URCAD 2007

Student Abstracts

In Alphabetical Order

How to read the abstracts

Title of Presentation

Name of Student Author, *Co-Investigator, Co-Investigator*
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.
Faculty mentor name, rank, and department are shown on a new line, 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.

Analysis of Transposon Mobility and Identification of Additional *gls* Genes in *Volvox carteri*

***Manar A. Abdelkade**r, Akelia Wauchope*
Stephen M. Miller, Associate Professor, Department of Biological Sciences

Asymmetric cell division is essential for generating cellular diversity in nearly every organism that possesses multiple cell types, but relatively little is known about how division symmetry may be regulated. We are studying asymmetric division in the green alga *Volvox carteri*, which has two cell types: ~2000 small, motile somatic cells and ~16 large reproductive cells (gonidia) that are set aside by asymmetric divisions. In Gls (Gonidialess) mutants only symmetric cell divisions occur. Previously, transposon tagging using *Jordan*, a 1.6kb class II (cut and paste) transposon, identified one *gls* gene that is required for asymmetric cell division. Class II transposons are useful because they often induce highly revertible mutations in the genes into which they insert, making it easier to clone the affected genes. Until recently, *Jordan* was the only known class II transposon in the *Volvox* genome; to improve our transposon tagging efficiency we used bioinformatic analysis to identify additional class II elements. So far 10 putative elements have been cloned and now we are assessing their mobility. Here we report these results and our efforts to use these new elements to clone additional *gls* genes.

This work was supported by an REU Supplement to NSF grant IBM-0444896 to SMM.

Studying the Protein-Protein Interactions Involved in HIV-1 Assembly

***Nerg D. AchiriMofor,** Sampson Kyere*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry

The purpose of my research is to characterize the protein interactions involved in HIV-1 assembly using NMR and X-ray Crystallography. Knowledge from these studies could provide new therapeutic targets for the treatment of AIDS. The assembly of HIV-1 is mediated by the Gag polyprotein. Prior to budding, exposure of the N-terminal myristyl group of the HIV-1 matrix region of Gag is coupled with Gag trimerization, via myristate interactions. This targets Gag to lipid rafts in the plasma membrane of the host cell during viral assembly whereby unknown Gag interactions occur.

Evidence of the presence of trimeric Gag has been demonstrated by analytical ultracentrifugation and electron microscopic studies of Gag proteins assembled on lipid monolayers. Unfortunately, efforts to study trimeric myristoylated Gag constructs by NMR, has been inhibited by aggregation and precipitation at concentrations that favor the trimeric species. To overcome these issues, a chimeric Gag-like construct was designed. Constructs were expressed in *E. coli* BL21 cells and prepared by affinity and ion exchange chromatography. Analysis by gel chromatography shows that the initial constructs GCN4-MA and GCN4-MACA readily form trimers and give rise to high quality NMR spectra, indicating studies of larger trimeric constructs including other Gag domains are now possible.

N.A. is a Meyerhoff Undergraduate Scholar supported by UMBC and the HHMI Undergraduate Scholars Program at UMBC and the Howard Hughes Medical Institute. S.K. is supported by the NIGMS initiative for Minority Student Development Grant (R25-GM55036) and the Proctor and Gamble Company.

Prevention of Aβ Cell Interaction Using Sialic Acid Analogues

Izath N. Aguilar
Theresa Good, Associate Professor, Chemical & Biochemical Engineering

Alzheimer's disease (AD) is the most common form of dementia. One of the pathological hallmarks of AD is the accumulation of β–amyloid (Aβ) peptide in the brain. It is believed that Aβ is a causative agent in AD. Sialic acid is an abundant sugar on the surface of neurons and is important in ligand-receptor interactions. We believe that sialic acid may be associated with the receptor for Aβ cell binding. In the current study, we are using a number of sialic acid analogues, ManNacH2O, ManNProp and AC4Man Prop, to examine if changes in the sialic acid structure lead to changes in Aβ binding and cell toxicity. We first examined the effects of sialic acid analogues on cell viability in SH-SY5Y cells using 7AAD staining and flow cytometry and found that they were non-toxic at the concentrations tested. We next will explore how analogues are incorporated on the cell surface, and how the presence of analogues alters Aβ interactions with cells. It is hypothesized that sialic acid analogues will prevent the aggregation of Aβ and toxicity in the cell. Understanding the mechanism of interaction between sialic acid analogues and Aβ could lead to the development of new treatments for AD.

*This work was founded, in part, by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and by NIH grant NS050346 to T.A.G.*

Activity of Promoter Regions Critical in *hZIP1's* Role in Prostate Cancer

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Renty B. Franklin, Professor, Department of Biomedical Sciences, University of Maryland, Baltimore, Dental School

The loss of Zn accumulation by the peripheral zone epithelial cells has been identified as one of the characteristics exhibited during the onset of prostate cancer. The hZIP1 transporter protein has been identified as playing a critical role in Zn accumulation within a normal prostate. Franklin et al. have shown a correlation between reduced hZIP1 gene expression, Zn depletion, and a decreased level of Zip1 protein in malignant prostate cell lines. This observation attributed the initial Zn loss in prostate cancer development to a down-regulation of hZIP1 gene expression. Our study investigates hZIP1 gene regulation by measuring a reporter gene activity under the control of the hZIP1 promoter. Three hZIP1 promoter regions were cloned upstream to the luciferase reporter gene in the PGL_3-Basic plasmid and successfully transformed into bacteria. Clones containing the inserts of interest were transfected into prostate cancer PC-3 cells and transfection efficiency was assessed using a plasmid expressing the EGFP. Analysis of hZIP1 promoter activity by measuring luciferase luminescence is ongoing and will help identify promoter regions crucial for hZIP1 activation and hZIP1 inhibition.

*This investigation was funded in part by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and NIH/NCI RO1 CA79903 (PI Dr Franklin).*

High Pressure Anion-Exchange Chromatography of Carbohydrates

Haroon Z. Ahmad
C. Allen Bush, Professor, Department of Chemistry and Biochemistry

The biochemistry of carbohydrates is unlike that of proteins or nucleic acids. Most polysaccharides share very similar molecular weights, sizes, and compositions. The experimental technique, High Pressure Anion-Exchange Chromatography, exploits the polarity of ionized groups on monosaccharides in alkaline conditions. The hydroxyl groups on the monosaccharides are deprotonated by the NaOH-rich eleuent and the varying monohydrates exhibit different retention times as they travel through a column of positively charged resin. The Dionex HPAE system studied in the project contained four main components; the gradient pump module, the autosampler, the pulsed amperometric detector, and the advanced computer interface, which communicated with our windows-based computer. Our project studied the methodology of each of these four instruments and laid out a user-friendly guide to using HPAE systems. The guide will prove useful for future carbohydrate analysis, in collecting consistent and accurate results, especially for researchers who have little experience with advanced biochemical techniques.

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

Study and Analysis of Dance from Former Mali Empire

Mya D. Ajanku,
Carol Hess, Chair Person of Dance Department

Financial and language barriers make the traditional study of West African dance almost impossible for an American. My fifteen-year study is based primarily in the United States. In an effort to “give back” and become more of an asset to my Community and School I seek to deepen and enrich my studies. In July of 2006 I attended Kankouran Dance Theater’s annual conference, the saving grace for many who lack the resources to travel to West Africa. The conference focused on the history, dance and music of the twelfth Century Mali Empire (location of Timbuktu) ruled by King Sundiata Keita. As a conference participant I studied under “Master African Dancers and Drummers” from countries that made up the former Empire. The artists passed on their legacy through stories, song and dance. Using knowledge gained from these workshops I created a choreography that shows a common theme: a couple starting a family. The piece follows a path that includes marriage, birth and celebration; it includes traditional dance and rhythm from multiple ethnic groups, and relays the message that in some ways we are all the same. In addition I will also share my knowledge with the dance department via a master class.

This work was funded by The University of Maryland’s Baltimore County’s Undergraduate Research Award.

Survivors of Domestic Violence: Violence Acceptance, Cultural Factors and Self Esteem

Megan B. Anders
Laura Ting, Assistant Professor, Department of Social Work
Robert Anderson, Assistant Professor, Department of Psychology

This study explored whether women from countries with high rates of intimate partner violence (IPV) have more acceptance of IPV and have more difficulty accepting help. Fifty seven women were surveyed using the Intimate Partner Violence Acceptance Scale and the Rosenberg Self Esteem Scale. From this group, five immigrant women were selected for qualitative interviews to explore their cultural beliefs about IPV. Two t-tests compared women from countries with higher and lower violence rates on their attitudes and acceptance towards violence and self-esteem. There were no statistically significant differences between the groups on self esteem however the high violence groups had higher scores for violence acceptance. There was also no difference on how helpful women found the psycho-educational groups to be. A slight negative correlation, although not statistically significant, was found between violence acceptance and self esteem. From the qualitative interviews, certain themes were identified which affected women's help seeking such as fear, isolation, shame, religiosity and lack of legal knowledge or cultural understanding about IPV.

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

Facebook Me: *The Facebook™* and Social Capital

Caroline Andes*, Eric Sieling*
Carolyn Forestiere, Assistant Professor, Department of Political Science

In this project, quantitative analysis was performed on an important aspect of online collegiate interaction, *The Facebook™*, in order to determine whether intensive use of *The Facebook™* among students at UMBC indicates increased levels of offline social capital. For the purposes of this study, social capital is defined as the personal relationships and social networks developed and maintained by individuals. Created in 2004, *The Facebook™* serves as an online social network linking approximately 90% of undergraduate students across the nation through personal profiles hosted by the network (Ellison, Lampe & Steinfield, 2006). A positive relationship between the intensive use of *The Facebook™* and increased levels of offline social capital at UMBC would indicate that *The Facebook™* and other online networks like it are not replacing the traditional varieties of social capital found on campus, but rather supplementing them through an online component. Building upon Dmitri Williams' (2006) Internet Social Capital Scales (ISCS), a set of social capital scales based on *The Facebook™* was developed over the course of this study. These *Facebook* social capital scales will be available to future researchers for use in conducting their own studies.

Investigation of the Interaction between RFX5 and CREB: Implications for the Regulation of MHC II Gene Expression

Olufolakemi O. Awe*, Colin Garvie*
Colin Garvie, Assistant Professor, Department of Chemistry and Biochemistry

Major Histocompatibilty Class II (MHC II) molecules play a major role in the proper functioning of our immune system. MHC II molecules are responsible for the presentation of antigenic peptides from foreign bodies to the receptors of CD4+ T lymphocytes, which in turn initiate an immune system response. If an individual has mutations or deletions in one or more of the four transcription factors that regulate MHC II expression the individual is classified as having bare lymphocyte syndrome (BLS). Two essential transcription factors in the MHC II transcriptional regulatory region include CREB and the RFX complex. This research focuses specifically on the interaction between CREB and RFX5. The interaction between CREB and RFX5 is proposed to be mediated by the bZIP domain of CREB. Full length CREB was inserted into a bacterial expression vector, and the protein was successfully expressed in *E. coli* bacterial cells. We have previously expressed and purified a variety of different fragments of RFX5. Next, we will analyze the interaction between CREB and RFX5 using chemical cross linking, size exclusion chromatography, and static light scattering techniques, in order to determine the minimal regions of RFX5 required to interact with CREB.

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

Localization of an Inhibitory Region in the *hZIP1* Promoter

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The human prostate normally accumulates high levels of zinc. However, in cancerous cells, the level of zinc drops significantly. While the mechanism is unknown, the down regulation of zinc transporter *hZIP1* has been proposed as one of the initial events leading to prostate cancer. We are searching for an inhibitory region located in the *hZIP1* promoter. The *hZIP1* promoter was first cloned into a pSEAP reporter vector to measure the promoter activity. After transfection of the construct in cells, the SEAP activity was measured. Preliminary data show that there is an inhibitory region within a 350bp section in the *hZIP1* promoter. We are shortening the promoter by restriction enzyme digestion to specifically identify this region. The results of the reporter assays using the new construct reveal that the *hZIP1* inhibitory region was not removed and the suspected region is now within a 241bp region. The next step would be to further shorten the region in order to precisely identify the binding site responsible for the inhibition of the reporter expression. This would be done using PCR or Exonuclease III – Nuclease S1 methods.

*This investigation was sponsored by NIH/NIGMS MARC U*STAR T34 08663 National Research Service Award to UMBC and NIH/NCI RO1 CA79903.*

Developing a Platform to be used for the Detection of Beta Amyloid Protein, a Protein Associated with the Development of Senile Plaques Found in Alzheimer's Disease

William Becker
Theresa Good, Associate Professor, Department of Biochemical Engineering

Currently, there are no diagnostics available for use in Alzheimer's disease prior to the death of the individual. While there are many possible markers for the disease, one protein that has been consistently associated with progression of Alzheimer's disease is beta amyloid. Beta amyloid is a 40 to 42 amino acid protein whose production and aggregation has been linked to different forms of Alzheimer's disease. The goal of this research is to help lead to the creation of a platform able to specifically detect beta amyloid pre-mortem. The platform is made from a gold slide with an amine group bound to the surface. Using this surface, diepoxide and sialic acid are then bound to the surface of the slide. From this platform, the goal is to bind the beta amyloid protein and identify using a florescent microscope. After the beta amyloid is found to be bound, the same surface chemistry is completed and irrelevant proteins are added instead of the beta amyloid. If the irrelevant proteins do not bind to the platform then the platform will be successful. The experimentation is to adjust the process via reaction conditions to specifically bind to the beta amyloid protein.

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

CR-*nitA*: the Synthesis of a Selectable Marker for *Volvox carteri* Transformations

Christopher T. Bednarek*, Matt Williams*
Stephen M. Miller, Associate Professor, Department of Biological Sciences

The green alga *Volvox carteri* possesses just two cell types and is an excellent model for the study of cellular differentiation mechanisms and their evolution. Currently there are only two selectable markers available for introducing genes into *V. carteri* to study their function. To create a new selectable marker for *V. carteri* transformation, a chlorate-resistant nitrate reductase gene (CR-*nitA*), has been synthesized. Nitrate reductase reduces nitrate to nitrite and, similarly, chlorate to chlorite, which is toxic to cells. Previous studies have demonstrated that a cysteine to alanine change in a conserved amino acid in nitrate reductase yields an enzyme that dimerizes but does not retain enzymatic activity. The CR-*nitA* marker gene encodes a product with an analogous c139a mutation and is driven by a high expression promoter so that transformants that take it up should over-express non-functional CR-NitA protein that dimerizes with wild type nitrate reductase. This should titrate functional nitrate reductase protein and permit transformants to survive chlorate. Gene assembly and subcloning steps are being used to synthesize a *Volvox* CR-*nitA* with a constitutive Hsp70-Rubisco-gene promoter and an HA-epitope tag. The completed construct will be tested for chlorate resistance following transformation into *V. carteri*.

This work was supported by an REU (Research Experience for Undergraduates) supplement to grant IBN-0444896 from the National Science Foundation.

Development of a Novel Food Spoilage Sensor

Caryn N. Bell*, William R. LaCourse, Aristotle Kalivretenos*
William R. LaCourse, Professor, Department of Chemistry

Food poisoning from spoiled product is a serious obstacle for the seafood industry. Spoilage is the increased production of amines from the degradation of proteins in the fish. Histamine is a natural toxin that causes scromboid poisoning, the severe form of food poisoning associated with fish spoilage. Consumers often try to sense the freshness of the product from sight and smell, but enough histamine could have been produced to cause scromboid poisoning before any of these changes occur. Therefore, the need for a food spoilage sensor that will detect and quantify amine presence is urgent. A colored compound that attaches to amines is the basis for the sensor. Preliminary studies have been performed to develop the best schematic layout for the sensor system. A patch that contains various layers that will hold the compound, protect the integrity of the fish and be easily understood by the consumer has been developed. The compound and proper materials have been experimentally incorporated into the system, and the effectiveness of this schematic is being studied. Current results suggest that the system is feasible and could be used in the market.

This research is funded by general research funds of the LaCourse laboratory and Aurora Analytics, LLC.

Calcium Dynamics in the Extra-Cellular Space of Neural Tissue

Abraham Beyene*, Mariajose Castellanos*
Mariajosé Castellanos, Assistant Professor, Department of Chemical Engineering

Calcium ion is involved in a number of signaling pathways and is necessary for synaptic transmission and plasticity. Calcium dynamics in the extra-cellular space is the subject of this study. In this work extra-cellular calcium consumption and replenishment was modeled using analytical approximations. We used differential equations to describe calcium ion concentration changes during action potentials. Although the approximations used do not include direct simulation of the diffusion of extra-cellular calcium within a local volume; we have observed that: 1) external calcium ion concentration ($[Ca^{2+}]_{ex}$) falls when neurons fire; and 2) neurons with higher firing rates are characterized by a lower calcium ion concentration at steady state. We also analyzed the sensitivity of $[Ca^{2+}]_{ex}$ to two biological parameters. We observed a strong dependence of $[Ca^{2+}]_{ex}$ to *k*, a parameter that characterizes the amount of calcium intake per spike; $[Ca^{2+}]_{ex}$ falls sharply for high values of k. The second parameter examined is associated with the time calcium pumps remain open in order to release $[Ca^{2+}]$ into the extra-cellular space. The changes observed were not as significant as observed with *k*. These observed fluctuations in $[Ca^{2+}]_{ex}$ have been shown to be part of normal neural activity and are supported by literature data. Future work includes the incorporation of diffusion of calcium ions in the extra-cellular glia.

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

Sequencing Melanopsin from the Bovine Retina

Sarah M. Bourdon*, Nancy S. Chiles*
Phyllis R. Robinson, Associate Professor, Department of Biological Sciences

Melanopsin is a G-protein coupled receptor (GPCR) found in photosensitive retinal ganglion cells. GPCRs make up the largest protein family and commonly are involved in signaling pathways. They are consequently the target of many commercial medicines. Specifically, melanopsin is a photopigment that helps regulate circadian rhythms. Our experiment aims to sequence the gene for melanopsin in the bovine retina and compare this to a predicted sequence of the gene. cDNA was synthesized from bovine retinal RNA using RT-PCR, with primers corresponding to the gene's predicted sequence. We then cloned the resulting DNA into bacteria. This was sequenced following amplification and isolation from the bacterial culture. At this point, we have analyzed one portion of the gene and have found that it does match the predicted sequence. Further work is needed to determine the sequence of the rest of the gene and to confirm that it codes for melanopsin. Once the sequence of the gene is confirmed, antibodies against the protein it encodes can be generated and used to purify protein from bovine retina for biochemical analysis. Due to the large size of the bovine retina, this would allow more efficient research regarding the role of melanopsin in circadian regulation.

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

Curating a Museum Exhibit: *The Glory of Ruins* Display in the Albin O. Kuhn Library Rotunda, January 31-March 24, 2007

Cally E. Brandt, Morgan E. Little
Richard S. Mason, Lecturer, Department of Ancient Studies

Curators have the extraordinary power to provide an intellectual and emotional experience for their audience through the exhibitions they create. *The Glory of Ruins* is an exhibit of nineteenth-century photographs of sculpture from the Parthenon in Athens, and mid-twentieth century photographs of Greek temples in Attica reflecting the stunning classical style of the buildings on the Athenian Acropolis. Professor Richard Mason's fall 2006 internship class developed the preliminary plans for the exhibition. During the winter break the exhibit was installed according to the design determined in class, and in adherence with the methods formally employed by museums and galleries. Informative texts augmented the photographs to provide both a visual and historical tour. All information and materials collected during the fall semester were revised, printed, matted, framed and displayed in the Rotunda of the Albin O. Kuhn Library & Gallery. This exhibit revealed the store of quality photographs in Special Collections to the UMBC community, and the determination and professionalism of students previously inexperienced with curatorship.

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

Mathematical Study of Quaternions and Their Properties

Clifford Bridges, *Muddappa Gowda*
Muddappa Gowda, Professor, Department of Mathematics

This study is meant to increase the working knowledge of quaternions. Quaternions were originally discovered by Sir William Rowan Hamilton in 1843. They are similar to complex numbers except for the commutative property. Quaternions form a four-dimensional linear space over the real number system with a basis {1,i,j,k}. The elements i, j, and k satisfy the relations: i^2 = j^2 = k^2 = -1 and ij = -ji = k, jk = -kj = i, and ki = -ik = j. Quaternions has been used in modeling 3 dimensional rotations, but they can also used in other real world applications. In the present work, we describe the algebra of quaternions, their interesting properties, and some connections between quaternions and 2 x 2 matrices with complex entries. We also describe properties of matrices with quaternion entries. In particular, we discuss invertibility, existence of eigenvalues, and rank of quaternion matrices.

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

Characterizing L4 and L22 Mutations in *E. coli* Strains Resistant to Oleandomycin Triacetate

LaToia Bryant*, Janice Zengel*
Janice Zengel, Senior Research Scientist, Department of Biological Sciences

Macrolide antibiotics, such as oleandomycin triacetate, inhibit bacterial protein synthesis by binding to the 50S ribosomal subunit in the peptide exit channel. Interestingly, many ribosomal globular proteins such as L4 and L22 have extensions that reach into the mass of rRNA within the ribosome. L4 and L22 tentacles extend such that the ends of the tentacles form a constriction at the beginning of the peptide exit channel. Mutations in the L4 and L22 tentacles result in oleandomycin triacetate resistance in *E.coli*. Resistance is conferred through alterations in the ribosome structure such that the affinity for oleandomycin triacetate is reduced or the binding of oleandomycin triacetate does not inhibit bacterial protein synthesis. Oleandomycin triacetate resistant colonies were isolated, and colony PCR was performed to amplify L4 and L22 genes. Following PCR purification, L4 and L22 genes were sequenced in order to classify mutations in L4 and L22 tentacles that confer oleandomycin triacetate resistance. After confirming oleandomycin triacetate resistance of the isolated mutant strains, additional characterization assays will determine temperature sensitivity, resistance or dependence on oleandomycin triacetate for viability, and growth rate. This study contributes to a greater understanding of the mechanisms in which antibiotics inhibit bacterial pathogen functioning.

This investigation was supported, in part, by the National Science Foundation (NSF) grant MCB-0349443 to the MARC U STAR Program.*

Structural Analysis of RFX5 Dimerization Domain

Jonathan T. Bryant-Genevier*, Kholiswa Laird, Colin Garvie*
Colin W. Garvie, Assistant Professor, Department of Biochemistry

Regulatory factor X5 is part of a transcription factor responsible for initiating immune responses against bacterial infections in mammals. Knowledge of RFX5's three dimensional structure would provide a better understanding of the intermolecular interactions within the multi-protein transcription factor and hopefully aid in our ability to manipulate the rate of production of MHCII molecules. RFX5 is the key DNA binding protein within the transcription factor and is composed of multiple domains. Little is known about the three dimensional structure of RFX5, though it is proposed that it forms dimers in solution. Computerized secondary structure predictions have suggested that one particular domain is responsible for this observation: the "Dimerization domain," composed of a 70 amino acid sequence. This domain never provided crystals that were suitable for solving the crystal structure by X-ray crystallography, so a fusion method was designed. Previous studies have shown that crystallization of small protein domains can be induced via fusion to the maltose binding protein. This project focused on fusing the Dimerization domain with the maltose binding protein in an effort to obtain crystals to solve the three dimensional structure.

This work was funded, in part, by the UMBC URA Program and by the UMBC Department of Biochemistry.

A Genetic Approach to Identify Targets of Ubiquitin Ligases from Animals and Plants

Ramon M. Cabrera*, Mauricio M. Bustos*
Mauricio M. Bustos, Associate Professor, Department of Biological Sciences

Protein ubiquitylation plays essential roles in eukaryotic cells. Ubiquitin protein ligases (E3) direct ubiquitylation to specific substrates, and are encoded by large gene families in humans and plants. Although E3 genes bear characteristic signature domains, like the RING domain, their substrates are very diverse. My goal is to create a genetic screen in yeast to identify substrates of RING-E3 ligases from humans and the plant *A. thaliana*. To validate the screening strategy, I will use the E3 ligase AIP6, its substrate ABI3, and the yeast marker ADE2. Yeast *ade2* mutant cells produce red colonies in the presence of low adenine concentrations. Complementation of that phenotype by the ABI3-ADE2 fusion will lead to normal, milky white colonies. Co-expression of AIP6 causes ABI3 ubiquitylation and rapid protein turn-over, which when applied to the ABI3-ADE2 fusion will result in red colonies. After that validation phase, the appearance of a red colony phenotype will be used to screen an Arabidopsis cDNA library fused to the same ADE2 reporter sequence, in concert with AIP6. Subsequent analysis of candidate clones will reveal potential substrates for the enzyme. A similar strategy will be used to find substrates of human E3 ligases.

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.*

The African American Experience at Eastern State Penitentiary: Insight into Prison Life and the History of Corrections

Robin D. Cagey
Ann C. Frankowski, Adjunct Assistant Professor, Department of Sociology and Anthropology

Throughout its history, Eastern State Penitentiary (1829-1971), located in eastern Pennsylvania, has had a significant population of African American inmates. In my research, I examined the African American experience inside the penitentiary and how it differed from that of white inmates throughout the years of its operation. Based on data drawn from primary and secondary documents found at the penitentiary and the University of Pennsylvania, and in online digital archives, I concluded that African Americans did have a very different experience. The most prominent areas of disparity are in the solitary confinement system (Eastern State was the first to implement a system of total solitary confinement), physical and mental health, issues of segregation and labor, and recreational activities. These findings help enrich the knowledge of African American history in the Philadelphia area and give insight into prison life and the history of corrections.

This research was funded, in part, by Eastern State Penitentiary Historic Site in Philadelphia, PA. The data has been provided to Julia Reynolds Masterman Public School's African American History curriculum unit.

Analyzing Predictors of Academic Success among African American Adolescents within an Urban Charter School

Durell M. Callier
Laura Ting, Assistant Professor, Department of Social Work

As the nation has sought to understand and decrease school dropout rates, so have local school bureaucracies such as the Baltimore City Public School System ([BCPSS], 2002; Smith, 2001). Research has shown that students drop out due to a lack of interest, and academic success (BCPSS, 2002). In an effort to understand factors related to student achievement, the purpose of this study was to examine proposed predictors of academic success, i.e. self-esteem, self-efficacy, adolescent educational expectations, and school engagement. This study used a secondary data set, measuring self-esteem, self-efficacy, adolescent educational expectations, and school engagement among adolescents between 11-15 years of age from an urban charter middle school. Participants for this study included a total of 64 students, grades 6^{th}-8^{th} of whom 48.4% were female, 50% male, and 1.6% unreported. The conceptual framework for the study was based on Badura's Self Efficacy Theory (1977). A multiple regression model predicting academic achievement was marginally significant at $p=.053$, accounting for only 14.7% of the variance. Other findings suggest that self-esteem correlates to school engagement, but not to self-efficacy, and that self-efficacy correlates to educational expectations. Implications for educators, policy makers and future research are discussed.

This work was funded through a Summer Research Institute Fellowship from the UMBC Ronald E. McNair Scholars program.

Sequencing the Melanopsin Gene from Bovine Retina

Nancy S. Chiles*, Sarah Bourdon, Phyllis Robinson*
Phyllis R. Robinson, Associate Professor, Department of Biology

Melanopsin is the photopigment used by intrinsically photosensitive retinal ganglion cells (ipRGCs) to detect ambient light levels in the environment. ipRGCs make up approximately 1% of all retinal ganglion cells. They are responsible for non-image-forming light responses, including circadian photoentrainment and pupillary light reflex. Melanopsin is a recently discovered member of the G protein-coupled receptor (GPCR) superfamily. The purpose of this project is to clone, sequence, and express Bovine melanopsin gene to learn more about this photopigment. Melanopsin has been previously sequenced from many sources including the retinas of mice, chickens, birds, humans and zebrafish. Bovine retinas were chosen due to their size, as more melanopsin containing cells would be present in a larger eye. mRNA was isolated from the retina and cDNA was made. Amplification was done using primers designed based on the predicted Bovine melanopsin sequence. A portion of the bovine melanopsin gene was successfully cloned and sequenced. Work is continuing to obtain a full length copy of the gene.

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

Who Says the Old Can't Move?

Katie A. Chrzanowski
Frederic Worden, Assistant Professor, Department of Visual Arts

"Who Says the Old Can't Move?" was a project developed to explore the world of classical Hollywood cinema. This music video, using the Brian Setzer Orchestra song *Jump, Jive, an' Wail*, was made from footage from 15 different Hollywood movies. The clips were chosen for their variety of movements and comedic elements. The editing made use of graphic matches and continuities of motion across a series of clips to create a fast moving and highly visual film. People often dismiss and discount classic films as boring and outdated. This video was created to prove that the classic film styles and actions can still be truly invigorating and fun as well as entertaining even as measured by today's contemporary standards. The movies from which clips were taken include: *Arsenic and Old Lace*, *Breakfast at Tiffany's*, *Bringing Up Baby*, *From Here to Eternity*, *Holiday*, *It Happened One Night*, *Jailhouse Rock*, *Monkey Business*, *My Favorite Wife*, *People Will Talk*, *Pillow Talk*, *Roman Holiday*, *The Shop Around the Corner*, *Singin' in the Rain*, and *Some Like it Hot*.

Analysis of Mutations in Ribosomal Proteins L4 and L22 in Spiramycin-resistant *Deinococcus Radiodurans*

Andrew M. Ciupek
Janice M. Zengel, Senior Research Scientist, Department of Biological Sciences

Ribosomes are the site of protein assembly in the cell. Several protein components of the ribosome have been linked to protein chain formation, but the specifics of their role are not well understood. Bacterial mutants resistant to spiramycin, a ribosome-inhibiting antibiotic, were isolated to observe how mutations within their ribosomes conferred resistance. Bacterial mutants were selected by growing *Deinococcus Radiodurans* on plates with 100 micrograms/ml of spiramycin for 3 to 4 days. These selected colonies were isolated and analyzed via colony PCR and DNA sequencing to identify mutations in two target ribosomal proteins, L4 and L22. Five mutations have been isolated within the L4 target, four of which had not been described previously. Testing for resistance to other antibiotics and temperature sensitivity in addition to and isolating and testing ribosomes for functionality changes will further classify the mutants. Understanding the effects of these mutations will add to the knowledge of ribosomal protein function and mechanisms of bacterial drug resistance.

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

Are Super Bowl Betting Markets Informationally Efficient? The Time Series Evidence

Kyle R. Clelan
Douglas Lamdin, Professor, Department of Economics

The research question addressed in this statistical study concerns whether the observed Super Bowl betting lines have predictive ability that is consistent with unbiased estimates of the outcome of the game. An unbiased estimate implies that, on average, the betting lines correctly predict the outcome of the game. In other words, this study addressed whether the betting markets for the Super Bowl exhibit what economists refer to as informational efficiency. Using all available data for the Super Bowl games for both point-spread and over-under betting lines, and the outcome of the games, regression analyses were conducted with these time-series data to test the hypothesis of informational efficiency. The results of this study extend beyond simply an interest in gambling and football. The informational efficiency of markets, such as for financial assets such as stocks, assumes that participants make informed decisions that reflect available information. If the hypothesis of informational efficiency is true, it will be supported by the evidence. This study thus is part of a broader concern of economists with the efficient operation of markets in general.

Synthesis of Carbocyclic Nucleoside Analogues as Potential Inhibitors of *S*AHase and Adenosine Deaminase

***Luis J. Cocka**, Naresh K Sunkara*
Katherine L. Seley, Associate Professor, Department of Chemistry and Biochemistry

Enzymatic inhibition of biological pathways essential for viral replication has shown promise in the design of viral chemotherapeutics. In that regard, enzymes like *S*-adenosyl-L-homocystine hydrolase (SAHase), adenosine deaminase (ADA) and methyltranferases (MeTase) are attractive targets due to their biological implications. Disruption of these critical enzymes has been shown to be particularly effective by the use of a novel class of nucleoside analogues. As a class, carbocyclic nucleoside derivatives are structurally modified such that they mimic the natural nucleosides enough to be recognized, but ultimately disrupt subsequent biological processes. The aim of this research project is to synthesize carbocyclic nucleoside analogues based on isoadenosine (IsoA). These targets feature three specific modifications: 1) replacement of the ribose sugar with a cyclopentyl ring to create stability that previously synthesized IsoA analogues lacked; 2) alteration of the connectivity between the sugar and the heterocyclic base moiety to further increase the stability of the target compounds 3) alteration of functional groups on the heterocyclic ring, making them possible targets for ADA. These combined features have the potential to theoretically produce inhibition on biological methylations and may exhibit synergistic inhibition and subsequently, greater potency as antiviral and anticancer agents.

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BODY

Irene Colorado
Cathy Cook, Associate Professor, Department of Visual Arts

Understanding movement is an integral part of animation, which is by definition the process of imparting life, motion, or activity. BODY is a rotoscoped, animated film that analyzes the human form and attempts to show a mastery of human movement through the study of dance. To produce this I collaborated with dancers, as well as an actress to explore the aesthetics of the movement our bodies are capable of. Once the film was edited I drew over each frame to form the animation. The choreography pays special attention to weight, balance, force, and anatomy, which is mimicked by the movement of the actress, the editing, and the animation style in order to form a cohesive final piece. Choreographing the dance gave me the opportunity to investigate both the abilities and limitations of human physical movements. I will be able to apply this new understanding of the body to future animations, as well as my new skills in research and development to study motion even further.

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

Analysis of HIV-1 SL4-U5 Binding Region

Ryan P. Connor, ***Khadijatou L. Njimoluh***, *Lianko Garyu, Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry

The psi-site (SL1-SL4), an ~120 nucleotide region located in the HIV-1 5' Untranslated Region (UTR), has been shown to play a critical role in the encapsidation of the viral genome via interaction with the nucleocapsid (NC) domain. Both phylogenic studies and in vivo experiments suggest that the U5 and SL4 regions participate in long-range interactions. Despite various structural studies conducted on the psi-site, the structure of the SL4 region remains unclear. Understanding the structure of SL4 would advance the knowledge of the structure of the complete 5' UTR, and thus further the understanding of the mechanism of viral assembly. Using Nuclear Magnetic Resonance and gel electrophoretic mobility shift assays, the interaction between the isolated SL4 and U5 regions was investigated. The gel electrophoretic mobility shift assays showed that SL4 and U5 formed a heterodimer. 2D-HMQC titration experiments in which U5 was titrated into SL4 were run at 35°C and 25°C; the results indicated either a conformational change or the formation of the SL4-U5 heterodimer. Further understanding of the SL4-U5 interaction may help in understanding the exact structure of the SL4 and U5 regions.

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Improving Software Maintenance through Better Documentation

Sumita Das
Wayne Lutters, Assistant Professor, Department of Information Systems
Carolyn Seaman, Associate Professor, Department of Information Systems

Finding and using software documentation has long been a challenge in supporting (modifying, enhancing, adapting) operational software. The purpose of this study is to better understand the sources of information that are helpful when maintaining software and identify best practices in using these resources. As part of a larger study, we conducted contextual, semi-structured interviews with a total of 23 software maintainers who were working on government contracted projects. We analyzed the data by coding these interview transcripts, searching through them for common themes. We produced a list of the most worthwhile behaviors and properties of documentation. The findings of this study are meant to assist software personnel in making documentation a more dependable and valuable source of information during the maintenance process. We identified some structural properties of documents that are particularly useful (e.g. indices, subheadings, glossaries, acronym lists). Source code appears to be the "ultimate documentation", i.e. the most trusted, so it's important that comments in the source code are readable and well-organized. We also found that, when maintainers could not find needed documentation, they relied on word-of-mouth for information. Participating organizations are eager to use the results of this study to improve their current documentation processes.

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

Low Return Rates and Pairing Infidelity in Two Maryland Oriole Species

Jenélle L. Dowling
Kevin E. Omland, Associate Professor, Department of Biological Sciences

We investigated the patterns of pair formation in the Baltimore Oriole and the Orchard Oriole. Few data have been previously published on the mechanisms of pair formation and pair fates of oriole species. During our study, we re-sighted color banded birds and observed pairing behavior during four breeding seasons. We also assessed rates of return from the wintering ground and pairing status. I then performed statistical analyses to determine the most common pairing strategy adopted by these two species. Our investigations show that Baltimore and Orchard orioles both have low rates of return to the study site. Next, our results suggest that both Baltimore and Orchard orioles always search for a new mate and never remain unpaired when their previous mate does not return. Lastly, we found that Baltimore and Orchard orioles rarely breed with the same mate two seasons in a row. Overall, our results suggest that instead of waiting for a previous mate's return, these orioles took advantage of the first mating opportunity available. This indicates that the strategy of searching for a new mate and not waiting for a previous mate may have evolved in these two species.

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

Tag!

Kelly Driscoll, Brian Curlee
Frederic Worden, Assistant Professor, Department of Visual Arts

Rotoscoping, a form of animation art that has been practiced since the early twentieth century, is a technique using live-action film footage in which the artist traces the photographed movement frame by frame. This project, inspired by the art of rotoscoping, was to be a short, three-to-four minute film in which live-action footage interacted with rotoscoped animation. Each second would consist of 15 frames, resulting in roughly a 3,000 frame final film. The story line is based on the childhood game of "Tag." Two HD video cameras were rented for a four-hour shoot and each camera was operated with similar visions of the execution of each specific shot. The technology used to do the rotoscoping, an arduous process that took up the majority of time, was achieved using the software program *After Effects*, two Mac laptops (PowerBook G4 and MacBook Pro), and two Wacom Tablets for tracing. The final result is an upbeat film consisting of intense colors and characters with a musical selection from the artists Hellogoodbye.

Acting from a Musical Approach

Jessica R. Dulaney
Colette Searls, Assistant Professor, Department of Theatre

Last summer I researched the skills and surrounding business of musical theatre at Collaborative Arts Project 21 (CAP 21) in America's theatrical center, New York City. At this studio I participated in classes taught by active professionals in the New York musical theatre business. These classes built on a foundation of intense acting training I had already gained in the Theatre Department at UMBC, and I applied them to mediums that I had not faced, which included songs and musical scenes. Areas of study included vocal performance and technique, musical scene study, audition technique, and music theory. In addition to courses, visits to the New York Performing Arts Library helped me to gather materials and resources such as librettos, sheet music, and recordings which are not found in a normal library. Attendances at Broadway performances were informative about contemporary trends in musical theatre. This helped me expand my selection of audition material for musical and non-musical theatre. My performance will be a presentation of three songs I studied this summer from the musical *The Apple Tree* using the skills acquired of singing technique and interpretation at CAP 21; a revival of this musical recently opened on Broadway.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and a Shakespeare on Wheels scholarship from the UMBC Department of Theatre.

Miracle: A Visual and Performing Arts Reaction

Danielle Durbin, Erin Terwilliger, Jake Jensen, Jon Pack, Kim Patrick, Una Petrovic
Anna Rubin, Professor, Department of Music

Our multi-media performance is based on a visual art work by Mariko Mori, entitled *Miracle*, a collection of eight circular photographs of micro- and macro-organisms. Each is placed on an iridescent piece of glass in a circular room. In the middle of the room is a suspended strand of crystals which hovers above a circle of rock salt. Danielle Durbin and Una Petrovic become the "crystals" through costuming with choreography to the music of Arthur Foote's *A Night Piece*. Kim Patrick recorded *A Night Piece* with a small chamber group including Danielle Durbin and mixed the recording in surround sound. Jacob Jensen has designed lighting for the performance. Erin Terwilliger and Jonathan Pack created a ring of large "rock salt and crystals" from foam, which forms a ring around the dancers. The audience sits along the circumference of the rock salt formation surrounding the dancers. After the performance, we will ask our audience members to fill out a questionnaire about the performance which we will compare to Mori's *Miracle*.

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

Olfactory Epithelial Cell Degradation in Mice with Surgically Occluded Nostrils

Ejiofor A. D. Ezekwe Jr.*, Tatsuya Ogura, Weihong Lin*
Weihong Lin, Assistant Professor, Department of Biological Sciences

The olfactory epithelium plays a major role in the sensation of smell. We are testing whether occlusion of a nostril causes epithelial cell degradation over time, to determine if these cells are modulated by air flow or sensory input. To make this determination we assayed mice nasal epithelial cells by cross sectioning their nostrils and processing these sections using immunohistochemistry. We labeled the sections with antibodies against the epithelial cells and counted the number of specific cells. This procedure has been run on control mice to ascertain a base line number of the epithelial cells and the results are currently being compiled. We have also cross sectioned the nostrils of mice with surgically occluded nostrils and will be performing immunohistochemistry on these cells in order to count them. In the long term, we plan to ascertain the chemical function of these cells and understand the pathways by which they function. The importance of the olfactory systems stretches from reproduction and mate selection, to food dissemination and predation avoidance, which is critical to the survival of many species.

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Comparison of Markers of Disease Severity in Patients with Sepsis and Matched Controls

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Systemic Inflammatory Response Syndrome (SIRS) occurs in critically ill patients. Sepsis arises when patients with SIRS develop an infection. Sepsis and septic shock are significant causes of morbidity and mortality in critical patients. It has been suggested that certain cell surface and soluble biomarkers distinguish patients with sepsis or those that will become septic, from those with SIRS but remain uninfected. We are developing a clinical assay that can aid in the early diagnosis and management of sepsis. Preliminary data suggests that certain markers are different in these two groups. We sought to determine whether the differences in the two groups are due to infection or simply due to severity of illness. We quantified the severity of illness in the patients using Sequential Organ Failure Assessment (SOFA) and Acute Physiology and Chronic Health Evaluation (APACHE) at different matched time points of the patients' hospitalization. There is significant difference in the APACHE and SOFA scores between the two groups. The data suggest differences in biomarkers may be related to differences in disease severity. A subset of patients matched for APACHE and SOFA scores will be evaluated to determine if differences in biomarkers between the groups are conserved.

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“Slipping Away”

Lisa C. Fecteau
Doug Hamby, Associate Professor, Department of Dance

“Slipping Away” is a dance piece which explores multiple manifestations of complex negative emotions. The choreography is based on research done at The Broadway Dance Center in New York City, an internationally recognized dance center educating dancers from around the world. The movement used to create the dance was strongly influenced by exposure to a wide range of styles of dance at the Broadway Dance Center. After six weeks of complete immersion in the dance community of New York, it became evident that these experiences needed to be shared. Compositional processes focused on the integration of movement improvisation and dialogue. The goal was to expand and explore the emotional and dramatic versatility of dance so that anyone who watches “Slipping Away” will be touched by at least one element of the production: the sound of a dancer’s voice, a characters narrative, a movement phrase, the use of space or the relationship between movement and music. In each case the viewer will make important connections between their own personal experience and “Slipping Away.”

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

Phosphodiesterase 2-Labeled Atypical Glomeruli and Sensory Neurons in the Olfactory System

Adrian A. Feijoo*, Tatsuya Ogura, Weihong Lin*
Weihong Lin, Assistant Professor, Department of Biological Sciences

Olfaction is of critical importance to all organisms in that it helps recognize and identify food, pheromones, predators, and potentially threatening environments. We are interested in olfactory detection of odorants, especially the role of the atypical glomeruli in the olfactory bulb and associated sensory neurons in the olfactory epithelium. These neurons express phosphodiesterase 2 (PDE2) and are different from the majority of neurons that express the cyclic nucleotide-gated channel subunit A2 (CNGA2) and the cAMP pathway. Furthermore, the functional role of these PDE2-positive neurons and atypical glomeruli in odorant detection is unknown. Thus, we are using an immunolabeling method to monitor the PDE2 expression in the olfactory system. We will determine the number of PDE2-expressing olfactory sensory neurons and atypical glomeruli in both CNGA2 knockout and wild type mice. In addition, we will determine whether the PDE2-associaed system is up-regulated in the CNGA2 knockout mice, of which the olfactory detection is severely impaired. Future studies will determine odorant-specific detection of atypical glomeruli and its compensative role to better understand the complexity of chemical olfaction.

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The Reliability and Internal Consistency of the Revised Dyad Adjustment Scale For a Sample of Young Romantic Couples

Jenny L. Ficco, Stefanie Kirk
Stanley F. Feldstein, Professor Emeritus, Department of Psychology

This study examined the psychometrics of the Revised Dyadic Adjustment Scale (DAS-R) and compared it with those of the full DAS in a college-aged sample of romantically involved persons. Undergraduate students involved in a romantic relationship completed both the DAS and DAS-R, approximately two weeks apart. The DAS-R has yet to be utilized to assess this population and results of this study may assist in an ongoing study on the characteristics of romantic relationships. The original DAS (Spainer, 1976) was created to assess the quality of marital relationships. The DAS measures their quality by determining the extent of agreement within the couples on various questions regarding their relationships. Questions on this assessment include topics that range from couples' overall happiness in the relationship to their agreement about making major decisions. 32 items comprise the original DAS, while the revised, shortened version of the DAS has only nineteen items (DAS-R). A positive correlation between the measures was found to be .71, controlling for gender and length of relationship. The internal consistency of the DAS is .84 and that for the DAS-R is .74. These results suggest that the DAS-R is a useful measure of college students' relationship quality.

How Momma Raised Me: Understanding the Upbringing of Rural and Urban Students and its Relation to College Attendance

Maddy M. Fickes
Kathy S. Bryan, Lecturer, Department of American Studies

In the past, many researchers have evaluated education in terms of who gains access to the various levels and who is excluded. While these research projects have revealed differences in access in terms of race, gender, and class, few have evaluated education in terms of rural or urban upbringing. Thus, this research seeks to examine higher education access as it differs by location while also acknowledging the frequently shared income level of individuals in these areas and how this connects the urban and rural. Through in-depth interviews with twelve current college students, six of whom grew up in an urban environment (Baltimore, Maryland) and six of whom grew up in a rural environment (Orrtanna, Pennsylvania), interviewees were compared in terms of their family life, available resources, and personal and external expectations. Analysis of these interviews reveals numerous similarities between rural and urban students' upbringings and college pathways despite the separation of location. Ultimately, the shared, underlying income level between rural and urban students similarly impacts their family upbringing, resources, and expectations, and consequently, fuels collegiate aspirations and attainment despite the differing external manifestations.

Is Socioeconomic Status Health Protective? Exploring the Mediating Role of Psychosocial Factors among African Americans

Julie C. Fields*, Jessica Kelley-Moore*
Jessica Kelley-Moore, Assistant Professor, Department of Sociology and Anthropology

In recent years the levels of unemployment in the United States have declined overall, but have remained heightened in certain groups, particularly among African Americans whose unemployment rates are 10.9 percent compared to 4.5 percent for White Americans. Much of the current research investigates the impact of unemployment on health disparities among African Americans. Previous research finds that among White Americans, those who are employed have better physical health as well as lower instances of depression. However, that protective effect is not observed in working African Americans. To determine why this effect is not observed, I will examine the mediating role of psychosocial factors, perceived societal position, and racial discrimination, in counteracting the protective effects of SES [Socioeconomic Status]. This project uses data from the study "Healthy Aging in Neighborhoods of Diversity across the Life Span" [HANDLS], an area probability sample of nearly 2,000 Black and White adults in Baltimore, Maryland. Bivariate and multivariate analyses will be used to estimate the impact of these intervening factors on the relationship between employment and health.

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Isolation of Mutations in L4 and L22 That Confer Resistance to the Antibiotic Tylosin

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

Ribosomes are responsible for translation of the genetic code to form proteins. Therefore, learning how ribosomes function through the understanding of how ribosomal proteins affect the peptide exit tunnel is of great interest. The r-proteins L4 and L22 may act as a gate by opening and closing the peptide exit tunnel which could in turn affect translation. The purpose of this project is to isolate the specific mutations of the L4 and L22 r-proteins in *Escherichia coli* that generate resistance to tylosin. Usually it can be assumed that a resistance to tylosin can confer cross resistance to other antibiotics with similar structures. In order to isolate mutants, *E. coli* was grown in the presence of tylosin at a concentration which would kill the wildtype but still allow the mutants to grow. Thus far, three mutations in L4, G66C, R69S, and K63E have been found and the results have been replicated. G66C and K63E had been isolated before in this laboratory but R69S is a novel mutation. Isolating these mutants in L4 and L22 will lead to a better understanding of how these r-proteins help regulate the peptide exit tunnel and how translation is affected overall.

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Movement and the Singer

Christie M. Finn
David Smith, Lecturer, Department of Music

The exploration and development of a classical singer's vocal technique is without end, leading one in many directions at the same time. This year, I have investigated several areas of vocal technique--one bringing me to understand more fully how my body relates to the actual sound my voice produces. This summer, I had the opportunity to travel to Minneapolis, Minnesota to attend the Wesley Balk Institute, a well-known program designed to address the performer as a whole (mind and body, as well as voice). Work at this institute includes in-depth movement training, meditation and private coaching, as well as developing and performing scenes with other singers. I personally performed scenes from the musical *West Side Story* and the opera *The Merry Wives of Windsor*. One piece that I coached in detail with faculty members at the institute was Luciano Berio's Sequenza III, the piece that I will be performing today. This is a vocal piece which also involves intense movement and developed acting skills. The text is taken from the modular poem by Mark Kutter: "give me/ a few words/ for a woman/ to sing a truth/ allowing us/ to build a house/ without worrying/ before night comes."

This work was funded, in part, by an Undergraduate Research Award from the UMBC Office of Undergraduate Education and an Honors College Special Sessions Scholarship.

Analyzing the Interactions between RNase MRP and XRN-1 to Further Investigate RNA Metabolism

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

RNase MRP is an endonuclease that cleaves ribosomal RNA at A3 and A2 of Internal Transcribed Spacer-1. Mutation in RNase MRP results in cartilage-hair hypoplasia, an autosomal recessive disease. I am attempting to map the deletion of the *RRP2* gene that codes for RNase MRP. RNase MRP appears to interact with an exonuclease XRN-1 that cleans up an RNA moiety created by RNase MRP. Previous experiments have attempted to delete the *XRN-1* gene to enable further analysis of the function of RNase MRP. We are attempting to delete the *XRN1* gene by generating a PCR fragment of the Kanamycin-resistance gene (KanR) flanked by pieces of the *XRN1* gene. Upon transformation of *Saccharomyces cerevisiae* with this fragment, kanamycin resistant colonies were selected. These colonies may be the desired strains in which the entire *XRN1* has been replaced by *KanR*. PCR has been done with oligonucleotides from the *XRN1* flanking locus and the *KanR* gene to evaluate if the pcr product recombined in the desired chromosomal position. Future experiments will test the ribosomal RNA processing of these mutants.

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Differential Gene Expression in Cultured Rodent Malaria Parasite

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There are over 200 million new malaria cases each year and it still kills more than one million people a year, mostly children. In addition, malaria may increase at an alarming rate because of decreased effectiveness of control measures, declining economic conditions in many endemic countries, and global warming that favors mosquito-borne pathogen transmission. The liver-stage malaria parasite has become an attractive target for vaccine design because such vaccines not only prevent the disease but also block transmission. As part of our ongoing work with the axenic culture of the rodent malaria parasite, Plasmodium yoelii, we were interested in examining the transcriptional dynamics during the sporozoite-to-hepatic stage transition. We applied RT-PCR to detect differences in gene expression between culture-derived and mosquito-derived parasites. The UIS4, a gene essential in the development of the liver stage, was targeted in our study. UIS4 was expressed in the mosquito-derived but not culture-derived sporozoites. We concluded that our observed low infectivity of the culture-derived parasite correlates with the lack of expression of UIS4. Our ongoing research is now focused on modifying the culture conditions to restore UIS4 gene expression and confirm the role of its gene product in infectivity.

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Sex Differences in the Influence of Resting Blood Pressure, Pain Catastrophizing, and Fear of Pain on Pain Outcomes

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

Pain is a critical national and international health problem. Research suggests resting systolic blood pressure inversely relates to pain sensitivity, while greater fear and pain catastrophizing are associated with heightened pain perception. Whether sex differences exist among these relationships is currently unknown. Additionally, laboratory studies examining *in vivo* pain catastrophizing and fear of pain are limited. This study used standard acute pain procedures to examine sex differences in physiological and psychological predictors of pain outcomes in healthy adults (N=64, 52% women). Hierarchical regression models examined the effects of resting systolic blood pressure (SBP), *in vivo* pain catastrophizing (CAT), and fear of pain (FPQ) on pain responses; McGill Pain Questionnaire (MPQ) and self-reported pain intensity and unpleasantness. Among women, CAT and FPQ significantly predicted higher MPQ pain ratings, and FPQ predicted higher pain intensity. Among men, SBP and CAT significantly predicted MPQ ratings, SBP predicted lower pain intensity, and CAT predicted higher pain unpleasantness. Results indicate that CAT is an important predictor of pain responses for both women and men, whereas FPQ was a significant predictor only among women and SBP was a significant predictor only among men. Potential implications of these findings for clinical pain interventions will be discussed.

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

The Beast and Dragon, Adored

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

By making "The Beast and Dragon, Adored," I hoped to emphasize the aesthetic value of film by constructing a movie that was made by a single person who did not have to answer to academic or professional pressures. If a film is produced by a single artist whose only concern is their own personal tastes, the film is the uncompromised vision of a single creative mind and as such it has the personal aesthetic punch of most exceptional literature, poetry, and painting. I was inspired to make a music video for a song by the band Spoon while driving and listening to their latest album *Gimme Fiction*. When I drew storyboards, I specified both the colors to be used and the way in which each shot would sync up with the song. I shot my movie in chronological order, and then edited it on the same days. In this way I was able to construct a consistent aesthetic. While editing, I always went with my first instinct because I knew that my audience would probably only see this movie once. I wanted to go with what looked good the first time around.

Richard Bentley's Edition of *Paradise Lost*

Elisa A. Frantz
Orianne M. Smith, Assistant Professor, Department of English

Many writers in the eighteenth century revered John Milton's *Paradise Lost*, including Richard Bentley, who published an edition of the epic poem that elevates it to the status of the Bible. Despite his reverence for Milton's great work, however, Bentley makes radical changes to the text. My research project explores Bentley's rationale for these changes. In the introduction to his edition, Bentley says his aim is to correct and purge the parts added without Milton's consent. He accuses corrupt editors of taking advantage of Milton's blindness to add their own poor verse. However, this is a ruse. Bentley makes changes that cannot be justified by his allegations against corrupt editors. Indeed the allegations are meant to cover a more serious critical problem. A radical change occurred in eighteenth-century biblical hermeneutic. Whereas for Milton, scripture was the word of God, for Bentley and his contemporaries, the Bible was a text written by human beings and therefore fallible. My argument is that Bentley's changes to *Paradise Lost* reflect this new biblical hermeneutic.

The Effects of High-Level Troleandomycin Resistance Mutations in rRNA of *Deinococcus radiodurans* on Ribosome Function

Shilpa Gadwal*, Lasse Lindahl, Janice M. Zengel*
Janice M. Zengel, Senior Research Faculty, Biology Department

I am studying the 23S ribosomal RNA (rRNA) of *Deinococcus radiodurans* mutants that are resistant to the antibiotic troleandomycin. The 23S rRNA is a component of the ribosome, the cellular organelle that is responsible for protein synthesis. *D. radiodurans* contains two nearly-identical copies of the gene for 23S rRNA. A change at one of several specific positions in just one of the two copies of the 23S genes confers low-level resistance to troleandomycin. In my project, I am seeking to identify mutants containing mutant copies of both 23S genes. To do this, I will isolate mutants that can grow at very high levels of the antibiotic and then sequence the 23S genes to determine if they both now carry the same mutation that was originally present in only one. Currently, I have found fourteen mutants in one gene and am working on obtaining the same mutation in the other copy of the gene. If I am successful in isolating mutants of *D. radiodurans* that have ribosomes containing only the mutant 23S rRNA, then I will be able to characterize the effects of the nucleotide changes on cell growth rate accuracy of protein synthesis and assembly of ribosomes.

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Novel Protein Secretion Systems in *Bordetella parapertussis*

Darryl D. Gaines*, Nicholas Carbonetti*
Nicholas Carbonetti, Associate Professor, Department of Microbiology and Immunology, University of Maryland School of Medicine

The bacterium, *Bordetella parapertussis*, can cause infection of the respiratory system known as whooping cough. This study aims to determine whether a cluster of genes predicted to encode a novel secretion system, including the gene Hcp1, are necessary for *B. parapertussis* to cause infection. To assess the importance of Hcp1, we used recombinant DNA technology to create a strain in which the gene was deleted. We used Polymerase Chain Reactions (PCR) to generate DNA fragments corresponding to the upstream and downstream sequences. These fragments were then digested with restriction enzymes and ligated with the cloning vector pJHC1. After confirmation of the correct plasmid by DNA sequencing, we introduced the plasmid into *B. parapertussis* through conjugation with *E. coli* SM10 cells. Transconjugants were then passed to select for allelic exchange onto the chromosome. Screening through transconjugants by PCR identified a strain in which the deletion was successfully introduced. This strain will now be tested in a mouse respiratory tract infection assay, to determine whether virulence is reduced. This study will further our understanding of the genes contributing to infection, in the hope that vaccines may be developed to combat whooping cough.

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Nested PCR to Amplify the *Plasmodium falciparum* Chloroquine Resistance Transporter (PfCRT) in Samples from Clinical Trials in Malawi

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Beginning in the 1960s, *Plasmodium falciparum* has developed widespread resistance to chloroquine, a drug used extensively to treat malaria. In 1993, reacting to the increased treatment failure of chloroquine, Malawi was the first country to withdraw chloroquine. Point mutations in the *P. falciparum* chloroquine-resistance transporter gene (*PfCRT*) protein are associated with drug resistance. The question remains whether there is currently a dominant presence of parasites carrying the wild-type *PfCRT* gene in Malawi, 14 years after ending chloroquine use. After Malawi withdrew chloroquine, prevalence of the chloroquine resistance genotype declined. Allele-specific restriction digestion assays have failed to detect any chloroquine resistant genotypes, or carrying the *PfCRT* T76 mutation. To confirm the absence of the chloroquine-resistant genotype by full sequencing of the *PfCRT* gene, samples were obtained from Malawi and DNA was abstracted from dry filter paper samples to amplify using nested PCR. Preliminary studies have established a nested PCR protocol to successfully amplify codons 326, 220, and 76 for 20 samples. The mutations in the *PfCRT* gene from patient samples are being examined by sequencing and once analyzed, the disappearance of chloroquine resistance will be confirmed. In the future, we hope to conduct sequencing on other codons of interest in *PfCRT* to confirm the full wild-type genotype.

This research was funded by a fellowship from the Howard Hughes Medical Institute Undergraduate Scholars Program at UMBC to Amber Gaither. This work was also funded, in part, by NIAD Grant U01AIO44824.

Parkinsonism Development in Cycad-Fed Rats

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Previous epidemiological studies of the Guamanian variant of ALS-PDC (Amyotrophic lateral sclerosis-Parkinsonism dementia complex) have demonstrated a causative link based on the consumption of cycad seed flour indigenous to the area. In cycad-fed rats, significant CNS pathology and behavior deficits were observed in addition to various neurodegenerative symptoms commonly attributed to Parkinsonism. Our current research entails administering behavioral tests to 29 male rats, including 16 cycad-fed rats and 13 flour-fed controls. To determine the earliest symptoms, our lab administers a series of studies with these animals over a continuous time period to note the progression or deterioration in the rats' motor functions. These include Paw-Printing Analysis, Rotarod Tests, Stepping Tests, Staircase Tests, Tapered Beam Tests, Cylinder Tests, and Drug Induced Rotation Tests. In the past cycad-fed rats have displayed symptoms suggestive of motor dysfunction. These tests will assist us in forming a progressive model that will demonstrate neuronal loss and motor dysfunction indicative of Parkinsonism.

Gender Shift from Spider-Man to Spider-Girl

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In an effort to define the role of gender in the comic books of today, the author analyzed the first five editions of the Amazing Spider-Man and the first five editions of the Amazing Spider-Girl for clues of conformity or nonconformity to traditional masculine and feminine roles, played out by the main characters and non-main-characters alike. The author used a cultural studies approach as she conducted this research. She focused on the relationship between the producers of the comic books and the consumers of the comic books who had an impact upon the shift of representation of gender within the Amazing Spider-Man and the Amazing Spider-Girl comic books over the past thirty-five years. The author analyzed the content of blogs posted by both fans and critics of the Amazing Spider-Man and the Amazing Spider-Girl comics for evidence of suggestions or comments pertaining to the representation of women in these comic books. The author located evidence of debate within the online discussions, evidencing that the consumers of the Spiderman comics had a huge role in influencing the way that the producers created the plots and sketches of the characters. The research reflected the importance of the contestation of culture even within the realm of a popular comic book.

Relationships and Interactions with Family and Peers as Predictors of Adolescent Substance Use and Depression

Jonathan Thomas Grabe
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Responses from 6504 adolescents in grades seven through 12 from the Add Health in-home and in-school Wave I surveys were used to examine the factors contributing to depression (measured by the Center for Epidemiological Studies Depression Scale, CES-D), drug use (measured by a count of all drugs used), and alcohol use (created by principal components factor analysis of responses to different drug use). Regression models for depression, alcohol use, and drug use studied perceived family and peer relationship quality, and the level of communication and interaction with parents and peers, respectively. Depressed individuals reported lower quality family and peer relationships, but no relationship was found for communication with parents. The level of peer interaction was related to increased drug and alcohol use. As peer relationship quality increased alcohol use decreased when communication with father was low but increased when communication with father was high. Suggestions for continued research into the influence of the peer and family environments on adolescent development are offered.

A State-of-the-Art Numerical Code for Probing the Workings of Quasar Jets

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We present a numerical code for modeling the variability of relativistic jets of plasma emanating from the vicinity of supermassive black holes found at the center of active galaxies called quasars. This is an important development, as variability is currently the only tool at our disposal for probing the spatially unresolved base of these jets. The issue becomes particularly timely with the anticipated launch of GLAST, NASA's new gamma-ray observatory that will provide us with unprecedented quasar variability studies. Previous homogeneous models cannot treat the observed high energy variability, and, therefore, are not suited for probing the most energetic jet phenomena. Our multi-zone model incorporates, for the first time, synchrotron-self Compton energy losses from photons produced throughout the source in retarded times. This is the dominant energy loss mechanism for flaring quasars, and its inclusion allows us to successfully model high energy variability. As a first application, we were able to reproduce the puzzling "orphan" TeV flares that were not accompanied by a corresponding X-ray flare. We are currently preparing a manuscript to be submitted to the Astrophysical Journal and we plan to make our simulation code available to the astronomical community through a UMBC web page.

This research was funded through a Chandra theory grant and a NASA long-term space astrophysics grant.

Enhancing the Educational Outlooks of Adolescent Mothers through Social Relationships

DeLeon L. Gray
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This study focused on relationship quality, social support, and support for autonomy and competence as predictors of academic motivation and the educational aspirations of 52 adolescent mothers in Baltimore City. The academic motivation and educational aspirations were expected to be predicted most strongly by: (a) the quality of the relationship between the adolescent and her mother, (b) higher amounts of general social support received by the adolescent and (c) the perceived support for autonomy and competence from the family of the adolescent. The quality of the adolescent mother's relationships with her best friend and father were associated with various aspects of academic motivation and educational aspirations. Overall social support received by the adolescent mother was also found to positively predict intrinsic academic motivation and extrinsic academic motivation while negatively predicting amotivation. Provision of support for the autonomy and competence of the adolescent mother by friends was found to be linked to overall future educational aspirations. Separating academic motivation and future educational aspirations revealed that these similar components of educational outcomes may be influenced by specific social relationships in different ways. Using the findings of this investigation, future research may focus on the implementation of effective interventions to improve the academic success of adolescent mothers, with an emphasis on their social relationships.

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Traditional and Modern Homophobia at UMBC

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Ilsa Lottes, Associate Professor, Department of Sociology and Anthropology
Fred L. Pincus, Professor, Department of Sociology and Anthropology

Using a sample of over 700 undergraduate students at UMBC, this study built upon existing research on negative attitudes toward lesbians and gay men, termed homophobia – intense fear or hatred of lesbians and gay men. Although many scholars and lay people are beginning to celebrate the supposed decline of homophobia and anti-lesbian and anti-gay behaviors, some scholars have argued that "traditional homophobia", which is based upon long-standing moral views, is on the decline; however, "modern homophobia", which is based upon contemporary views of lesbian and gay rights, remains high and relatively constant. This study examined the distinction between traditional and modern homophobia. To assess attitudes and behaviors of UMBC undergraduate students toward lesbians and gay men, this study relied on a survey using questions from three existing measures: the Attitudes Toward Lesbians and Gay Men scale to assess "traditional homophobia"; the Modern Homonegativity scale to assess "modern homophobia"; and the Behaviors Toward Homosexuals scale to assess positive and negative behaviors toward lesbians and gay men. This study also determined whether variables such as gender, race/ethnicity, nationality, religion, political orientation, socioeconomic status, academic major and year, and extra-curricular activities, are significantly related to levels of traditional and modern homophobia.

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

The Interaction between Resource Quality, Invertebrate Density and Microbial Contributions to Leaf Litter Decay in a Stream Food Web

Crystal M. Healy
Christopher M. Swan, Assistant Professor, Department of Geography and Environmental Systems

It is often assumed that detritus-based food webs, especially those occupying small forested streams, are controlled by bottom-up processes. For example, increase in quality of detritus (e.g., senesced leaf litter from streamside forests) fuels production of primary consumers, such as aquatic leaf-chewing invertebrates, increasing the availability of these prey to predators. However, microbes, especially fungi, are also primary consumers of leaf litter, and can contribute substantially to leaf decomposition rates. As invertebrates encounter and consume leaf litter, they also consume microbes, changing the degradative capacity of the bacteria and fungi. Therefore, the density of invertebrate consumers can not only regulate leaf litter decay, but also the capacity of microbes to contribute to this same process. The purpose of this study was to understand if increasing the abundance of a common stream detritivore, larvae of the caddisfly *Pycnopsyche* sp., influenced the degradative ability of stream fungi. I predicted that the strength of the interaction would increase on very labile leaf litter, (e.g., Red maple), but be less intense on refractory litter (e.g., Beech). Together, this work revealed the dynamic nature of invertebrate-microbial-litter interactions, and further identified the potential for strong biological feedback consumers can have on resource dynamics in stream ecosystems.

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

A Novel System for Inducible Gene Expression in the Prostate

***Jamie C. Heard**, Varsha Rao, Charles Bieberich*
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Finding effective methods for treatment of benign prostatic hyperplasia (BPH) and prostate cancer has been difficult, partly because many factors play a role in their development. Nkx3.1, functioning as a tumor suppressor, plays an instrumental role in the development of prostatic epithelial cells. These cells exhibit deregulated growth in the absence of Nkx3.1. Manipulating Nkx3.1 expression can potentially allow regulation of prostatic epithelial cell growth. A mouse model system with the reverse tetracycline trans-activator- tetracycline operator (rtTA-TetO) system may allow regulation of Nkx3.1 expression in the prostate. Using the rtTA-TetO system, nkx3.1 expression can be monitored in response to tetracycline. The rtTA has been modified with a hoxb-13 homology region and resistance markers have allowed proper selection of hoxb-13:rtTA recombinants. This construct along with a Tet operator-nkx3.1 construct will be recombined into a bacterial artificial chromosome containing hoxb-13 regulatory elements, which will later be used to generate transgenic mice. We hypothesize this system can induce nkx3.1 expression in the prostate and modulate progression of prostatic epithelial cell growth in BPH and cancer. Progress toward constructing this system has been accomplished.

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Autonomous Flying Control Systems for Mini-flying Robots

***Askia Hill**, Brandon Morton*
Fow-Sen Choa, Professor, Department of Computer Engineering

The complete goal of this project is to construct a reconnaissance robot that can fly autonomously using build-in artificial intelligence. The robot's purpose is to identify a location with explosive or toxic chemicals. Within the one-year period, the project is focusing on construction of the flying system controlled by a remote computer through radio channels. When the control subroutines are completed they are loaded to an industrial control chip including a CPU and memories and installed into the flying robot. My focus in the project is to build these flying control subroutines and hardware interfaces. These include utilizing output signals from two on-board mini-cameras to identify the position of the flying tool and the upcoming scene and threats. The programming goal is to make right decisions to accomplish the stability of the flight, to respond to terrain changes, and to do path finding.

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Cost-Effective Wireless Sensor Network for Environmental Sensing

Albert C. Hsu*, Christy Chan, William A. Wardlaw*
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In order for the wireless sensor network in a remote environment to remain cost-effective, it must use a minimal amount of power. The purpose of this research is to design such a low-power and cost-effective wireless sensor network. The network design involves development of hardware architectures using inexpensive, low-cost components, the development of network protocols to minimize transmitter and receiver usage, and optimization of software for reduced hardware utilization on each sensor node. Preliminary tests show that such a network is feasible on the designed hardware. Additional work will involve enhancement of data transmission fidelity, the ability for sensor nodes to independently report events, and further optimization of software algorithms and network protocols. The developed wireless sensor network would allow rapid monitoring of environmental conditions. The prohibitive cost of battery replacement in remote areas can be remedied through development of power-efficient hardware and software, while keeping overall hardware costs to a minimum. The increased adoption of such low cost wireless environmental monitoring sensor networks will lead to a vastly improved view of our environment throughout the region.

This work was funded, in part, by UMBC through the Center for Advanced Sensor Technology, Department of Chemical and Biochemical Engineering, and by the Strategic Environmental Research and Development Program.

Uveal Melanoma Vaccines Express Major Histocompatibility Class II Molecules in the Absence of Invariant Chain

Uzoma K. Iheagwara*, Jacobus J. Bosch., Suzanne Ostrand-Rosenberg*
Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

Primary uveal melanoma is the most common cancer of the eye and is universally fatal in the 50% of patients that develop metastatic disease. We are developing cell-based vaccines that consist of tumor cells transduced with genes encoding Major Histocompatibility Class II (MHC II), and costimulatory molecule CD80. Previous studies in animal models have shown that expression of MHC II in the absence of accessory-molecule Invariant Chain (Ii) is essential for these cell-based vaccines to induce protective anti-tumor immunity. We hypothesize that transduced uveal melanoma cells express MHC II intracellularly and at the cell surface in the absence of Ii. To visualize the intracellular trafficking pathway of MHC II in the absence of Ii, we have created a retroviral vector encoding HLA-DR1 α- and β chain with a green fluorescent protein (eGFP) fused to its cytoplasmic domain. As measured by flow cytometry and western blot analysis, HLA-DR1-eGFP transduced uveal melanoma cells express HLA-DR1-eGFP on the cell surface in the absence of Ii. Confocal microscopy indicates HLA-DR1-eGFP is expressed intracellularly and at the cell surface. In conclusion, transduced uveal melanomas express MHC II molecules in the absence of Ii. MHC II may traffic to the cell surface using the endocytic pathway.

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Non-Covalent Interactions Between 1,8-Naphthalimide Compounds and Amino Acids

Joy K. Ihekweazu*, Lisa Kelly*
Lisa Kelly, Associate Professor, UMBC Department of Chemistry

The refinement of chemical systems to probe the structure of biological molecules and act as therapeutic agents has lead to studies on synthetic materials that can be activated by ultraviolet or visible light. Naphthalimide complexes have been synthesized as nucleotide binding agents. Naphthalimide derivatives interact with DNA, and can photoinduce DNA cleavage. Studies have shown that the cleaved site may be controlled by the substituent on the naphthalimide. For example when L-lysine is bound to a naphthalimide, it is capable of recognizing either guanine or thymine and cleaving these sites. Changes in the UV absorption spectrum were monitored to assess the naphthalimide-amino acid interactions. Current research is being done to test the binding properties of naphthalimide compounds with phenylalanine, lysine, tyrosine, and tryptophan. The amino acid was titrated into the naphthalimide at concentrations 0.909 mM up to 3.333 mM. Current results show that tyrosine and tryptophan do not bind to the naphthalimide compound. Future research will test each of the amino acids at higher concentrations to determine which amino acids bind with the naphthalimide compounds. In addition other naphthalimide derivatives will be used.

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Fabrication and Characterization of Quantum Cascade Lasers

Hasina Jamal
Fow-Sen Choa, Professor, Department of Computer Science and Electrical Engineering

Quantum-cascade-lasers (QCLs) are becoming increasingly important laser sources for many applications such as gas sensing, chemical detection, free-space communications, infrared counter measure, imaging, and biological instrumentation**.** Conventionally, these applications were performed using laser sources like CO_2 lasers, solid state or other types of gas lasers. Compared with these large laser systems, QCLs provide excellent advantages on size, weight, and power consumption. In this study, we concentrated on the fabrication and measurement of quantum cascade lasers. By using cleanroom equipment we fabricated QCLs using semiconductor wafers grown at UMBC, Prof. Choa's Group. The laser characteristics we measured included the I-V (current-voltage) curves, the temperature dependence of laser output power, the L-I (light-current) curves, and the temperature dependence of laser thresholds. With this measured information we can go back and check design parameters of these lasers. This will help us to understand the key performance limiting factors of QCLs and help us to design better performance QCLs in the near future.

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Evaluating the Predictive Accuracy of the WRF Model in Assessing Wind Resource at High Resolution

Serina Jensen**, **Daniel Staples, Jonathan Williams
Lynn C. Sparling, Professor, Department of Physics

Our project evaluated the predictive accuracy of the Weather Research Forecasting (WRF) model in assessing the wind resource at UMBC. In light of the human cost of energy sources such as coal and the negative impact on the environment of using oil, interest in studying renewable energy sources such as solar power, wind power and bio-mass technology has increased. Wind energy draws electrical energy from the mechanical energy of spinning turbine blades. It provides a clean, sustainable and inexhaustible energy source. The Weather Forecasting Model was used to generate data predicting the wind speed and direction in a high resolution region centered at UMBC. We then compared probability distribution functions (PDFs) of this data to PDFs of collected data from local anemometer measurements. We found that the data sets were qualitatively similar but that further analysis is required in order to fully evaluate the WRF model's utility in assessing wind resource.

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B-cell Delivered Gene Therapy for Tolerance

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David Scott, Professor, Center for Vascular and Inflammatory Diseases, University of Maryland School of Medicine

Occasionally, the mechanism that governs the immunological process malfunctions leading to autoimmunity, an attack on the organism by its own immune system. In previous experiments designed to induce tolerance for self-antigens, B cells transfected with retroviruses, while being effective, caused unexpected disease. The goal of my experiment is to test whether a non-retroviral B cell system can be produced. Plasmid DNA for the antigen Ovalbumin-IgG (OVA) was inserted into mouse B cells to get these cells to express OVA as a self-antigen. These cells were then injected into DO11.10 mice divided into 3 groups: OVA-IgG; GAD-IgG (mock control) and; OVA protein. Immune system organs were later removed and cultured with OVA peptide. The response of the cells in the organs was then measured using a thymidine pulse. If the non-retroviral mechanism works, the organs of the mouse injected with B cells modified to express OVA should be hypo-responsive, compared to GAD-IgG, when challenged with OVA because those modified to express OVA should no longer label the OVA as foreign but as self protein. These cells should also relay this message to other cells of the immune system thereby inducing tolerance to self-proteins, keeping the body from attacking itself.

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Improving Mechanical Properties of PMMA Bone Cement with Nano and Micro Particles

Brandon J. Johnson*, Ricardo Pinto*
L.D.T. Topoleski, Professor, Mechanical Engineering

Total joint replacement is one of the most successful treatments for arthritis. Polymethylmethacrylate (PMMA) bone cement is commonly used as a grouting and stress-transfer agent in artificial joints. Failure of artificial joints has been attributed to, among other things, failure of the bone cement surrounding the implant. It is therefore the focus of this project to strengthen the mechanical properties of bone cement for the advancement of artificial joints. Changing the fundamental microstructure may lead to increased fracture and fatigue resistance. With the help of the Rohm and Haas Company, new bone cements will be created using novel particles with sizes on the micro and nano-scale to improve the microstructure. We will perform fracture toughness tests on samples of the new cements to serve as an initial indicator of performance compared to standard medical bone cement. Other mechanical tests such as fatigue crack propagation analysis, SEM imaging, and surface profilometry will be used to assess mechanical performance. Longer fatigue life of bone cement will ultimately result in longer operational life of cemented prosthetics joints.

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Elucidating the BLV Encapsidating Ψ–site in the 5' Noncoding Region of Gag

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BLV is an exogenous type C retrovirus that affects over 50% of cattle in the United States, often leading to malignant lymphoma development. Genetically similar to the Human T-Cell Leukemia Virus Type (HTLV-1), this retrovirus is prevalent in Japan, the Caribbean, and Central Africa and infects humans through sexual contact to produce a lymphoma phenotype; with a better understanding of the encapsidation signal or Ψ–site of BLV, new means of stopping the spread of BLV and HTLV-1 can be found. Our project focuses on recognizing the genome that initiates packaging of the Bovine Leukemia Virus (BLV) genome. The encapsidation signal being explored, PBSSLV is located in the 5' noncoding region of the BLV genome and consists of two stem loops. We have made proviral DNA of our Ψ–site and a transcript containing the BLV Ψ–site. Our results obtained from titrations of Ψ–site with Nucleocapsid (NC) indicated that PBSSLV is completely bound to NC at a 1:1 ratio. Isothermal Titration Calorimetry (ITC) has been performed to determine the binding constant and Nuclear Magnetic Resonance (NMR) to elucidate the structure of NC bound to the proposed Ψ–site. We hypothesize that the encapsidation signal is PBSSLV.

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Bridging the Gap between HIV/AIDS and Awareness in Ghana, Africa

Simonne M. Jones
Cindy Schaeffer, Assistant Professor, Department of Psychology

The study evaluated the effects of an HIV/AIDS awareness intervention on children living in Kitase and the surrounding villages in Ghana, Africa. Under the placement of Full Circle, a non-profit organization, I served as a faculty member at a community school around the Akupim South District, and was responsible for the education of children in a specified curriculum including math, science, and HIV/AIDS awareness. A self report instrument was given to the children before and after the HIV/AIDS curriculum had been implemented. From these data the effectiveness of the curriculum was evaluated along several dimensions, including HIV transmission myths and facts, attitudes, personal risk and self-efficacy. Results suggested that the youth had significantly fewer negative attitudes and transmission myths from pre- to post- intervention. The level of awareness in the children may affect the presence of AIDS in Ghana in the future. Educating children in Africa about HIV/AIDS can make a profound difference in the prevalence of the disease. The results from this study could raise awareness about the health disparities specifically caused by HIV in Ghana, a country not immediately brought to mind when considering the AIDS epidemic in Africa, yet one that is significantly impacted.

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

Investigating Potential Second Site Suppressors in the Amp A pathway in *Dictyostelium discoidium*

Vovanti Jones*, Jessica Sazma, Daphne D. Blumberg*
Daphne Brewster, Associate Professor, Department of Biological Sciences

Amp A is a *Dictyostelium discoideum* protein that plays a role in cellular adhesion. Mutants overexpressing Amp A and Amp A null mutants reveal distinct phenotype changes. Compared to wildtype cells, Amp A null mutants have increased adhesion and delayed development. Amp A overexpressers arrest during the mound stage of development and have decreased adhesion. To identify components interacting in the Amp A pathways, second site suppressors were created that can overcome the primary mutation of overexpressing Amp A. Using restriction enzyme mediated integration; a blastocidin resistance cassette was randomly inserted into the genome of Amp A overexpressing cells. Insertion of the cassette into the Amp A signaling pathway should disrupt the gene and ultimately the Amp A pathway. Disruption of the Amp A pathway should be detectable by alterations in the primary overexpressing phenotype when compared to a wildtype or knock out phenotype. Potential second site suppressors were characterized by examining phenotypic changes in migration, development and adhesion. Discovered mutants displayed an increased cell adhesion but retained the original developmental phenotype. Currently mutants are being investigated that have changes in the developmental phenotype. The identification of these second site suppressors provides insight into the role of upstream and downstream components in the Amp A pathways.

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Being Human

Strider Jordan
Frederic Worden, Assistant Professor, Department of Visual Arts

"Being Human" explores the idea of what binds us all together as people on this planet, the fundamental characteristics that make up who we are. No one can be sure of his or her own destiny and it is often those who seemingly have lost everything who will slip beneath our radar. It can be a bad decision or simply bad luck that puts us into the position of having to reexamine our lives. In making this film, my first concern was to pose a question that might seek to uncover what it is that connects us as humans. As my first attempt at making a documentary film, I found that I was engaged in a real learning process. What came out of the process was more than what was originally intended. Not only did I learn about other people's points of view, but I was able develop new skills as a listener as well as more empathetic understandings of people living in very different circumstances from my own. Both of these skills I believe are crucial to the process of filmmaking. My video develops through a series of interviews with people I met on the streets of Washington, DC.

Age and Gender Effects in Pain Distraction Intervention

Joseph B. Keller, ***Cyrus F. Mistry***, *Karen E. Weiss*
Lynnda M. Dahlquist, Professor, Department of Psychology

Differences in pain tolerance as a function of subject age and gender were examined in a distraction study. Pain tolerance was defined as the number of seconds the child was able to keep his or her hand submerged in water maintained at five degrees Celsius. Forty-one children (44% male, 56% female) between the ages of 6 and 14 were included in this secondary data analysis. The primary study involved the effects of virtual reality distraction on pain tolerance. Children's pain tolerance scores were obtained during a baseline trial, a trial of "normal" video game distraction, and a trial that utilized a head-mounted display (HMD). Data from the primary study suggested that the "normal" condition provided the most effective distraction. Regression analysis demonstrated that age predicted the change in pain tolerance from baseline to the "normal" video game distraction (R^2=0.251, β=0.501), with older children showing the greatest improvement. Gender effects also were evident: relative to baseline, females demonstrated significantly greater improvements in pain tolerance scores than males in the "normal" condition ($t(39)$= -1.806 p=0.079). Results indicate that gender and age can have profound effects on virtual reality distraction methods, and must be taken into account before implementation.

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Seeing Through Smoke: The Role of Science in Public Health Policy Following the 1952 London "Killer Fog"

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An unusually dense smog, brought about by a combination of coal-related air pollutants and atmospheric inversion, descended upon Greater London between December fifth and ninth, 1952. Soon after, its deadly nature was revealed, and the words "Killer Fog" ripped through headlines, along with a mounting death count. The magnitude of the event served as a backdrop to the creation of the 1956 Clean Air Act, which is seen today as a groundbreaking piece of British environmental legislation. This study focuses on how scientific research regarding human health was incorporated into the formation of the new law, and the political, economic, and social factors involved in this incorporation. "Seeing Through Smoke" focuses specifically on the Atmospheric Pollution Research Committee, formed by Parliament shortly after the fog, which reported on its cause and recommended future action. Memorandums, paperwork, and letters from this committee, now housed in the National Archives in London, were used to trace public health concerns to their eventual legislative resolution. This study shows the complex process of turning narrowly focused facts into broad-reaching laws, with a focus on the choices that were made to address only some of the air pollution constituents.

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

Reconstructing Carotenoid Color Evolution in Caciques

Lynna M. Kiere*, Christopher M. Hofmann, Kevin E. Omland*
Kevin E. Omland, Associate Professor, Department of Biological Sciences

In this study, we reconstructed the evolution of carotenoid color in caciques, a group of Central and South American blackbirds. Carotenoids are a pigment responsible for many of the brilliant yellow, orange, and red colors found in animals. Most cacique species have predominantly black feathers with discrete patches of carotenoid colored plumage on one or more body regions. The color of these patches seems to divide the caciques into two separate groups – those with yellow plumage and those with red. Interestingly, there are no orange intermediates. To eliminate bias, we used a machine called a reflectance spectrometer to measure color numerically. We found that the yellow and red groups are separated not only visually, but also numerically by spectral location (a number representing hue). We reconstructed cacique color changes using the existing evolutionary tree based on mitochondrial DNA. Because of the lack of intermediate colors or overlap between the "red" and "yellow" groups, carotenoid color in caciques seems to be evolving in a discrete (single step from yellow to red) rather than a continuous manner (gradually shifting from yellow through various oranges to red). Our reconstructions suggest a yellow ancestor, with two independent changes to red coloration.

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Domestic Violence: Risks of Contact and Restraining Orders

Kelly A. Kovack*, Christopher M. Murphy*
Christopher M. Murphy, Associate Professor, Department of Psychology

Researchers in this study focused on the influence of protective orders and frequency of contact on domestic violence, using archival data collected during routine intake and treatment procedures at a domestic violence offender treatment program in Howard County, Maryland. The researcher hypothesized that higher frequencies of contact would be associated with higher levels of abuse, and further expected protective orders to serve as a short-term risk factor for abuse. Resulting correlations generally showed the expected relationship between higher frequencies of contact and higher levels of abuse. Factorial analyses of scores from abuse subscales for groups with and without protection orders did not consistently show different levels of abuse between these two groups. Various types of contact were maintained among those with protection orders. These results indicate that higher levels of contact are related to higher levels of abuse in violent relationships. Protective orders, while not necessarily exacerbating abuse, still may not be serving their purpose of protecting and separating violent partners.

Noam Chomsky's View of the Mind: Its Philosophical Implications and Antecedents

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What is Chomsky's view of the mind? Within what philosophical controversy and tradition is his view embedded? What are the view's implications for research in other areas of philosophy such as ethics? Chomsky argues that the human mind must be innately endowed with knowledge in certain cognitive domains, because if it wasn't, many aspects of human knowledge within these domains could not be adequately accounted for. Chomsky's view of mind accords with the views of rationalist philosophers and directly opposes the views of empiricist philosophers, who take the mind to be a blank slate in its initial state. A program of research in linguistics, guided Chomsky's view of mind, aims to distinguish the innately specified and universal aspects of human beings' knowledge of language from the contingent aspects of that knowledge and to discover how the latter arises as an interaction effect of innate knowledge and linguistic experience. A similar program of research based on Chomsky's view of the mind is currently being carried out in the area of ethics. The information presented in this project will be of interest to all those who want to learn something about human nature and, therefore, about themselves.

Parental Autonomy Development in Immigrants from the Former Soviet Union

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In the US there are close to a million immigrants from the republics of the former Soviet Union (FSU) and that number is growing with over 50,000 immigrants admitted every year from these countries. Although the USSR no longer exists, its values and methods of upbringing are still followed by parents who were raised and taught under the Soviet system. The communist philosophy focuses on collective upbringing, obedience to authority, and strong family. Parents from the FSU tend to be more psychologically controlling and allow less psychological autonomy to their children than their American counterparts. Past research has found that high perceived autonomy-support predicts greater academic self-motivation, more adaptive learning strategies and higher well-being for adolescents in both individualistic and collectivistic countries. This research project explores the parental practices and children's autonomy development among the Russian-speaking community in the Baltimore area. Specifically, it looks at parent's development of autonomy in their adolescents, and its relations to the adolescents' (1) academic motivation, (2) psychological well-being and (3) risk-taking behaviors. This research hopes to achieve a better understanding of the role of Soviet culture in the parenting practices of post-USSR generations families who immigrated to the United States, and its relations to their adolescents' well-being and development.

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

Dare for More: Analysis of Pepsi's Global Television Marketing Campaign

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The Pepsi "Dare for More" campaign encouraged consumers to pursue the wonderful life that they were persuaded to desire in the preceding "Ask for More" campaign. Glocalization encompasses how global corporations market their products in a manner that retains a global brand image while acclimating to local cultures. As the world becomes more globalized, glocalization features in the debate of whether or not global corporations are a form of cultural imperialism. Markets in India and China provided interesting case studies due to their burgeoning markets. The "Dare for More" campaign encouraged consumers to pursue and acquire more paralleling the aspirations of a global corporation to grow and make more money. The research analyzed how Pepsi television advertisements that were created for markets in China and India defined a local national identity for Pepsi Cola. Television advertisements and ads created for a global audience were also analyzed for a definition of global identity with emphasis on advertisements shown during the 2006 World Cup. Besides analyzing ads, methods in this project included interviewing Pepsi employees, studying other glocalized products and understanding the markets in which the television advertisements are shown.

Evaluating the Fiscal Effects of Same-Sex Marriage in Maryland

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Tim H. Gindling, Professor, Department of Economics
Ilsa S. Lottes, Associate Professor, Department of Sociology and Anthropology

Recent legislative and judicial initiatives have forced same-sex marriage into the public arena. Numerous studies have shown that a lack of legal recognition for same-sex marriage has negative consequences on same-sex couples and their children. This interdisciplinary study analyzes quantitative and qualitative data to measure the fiscal impacts of legalizing same-sex marriage in Maryland. Expected findings include: (1) a positive change in income taxes collected by the State; (2) decreased expenditure on State-funded public assistance programs; and (3) decreased legislative time devoted to bills concerning same-sex marriage, and thus decreased political costs, culminating in a net gain in State welfare. Preliminary estimates of the net change in income taxes indicate a potential annual state gain of $1 million dollars. Historical data and case studies are also reviewed to gain insight into the economic, sociological, political, and psychological effects of same-sex marriage. This research is particularly relevant to the current political climate surrounding this issue in Maryland; the state's highest court will soon decide a case involving same-sex couples' right to marry. The results of this research can serve as an important resource in the inevitable legislative battle that will follow the Court's deliberation.

The Effects of Osmolytes on Aβ Oligomer and Fibril Stability in Physiological Buffers

Debora W. Lin, *Theresa Good*
Theresa Good, Associate Professor, Department of Chemical and Biochemical Engineering

Alzheimer's disease (AD) is the most prevalent cause of dementia in the US. A pathological feature of Alzheimer's disease that is of particular interest is the deposition of the β-amyloid (Aβ) peptide. Many researchers believe that Aβ affects neurotoxicity associated with AD, and that Aβ toxicity is a strong function of peptide structure. Our goal is to develop a way to reduce the stability of the most toxic form of the Aβ peptide, the Aβ oligomer, by using a variety of small osmolytes in hopes to sway the equilibrium to form Aβ fibrils which are less toxic to cells. We will examine the stability of the oligomers and fibrils with the addition of osmolytes by measuring changes in CD absorbance. In addition, we will investigate the relative distribution of fibril, oligomer, and small soluble Aβ species before and after addition of osmolytes using a variety of biophysical methods. We believe that the results of our findings will provide strong evidence that altering the stability of Aβ would be a favorable strategy to prevent Aβ toxicity and guide the development of new therapeutics for AD.

*This investigation was supported, in part, through the Minority Access to Research Careers Undergraduate Student Training in Academic Research (MARC U*STAR) Program at UMBC, which is funded by UMBC and a National Research Service Award GM 08663 from the National Institutes of Health. Additional support was provided by a grant from the NIH (R01 NS42686).*

Laser-Stimulated Raman Spectroscopy as a Method for Remote Atmospheric Sensing Technology

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Modern unconventional weaponry often incorporates aerosolized chemical and/or biological agents that can only be detected at close range. Few systems capable of detecting these agents from a distance have been developed for defense use. This project seeks to use Laser-Stimulated Raman Spectroscopy (LSRS) to probe various gases and vapors and eventually provide both theoretical and experimental fundamentals of LSRS for building remote, or stand-off, sensing systems in homeland defense or other atmospheric applications. Raman spectroscopy is a promising field for optical detection of these agents because it can characterize different substances based on peak wavelength, giving each substance a unique spectral signature. In addition, the intensity of the signal is directly related to concentration. Finally, the remote sensing can be done in a back-scattered geometry. The dependences of the Raman signal on laser power and gas pressure for hydrogen and methane have been thoroughly investigated in the literature, but few studies for propane, acetone, carbon dioxide, or mixtures of these gases exist. Data on the power and pressure dependence of these gases has been recorded with the goal in mind of developing a thorough understanding of LSRS and applying it to the problem of stand-off detection.

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***In vivo* Effects of Bisphenol A on the Expression of *BRCA1* in the Mouse Mammary Gland**

Candace B. Mainor, *Laundette Jones*
Laundette Jones, Assistant Professor, Pharmacology and Experimental Therapeutics

Bisphenol A (BPA) is a synthetic endocrine disruptor, which acts similar to the endogenous hormone, estrogen. Human exposure to BPA occurs through leaching from various consumer products. Previous *in vitro* studies in our lab have shown that when MCF-7 cells were treated with BPA, BRCA1 expression was altered. Women who have mutations in their BRCA1 gene are more susceptible to developing breast cancer. To study the *in vivo* effects of BPA on the expression of BRCA1 in the mammary gland, C57Bl6 female mice at 4 months of age were exposed to environmentally relevant concentrations of the Bisphenol A (0.25 BPA/kg/day) for 4 weeks and compared to mice exposed to DMSO. The animals were sacrificed, the #4 mammary gland was isolated for whole mount analyses, and proteins were isolated from the #2 and #3 mammary glands to examine the expression of BRCA1. We found that there were no significant differences observed between the whole mount analyses of mammary glands isolated from BPA treated and DMSO treated female mice. Western blots are in progress, yet no conclusive data has been collected to date. We hypothesize that BPA will decrease the expression of BRCA1 in the mouse model.

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Structured Stochastic Model of Influenza A Virus in a Host Cell

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The Influenza A virus is a leading cause of death (20,000 people/year) and human suffering. Gaining insight into the mechanisms of viral replication could shed light on new methods to fight influenza infections. This work involves stochastically modeling each step of the infection from viral entry into the host cell to budding (formation of virons on the cellular membrane) and viral release into the cytoplasm. Currently the model includes roughly 40 chemical equations. A modified version of Gillespie's Next Step algorithm[1, 2] was used to perform the simulation. The model was written in C++ and all of the data analysis was done with MatLab®. Once the kinetic constants are optimized, the simulation will provide a better insight into the disruption susceptibility of the viral infection at various points in the process. Future work for this project includes integrating the current model with a simulation of a bronchial passageway. Such a model could predict the minimum number of virons needed for human infection.

[1]Gillespie, D., T. Exact Stochastic Simulation of Coupled Chemical Reactions. *Journal of Physical Chemistry*, **1977**, (81): 2340-61.
[2]Gibson M., A. and Burke J. Efficient Exact Stochastic Simulation of Chemical Systems with Many Species and Many Channels. Journal of Physical Chemistry, **2000**, (9):1876 -89.

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Using the Tail Suspension Test to Assess Involvement of PKCI/HNIT1 on Mouse Behavior

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The purpose of the study is to investigate the effects of PKCI/HINT1 in the mice central nervous system (CNS) by using the tail suspension test. PKCI/HINT1 is a ubiquitous protein that is found in the brain, liver, and kidney. However, its function in the central nervous system is not known. In recent studies, it has been shown that PKCI/HINT1 mRNA expression in patients with schizophrenia is decreased in the frontal cortex of the brain. Moreover, mice lacking the PKCI/HINT1 gene present one positive sign of an animal model of schizophrenia when administered with D-amphetamine. To assess PKCI/HINT1 function in the brain, we looked at its involvement in the depression trait in mice using the tail suspension test. Young adult (three months), adult (six months), and mature adult (nine months) PKCI/HINT1 knockout mice and their wild type littermates were measured for immobility using the tail suspension test. It was found that the knockout mice exhibited less immobility in the tail suspension test than the wild type, therefore indicating that these animals have less behavioral expression of the depression trait. This study implies that PKCI/HINT1 protein might be involved in depression.

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

Jessica A. McGrath*, Cassiah Smith, Michael F. Summers*
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Feline Immunodeficiency virus (FIV) is a retrovirus that is distantly related to other well known viruses such as Human Immunodeficiency Virus (HIV) and Simian Immunodeficiency Virus (SIV). Gag is a major structural polyprotein that facilitates the assembly and budding of retroviruses, such as FIV. The interaction between the N-terminal Gag Matrix (MA) domain and the plasma membrane is a key process in viral maturation. The Gag MA must be co-translationally myristoylated to achieve this membrane interaction enabling the virus to mature and become infectious. We have isolated myristoylated and unmyristoylated FIV Matrix protein (FIV MA) to better understand how the myristoyl group targets the Gag protein to the membrane. FIV MA was successfully isolated by amplifying and cloning it into a co-expression vector containing the yeast N-myristoyl transferase gene. Our results show an interaction between cellular PI(4,5)P2 and FIV MA, which suggests that the PI(4,5)P2 MA interaction is important in the process of FIV viral assembly at the plasma membrane (PM). Nuclear magnetic resonance (NMR) will be used to identify key residues and determine the structure of the FIV MA protein. From the structure we will be able to better understand the role of FIV MA in Gag assembly and how it targets very specific regions of the plasma membrane.

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Production of Tapered Optical Fibers

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In this experiment, we develop a method for creating tapered optical fibers, reducing the fiber diameter from 125 μm to less than one micron. Optical fibers are heated and pulled to these sizes at different speeds and lengths, using different flame torches and gases. Since manual pulling is not adequately precise for such small diameters, we use computer-controlled encoder-mic translation stages instead. The resulting fibers are initially viewed under a compound microscope to approximate their size. Once the fibers approach the size of one micron, an in situ optical interference test using a laser and a detector is performed to test them for single mode behavior in real time. Once single mode low loss fibers of appropriate size have been achieved, these fibers have several potential applications. They can be used to couple light to micro cavities, enhance nonlinear optical interaction with atoms, and to lower gate failure in optical quantum computing setups. The development of an effective method for creating tapered optical fibers is important both in that it advances scientific research in optics and in its practical applications in quantum computing.

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Sex Differences in the Expression of Calcium Transporters in the Hypothalamus

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Calcium transporters play a vital role during neuronal development, since both too little and too much intracellular calcium can result in cell death. Specifically, plasma membrane calcium ATPase (PMCA), sodium/calcium exchanger (NCX), and sarco-endoplasmic reticulum calcium ATPase (SERCA) are involved in the removal of calcium ions from the cytosol. Sex differences and/or hormonal effects in the level of these transporters might be one explanation for the sex difference seen in many developmental diseases. In the current study, we are investigating the role of these calcium transporters during the development of male and female hypothalamic tissue and how hormones affect the transporters' concentration. Western blot analysis was utilized to determine if there are significant variations in the concentration of the transporter proteins in male and female rat pups. Preliminary results indicate a significant sex difference in PMCA, in which there is a higher concentration of the protein in males (t-test; $p=0.0283$). Further investigation will determine if there is also a significant sex difference in levels of the SERCA or NCX protein. We will also use immunocytochemistry to determine if there are any differences in the localization of these calcium channels in male and female hypothalamus. Furthermore, we will be using western blot analysis to explore the role of dihydrotestosterone, an androgenic hormone, on the protein level of these calcium channels in males and females.

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Gene Expression of Omentin 1/2 in Stromal Vascular Cells of Adipose Tissue

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Obesity is reaching epidemic proportions worldwide and is a risk factor for diabetes and cardiovascular disease. Omentin is expressed and secreted from visceral adipose tissue stromal-vascular cells and increases insulin-stimulated glucose transport in 3T3-L1 adipocytes. Both Omentin 1 and Omentin 2 have been shown to be associated with diabetes and metabolic disorders in genetic studies. Gene expression was determined using real time Q-RT-PCR. Omentin 1 was primarily expressed in visceral fat with lower levels of expression in the heart and lung. Omentin 2 was predominantly expressed in the intestine with lower levels of expression in lung and visceral fat. In visceral fat, Omentin 1 levels were 50-fold greater than Omentin 2. Gene expression of CD68, PECAM1, Cytokeratin 18, and Adiponectin was determined in visceral and subcutaneous adipose tissue from six patients to potentially identify the cellular subpopulation most highly correlated with omentin expression. The mesothelial cell marker, Cytokeratin 18 most closely matched the expression of Omentin 1 and Omentin 2 between subcutaneous and omental fat. Stromal-vascular cells from visceral adipose tissue were fractionated into macrophage, endothelial and mesothelial cell types using Dynal magnetic beads to identify expression levels of omentin 1/2.

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Call Me Brother: A Collection of American Immigration Stories

Truc M. Nguyen
Christopher A. Peregoy, Instructor, Department of Visual Arts

Call Me Brother is a photodocumentary on immigration. From the nation's founding to the current immigration controversies, immigration is a part of our shared history. This project involved photographing and interviewing members of my family who have immigrated into the American culture from Viet Nam and faced issues of assimilation and culture clash. By exploring this process, we can understand the sacrifices made by our ancestors, and the *true* cost of the American dream. The result of this project is a self-published photographic and narrative documentary showing many sides of the immigration experience. Some children of immigrants and multi-racial families struggle with identity issues, while others integrate or adapt more successfully. This small slice of the American immigration narrative may encourage people to explore their family's history, and learn to understand immigration in general. Through this photodocumentary different generations can come together and truly understand one another. As my Uncle Long describes in his interview: If you don't have a past, how can you have a future?

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Interaction of PYK2 and PTP-PEST with Leupaxin in Prostate Cancer Cells

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We have identified the presence of Leupaxin in prostate cancer cells. This protein belongs to the paxillin extended family of focal adhesion-associated adaptor proteins. Previous studies have demonstrated that Leupaxin is a component of the podosomal signaling complex found in osteoclasts, where Leupaxin was found to associate with the protein tyrosine kinase Pyk2 and the protein-tyrosine phosphatase-PEST (PTP-PEST). In the current study, Leupaxin was detectable as a 50 kDa protein in PC-3 cells, a prostate cancer cell line. In PC-3 cells Leupaxin was also found to associate with both Pyk2 and PTP-PEST. A recombinant adenoviral-mediated overexpression of LPXN resulted in an increased association of Pyk2 with LPXN, whereas a similar overexpression of PTP-PEST resulted in a decreased association of Pyk2 with Leupaxin. The overexpression of Leupaxin in PC-3 cells resulted in increased migration, as assessed by in vitro Transwell migration assays. To the contrary, the overexpression of PTP-PEST in PC-3 cells resulted in decreased migration. Finally, overexpression of LPXN resulted in increased activity of Rho GTPase. Our data demonstrates that LPXN forms a signaling complex that may play a role in PC-3 cell function.

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The Localization of Parvalbumin in the Human Prefrontal Cortex: A Light and Electron Microscopic Study

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Schizophrenia has been characterized by abnormalities in the prefrontal cortex (PFC), a brain region associated with higher cognitive functioning including working memory. In the prefrontal cortex, Parvalbumin (PV), a calcium-binding protein is co- localized with GABA in a population of cortical interneurons. The goal of this study is to observe the ultrastructure of postmortem brain tissue in the human prefrontal cortex. Normal human cortical tissue (n=4) was processed for PV immunoreactivity (PV+), prepared for light and electron microscopy, and analyzed using quantitative and qualitative techniques. Most PV labeled neurons (63%) had a round nucleus, centered in the middle of the cell and a moderate amount of cytoplasm. The remaining labeled neurons (27%) had notched nuclei that were ectopically centered. The majority of synapses were asymmetric (85%). Synapses were formed with unequal frequencies onto spines (65%) and dendrites (35%). Synapses formed by PV+ axon terminals comprised 5.5% of total synapses. These terminals formed mostly asymmetric synapses (62%) onto unlabeled profiles (76%). Synapses were targeted more frequently onto labeled dendrites (80%) than labeled spines. Perforated synapses comprised 7.3% of total synapses. The findings describe the morphology and ultrastructure of parvalbumin containing cells and serves as a normative analysis for future studies.

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A Quantitative Model of the Rho GTPases Network

Oluwaseun Olayiwola
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Rho GTPases are molecular switches of the Ras family (important molecular switches involved in cell adhesion, migration and proliferation). The Rho proteins regulate many essential cellular processes; such as transcription, actin (cytoskeleton) dynamics, and mitosis progression. Rho proteins are one of the targets for bacterial virulence factors. Literature data allows the construction of a map that includes the sequential activity, interactions, and cascades of the cross talk between the virulence factors and Rho GTPases. We will use this information and quantitative kinetic data on single proteins to develop a mathematical model. This model will be employed to evaluate mechanistic issues and to determine pathways sensitivity throughput to altered enzyme kinetics. The goal of this work is to participate in the developing effort to create predictive models using literature data and unravel the relationship between bacterial virulence factors and Rho GTPases.

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The Neurotoxic Effects of Glutamate in Neonatal Rats

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Hypoxia/ischemia (HI) brain injury in infants often leads to a lifetime of neuropathological deficits. In adults, HI induces cell death via glutamate release, NMDA receptor activation and AMPA/KA receptor activation. Conversely, infant neurons are insensitive to damage mediated by either receptor. Our lab has shown that the *in vitro* neurotoxic effects in neonates are due to activation of Type I metabotropic glutamate receptors (mGluRs). These receptors activate a second messenger system, which causes the intracellular release of Ca++ from the endoplasmic reticulum. Interestingly, damage was prevented by pretreatment with estradiol. The aim of this project is to identify the *in vivo* neurotoxic effects of glutamate in neonates. To determine the extent of glutamate damage under physiological conditions, volumetric analysis will be conducted on immature hippocampal neurons. Day of birth rats were administered glutamic acid or saline via ICV injections and perfused one week later. Fixed brains were cut into 60-micron sections and divided into groups for cresyl violet staining and immunocytochemistry for NeuN antibody. Hippocampus tracing and neuron count will assay cell death, while treatment with antagonists will show if the damage is due to mGluR activation. Future study includes investigating the protective effects of estradiol *in vivo*.

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Outcomes of Female Patriotism: The Women of the WAVES during and after World War II

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The purpose of this research is to explore the post-war patriotic consciousness of American women who served in the Navy as WAVES during WWII, via a sampling of their oral histories and two national surveys of female veterans. The oral histories are part of an ongoing public collection with the Veteran's Oral History Project and the Women in Military Service for America memorial. Additionally, the surveys are public and distinct in comparison, one being an objective questionnaire collected by the Veterans Administration and the other a participatory survey gathered by WAVES National. My research answers two main questions: What were the lasting effects of the WAVES' WWII patriotism on our American communities and how did our female veterans continue to practice their patriotism once the war ended? Veteran women exhibited a gendered patriotism for America both during their time of service and after the war. They embraced societal patriotic roles post war, thereby helping America rebuild at a time when female veterans were merely expected, by social standards, to return to a cult of domesticity. WAVES women were a group of accomplished and independent individuals who asserted themselves in their communities; while many female veterans focused on family and education, others were active in careers and civic duties such as social clubs, leadership, and politics. Some women remained in the Women's Reserve and some joined the Navy upon the approval of full integration in 1948. Overall, the WAVES' patriotism transcended their period of active military service and continued into the post-war era, although they channeled it in new directions.

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Visualization and Analysis of RNase MRP in *Saccharomyces cerevisiae* using Optimized Tetracystine Tagging of SNM1p

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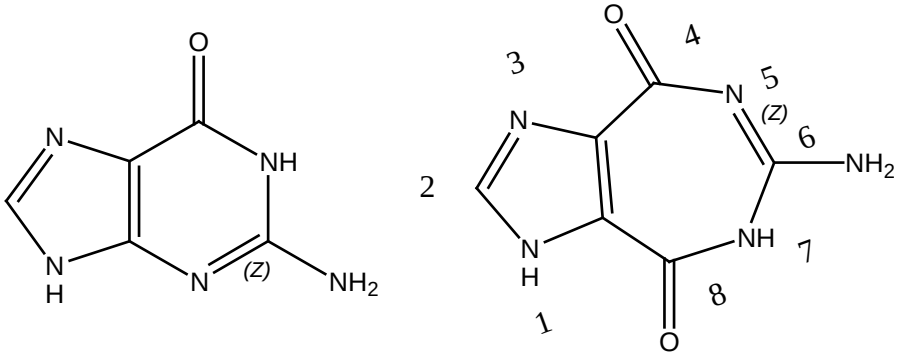
Lasse Lindahl, Professor, Department of Biological Sciences

Visualizing localization of a protein in a cell can help identify its function. Recent developments in tagging allow for proteins to be tagged with a small mutation and then visualized in living cells. We are interested in determining the localization of endoribonuclease RNase MRP in *S. cerevisiae*. This enzyme, part of the ribosomal RNA processing pathway, cleaves precursor rRNA at the A3 site producing a precursor of 5.8S RNA. The enzyme is composed of one catalytic RNA subunit and nine structural proteins. SNM1 is an ideal gene to tag because it encodes SNM1p, the only protein found in RNase MRP and not RNase P, another ribonucleoprotein. The tag used contained optimized amino acids. It has been shown that tetracystine peptides containing proline and glycine between dicystine pairs produce optimal binding and imaging contrast. An *E. coli* strain pRS316 containing a cloned SNM1 gene was grown. Codons for the tag were chosen based on usage statistics for yeast and site directed mutagenesis was used to fuse the tag to SNM1. A subcloning strategy was implemented to incorporate the tag into yeast. Yeast expressing tagged SNM1p were imaged with a combination of microscopy techniques using the biarsenic dyes FlAsH and ReAsH.

Synthesis of Ring Expanded Nucleoside Analogues for Inhibition of the Hepatitis B and C Viruses

Irene S. Pastis, *Peng Zhang*
Ramachandra Hosmane, Professor, Department of Chemistry and Biochemistry

Viral hepatitis, caused by hepatitis B and C viruses, is the one of the major causes of morbidity and mortality in the world. This project focuses on the organic synthesis of ring-expanded nucleic acid bases as potential anti-viral agents. These bases have the ability to base pair with the naturally occurring bases with the only difference that the expanded ones, if incorporated into nucleic acids, will not allow the DNA chain to continue because they produce a "kink" in the DNA strand. The synthetic challenge in the lab is to replace the 5:6-fused heterocyclic system of the naturally occurring purines with the expanded ring system of 5:7-fusion. After extensive research, our lab has discovered that a number of compounds containing the 5:7-fused imidazole[4,5-*e*][1,3]diazepine ring, possess potent anti-HCV and anti-HBV activities. My research goal is to enhance the potency of these nucleosides/tides by modifying the below ring system with substitutions at positions 1, 2 and 6 (see Figure) as well as to study the relationship between the structure and its biological activity.



Guanine Expanded Guanine

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

Structural Analysis of the Myristoylated Matrix Protein of the Feline Immunodeficiency Virus

***Sean C. Patro**, Cassiah J. Smith, Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry

The Feline Immunodeficiency Virus (FIV), which infects wild and domestic cats, is a retrovirus, and part of the lentivirus sub-family. Localization of the virus to the host plasma membrane is vital for retroviral replication. Viral assembly and budding at the plasma membrane are mediated by the Gag polyprotein. Gag is processed into five different proteins, one of which is the matrix (MA) protein. MA plays a significant role in viral assembly due to the co-translational addition of a myristoyl group. The myristoyl group anchors the MA domain of Gag to the membrane where assembly occurs. Our research investigates how the myristoyl group targets FIV-MA to the plasma membrane and its role in viral assembly. Molecular cloning, protein expression, purification, and Nuclear Magnetic Resonance (NMR) are used in the synthesis, and structural and functional analysis of the myristoylated and unmyristoylated FIV-MA. Preliminary data have shown evidence of interaction between FIV-MA and the cellular factor PI(4,5)P2, suggesting that PI(4,5)P2 may play a key role in viral assembly. The analysis of the data provided by this research will be used to determine the structure of FIV-MA and could provide insight into the viral assembly mechanisms of FIV and other related viruses.

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The Cyberpeople Jack Implant: A Study of Remediation, Ethics, and Technology

Christopher Paul
Dr. Jennifer Maher, Assistant Professor, Department of English

Internet users are expected to make meaning from a myriad of communication modes (e.g., audio, image, and text). Bolter and Grusin (1999) explain that the concept of “remediation," a “complex kind of borrowing in which one medium is itself incorporated or represented in another medium,” can facilitate such meaning-making. An example of remediation is the taking of a digital photograph of a painting for display on the Internet. As a new medium, the photograph of the painting becomes digitally portable, accessible to anyone on the Internet. But, at the same time, the photograph loses the textures created by the artist’s paint strokes. With the increasing digitization of analog communications, I argue that we must understand the effects, both positive and negative, that occur through the process of remediation. Consequently, in this project, which explores a hypothetical patent for what I have termed the “Cyberpeople Jack Implant,” I offer a model for such critical reflection and construct an ethical argument about the “remediation” of science via digital technology.

Determination of Spatial and Temporal Location of Candidate Bar-1 Target Genes in *Caenorhabditis elegans* during Development

Carlita C. Phillip, *Belinda Jackson*
David M. Eisenmann, Associate Professor, Department of Biology

The Bar-1 protein, a homolog of the β-catenin protein of the Wnt signaling pathway which is pivotal in *Caenorhabditis elegans* vulval development, targets several known and unknown gene loci as a transcription factor. We hope to determine the spatial and temporal expression patterns of known and novel target genes of Bar-1 as they are expressed during *C. elegans* vulval development. The information on these expression patterns will aid in the understanding of *C. elegans* and vertebrate development via the Wnt signaling pathway. Previously, 33 candidate target genes were selected after microarray and quantitative reverse transcriptase PCR procedures. The construction of reporter constructs via SOEing PCR for these candidate target genes allows for the determination of their gene expression locations during vulval development. Future study of these target genes via mutation, deletion and silencing of the target genes will result in a further understanding of gene function. Due to the highly conserved nature of the Wnt signaling pathway, the use of the *C. elegans* developmental model allows for the possibility for translation of these gene loci and function to the vertebrate system.

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The Feasibility of Biodiesel from Phytoplankton

Stephen A. Pirpiris
Tony Farquhar, Professor, Department of Mechanical Engineering

The purpose of this research is to develop and model a cost effective process for commercially producing Phytoplankton in controlled water for conversion to Biodiesel. At present, all biodiesel production in the US produce fuel using land based crops like soy beans. This research defines a set of growing conditions that could ultimately result in less expensive aquatic feedstocks. In all likelihood, the extent to which liquid fuels can be derived from farmland production will be limited by the competing needs for arable land to grow foods and by changing weather patterns. Previous research concluded by the Department of Energy has shown that the costs of open pond growth of biodiesel feedstock far exceed the current costs of fossil fuel. This project has tested the concept of growing plankton in super-fertile aqueous solutions maintained in clear vertical acrylic pipes. This research will demonstrate the feasibility of large scale Phytoplankton manufacturing as a first step towards demonstrating that aqueous feedstocks could ultimately be competitive as an alternative fuel source.

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

Recollections of Katrina: A Visual Exploration of the Subjectivity of Memory

Stephanie C. Potter
Calla E. Thompson, Assistant Professor, Department of Visual Arts

In "Recollections of Katrina: A Visual Exploration of the Subjectivity of Memory," the overlap between subjective and collective memory is explored through a series of photographic works. This work is intended to provide an alternative understanding of the human cognitive process by transforming 'memory' into tangible forms. This will allow a visual representation of a complex and metamorphosing phenomenon. "Recollections of Katrina" attempts to create a visual diagram of memory as it affects individuals in a collective group. As an entity that everyone possesses, memory affects every individual in a different way. This work is based on data from interviews with Baltimore residents concerning their memories of hurricane Katrina. In order to represent both common and distinct memories, those that were abstract and generic were accentuated and enlarged, while those more specific and individual were isolated and minimized. The phenomenon of memory is transformed into visual images to which outside viewers can respond: Reality congeals around common cores, and distorts when filtered by subjective perception. Memory is abstract by nature.

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

Creating Academic Success through Guided Study Sessions

Debra L. Potts, ***Leila E. King***
Susan J. McFeaters, Program Director, Department of Social Work
Diane L. Alonso, Program Director, Department of Psychology

This research study examines the effectiveness of Guided Study Sessions (GSS), an academic intervention program, on the improvement of student academic performance. The term, Guided Study Session, was coined at the University of Maryland, College Park and is based on the nationally recognized Supplemental Instruction program. The Psychology and Social Work programs at UMBC, located at the Universities at Shady Grove in Rockville, Maryland, currently hold Guided Study Sessions for students. GSS, sponsored by the Center for Academic Success (CAS), are conducted by UMBC seniors who have excelled academically in the required foundation psychology or social work courses that the GSS supports. In addition to their experience, the seniors have received GSS leadership training. The purpose of the GSS is to guide students in both what to learn and how to learn for the GSS-linked course. Student responses are being captured through a self-report evaluation in which those students who have participated in the GSS are asked to assess how GSS affected their academic performance. It is expected that the data will show that GSS has a positive effect on student academic performance.

Fluorescent Fluoride Ion Detection in Drinking Water Based on Alizarin Red S- Al(III) Complex

Akanksha W. Raja, *Govind Rao*
Govind Rao, Professor, Department of Biochemical and Chemical Engineering
Yordan Kostov, Assistant Professor, Department of Biochemical and Chemical Engineering

It is important to be able to detect unhealthy amounts of fluoride in drinking water as quickly and efficiently as possible. The purpose of my project was to test a fluorescent fluoride ion signaling system. I used solutions with various concentrations of fluoride to see if a small coaster sensor could give accurate absorbency readings of fluoride levels. In order to test the sensor, stock solutions were made using Alizarin Red S (ARS), Anhydrous Aluminum Chloride, Anhydrous Sodium Acetate, Acetic Acid, and Sodium Fluoride. Solutions of Alizarin Red S, Aluminum Chloride and an Acetate buffer were mixed with varying fluoride concentrations. Then about 3mL of each solution was tested on the coaster and the absorbency spectra for each solution was recorded. Based on the absorbency readings, results were reproducible and a clear distinction between lower and higher levels of fluoride concentrations. Thus our results show that the coaster sensors accurately detect the amount of fluoride concentration.

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

“Traum Baum” Public Art as Catharsis: Interactive Sculpture and Community Outreach

Christina Ralls*, *Katie Better
Steve Bradley, Associate Professor, Department of Visual Arts

Our media is focusing more and more on war, crime, poverty, violence, and fear. People are getting caught up, rushed and stressed from the demands of our information age, forgetting their own needs and dreams. We feel that the ability to create can be a powerful combatant against the negative results of society’s demands. Feelings of purpose, meaning and catharsis can be felt when one participates in an art piece, helping to ease adversity. We offered artistic interaction to a wide demographic with hope to inspire participants to positively evaluate their lives and think about what makes them feel fulfilled and happy. In the spirit of spring and renewal our sculpture, *Traum Baum (Dream Tree),* was designed after a colorful maypole with children figures grasping large vinyl banners. We asked people to remember that childhood question, “What do you want to be when you grow up?" and write their aspirations on the banners. The work was introduced at the Baltimore Museum Art's siteMaryland exhibit. The words written on the banners were intense, personal, and overall beautiful. The success has inspired us to continue our research in community outreach and explore other ways of interaction with artistic presentation.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education and the “siteMaryland” Governor’s Arts Initiative provided by the Maryland State Arts Council.

Barriers to Optimal Health and Social Services Provision among Rural African American Women

Jacqueline A. Redmond
Tiffany Sanders Baffour, Assistant Professor, Department of Social Work

Rural communities face unique health care challenges including under-funded hospitals, over-worked clinicians, and challenges to basic services. This research is a secondary analysis of a sample of pregnant and parenting African-American women who live within a southern, rural community. The original data was collected from 2004-2005 using participants enrolled in a peer health education project. Ninety-seven participants ranged from ages 14-35 and case records were examined. Data from records were coded and a database was created using Statistical Packages for the Social Sciences. This research project seeks to answer the following: (1) What services were most frequently used by participants? (2) What were the potential barriers to service delivery? (3) Were barriers experienced by participants institutional or personal? (4) Were program graduates more likely to experience barriers than non-graduates? Descriptive statistics showed most frequent referrals to be GED classes (42.3%), housing (14.4%), and Healthy Start (11.3%). Outcomes found 26.8% went for services, 40.2% of workers were unable to contact client for follow-up, and 9.3% of clients remained waiting for services. Chi Square analysis was also utilized. This study is relevant to enhancing quality and life of rural residents through examining potential barriers and improving health and social service delivery.

Drug Delivery Devices Based on Hydrogels of Naturally-Derived Biopolymers

Robert Perrin Reeves*, Jennie Leach*
Jennie Leach, Associate Professor, Department of Chemical Engineering

The goal of this work was study the rate at which proteins diffuse within naturally-derived biopolymer hydrogels, currently being developed within our laboratory. Hydrogels provide unique advantages as materials for controlled delivery of water-soluble drugs and scaffolds for growing engineered tissues. A key parameter of interest is the rate that soluble molecules (e.g., drugs, proteins) diffuse within the hydrogel. Diffusion rates will impact cell and tissue behavior and are dependent on the hydrogel pore size, structure and crosslinking. To synthesize the hydrogels, we chose a cellulose derivative, carboxymethyl-cellulose (CMC), which is water soluble, selectively degradable by cellulase, and biocompatible with mammalian cells and tissues. We modified the CMC with photocrosslinkable methacrylate groups to create methacrylate-CMC (M-CMC). To tune the hydrogel physical properties (e.g., degradation, pore size), we also incorporated polyethylene glycol dimethacrylate (PEG-DM) into the hydrogel structure. Based on previous characterization studies, we chose six ratios of photocrosslinked M-CMC and PEG-DM for use as devices to controllably deliver a model drug protein, bovine serum albumin (BSA). We compared hydrogel composition with effective diffusion coefficients of BSA; our current data suggests that protein release correlates with total polymer mass by volume, not by ratio of CMC to PEG.

This work was funded, in part, by UMBC and the Henry Luce Foundation.

Interactions between DNA Repair Enzyme Thymine-DNA Glycosylase and Cell Cycle Checkpoint Protein Hus1

Brittany A. Richardson*, Amrita Madabushi, A-Lien Lu-Chang*
A-Lien Lu-Chang, Professor, Department of Biochemistry and Molecular Biology

DNA repair enzymes and cell cycle checkpoint proteins play critical roles in genome stability; their improper functions result in carcinogenesis. About one third of germline mutations leading to genetic disease are at CpG sites, which are susceptible to spontaneous deamination to yield U/G and T/G mismatches. The human DNA repair enzyme thymine DNA glycosylase (hTDG) is a key DNA glycosylase in the base excision repair pathway that repairs these deamination lesions. The cell cycle checkpoint protein Rad9-Rad1-Hus1 (the 9-1-1 complex) serves as the surveillance machinery involved in safeguarding the genome. We have shown that the 9-1-1 complex interacts with and enhances the activity of hTDG. The overall aim of the study is to define the interaction region between hTDG and Hus1. Several truncated hTDG were cloned and overexpressed in *E. coli* cells. The proteins were purified and biochemical assays were performed. Pull-down assays were carried out to check for physical interaction, and glycosylase activity assays were carried out to check for functional interaction. We were able to determine that the N-terminal domain (residues 67-110) of hTDG is important for interaction with hHus1. We plan to further characterize the region by using synthesized peptides (within the residues 67-110 of hTDG) in physical and functional competition assays involving hTDG and Hus1.

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Particle Manipulation Using Dielectrophoresis

Astin M. Ross*, Hongjun Song, Vishwanath Mulukutla, Dawn Bennett*
Dawn Bennett, Assistant Professor, Department of Mechanical Engineering

Micro-total-analytical systems for analyzing chemical/biological substances are now used across a wide variety of biological applications. Before analysis is conducted in a micro-total-analytical system, analytes of interest must be separated from the background matrix and positioned to locations conducive for analysis. The use of AC electric fields was demonstrated to have promising potential for these lab-on-a-chip systems. The main purpose of this project is to design and fabricate a novel microfluidic device capable of separating particles from the background matrix using a high-gradient strong AC electric field. This technique of manipulating particles with AC fields is known as dielectrophoresis and has potential applications in the medical field as well as national defense. Various electrode geometries have been chosen. Upon completion of the designs, the devices will be fabricated using photolithography in the cleanroom at UMBC. Fabrication of the devices will be followed by testing of particle suspensions using traditional dielectrophoresis.

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Habituation to the Distractive Properties of Virtual Reality in Pain Analgesia

Charles E. Rutter
Lynnda M. Dahlquist, Professor, Department of Psychology

Immersive Virtual Reality (VR) has gained prominence in the clinical psychology literature as a powerful distractor from procedural pain. However, the cause of this distraction is unknown, and may stem from the novelty of the VR. If so, the analgesic effects of VR would decrease with repeated exposure as the novelty wears off. The current study addresses this question, testing the distractive properties of VR over the course of eight weeks. Subjects underwent weekly VR sessions while measurements of pain threshold, tolerance, and several subjective ratings of pain experience were taken. Analysis of compiled data shows VR led to significant increases in pain threshold and tolerance, as well as significant decreases in pain intensity, anxiety, and time spent thinking about pain. There was no evidence of habituation to the effects of VR on pain threshold, tolerance, time spent thinking about pain, pain intensity, or anxiety. Moreover, decreases in time spent thinking about pain were correlated to the level of enjoyment of the VR game, and decreases in anxiety level and pain intensity. These findings support the long-term clinical utility of VR, where it could serve as a powerful non-narcotic analgesic.

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Detection of Circulating Hsp90α in Plasma from Tumor-Bearing Mice and Patients

Charles E. Rutter*, Naomi Horiba[1], Peter L. Gutierrez[1], Ulka Vaishampayan[1], Patricia LoRusso[1], Edward A. Sausville[1], Angelika M. Burger[1]*
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Biomarkers that classify cancers, guide treatment, and predict response are instrumental in optimal development of molecularly targeted drugs. One such drug, a benzoquinone ansamycin named 17-allylaminogeldanamycin (17AAG), targets the heat shock protein 90 (Hsp90), which exists in two major isoforms, Hsp90α and Hsp90β. We have demonstrated the secretion of HSP90α into the extracellular milieu in response to 17AAG, indicating that secreted Hsp90α could be a plasma marker of effects on tumors in patients. To investigate whether the elaboration of Hsp90α into the plasma is specific for tumor-bearing individuals and whether it is dependent on tumor burden, we studied plasma of 68 nude mice with and without xenografted human tumor tissues and 10 cancer patients using the human Hsp90α ELISA assay. All xenograft-bearing mice had significant levels of Hsp90α in the plasma, whereas tumor-free mice had no Hsp90α. Moreover, there was a strong correlation ($r = 0.79$) between Hsp90α concentrations in plasma and the approximate tumor weight. Similarly, the cancer patient plasma samples were all Hsp90α positive. Our data suggest that plasma Hsp90α might be a useful biomarker for tumor detection and warrants further investigation as a biomarker of response to benzoquinone ansamycins.

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Metabolic Regulation of RUNX2 Transcription Factor Expression in Endothelial Cells

***Maryann Salib**, David D'souza*

Antonino Passaniti, Assistant Professor, Departments of Pathology and Biochemistry and Molecular Biology, and the Marlene and Stewart Greenebaum Cancer Center Program in Oncology, University of Maryland School of Medicine

The RUNX2 DNA-binding transcription factor regulates tumor growth and angiogenesis by controlling the expression of target genes such as VEGF, angiopoietin-1, and matrix metalloproteinases. Reduction of RUNX2 slows endothelial cell (EC) cycle progression, while RUNX2 overexpression promotes EC proliferation and differentiation. RUNX2 expression is stimulated by IGF-1, an angiogenic factor, through the PI3K and ERK signaling pathways, resulting in phosphorylation by cyclin dependent kinase-1. Because of the known synergistic effects of IGF-1 and glucose, we hypothesized that glucose could be a factor in the regulation of tumor-cell proliferation and/or angiogenesis by regulating the expression of RUNX2. We found that physiological levels of glucose (5mM, 90 mg/dL) administered to starved EC, increased RUNX2 protein and DNA binding activity within four hours as determined by Western blot and electrophoretic mobility shift (EMSA) analyses, respectively. RUNX2 activation was prevented by IGF1-receptor kinase inhibitors, implicating IGF1 in the glucose response. Current experiments are being directed to understanding the function of RUNX2 in endothelial cell differentiation. Glucose regulation of RUNX2 expression is especially relevant for identifying new therapeutic targets to inhibit cancer cell growth and the vascular complications of diabetes.

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Characterization of *HTA8,* a Histone H2A Gene, in *Arabidopsis* Defense Regulation

Sasan Salimian
Hua Lu, Assistant Professor, Department of Biological Sciences

The goal of my research is to characterize the role of *HTA8,* a histone H2A gene, in defense regulation in *Arabidopsis thaliana*. Plant diseases are the largest deterrent to agriculture worldwide. Identification and characterization of novel defense genes will help us to design better strategies to enhance plant disease resistance. The *hta8* mutant was isolated from a large-scale mutant screen aimed to identify novel defense related genes in Arabidopsis. This screen is based on the unique defense-dependent size change of *accelerated cell death 6-1 (acd6-1). acd6-1* is a tiny plant with constitutive defense. Suppressors of *acd6-1* are larger plants associated with reduced defense. Mutation in *HTA8* suppresses *acd6-1* dwarfism, suggesting a role of *HTA8* in defense regulation. To confirm this, I will complement the *acd6-1hta8-1* plants with a correct *HTA8* to see if this causes a rescue phenotype, returning larger-sized *acd6-1hta8-1* plants to smaller *acd6-1*-like plants. If so, I will further characterize how HTA8 regulates defense responses by infecting *acd6-1hta8-1* and *acd6-1* plants with *Pseudomonas syringae* and examining bacterial growth and disease symptom development in the mutants. This work will elucidate if *HTA8,* a gene involved in chromosome remodeling, also plays a role in plant defense.

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Endorsement of BRIEF: Validity Items May Identify Low Participant Investment in Behavioral Research

Jaclyn R. Samek*, Robert J. Spencer, S. Carrington Rice, Shari R. Waldstein*
Shari R. Waldstein, Professor, Department of Psychology

Researchers routinely rely on self-report data when assessing behavioral functioning. The integrity of these data, however, is dependent upon the motivation of the respondent. Here, validity items from the Behavior Rating Inventory of Executive Function (BRIEF) were used to identify participants who might have poor motivation while taking part in a behavioral study. Seventy-four undergraduate students completed the BRIEF, a self-report questionnaire that contains 75 items pertaining to executive functioning in the everyday environment. Participants indicated whether, over the past month, they had "never", "sometimes", or "often" experienced problems with each behavior. The BRIEF includes five validity items, which were rarely endorsed as frequent by the standardization sample. For example, few adults would indicate "often" to an item stating "I forget my name." Nineteen (25%) of the present participants endorsed at least one infrequent response to a validity item. Those participants endorsing at least one of the validity items reported significantly fewer problems with executive functioning and arrived to their testing appointment significantly later than those who did not (*p*'s < .001). Thus, endorsement of even one validity item may suggest poor investment on the part of research participants, and the results from such protocols should be interpreted with caution.

Evaluating the Performance of the BLAST Sequence Similarity Searching Algorithm

Ivette Santana-Cruz*, Mileidy Gonzalez, Stephen J. Freeland*
Stephen J. Freeland, Assistant Professor, Department of Biological Sciences

Genome sequencing efforts provide us with an ever-increasing number of biological sequences. Current resources prevent the use of empirical methods to find associated structure and function information in a timely manner. The BLAST (Basic Local Alignment Tool) family of programs are among the most widely used tools to automate the task of inferring such information, allowing us to find associated sequences with useful information that can be transferred to the sequences of interest.

We tested performance by querying BLAST with sequences gathered in the CATH protein structure classification database, in which true relationships between all sequences are known. Using the BLAST algorithm we found that 60 out of 549 protein sequences were incorrectly matched. These results are well above the theoretical expectations of BLAST's authors. The sequences that misbehaved were compared with those that behave correctly but no simple pattern differentiated them from their "correct" counterparts. Some suggestions we propose are that these protein sequences could be examples of convergent evolution, similar sequences which fold into different structures or examples of regions of protein fold space where different folds meet. We intend to perform further testing using a modified version of the algorithm called PSI-BLAST to perform comparison analysis with new findings.

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The Seven Deadly Sins

Andrew J. Shoenfeld
Lynn Cazabon, Associate Professor of Art, Department of Visual Arts

The intention with "The Seven Deadly Sins," is to contemporize the ancient meaning of morality by examining and modernizing the sins that, when avoided, influence a moral life. This series of seven illuminated images, each representing a different cardinal sin, is an amalgamation of conservation of faith with destruction of realism through fantastic digital imagery. The body of work is intended to evoke self-reflection in the viewer through confrontation with numerous symbolic objects and situations they are surrounded by every day. These representations of modernity in, "The Seven Deadly Sins," such as television, war, fast food, money, and other conventions are used to anchor these images with historical references and to act as a warning of the potential downfalls of the individual in the modern world. The combination of visual imagery and allegorical manifestation forces the viewer, consciously or subconsciously, to judge the relevance of such sins in their own life experiences and discover reservations they have within their own character and begins the process of self-actualization.

Role of TRAIL in Induced and Spontaneous Murine Lupus Models

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TNF-related apoptosis-inducing ligand, (TRAIL) is expressed on the surface of immune cells and exerts apoptotic as well as non-apoptotic functions. Our previous studies suggest that TRAIL has non-apoptotic, immunoregulatory functions in systemic lupus erythematosus (SLE), an autoimmune disease characterized by autoreactive T and B cell proliferation and autoantibody production. Results from the current study showed that in the chronic-graft-versus-host disease mouse model of lupus, disease parameters including T cell activation and proliferation, production of autoantibodies and extent of renal involvement were significantly decreased in the absence of TRAIL on donor T cells. These data suggest that TRAIL may play a role in sustaining auto-reactive T and B cell activation and collaboration. To determine whether TRAIL-TRAIL R interactions plays a role in a spontaneous lupus disease model, the agonistic TRAIL-R antibody, MD5-1 was administered to 4 month old NZB/NZW mice and its effect on production of ssDNA antibodies was evaluated by ELISA. Results showed that MD5-1 administered over a 12-week period did not significantly alter the production of anti-ssDNA antibodies. These results suggest that TRAIL-TRAIL R interaction is less important in this lupus disease model.

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Baroque String Ensemble

Rachele Sills, violin; Anna An, violin; Michael Herder, violin; Megumi Mizumoto, violin; Talya Schenk, viola; Matthew Poloncha, viola; Dami Soh, cello; Joe Martone, double bass; Grace Kim, piano
Dr. Airi Yoshioka, Assistant Professor of Violin, Department of Music

The mission of the Baroque String Ensemble is to bring energetic and enlightening performances of music from the Baroque era to the public. This ensemble was formed in the fall of 2006 to create an opportunity for further exploration of this repertoire. During the Baroque period, numerous changes were made in the written representation of music, and the way instruments appeared and were played. We research these performance practices and attempt to incorporate authentic styles in our playing by experimenting with different ornaments through trial and error, studying the score for passages and voices to highlight, and playing on replicas of a Baroque Bow to get a historical perspective of how sound was produced. In an effort to capture the style, color, and edicts of the period, we rehearse weekly and are coached by Dr. Airi Yoshioka. The Baroque String Ensemble will be performing excerpted movements from Vivaldi's Concerto Grosso for 4 Violins in b minor and Brandenburg Concerto No. 3 by J.S. Bach.

Study and Archiving of Impulses for Convolution Reverb

Trevor M. Simpson
David Kim-Boyle, Professor, Department of Music

The purpose of this research was to understand fully and archive the acoustic responses of various spaces throughout the UMBC campus. Reverb, or ambience, is an often-overlooked phenomenon that plays a pivotal role in how all people perceive sound. The effect is signature to every room, with each potentially sounding very different depending on its size, shape, building materials, etc. Through a science called convolution, I have been able to "capture" the response of many signature-sounding rooms across campus. The process involves the playback of uniform sine-wave sweeps, passing through every audible frequency, and the recording of these sweeps and their related reverberance in any given room. After the fact, a computer program is used to remove the sine-wave sweep from the recording, leaving only the acoustic response of the room at every frequency. The end result of my research is a comprehensive library of these responses, available to all students for use in the UMBC Recording Studios. A performer recorded in virtually any space may be made to convincingly sound as if they were in any of the rooms sampled. The implications of this research are significant; not only are these samples available for current use, they will continue to preserve the history of the University for generations to come.

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

Characterization of Nucleocapsid Protein Binding to the Psi-Site of the Moloney Murine Leukemia Virus Genome

Adjoa Smalls-Mantey*, Anwesha Dey, Michael F. Summers*
Michael F. Summers, Professor, Department of Biochemistry and Chemistry

Moloney Murine Leukemia Virus (MLV) selectively packages two copies of its full length RNA genome. Packaging specificity is mediated principally by interactions between the nucleocapsid (NC) domain of the assembling Gag polyproteins and a cis-acting segment located in the 5' leader region of the MLV viral genome called the Psi-site. We recently discovered that genome packaging of MLV was mediated by a riboswitch mechanism in which high affinity NC binding UCUG segments within the NC core encapsidation signal (NC-CES) are sequestered by base pairing in monomeric RNA and become exposed for NC binding upon dimerization. We have expanded our studies to characterize the binding of NC to the entire Psi-site. To determine the ratio of NC binding to monomer and dimer forms of the Psi-site, monomer and dimer constructs of the Psi-site were incubated with NC and the amount of bound NC was determined by measuring the band intensities of SDS-PAGE. Our data indicates that an average of seven NC domains bind to the entire dimerized Psi-site. This data supports our model where one site is available for binding in the monomer and seven in the dimer.

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Perceptions (or Misperceptions) and the Troubled State of US-Iranian Relations

Christina Marie Stanley
Cynthia Hody, Associate Professor, Department of Political Science

"Perceptions (or Misperceptions) and the Troubled State of US-Iranian Relations" examines the foreign policy stances of the United States and Iran dealing with nuclear proliferation through comprehensive qualitative research. This paper analyzes the history of modern US-Iranian relations, examining cultural, socio-economic, political, and international factors which affected foreign policy. Through empirical policy research the paper examines whether current US policy positions encourage or dissuade states like Iran from becoming nuclear powers. The research adopts the concept of perceptions and their effect on the policies of states, as proposed by Dr. Robert Jervis in "Hypothesis on Misperceptions" (1968). Jervis argues that a state may correctly predict the actions of another actor, but miss the intentions thereby misperceiving the situation. By using this theoretical framework I argue that misperceptions maybe a key element in explaining the long term failure of US-Iranian diplomatic relations. The paper proposes an actionable policy recommendation for the US government in the aim of eventual peace in the Middle East region, and nuclear non-proliferation in Iran.

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

Microbial Respiration on Mixed Leaf Substrates Mediated by Insect Feeding

Aaron B. Stoler, *Christopher M. Swan*
Christopher M. Swan, Assistant Professor, Department of Geography and Environmental Systems

The primary source of energy in small, forested streams is senesced leaf litter from streamside forests. After leaf senescence, bacteria and fungi immediately colonize leaf litter and begin the decomposition process, making the leaves more palatable to detritivorous insects, who further contribute to decay via feeding activity. It is not known, however, whether mixtures of leaf species affect bacterial and fungal activity (e.g., respiration), or what the interaction is with insect feeding activity. This is a real issue, since multiple tree species provide input into most streams. Our work attempts to observe such interactions over many points during the decay process by examining bacterial and fungal respiration. Our research constitutes two separate, temporally based, dark-bottle respiration experiments. In the first experiment, leaf cores of three different species (representing a spectrum of slow to fast decay rates) were divided into monocultures and mixtures, and placed into a first-order stream, allowing bacteria and fungi to colonize the leaves. On three sample dates ranging from two to ten weeks, a set of cores from the leaves were taken and placed into respiration chambers with or without a grazing amphipod. Results suggest both synergistic and additive effects upon comparison of the mixture and monoculture treatments. The second experiment was similar, but sought to better understand the individual effects of each component in the mixture treatments and to examine the effect of changing the insect guild from a grazer to a shredder. These results verify the results of the first, and further express a tendency for microbial respiration to increase as the activity of the consuming insect increases.

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

Spiramycin-resistant Mutations in *Escherichia coli* L4 and L22

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

Spiramycin is a macrolide antibiotic with a 16 member lactone ring used for the treatment of infections. Macrolide antibiotics inhibit bacterial growth by binding to a specific site in the 50S subunit of the ribosome, thus inhibiting protein synthesis. Resistance to macrolides can result from mutations in the RNA component of the 50S subunit, or in one of two protein components, L4 or L22. This experiment was conducted to see whether spiramycin-resistant mutations occur in *Escherichia coli* with a focus on the L4 and L22 ribosomal proteins. *E. coli* was plated at a concentration of 1.5 mg/ml and growth was analyzed. Resistant colonies were isolated and their L4 and L22 genes were amplified by PCR and sequenced. Thus far, one mutation, G64V, has been found and experiments are being conducted to analyze its effect on cell growth. The aforementioned mutation and others found in L4 or L22 will be used to determine how mutations affect the 50S subunit. This information will help further our understanding of L4 and L22, which are already known to affect the structure of the peptide exit tunnel and will also contribute to our understanding of ribosomes, which are essential to the process of translation.

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UMBC Game Developer's Club: Project Tetra

President/Programmer: ***Eric Jordan***
Programming: ***Josh Allen, Chris Conley, Charles Lohr, Paul Oliver, Elliot Paige***
Art: ***Micha Betts, Katie Chrzanowski, Arthur Gould, Robert Jones, Marcus Lepage, Kiran Sudhakar,***
Lesa Wilcox, Helen Zhang, Megan Zlock
Sound Effects/Music: ***George Aninwene II, Andrew Garrahan, Maura Sateriale***
Penny Rheingans, Associate Professor, Department of Computer Science and Electrical Engineering

The UMBC Game Developer's Club has brought together students from a variety of science and art-related backgrounds who share a passion: the video game industry. To that end the club set out once again to create a 3D real-time game. This endeavor embodied both creativity and technical achievement. Our artists were challenged with 3D modeling, computer animation and texturing. Meanwhile our programmers had the daunting task of coding a 3D game complete with online capabilities. Together the members of the UMBC Game Developer's Club have built teamwork, learned a trade and created an exciting new game. This year's game, Project Tetra, takes place in the murky depths of Atlantis as a band of Victorian era travelers set out to discover hidden treasure in these remote ruins. The game features classic turn-based role playing game play with the addition of online cooperative play. This project has given UMBC students the opportunity to work with a full-scale, professional game engine known as Gamebryo. The club has put that technology to good use in Project Tetra! Also on display at the Game Developer's table will be several other small projects that club members have produced including last year's game project: Scarred Steel.

Neurite Outgrowth and Integrin Signaling Pathways in 3D Systems

Erin L. Voss*, Elizabeth M. Powell*[1]*, Celine Plachez*[1]*, Jennie Leach*
[1]Department of Anatomy and Neurobiology, University of Maryland School of Medicine
Jennie B. Leach, Assistant Professor, Department of Chemical and Biochemical Engineering

Neurons sense ligands in the surrounding extracellular matrix and respond through integrin signaling pathways which influence nerve growth. Neural signaling response controls the outgrowth of neurite projections and is thought to be different in 2D and 3D systems, with the in vitro 3D environment being a better representation of in vivo systems. Currently, integrin signaling in 3D environments is poorly understood, but improving knowledge of this biological response would be invaluable to the development of advanced nerve regeneration therapies. The goal of this work is to define how neuronal signaling in vitro is altered in 3D environments compared to established 2D cell culture substrates. Dorsal root ganglion (DRG) neurons isolated from E13.5 mouse embryos are studied in 2-and-3D collagen and synthetic systems. The location and quantity of the integrin signaling molecules β1 integrin, focal adhesion kinase (FAK), and Rho GTPases are analyzed and compared for neurons in 2D and 3D systems. Fluorescent immunocytochemistry is utilized to tag and image these molecules, and immunoblotting allows for determination of molecular expression levels. Results are compared for DRG neurons placed on a 2D collagen-coated coverslip or tunable synthetic polyethylene-glycol (PEG) gel scaffold or suspended in a 3D collagen matrix or PEG gel.

This work was funded, in part, through the UMBC College of Engineering and Information Technology (JBL), the Henry Luce Foundation (JBL), the March of Dimes (EMP), and NIH DA018826 (EMP).

Investigations of the Temperature Elevation and Nanoparticle Distribution during Magnetic Fluid Hyperthermia

Dianne Weeks*, Maher Salloum*
Liang Zhu, Assistant Professor, Department of Mechanical Engineering

Magnetic nanoparticle hyperthermia has been used for cancer treatment. In the method used here, magnetic nanoparticles delivered to the tissue induce localized heating when exposed to an alternating magnetic field, leading to thermal damage to the tumor. Controlling the heat distribution and temperature elevation in such treatment is still an immense challenge. In this study, we inject nanofluid and nanoparticles into agarose gel to mimic fluid transport in the extra-cellular space of biological tissue. Nanoparticle distributions are examined via digital images of the nanofluid spreading in the gel. By adjusting gel concentration and injection flow rate, we identify an idealized particle delivery strategy for inducing a spherical shaped nanoparticle deposition. Thermocouples are then inserted into the gel to measure the temperature elevations at various locations. The preliminary experimental results suggest that a spherical shaped particle deposition is possible with a relatively low injection rate of the nanofluid and a technique that minimizes the air gap surrounding the injection needle. Temperature rises measured by thermocouples have shown that the nanoparticle distribution in the gel is not uniform. Based on the particle deposition pattern, a theoretical model is developed to simulate the temperature distribution in tissue during nanoparticle hyperthermia treatment.

*This project was funded, in part, by UMBC DRIF and the NIH/NIGMS National Research Service Award GM 08663 to the Minority Access to Research Careers MARC U*STAR Program at UMBC.*

Stages of Ethical Thought

John W. Weller
Susan J. Dwyer, Associate Professor, Department of Philosophy.

This research centers on determining the existence (or lack thereof) of basic conceptual stages of ethical reasoning (as opposed to the ideas that there are no ethically-driven aspects of conceptual thinking, or that ethical reasoning is a seamless—and therefore stage-less—process), specifically as it relates to philosophical ethics. In philosophy, ethics is divided into three major types: personal character/intent-based (called “Virtue-Ethics”), obligation-based (called “Deontology”), and consequence-based ethics (called “Consequentialism”). These have, historically, been treated separately and different theories of ethics will emphasize one kind of ethics over the others, usually to the point of making the proposed theories mutually exclusive. By correlating and cross-applying relevant studies from the fields of psychology, biology, and philosophy (including studies of moral heuristics, intentionality, and philosophy of mind), this research was able to a give a new perspective on how we reason when faced with an ethical problem or situation. This could potentially alter how we explain, discuss, and approach ethical issues (inside or outside of philosophy).

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

The Effect of Leaf Litter Species on Tri-trophic Interactions in a Detritus-based Stream Ecosystem

Ryann A. Williams*, Christopher M. Swan*
Chirstopher M. Swan, Assistant Professor, Geography and Environmental Systems

Little is known about the predator-prey interactions within naturally-occurring leaf litter assemblages where stream insects occur and consume leaf material. Therefore, I manipulated the types of leaf species that detritivores have access to and the presence and absence of insect predators. Cylindrical chambers were filled with commonly found tree species and predators: Red Oak, Red Maple, or a mixture of the two, and crossed with a perlid or ptero, either already added or prevented from entering, using different mesh sizes. A total of 126 chambers were set out in Fishing Creek, in Frederick, Maryland for a total of 5 weeks. Once the chambers are taken out of the stream, the insects and the leaves remaining will be separated. Leaf mass loss will be determined, in addition to the number of insects colonizing the chambers. The results of this work will demonstrate how predation on aquatic detritivores can alter the decay rate of different species of leaf litter and how the loss of streamside tree species can alter trophic interaction in aquatic food webs.

*Funding for this research was, in part, provided by the UMBC) through the NIH/NIGMS National Research Service Award 08663 to the MARC U*STAR Program at UMBC.*

Transitions: Photographs by Robert Creamer

Jeannie S. Yoon
Lynn Cazabon, Associate Professor, Department of Visual Arts

In the short history of photography, there is little documentation of the actual process of photography aside from the photograph produced. To help fill this void, a short documentary video was made about the photographer Robert Creamer. The video is currently exhibited at the Smithsonian Museum of Natural History. The video captures the spirit of the creative process and the innovative "camera-less photography" techniques involved in creating Creamer’s images. Creamer, an accomplished photographer, began his career as a botanist, which has heavily influenced his work. In this body of work he uses scanners to create images, primarily of flora and fauna. He was filmed while he selected the raw material for scanning then worked with these scanners in his home studio, and in his greenhouse. His specific process echoes the themes in the images he creates; the process is a form of art itself, and the film conveys this process, so the viewers can better appreciate Creamer’s work.

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

SCHOLARLY ORGANIZATIONS REPRESENTED AMONG TODAY'S PARTICIPANTS

(Based on participants' responses on their event application.)

Alpha Kappa Delta
Eric Grollman
Louis Leibowitz

Center for Women in Information Technology (CWIT) Scholar
Katie Chrzanowski
Sumita Das

Chi Alpha Sigma
Jessica Folk

Corporate Awards
Kyle Clelan (Verizon)

Dean's Scholar
Jonathan Grabe

Golden Key International Honour Society
Haroon Ahmad
Christopher Bednarek
Caryn Bell
LaToia Bryant
Kyle Clelan
Foyin Fasanmi
Adrian Feijoo
Maddy Fickes
Julie Fields
Jonathan Grabe
Philip Graff
Eric Grollman
Askia Hill
Uzoma Iheagwara
Hasina Jamal
Brandon Johnson
Debora Lin
Cyrus Mistry
Bettel Mussie
Stephanie Núñez
Frances Onyimba
Christina Ralls
Charles Rutter
Maryann Salib
Andrew Shoenfeld
Adjoa Smalls-Mantey
Erin Voss

Goldwater Scholars
Stephanie Núñez
Adjoa Smalls-Mantey

Goldwater Honorable Mention
Philip Graff

Goldwater Nominee
Debora Lin

HHMI Scholarship Program
Nerg AchiriMofor
Ramon Cabrera
Foyin Fasanmi
Whitney Fields
Tiffany Fleet
Amber Gaither
Marcus Gillis
Joy Ihekweazu
Tamika John
Vovanti Jones
Candace Mainor
Jessica McGrath
Stephanie Núñez
Frances Onyimba
Sean Patro
Adjoa Smalls-Mantey
Steven Tuyishime

Heritage Award
Trevor Simpson

Honors College
Cally Brandt
Robin Cagey
Christie Finn
Philip Graff
Simonne-Michelle Jones
Kelly Kovack
Charlene Kuo
Morgan Little
Lidiya Mishchenko
Stephanie Núñez
Charles Rutter
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Aaron Stoler

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Cally Brandt
Robin Cagey
Lisa Fecteau
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Morgan Little

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Katie Chrzanowski
Christina Ralls

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Matthew Loftus

Linehan Artist Scholars
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Danielle Durbin
Lisa Fecteau
Christie Finn
Anna Kuklova
Kimberly Patrick
Rachele Sills

MARC U*STAR
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Roderick Bautista
Caryn Bell
Abraham Beyene
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Ryann Williams

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