care providers. Beliefs about the risks of antidepressants appear to be grounded in cultural expectations that women who are "good mothers" will keep their bodies "clean" during pregnancy.

Developing a System to Regulate Gene Expression in the Mouse Prostate

Aminah Wali, *Varsha Rao, Charles Bieberich*
Charles Bieberich, Professor, Department of Biological Sciences

The prostate gland is prone to the development of several diseases. This includes prostate cancer, which kills 30,000 men in the United States each year. In ~85% of prostate cancer cases, levels of the NKX3.1 homeodomain protein are reduced. We hypothesize that restoring NKX3.1 expression in prostate cancer patients will reduce cancer progression. To study the effect of regulated NKX3.1 expression in the prostate, we propose to use the Reverse Tetracycline Transactivator (rtTA) system in transgenic mice. The rtTA hybrid protein binds to the Tet-operator (TetO) in the presence of tetracycline, or doxycycline, resulting in transcription of genes controlled by TetO. To drive the prostate-specific expression of rtTA and therefore the mouse Nkx3.1 gene, we will employ the Hoxb13 promoter, which demonstrates prostate- and colon-specific expression. We have generated mice with Hoxb13-driven rtTA expression and are building the TetO-Nkx3.1 construct. The completed construct will be introduced into mice, and the Hoxb13-rtTA mice will be crossed with mice containing the TetO-Nkx3.1 responder. Administration of doxycycline to double transgenic mice will induce Nkx3.1 expression in the prostate. This system will be used to evaluate the effects of restoring Nkx3.1 expression at various stages of prostate cancer progression.

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

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

Robert D. Wardlow II*, Shirley Gaa*[1]*, Terry B. Rogers*[1]
[1]Department of Biochemistry and Molecular Biology, University of Maryland School of Medicine
Terry B. Rogers, Professor, Department of Biochemistry and Molecular Biology, University of Maryland School of Medicine

Our research is seeking to determine a mechanism by which mesenchymal stem cells are able to protect ventricular myocytes from damage by a model for cardiac stress. We have used the bacterial endotoxin LPS and the proinflammatory cytokine IL-1B as agents to induce dysfunction in cardiac cells. To characterize the action of these stress-inducing factors we have performed experiments using neutralizing antibodies against substances that could mediate their effect. Using a transwell culture system, we have been able to show that mesenchymal stem cells are able to protect myocytes from damage by a paracrine mechanism. We are continuing to research this mechanism by attempting to determine what factors released from the mesenchymal stem cells could be causing this protection. Our current results suggest that the cytokine IL-18 may be responsible for mediating the stress response to LPS, and that the stem cells protect myocytes without the requirement of direct contact. The protective factor released by our stem cells may act by preventing IL-18 release but further studies must be conducted to prove this. A better understanding of how the stem cells act under these circumstances could lead to new treatments for cardiovascular diseases.

This work was funded, in part, by a grant from the HHMI Foundation, the HHMI Undergraduate Scholars Program at UMBC and by a grant from the Maryland Stem Cell Research Fund.

An Ecological Examination of Psychological Control in Korean Immigrant Families

Momoka Watanabe, *Sevgi Bayram Ozdemir, Charissa S. L. Cheah*
Charissa S. L. Cheah, Associate Professor, Department of Psychology

Parental use of psychological control has been shown to be linked to adjustment problems in children (Olsen et al., 2002). However, relatively little research has examined the predictors of psychological control (Barber, 2002; Walling et al., 2007), especially in different cultural groups. The present study utilized Bronfenbrenners' (1979) ecological model to examine how Korean immigrant mothers' (1) subjective well-being; (2) marital relationship quality; (3) parenting-related stress; and (4) acculturation strategies were related to their use of psychological control. Ninety-five immigrant Korean mothers in the U.S. (M=35.81years, SD=3.73) with 2-6 year old children (M=4.26years, SD=1.10; 47% girls) participated in the study. Results revealed that mothers' well-being and marital relationship quality were negatively associated with psychological control, r=-.253 and r=-.215, p's<.05, respectively. Moreover, these associations were mediated by the intensity of parenting stress, $t(93)$=-2.90, p<.05; $t(93)$=-2.71, p<.05, respectively. Interestingly, mothers' acculturation style (i.e., assimilated, integrated, marginalized, separated) were not predictive of psychological control. Individual and family-related characteristics may be more critical than their acculturation in predicting Korean immigrant mothers' use of psychological control. Our findings illustrate the importance of understanding psychological control in light of the parents' personal psychological resources and social-cultural factors within the Korean immigration context.

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

The Erosion of Control: The Effects of Duration of Conflict on a State's Human Rights Policy

Gavin D. Way
Brian Grodsky, Assistant Professor, Department of Political Science

Since the collapse of the Soviet Union, the international system has been forced to confront the phenomenon of failed states. With international attention focused on this problem, awareness of repression and abuses has proliferated during the past decade. Small-scale wars, typified by insurgencies in this study, are just one means that can drive a state to the brink of failure. Using the Political Terror Scale (PTS), comprised of values reported by the State Department and Amnesty International, this study quantifies the change in a state's human rights conditions during times of small-scale wars. Based on data limitations, the study focused on states with insurgencies between 1973 and 2007. The original study was conducted with five year intervals, though the final study has used a variety of units of length in attempting to achieve the highest R-squared value. The results indicate that the duration of a conflict may act as a 'moment of crisis,' a phenomenon that current literature argues can dramatically weaken domestic human rights. As we better understand the variables and correlates of repression and how insurgencies can affect states, we may work to develop a better preemptive method to stifle future abuses.

Father Absence: A Risk Factor for Developing Behavior Problems in Childhood

Crystal M. White, *Laura A. Scaletti*[1]*, Maureen M. Black*[1]
[1]University of Maryland School of Medicine, Department of Pediatrics: Growth and Nutrition Division
Laura A. Scaletti, Lecturer, Department of Psychology

Research that examines the effects of father-figure availability on child behavior is limited. However, a few studies suggest that father involvement is associated with lower incidences of child behavior problems. The present study hypothesized that father involvement is negatively associated with child behavior problems. Participants were selected from a study that examined the longitudinal effects of prenatal drug exposure on children development (N =200) based on available demographic and Child Behavior Checklist data when children were seven years of age. Preliminary analyses revealed no significant differences between the number of behavior problems displayed by the father and no-father groups; there were no differences in the type of behavior problems exhibited by males and females. Next, multiple regression analyses were conducted to test the effects of father involvement on behavior problems within the father figure group (n=181). After controlling for drug exposure, the amount of father involvement significantly predicted internalizing, $F(2,178)=4.16$, $p<.05$, externalizing, $F(2,178)=9.41$, $p<.001$, and total behavior problems, $F(2,178)=10.39$, $p<.01$; the less time spent with their father figure, the more behavior problems children displayed. The relations between specific types of father-involvement and behavior problems will be discussed.

This work was funded by a grant to the third author (NIDA RO1 DA021059).

Grizzled Opsins: A Study of the Photoreceptors of *Ursus artos horribilis*

Elliot R. White*, Megan L. Porter, Phyllis R. Robinson*
Phyllis Robinson, Biological Sciences

The goal of my research was to clone and express the visual opsins of the Grizzly Bear (*Ursus* artos *horribilis*). Opsins are heptahelical transmembrane g-protein coupled receptors found in the retina. In mammals, there are generally 3 different image forming photopigment genes: rhodopsin, a short wave sensitive opsin, and a long wave sensitive opsin. Determining the visual spectra of the grizzly bear photopigments would be significant in that it would be the first full length opsin sequences and the first absorbance spectra obtained for any species of bear. My goal is to characterize the opsin sequences and determine the absorption maxima of the grizzly bear's visual pigments in order to gain valuable perspective on the visual system of a vunerable species. PCR primers were created on basis of sequence homology with other mammalian opsins, and primer sets for melanopsin, rhodopsin, short wave sensitive opsin, and long wave sensitive opsin have yielded PCR products, and a partial sequence has been obtained for both short wave sensitive and long wave sensitive genes and placed in a P-GEM vector. I cloned and intended to express the grizzly opsin genes. The next step is to obtain full length copies of each gene, and successfully ligate them into an expression vector.

This work was funded, in part, by NIH and NSF grants to PRR.

The Role of Human Endogenous Retroviruses (HERVS) in the Pathogenesis of Acute Onset Schizophrenia

Melanie G. Wiley
Erik P. Lillehoj, Associate Professor, Department of Pediatrics, University of Maryland School of Medicine

Schizophrenia is a severe brain disorder that disturbs a person's reality, falling within the top ten of debilitating diseases and affecting one percent of the world population. We theorize that endogenous retroviruses are involved in the pathogenesis of schizophrenia. Previous studies indicated environmental factors like birth seasonality and urbanization contribute to schizophrenia. Based on this we propose that an infection could activate endogenous retroviruses that cause the symptoms during adolescence. We hypothesize that activation of proviral DNA during acute phase schizophrenia leads to an antibody response by the patient that can be detected with exogenous retroviruses. To test this hypothesis, serum of schizophrenic patients and match controls were used. Retroviruses underwent protein purification and were analyzed with Western blotting. Patient samples were tested against the retroviral proteins from each retrovirus using ELISA. The results demonstrated that 1) antibodies against unfractionated proteins were present in a greater percentage of schizophrenic patients than controls and 2) purified retroviral envelope gp70 was a better target antigen for identifying than other unfractionated protein fractions. In conclusion, this study supports the theory that retroviruses may contribute to the etiology of some cases of schizophrenia.

This work was funded, in part, by a grant from the HHMI Foundation, the HHMI Undergraduate Scholars Program at UMBC and the Stanley Medical Research Institute (grant 07R-1665).

An Approach to Lowering Gang Levels

Immanuel Williams
Jinglai Shen, Assistant Professor, Department of Mathematics and Statistics

Gang violence in America has been a problem for many years. Gangs are generally referred to as a group of individuals who share a common identity and close relations. However, in this project, the term gang describes a group of individuals working to unlawful or antisocial ends; for example, a band of antisocial adolescents. Gangs often participate in deviant activities for survival. The purpose of this project is to create a mathematical model that represents two gangs in a common region, explore the dynamics between the two gangs and investigate when the police are introduced into the model. There are two different approaches that the police can be used in order to lower the population of the gangs in a common region. The first model is based on the fact that the police do not have a preference for either gang. This means that when the police stop a gang member for a crime they will incarcerate them without being bias. The second model is based on the fact that the police do have a preference for one of the gangs. This means that when the police stop a gang member for a crime, the police will incarcerate more individuals from one gang then the other. This model is important because law enforcement agencies and other organizations could use this either model to lower gang population in a particular area.

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

Lemony Snicket as a Gateway to Children's Holocaust Literature

Susan B. Wilmes
Michele Osherow, Assistant Professor, Department of English

Literary critics contend that Holocaust literature for children must communicate the events of the Holocaust truthfully, not be too frightening, and incorporate some element of hope. I argue that in order for the genre to incorporate such drastically opposing requirements, it must be expanded to include works such as Lemony Snicket's *A Series of Unfortunate Events*, written pseudonymously by Daniel Handler. Though the series is fictitious, it explores common Holocaust themes in a safely removed setting, thus serving as a gateway to more historical and complicated literary depictions of the Holocaust. Understanding the ways Handler's books successfully navigate critics' requirements allows us to ensure that the genre will responsibly prepare children to understand the Holocaust. I surveyed a broad range of critical literature discussing core characteristics and concerns of both Holocaust and children's literature, as well as primary materials created to introduce children to the Holocaust. I also conducted a close reading of the thirteen texts in Handler's series, analyzing their contributions and relevance to the genre. Handler's books acknowledge the imperfect, dangerous nature of the world while affording the central characters opportunities for self-sufficiency and optimism within dire situations.

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

The Role of *Staphylococcus aureus* Soluble Biofilm Proteins in Inhibiting Neutrophil Migration

Hannah K. Wilson
Julia M. Ross, Professor, Department of Chemical and Biochemical Engineering

The formation of bacterial biofilms by organisms such as *Staphylococcus aureus* allows the bacteria to evade antibiotic treatment as well as the host immune response. *In vivo*, neutrophils have been shown to migrate to *S. aureus* biofilms and would be expected to phagocytose the bacteria. However, the persistence of biofilm-associated infections indicates that the neutrophils cannot eliminate the infection. It is hypothesized that the biofilm is interfering with the neutrophil's ability to sense the biofilm (known as "chemotactic ability"), thus inhibiting its response. This study aims to monitor the release of chemotaxis-inhibitory and chemoattractive substances from the biofilm. Fluorescently labeled neutrophils will be exposed to the supernatant of either biofilm or shakeflask-grown *S. aureus.* Chemotactic ability will be assessed by measuring the relative number of neutrophils that migrate through a polycarbonate, 3-micron pore-sized Transwell insert towards a known chemoattractant. If a chemotaxis-inhibitory substance is released by *S. aureus*, fewer supernatant-treated cells than untreated neutrophils will migrate through the filter, resulting in lower fluorescence. Understanding the effect of the biofilm phenotype on neutrophil function will help researchers develop treatments for biofilm-related infections.

*This work was funded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and through an Undergraduate Research Award from the UMBC Office of Undergraduate Education.*

Male Breast Cancer: Three Portraits

Michelle Renay Wilson
Calla Thompson, Assistant Professor, Department of Visual Arts

My research combines documentary photographs of three male breast cancer survivors with their written narratives as a way to record the physical and psychological effects of male breast cancer. In 2009, according to the National Cancer Institute, men accounted for one percent, or 1,990, of all breast cancer cases in the United States. That same year the institute also reported 440 male breast cancer deaths. Because of the relative rarity of breast cancer in men, some men delay discussing changes in their bodies with a physician. My research with three survivors, Robert Kaitz, Brandon Greening, and Dale Allen Crowley, extends the current dialogue that represents breast cancer as a female disease. I produced post-surgery portraits of shirtless male breast cancer survivors as well as photographs of the subjects involved in their daily lives. In addition to acting as a record of three men's struggles and triumphs, the images combined with written testimonies convey the importance of awareness and early detection as critical to long term survival.

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

Controlling Particle Swarm Optimization with Learned Parameters

Kevin A. Winner*, Don Miner, Marie desJardins*
Marie desJardins, Associate Professor, Department of Computer Science

Particle swarm optimization (PSO) is an approximation technique that uses a collection of independent "particles" exploring a search space to find an optimal value for some function. PSO uses many parameters and is a randomized algorithm. These properties mean that controlling particle swarm optimization is an unintuitive task, involving a process of adjusting low-level parameters of the system that often do not have obvious correlations with the emergent properties of the optimization process. We propose a method for controlling particle swarm optimization with non-explicit control parameters: parameters that describe self-organizing systems at an abstract level. Effectively, this process converts intuitive control parameter values into explicit configurations that particle swarm optimization can directly apply. In this paper, we introduce the motivation, methodology, and implementation of our approach.

This work was supported in part by NSF ITR #0325329 and through a travel award from the UMBC Office of Undergraduate Education.

Examining Cloud Microphysics and Thermodynamics in the Laboratory

Naomi M. Wolford
Manfredo Tabacniks, Goddard Visiting Fellow and Senior Research Scientist
J. Vanderlei Martins, Associate Professor, Department of Physics

A gas calorimeter was constructed in order to measure the heat exchanges that take place as water droplets change from liquid to solid ice particles inside clouds. The goal in the construction of such a gas calorimeter is to study and measure the latent heat released by the freezing of super-cooled water droplets in similar conditions to those existing in real atmospheric clouds. The information obtained in this research will have applications in the study of clouds and the climate, and lead to improved weather and climate models. The importance of this work is that the freezing temperature and latent heat released by super-cooled water droplets may actually differ considerably from previously gathered data.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, the UMBC Joint Center for Earth Systems and Technology (JCET), and NASA.

Efficient Algorithms in Elliptic Curve Cryptography

Lauren J. Won
Timothy Hall, Cryptographic Algorithm Validation Program, National Institute of Standards and Technology (NIST)

The goal of my research project was to improve the performance of the Elliptic Curve Cryptology (ECC) Digital Signature Algorithm in the Cryptographic Algorithm Validation System (CAVS) Program. The CAVP at NIST created and maintains this CAVS Program for use in checking the validity of cryptographic implementations. Every single implementation of cryptography used by the U.S. Federal Government for non-classified data must pass the tests generated by CAVS, including cryptologic functions of most major operating systems and web browsers, smart cards, and many other applications. ECC is a public key cryptography scheme with predefined constants. This project concentrated on curve parameters defined over binary finite fields for m bit integers with an irreducible polynomial, f(x), two constants to define the elliptic curve, a, b, and a generator point G. These parameters are used to compute point multiplication and addition. Within ECC, the point multiplication is the most computationally costly operation. The CAVS program took about 10 seconds to compute a public-private key pair for the B-571 curve, the largest curve currently tested on the CAVS program. After we implemented fast operations over the binary finite field by the use of projective coordinates, precomputations, and the fixed-base comb method, we tested the results of point multiplication for the B-571 curves with results on the order of 10 milliseconds. We were able to validate our results by comparing with the pre-existing implementation in CAVS.

This work was made possible through the Summer Undergraduate Research Fellowship at the National Institute of Standards and Technology.

The Effect of Transgenic Manipulation of the BK Channel (*Kcnma1*) on Circadian Rhythmicity

Breanne N. Wright*, Andrea Meredith*[1]
[1]Department of Physiology, University of Maryland School of Medicine
Andrea L. Meredith, Assistant Professor, Department of Physiology

The aim of our research is to understand how BK Ca^{2+} and voltage-activated K^+ channels expressed in the suprachiasmatic nucleus (SCN), the brain's clock, control circadian behavioral activity. Previous experimentation showed that when the function of the BK channel-encoding gene was knocked out (*Kcnma1-/-*), the expression of circadian time, mediated by the daily patterning of action potentials in the SCN, was disrupted in mice. Aiming to further understand how the BK channel regulates circadian rhythmicity, we created the transgene *Per:R207Q*, harboring a point mutation in the voltage-sensitive region of the channel. We hypothesized that expressing one or two copies of *Per:R207Q* on a wild-type background would disrupt circadian activity in mice. We used actograms of wheel-running rhythms to assess circadian behavioral rhythms, as measured by the circadian period and chi-squared amplitude. Our preliminary data has shown a detectable circadian rhythm in transgene-expressing mice. Further analysis is required to determine the degree of circadian disruption. Subsequent investigation involves analyzing the circadian patterns of *Kcnma1-/-* knock out mice with the addition of one or two copies of *Per:R207Q*. A better understanding of how these circadian patterns can be manipulated may impact the treatment of sleep disorders and other disruptions of circadian rhythmicity.

This work was funded, in part, by seed funding to ALM from the University of Maryland School of Medicine.

Homeless Children and the Foreclosure Crisis: Implications of the McKinney-Vento Act

Gabrielle Wyatt
George La Noue, Professor, Department of Political Science and Public Policy

Since 1987, the McKinney-Vento Act has guaranteed homeless children the right to a free and appropriate public education. My research analyzes how Maryland public school districts are responding to an increasing homeless student population due to rising foreclosure rates. Primary research was conducted through semi-structured interviews with local Homeless Education Liaisons to understand how schools are identifying, enrolling, and providing services to housing-distressed students. Secondary research focused on how school districts have removed barriers to enrollment for homeless students. Analyzing school databases, policies, and communication regarding homeless student rights, I noted and compared references to the McKinney-Vento provisions. In exploring the relationship between rising foreclosure rates and homelessness, an invisible student population emerged that had never experienced homelessness and was reluctant to seek services. Schools are mandated to identify and address the needs of housing-distressed and homeless students; however, schools were hesitant to use factors beyond appearance and hygiene to determine homelessness, marginalizing students affected by foreclosure. In order to identify students early and target resources effectively, it is important to find better ways to describe and estimate the number of students affected by the foreclosure crisis.

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

Why Ethnic Diversity Matters and its Impact on Universal Health Care in the United States

Gillian F. Yeadon
Carolyn Forestiere, Associate Professor, Department of Political Science

This thesis explored why many countries in the Organization for Economic Co-operation and Development (OECD) have universal health care (UHC) programs while the United States does not. As the health care debate raged in Congress, the controversy surrounding its implementation continues to stir. Using three case studies, Germany, the United Kingdom and Japan, I explore how ethnic diversity within countries influences why and how foreign countries can provide UHC. Ethnic diversity matters because it has the ability to influence the social distance between people, which translates into their stances on policies that shape the country as a whole. Looking at the United Kingdom and Germany, two multiethnic societies, the role ethnic diversity plays in their UHC polices becomes clear. Using established primary and secondary sources, and measuring the percentage of different ethnic groups, I answered important questions about the feasibility of UHC in America and its degree of ethnic diversity compared to other OECD countries. I found that diversity in American stood in the way of its ability to move forward on this important political problem.

TRPM5 Expressed in SCCs is Important in Regulating Chemical Access to the Vomeronasal Organ

Lana Zhang, *Kurt Krosnowski*
Weihong Lin, Assistant Professor, Department of Biological Sciences

The vomeronasal organ (VNO) is situated in the nasal cavity of many vertebrates, including mice. The VNO detects pheromones and odorants and is involved in regulating social and sexual behaviors. In the entry duct of the VNO, solitary chemosensory cells (SCCs) mediate sensory detection of incoming stimuli. We hypothesized that transient receptor potential channel M5 (TRPM5) expressing SCCs are involved in the chemical sensing of irritants and bitter compounds. We created a behavioral assay to determine the role of TRPM5 in SCCs in regulating chemical access to the VNO. In the assay, the odorant or irritant solutions were mixed with rhodamine fluorescent dye and were directly applied to the noses of awake mice. The fluorescent intensity values of the VNO were then measured to monitor chemical access, and these values were compared between wild-type and TRPM5 knockout mice. The VNO of wild-type mice showed less fluorescent intensity when exposed to bitter compounds compared to TRPM5 knockout mice. In addition, a pharmacological agent was used to block the TRPM5 channel, which resulted in significantly increased fluorescence intensity in wild-type mice, but not in knock-out mice. In conclusion, TRPM5 in SCCs plays an important role in regulating chemical access to the VNO.
This project is supported by UMBC and NIH Grants to Weihong Lin.

Characterization of Prostate Specific Regulatory Elements in Transgenic Mice

Albert Zhou, *Cooduvalli Shashikant*
Charles Bieberich, Professor, Department of Biological Sciences

The prostate is a male accessory sex gland that stores and secretes a fluid that constitutes part of the seminal fluid during ejaculation. Prostate diseases may cause pain, difficulty in urination and ejaculation, or erectile dysfunction. To develop mouse models that mimic human prostate diseases and to understand the molecular basis of prostate-specific gene expression, it is important to identify and characterize DNA regulatory elements that direct transcription in the prostate. Recently developed homologous recombination methods enable us to manipulate large DNA constructs to identify and characterize DNA elements that lie distant from the coding regions they regulate. The goal of this project is to use a transgenic reporter gene approach to identify DNA regions capable of conferring gene expression in the prostate gland. Potential regulatory elements both up and downstream of two prostate restricted homeobox genes were used to direct expression of the *E. coli* Beta-galactosidase reporter gene. Transgenic mice carrying these constructs were generated. Southern blot analyses were performed to genotype the transgenic mice. The analyses of transgenic mice carrying reporter genes bearing regulatory elements that may be transcriptionally active in the prostate and other tissues are currently in progress. The results of these studies will be discussed.

Maternal Depressive Symptoms, Parent-Child Relationships, and Children's Peer Problems in Chinese Immigrants

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

Immigrant Chinese mothers are vulnerable to experiencing depressive symptoms due to the potential challenges encountered during the adaptation process (Mui & Kang, 2006; Salaff & Greve, 2004). Depressed mothers are less likely to provide a nurturing environment for their preschool children than their non-depressed counterparts (Johnson & Flake, 2007). Also, maternal expression of warmth in mother-child interactions has been shown to be associated with less peer rejection in children (Patterson, Cohn, & Kao, 1989). However, research on these topics in Chinese immigrants remains limited. Thus, this study aimed to examine the associations between maternal depressive symptoms, level of warmth in the mother-child relationship, and their children's peer problems. Eighty-three immigrant Chinese mothers in Maryland with pre-school children participated. Simple regression analyses showed that: (1) maternal depressive symptoms were positively associated with peer problems in children, $\beta = .26$, $p < .05$, (2) maternal depressive symptoms were negatively associated with maternal warmth, $\beta = -.25$, $p < .05$, and (3) warmth was negatively associated with peer problems in children, $\beta = -.25$, $p < .05$. The role of the immigration and sociocultural context in Chinese immigrant mothers' mental health, mother-child relationship, and their children's social adaptation with peers in the U.S. will be discussed.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education, and the Foundation for Child Development.