URCAD 2008

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.

Role of K^+ Channels in Aβ Toxicity

***Izath N. Aguilar**, Theresa Good*
Theresa Good, Professor, Chemical and Biochemical Engineering

β-Amyloid (Aβ) peptide is the most abundant protein found in senile plaques, a hallmark of Alzheimer's disease (AD), and is believed to lead to neurodegeneration during disease. The mechanism by which Aβ interacts with the neuron cells is unknown, but one hypothesis is that Aβ interacts with K^+ ion channels. Previous studies have shown that K^+ channels play a crucial role in cell survival. In the current study, we first examined cell viability when exposed to 10 mM of extracellular KCl alone or when exposed to extracellular KCl and exogenously added Aβ at two concentrations. Cells were stained with Propidium Iodide (PI) and viability analyzed with flow cytometry. Preliminary results indicate that KCl exposure was not toxic to SH-SY5Y cells, a neuroblastoma line frequently used to examine Aβ toxicity. Cells depolarized with KCl were less vulnerable to Aβ compared to the cells with no KCl added. We will next explore other neuron-like cell lines and relate vulnerability to Aβ with in the presence of depolarizing KCl concentrations with number and type of K^+ channels in cells. Understanding the role of K^+ channels in Aβ toxicity could lead to the development of new treatments for AD.

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

Role of Chemosensory Organs in Food Discrimination by *Manduca sexta*

Belinda N. Akpeng
Frank Hanson, Professor, Department of Biology

Insect pest control and crop damage pose a tremendous economic loss to agriculture. The cause of this is being studied using the tobacco hornworm *Manduca sexta* as a model system. This insect only eats certain acceptable plants and rejects deterrent plants, presumably because of their ability to taste (gustatory) and smell (olfactory) the chemical components of food. Our studies involved the role of individual chemosensory organs in food discrimination using a two-choice bioassay. Larvae missing certain chemoreceptors due to surgery were given a choice between canna (*Canna generalis*) a strongly deterrent plant and moist filter paper (a neutral stimulus) to determine whether loss of these chemoreceptors had changed their feeding behavior. Amputation of either the gustatory or olfactory receptors did not result in a significant reduction in discrimination but when both gustatory and olfactory chemoreceptors were removed, a great loss of discrimination was seen. This indicates that all three known chemosensory organs play important roles in the food choice by *M. sexta.* A better understanding of the sensory detection of deterrent factors by *Manduca sexta* can help in the management of crop damage by pest insects.

This work was funded, in part, by the Biology Department Designated Research Fund.

Adventure in Learning the Language of Music

Anna An
Airi Yoshioka, Assistant Professor, Department of Music

This research focused on the development of the skills and techniques that are necessary for violinist to become an accomplished performer and a knowledgeable teacher. Last summer, I attended Sang-Lock Summer Music Festival in Korea. With more than 300 students and 80 teachers from around the world, the festival offered eclectic styles and aspects of language in Music. Areas of studies included master classes, private lessons, lectures, string ensemble, performances and recitals. Kyung Sun Lee, a professor at Oberlin Conservatory, discussed several ways to improve my bowing techniques and right arm movements during our lesson. I also learned to apply Russian vibrato technique during my lessons with Trans Kook, a professor at Russia Gnesin Conservatory. As a string ensemble, we performed the second movement of Tchaikovsky's Serenade and learned to analyze a score, communicate with others, apply the intention of the composer, and demonstrate proper stage etiquette. On top of these experiences, I was thrilled to exchange ideas with fellow students about our life as professional musicians. This amazing experience with hardworking students and teachers enlightened my life with new ideas and skills and moreover, gave me life-long lessons that will guide me as a stronger musician.

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

The Effects of Child Food Allergy on Family Activities

Bridget R. Armstrong, Elizabeth A. Silberholz*, Emily Law, Karen Weiss, Soumitri Sil, Claire Ackerman, Linda Herbert*
Lynnda M. Dahlquist, Professor, Department of Psychology

Food allergy affects two to eight percent of children (Wood, 2003). Past studies found that food allergy limited family activities and affected parents' emotional function (Sicherer, 2001). However, limited research has been conducted concerning the frequencies of specific daily activities and how much strain they place on families. Thirty-one caregivers of food-allergic children from a university-based allergy practice completed a questionnaire that assessed the frequency of various child and family activities and the degree of hassle each activity posed. A comparison group of 15 caregivers of healthy children completed the same questionnaire. The data indicated that parents of food-allergic children reported greater hassle regarding family activities such as eating in a restaurant and participating in school field trips. However, analyses revealed that there was no significant difference in the frequency that families with allergic and non-allergic children participated in these activities. Food allergies clearly increase perceptions of inconvenience in regard to family activities. Further study is needed to determine whether these higher hassle levels negatively impact other family interactions, such as marital stress and parenting practices.

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

Identifying NKX3.1 Regulatory Targets

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

Prostate cancer is the second leading cause of cancer death among men in Western Europe and North America. Prostate cancer is a condition which involves prostate epithelium overgrowth. *NKX3.1* encodes a homeodomain transcription factor that is necessary for normal prostate development and is one of the earliest known markers for prostate differentiation. This gene, located on chromosome 8p21, is commonly deleted in up to 85 percent of late stage prostate cancer cases. We are going to restore *NKX3.1* by adding a recombinant *NKX3.1* gene. Viral restoration of *NKX3.1* expression in a mouse model of prostate cancer can diminish tumor growth. These findings suggest that *NKX3.1* is a potential gatekeeper tumor suppressor and that restoration of *NKX3.1* may provide a potential therapeutic for prostate cancer. We will examine variations in gene expression through immunoflouresence and chromatin immunoprecipitation (ChIP). Our hypothesis is that increasing levels of *NKX3.1* protein in a metastatic prostate cell line will alter the expression of genes regulated by this protein. Identifying these genes may reveal new methods to help control the growth of prostate epithelial cells for the treatment of prostate cancer.

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

Creating Academic Success through Guided Study Sessions

April P. Asare, Nancy A. Borger
Susan J. McFeaters, Program Director, Department of Social Work

The objective of this research study is to determine the Guided Study Session participants' perception of how effective the sessions are in helping them improve academically. The Social Work and Psychology programs at the University of Maryland, Baltimore County, located at the Universities at Shady Grove in Rockville, Maryland, hold Guided Study Sessions (GSS) for students who are enrolled in specific courses offered by these programs. GSS, sponsored by the Center for Academic Success (CAS) at the Universities of Shady Grove, are led by seniors who have successfully completed the course for which the GSS offers and also who have received leadership training specific to GSS. Students voluntarily enroll in GSS for specific courses. The main purpose is to teach students how to study for their courses more effectively. The purpose of our research is to examine how effective the GSS actually are in improving student academic performance. We are collecting our data by means of a self-report evaluation form whereby the students who participate in the GSS are asked to report how they feel the GSS has affected their academic performance. We hope our data collection demonstrates that the GSS has a positive effect on student academic performance.

Identification of the Secondary Structural Elements of the RFX Gene Regulatory Complex Proteins by CD Spectroscopy

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

Major Histocompatibility Class II (MHC II) molecules play a vital role in the proper functioning of the immune system. MHC II molecules are coded for by the MHC II genes whose expression is regulated by a complex of proteins that bind to the MHC II Regulatory Region. The proteins within this complex include the heterotrimeric RFX complex (RFX5, RFXB, and RFXAP), the NFY complex (NFY-A, NFY-B, and NFY-C), CREB and CIITA. Mutations in any component of the RFX complex or CIITA disrupts expression of the MHC II gene and leads to an immunodeficiency disorder. We are currently conducting biophysical studies of the RFX complex in order to develop a model of how it assembles and binds to the MHCII Regulatory Region. In these studies, circular dichroism (CD) spectroscopy has been utilized to analyze the folded state of the RFX proteins and as a means to experimentally predict the presence of secondary structure elements (alpha helices and beta sheets). Estimates of secondary structure by CD spectroscopy, together with theoretical secondary structure predictions, were used to develop a model of the RFX proteins.

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

Drug Combination Therapy for Malaria: Analysis of Experimental Studies and Proposal for a Comprehensive Approach

Joyce A. Awuro, *Sangnyui Tani*[1]
[1]University of Maryland College Park
Andrea L. Kalfoglou, Assistant Professor, Department of Sociology/Anthropology

It is unclear which combination drug therapies to treat malaria causes by plasmodium fulciparium are appropriate in different ecological and social settings. Malaria affects 40 percent of the world's population and is the leading cause of death in some African countries. Each year, more than a million children under the age of five die from this disease. Plasmodium fulciparium, the most common cause of malaria, has become resistant to many anti-malaria drugs. As a result, 34 African countries have adopted artenisinin-based combination therapy. This paper reviews and assesses clinical trials that used artinisinin-based combination therapy to treat and prevent falciparum malaria in different parts of the world. Following the assessment of the clinical literature, I discuss the environmental and economic factors that may influence the success of anti-malaria drug combination treatments. I conclude that additional research is needed to determine which combination therapies are most appropriate for different populations. In addition, we cannot neglect traditional public-health interventions that disrupt the chain of infection such as the use of bed nets, mosquito repellant, and water treatment.

Gender and the Use of Social Networking Sites

Tawny F. Barin
Anita Komlodi, Assistant Professor, Department of Information Systems

Social networking websites have increased in visibility in recent years and provide an important platform for college-age users' communication and social networking. This study investigated the rising significance of social networking sites in the lives of college-age users, specifically exploring whether there are any differences in how male and female users represent themselves and relate to their self representations. Data was collected from thirty participants, fifteen male and fifteen female college students ranging from the ages of 18 to 22, via participant interviews, observation of their regular use, and analysis of the content of their social networking profiles. Through these methods, both gender differences and similarities were identified in the areas of use, identity representation, socialization and communication. The results have helped us gain a better understanding of how and why interaction within online communities has become such a significant part of life for this user group, despite the lack of face-to-face communication, and in the areas of sociability and usability of online communities in general.

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

Development of an Artificial Nose for Detecting Ambient-Air Particulates

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

A sampling and detection system was developed for measuring the concentration and composition of fine particulates that would be found in ambient air. Inhalation of particulates has been linked to numerous adverse health effects. For example asthma can result from the inhalation of larger particulates, and more serious problems such as lung cancer or Alzheimer's disease occur with small particulates. A method of measuring the concentration of particulates in the ambient is in use, but the composition of these particulates is not as highly regulated. The system presented here seeks to simulate the human nose by using a microdialysis probe and a sampling scheme that is more similar to inhalation than current methods. The sample was directed to GC/MS analysis. Particulates were either collected, like dust and cigarette smoke, or particulates were synthesized. Once the precision and accuracy of the method is maximized, it can be compared to the current methods used to sample particulates.

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

Backpropagation Analysis of Silent Cerebrovascular Disease and Cognitive Function in a Community-Dwelling Adult Sample

Joshua F. Betz
Shari R. Waldstein, Professor, Department of Psychology
Tülay Adali, Professor, Department of Computer Science and Electrical Engineering

Silent cerebrovascular disease is prevalent among older adults and is a risk factor for future stroke. Indices of silent cerebrovascular disease include structural brain abnormalities on magnetic resonance imaging (MRI) such as white matter hyperintensities, ventricular enlargement, and widening of the sulci. Here we examined the relation between MRI ratings of silent cerebrovasulcar disease including periventricular and deep white matter disease, silent brain infarction, and brain atrophy to cognitive function using a novel computational approach. Using demographic, neurocognitive, and neuroimaging data from 98 healthy, community-dwelling older adults [mean age = 66.5 (6.6), 65 percent male], a neural network regression model was trained to estimate a participant's performance on neurocognitive tests of attention, memory, executive functions, and spatial abilities including Digit Span, the Stroop Color-Word Test, the Trail Making Test, Logical Memory, Visual Reproductions, Judgment of Line Orientation Test, and Block Design. The network was trained using data from 74 participants until convergence, and performance of the model was subsequently evaluated on a randomly-selected validation set of 24 participants. Estimated performance on neurocognitive testing could provide valuable information in both clinical and research applications.

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

Morning

Andrej J. Bevec
Eric Dyer, Assistant Professor, Department of Visual Arts -Animation

The goal of this project was to create a short animated film that blended traditional two-dimensional animation techniques with modern animation and compositing tools. The animation needed to retain a pen-and-ink style while still allowing for the use of three- dimensional background components, creating a technical challenge. The animation explores the effectiveness of short narrative in a largely silent space: the film essentially has no dialog but tells a complex story. Thematically it addresses the helplessness of man in the sprawl of urban topology and modern living. The character animation was created with the traditional pose-to-pose method: the film was timed frame-by-frame and extreme actions were drawn first. Sequences of drawings were then created between the extreme actions to create a sense of animation. These drawings were then individually refined and colored before being added on top of the background elements. The work addresses the technical difficulties that arise from blending modern and traditional animation methods while also experimenting with allegorical storytelling in a silent, compact medium.

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

Calcium Dynamics in the Extracellular Space of Neural Tissue

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

Calcium ions are involved in a number of signaling pathways and are necessary for synaptic transmission and plasticity. Calcium dynamics in the extracellular space of neural tissue is the subject of this study. In this work, extra cellular calcium dynamics in neural tissue is investigated using a deterministic and stochastic model. The model development depends on the identification of three important transport phenomena: (1) consumption, (2) replenishment and (3) diffusion. The deterministic model was developed by describing these transport phenomena using differential equations. The stochastic model was developed by creating a Gillespie algorithm analogy for the mentioned mechanisms. The models showed that calcium fluctuation in neural tissue is a part of normal neural activity. The sensitivity of this fluctuation to various biological parameters was studied. The signaling capabilities of this fluctuation were studied owing to calcium's involvement in hundreds of intracellular processes. We saw that the fall in calcium ions was strong enough to be felt through the neural tissue. The roles of diffusion in setting up conditions under which these fluctuations can be amplified and felt through the neural tissue were investigated. Variables that can influence diffusion and possibly have an impact on the signaling capabilities of this fluctuation were investigated.

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Active Coping and Perceived Control Influence Cortisol Responses to Acute Pain among Women

Samantha P. Bier*, Burel Goodin, Lacy Mayes, Gayle Page[1], Lynanne McGuire*
[1]Johns Hopkins School of Nursing
Lynanne McGuire, Assistant Professor, Department of Psychology

Low levels of cortisol in response to stress have been linked with poor health outcomes, including chronic pain. Previous studies have noted sex differences in psychological and physiological responses to pain. The present study examined whether active coping predicted magnitude cortisol response to acute pain, and whether perceived control over pain moderated this association among men and women. Young, healthy adults completed a cold water acute pain task and provided salivary cortisol samples before and after pain. The Survey of Pain Attitudes (SOPA) was used to assess perceived control over pain, and active coping was assessed by the Coping Strategies Questionnaire-Short Form (CSQ-SF). Results showed a significant relationship between greater use of active coping and a greater magnitude salivary cortisol response to acute pain among women who reported high perceived control over pain; associations among men were nonsignificant. Alternatively, women who did not perceive control over pain and who engaged in fewer active coping strategies did not produce an adaptive cortisol response to pain. Future work should examine whether interventions targeting perceived control and coping modify cortisol responses to acute pain toward a more adaptive response.

This study was funded by a UMBC SRIS.

Site and Social Hierarchy in the Mycenaean Kingdom of Pylos

Weston S. Bittner
Marilyn Y. Goldberg, Professor, Department of Ancient Studies

Study of the emergence of statehood on mainland Greece, i.e., the formation of a system of government extending throughout a region, was limited traditionally by both a deficiency in the archaeological record and a subsequent focus on well-known palatial centers. This narrow focus created the illusion of a large gap between the elite and the general population of Mycenaean Greece. Recent developments in regional survey, however, have shifted the focus away from the palace to smaller habitation sites and installations. Thus, regional palatial centers are considered as independent extensions of polity. In this project I focused on the regional center. Multiple relationships and systems of control were identified between the regional center and its palace through the movement of agricultural and industrial produce. These relationships were not limited to those between the palace and regional center; for important installations and individuals in neither palace nor regional center also were identified. The ability of the palatial and regional center to maintain control that permitted a constant movement of produce stemmed from the role of both as social centers for the region, and from their ability to limit access to certain items. The results of this research revealed a greater diversity of settlement and social class within the kingdom of Pylos. It also suggested a network of control extending from the palace to its regional capitals in a provincial form of government. Theoretical and practical aspects of such comparisons will continue to offer verifiable hypotheses in future studies that will further delineate this system of government within Pylos and throughout Mycenaean Greece.

This work was funded by an Undergraduate Research Award from the UMBC Office of Undergraduate Education and an Ancient Studies Department Fieldwork Scholarship from the UMBC Department of Ancient Studies.

Sparrows Point: A Study of the Influence of Deindustrialization on a Baltimore Neighborhood

Sarah M. Blusiewicz
Kriste Lindenmeyer, Professor, Department of History

This project examines the effects of deindustrialization on the Sparrows Point community in Maryland from the mid 1970s to the present. The decline of the steel industry in Sparrows Point led to significant social shifts including changes in education, employment trends, demographics, and the very character of the neighborhood that are examined in my study. The history of Sparrows Point illuminates what happens to a community from an industrial boom stage, through the deindustrialization process, and to its struggle to reinvent itself in a global economic world. The examination of larger economical trends provides a national and international context for the Sparrows Point experience. Included oral history provides important evidence in this project and helps to establish conclusions and provide personal analysis of the deindustrialization process. This project uses an interdisciplinary approach of sociology, economic, political science, and history to examine the changes in Sparrows Point during the late twentieth century.

Analysis of the Mechanical Behavior of Bovine Descending Aorta

***Brandon H. Borde**, Joseph Washington*
Tim Topoleski, Professor, Department of Mechanical Engineering

There is a large potential for arterial damage when the human body is subject to traumatic conditions (e.g. a car crash). Therefore, it is important that we fully understand how such conditions can lead to the damage or rupture of arteries. To test the mechanical response of blood vessels under various loads that simulate trauma, samples of bovine descending aorta will be tested using our Biological Materials Testing System (BiMaTS, Topoleski, *et al*., 1997). The BiMATs will be used to apply different loads to each specimen, while a CCD camera tracks the displacement of markers on the specimen's surface. From these measurements, we will analyze stress-strain behavior. After testing, the samples will be treated with three different staining solutions to differentiate between of the artery's elastin, collagen and the smooth muscle cells. We will investigate the relationships between the arterial structure, and the response to the mechanical loading. Currently, we are improving the testing capability of the BiMaTs by integrating a new software package called LabView. The original hardware (stepper motor and encoder) are wired through a new terminal that interfaces with the software for data acquisition and interpretation.

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

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

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

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

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Two Media, Same Metamorphoses: The Works of Ovid and Bernini

Cally E. Brandt
Carolyn G. Koehler, Professor, Department of Ancient Studies

As the Renaissance faded into the Baroque style of art, Bernini worked marble into some of the most moving representations of Ovid's masterful poem, the *Metamorphoses.* I discovered connections between Bernini's sculptures, *Pluto and Persephone, Apollo and Daphne* and Aeneas in his *Flight from Troy,* and the work of Ovid, an ancient Roman poet of the late first century B.C. to early first century A.D. With detail that provides a unique reading of the *Metamorphoses,* Bernini retells Ovid's poem, so that not only do the images enrich the text, but also the text illuminates the visual representations. I analyzed the formal artistic values of the sculpture alongside the literal translation of text, and compared the differing personalities of the characters. I have discovered that there is a convergence of ideas about the *Metamorphoses*, which inspires a more accurate and insightful interpretation of the whole work.

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

Procopius of Caesarea: The Buildings

Timothy M. Brosius
Fred Worden, Assistant Professor, Department of Visual Arts

This project was a coming together of a large research effort and a film production workflow. *Procopius of Caesarea: The Buildings* took hundreds of hours over the course of half a semester to complete and along the way afforded me the opportunity to work with experts in both Byzantine history and film production. The film is about Procopius, the Byzantine historian at the time of Justinian the Great, and his viewing of the completed structure of the Hagia Sophia in Constantinople. I collaborated with UMBC professor of Byzantine history, Dr. John Birkenmeier. With his help and lots of research, I was able to use the actual plans of the modern day Hagia Sophia and primary source texts written by Procopius and others to create a three-dimensional model of the building as it would have looked in 560 CE when Procopius saw it. I also worked with UMBC professors Cathy Cook and Fred Worden to master the necessary production techniques to produce the film in Super 16mm color film and composite the film into the animated environments. The final step was transferring the completed work to digital video in order to capitalize on that medium's distribution possibilities.

Analysis of Aromatase Expression in the Breast/Stromal Microenvironment between African American and Caucasian Women

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

Premenopausal African-American women have a higher incidence of breast cancer when compared with premenopausal women of other ethnic groups. These differences could be due to distinct biological factors affecting the growth of mammary epithelial cells and their interaction with the surrounding breast adipose tissue. Aromatase (*CYP19*) plays a crucial role in estrogen production and subsequently a role in breast cancer. This study will utilize normal breast pre-adipocytes and malignant epithelial cells from premenopausal African-American and Caucasian women to determine whether there are race-specific differences in aromatase expression. Breast pre-adipocytes will be treated with two known modifiers of aromatase expression: (1) malignant epithelial cell-conditioned media, and (2) the synthetic herbicide, atrazine. Total RNA will be isolated and TaqMan-based real-time PCR will be performed to measure aromatase transcript levels. Preliminary studies have been performed to optimize the real-time PCR assay conditions using abdominal and subcutaneous adipose tissue taken from a Caucasian female sample. Current results suggest that aromatase can be readily detected in the human samples by real-time PCR and it is predicted that aromatase expression will be higher in breast preadipocytes from African-American women compared to Caucasian women in response to the aforementioned treatments.

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Mechanical Properties of Electroformed Fused Deposition Modeled-Copper-Nickel Hybrid Materials

Devin E. Burns*, Babak Farrokh*
Marc Zupan, Assistant Professor, Department of Mechanical Engineering

Rapid prototyping parts are used widely in the engineering design process, but are frequently limited only to the design process because of their poor mechanical performance. Research on stereolithography and laser sintered parts suggests that electroforming over rapid prototype materials results in improved mechanical properties. This work explores electroplating over fused deposition modeled parts with copper and nickel. Mechanical response is investigated with respect to plating thickness and fused deposition build orientation. Results indicate that electroplating copper and nickel coatings increases yield strength (up to four times), stiffness (up to fifteen times) and toughness of the parts. Parts built with the fused deposition fibers parallel to applied loads exhibit higher yield strengths whereas parts built ±45º to applied loads exhibit higher elongations to failure and toughnesses. The stiffnesses of the parts did not exhibit build-direction-dependence.

This work was funded through an Undergraduate Research Award from the UMBC Office of Undergraduate Education. Thanks to Sean Wise at Repliform (Baltimore, MD) for performing the electroforming.

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

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

Much of what we know about G-Protein Coupled Receptors (GPCR's) structure is solved from studies of rhodopsin, because it is the only GPCR to have its crystal structure unraveled. Although the dark state structure for rhodopsin has been determined, no other opsin structure has been deciphered including the many cone opsins used in bright light detection and color vision. The primary goal of this project is to further the understanding of the cone opsin structure using site directed spin labeling. A series of mutant cone opsins must be constructed where the native cysteines are replaced with serines. Additionally, site specific residues are changed to cysteines where we desire to place the spin label using Quickchange Mutagenesis™. Through a PCR type protocol, the primers are elongated to replicate the entire length of the plasmid. Through the digestion of the parental template by *Dpn*1, desired DNA with mutation would be able to be transformed into a bacterium. Through these methods C140S and V139C mutations were made in rhodopsin and the corresponding residues C156S and V155C, as well as cystein mutations at residues 248-252 were mutated in the Human green opsin. All five mutation sets are accomplished, four mutations in each insert set.

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

The Effect of Mouse Nasal Epithelium Damage on the Proliferation of Solitary Chemosensory Cells

Ramon M. Cabrera*, Weihong Lin*
Weihong Lin, Assistant Professor, Department of Biological Sciences

Solitary Chemosensory Cells (SCCs) are cells that were first found in aquatic animals but have recently been discovered in the respiratory and digestive systems of mammals. The SCCs that are the main focus of my project are located in the mouse nasal epithelium. The specific function of SCCs in mammals is unknown. We hypothesize that they play a role in triggering responses to airborne irritants. The goal of my project is to test whether the destruction of the mouse nasal epithelium has an effect on the number of SCCs found in the mouse epithelium after the epithelium has recovered from the damage. The developmental origin of SCCs in mammals is still very unclear so this project could also possibly elucidate the relationship between the epithelium and the SCCs located within it. In order to damage the epithelium, I will use the chemical methimazole. To analyze the proliferation of the SCCs, BrdU labeling will be used. Preliminary tests have shown the BrdU labeling process to be successful, and further testing will be used to establish a baseline value for the number of SCCs in the epithelium before damage occurs.

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Solvent Effects on Charge-Transfer Complexes

Elizabeth A. Campbell
Bradley R. Arnold, Associate Professor, Department of Chemistry and Biochemistry

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

This work was funded, in part, by ARL-JIEDDO.

Beats from the Streets: Music in its Most Sincere Form

Paul J. Carmack
David Kim-Boyle, Assistant Professor, Department of Music

Beats From the Streets was an effort to try and get those who love music to support those who make it by recording and publishing the music of street musicians and donating all profits to charity. I traveled into Washington D.C. and New York City to find musicians, some who love music and some who rely on it. I went into the cities and interviewed these artists and found out about their different experiences that have led them to creating music on the streets of their respective cities. I found out about the music that they make, and the rules that local government has made to try and abolish this form of "aggressive solicitation." After I talked to these artists, they allowed me to record some of their music. I took all of these recordings of inner city musicians and compiled a CD that I then sold with all funds raised donated to the Coalition for the Homeless in Washington D.C.

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

The Investigation of Toxic Crotamine for Drug Delivery

Pei-Chun Chen
Richard Karpel, Professor, Department of Chemistry and Biochemistry

Crotamine is a toxic component of the venom of the South American rattlesnake. At sub-lethal concentrations, it is a potential drug delivery vector because it penetrates the cell membranes and localizes in the chromosomes. In addition, it binds plasmid DNA. This investigation is concerned with the details of the DNA binding properties of crotamine, and provides the binding site size, affinity, and length dependence. The binding site size determined from the raw fluorescence quenching data appeared to be seven nucleotides per crotamine. Using a Scatchard plot analysis, the actual site size was 4.6 nucleotides per crotamine, and the binding was non-coorperative and overlapping. In a buffer containing 0.01 M NaCl, the association constant for this stoichiometric binding was 2.1 X 10^6 M^{-1}. With long-chain nucleic acids, consistent quenching data was not observed. UV spectra of protein and long-chain nucleic acid mixtures showed evidence of scattering, suggesting that aggregation was occurring. The aggregation was dependent on DNA length and the degree of binding saturation. At a protein to DNA ratio below saturation, longer strand nucleic acids precipitated from the solution more readily than shorter strand nucleic acids. Ongoing experiments include determining the protein's preference for single vs double strand nucleic acids and base specificity.

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

Education and its Role in Recovery from a Hip Fracture

Nancy S. Chiles*, Ann Gruber-Baldini*
Ann Gruber-Baldini, Associate Professor, Epidemiology and Preventative Medicine, University of Maryland School of Medicine

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

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Invisible Me

Angel D. Chinn
Doug Hamby, Associate Professor, Department of Dance

This dance experiments with lighting design to explore ideas of perception. This piece seeks to provide the audience with two perspectives on one idea. Special lighting is used to create a silhouette of the dancer. The dance intertwines silhouetted moments and clear light to provide two different views of one dancer or entity. *Invisible Me* attempts to create expression through dance while challenging the audience to examine their sense of perception. As the lights dim, only the shadow of the dancer emerges, and there is great emphasis on the shapes of the body. The interpretation of the piece relies solely on the articulation of the body and visceral movement. As the performance progresses, the lights brighten and the complete dancer once again becomes distinguishable. This time the audience gets to explore the piece not only through the shape of the body and movement, but also through the face. Some viewers may now identify and connect to the eyes and facial expression, while others may relate more to reading the body language. This piece encourages the audience to examine one idea from two alternating perspectives. *Invisible Me* aspires to entertain and provide an outlet for discovery, expression and discussion.

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

Michael A. Comberiate, Jr.*, Joseph McQuail[1], Maria M. Hadjimarkou[1], Tamara Blutstein[1], Loren Thompson[1], Jessica A. Mong[1]*
[1]University of Maryland School of Medicine
Jessica A. Mong, Associate Professor, Department of Pharmacology and Experimental Therapeutics

Cigarette smoking by pregnant mothers has been associated with adverse outcomes including low birth weight and reduced fetal oxygenation. Nicotine, a significant toxic component of this smoke, is able to cross the placental barrier and directly interact with fetal organs. Complications from neonatal nicotine exposure have been associated with later cognitive deficits including lower IQ and attention deficit disorder. Previous work has demonstrated that fetal nicotine exposure induces proinflammatory cytokines in the developing hippocampus. Matrix metalloproteinases (MMPs), implicated in normal synaptic formation in the hippocampus, degrade the extracellular matrix and are additionally activated by inflammation. Presence of MMPs in significantly different levels than control animals may indicate perturbation by nicotine exposure. To test the hypothesis that nicotine acting directly on the brain changes MMP protein levels, fetal guinea pigs were exposed *in utero* to nicotine. Pregnant animals were exposed to nicotine and the fetal brains collected and fresh-frozen. The brains were sectioned via cryostat and regions of the hippocampus were removed and processed via Western blotting with the antibody Anti-MMP-9, near C-terminus, clone 56-2A4, which marks MMP concentration. Higher MMP levels appear as increased banding during the Western blot procedure; comparison to control animals determines the effect of nicotine exposure.

This project was funded, in part, by an OTRD grant awarded to LT and JAM.

Do Race and Gender Influence Perceptions about Individuals with Sickle Cell Disease?

Ishmeal M. Conteh
Shawn M. Bediako, Assistant Professor, Department of Psychology

Very little is known about social attitudes towards sickle cell disease (SCD). The present study evaluated social perceptions about individuals with SCD. Two hundred twenty-nine male and female adults from a broad range of racial and ethnic backgrounds completed an online survey in which they were asked to indicate on a seven-point scale the extent to which positive and negative adjectives described the "typical person" with SCD. Results of independent *t*-tests and one-way analyses of variance suggested the presence of both racial and gender differences. Specifically, among those reporting *positive* perceptions of SCD, females had significantly higher ratings than males (4.58 vs. 4.32) and African Americans had higher ratings than Asian Americans (4.6 vs. 3.97). Among those reporting *negative* perceptions of SCD, White Americans had significantly higher ratings compared to African Americans (3.52 vs. 3.15). These results suggest a need for further studies that assess the impact of public perceptions SCD, particularly on the psychological, emotional and social adjustment of individuals who cope with the illness.

This study was funded by a Henry C. Welcome Fellowship Grant awarded to Dr. Bediako through the Maryland Higher Education Commission.

Copper Amyloid-beta Complex in Alzheimer's Disease

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

Alzheimer's disease (AD) is the seventh leading cause of death in the United States. Extracellular proteinacous plaques of the amyloid-beta (Aβ) peptide are linked to dementia in patients. Metal ions like copper (Cu) are in the Aβ plaques from AD patients, but the significance of this finding with regard to disease etiology is unknown. We aim to characterize the interaction of copper with Aβ to elucidate its role in AD. The Aβ gene has been amplified by PCR and ligated into a modified *pET-21* vector designed by Dr. Garvie (UMBC, Chemistry and Biochemistry). This vector allows for controlled expression and includes a protease site that allows for cleavage of the Aβ peptide. Expression will be evaluated using gel electrophoresis. The Cu:Aβ complex changes its size/structure over time and the effect of these changes on neurotoxicity is not known. We will determine neurotoxicity of these Cu:Aβ complexes using a rapid neurotoxicity assay developed by Dr. Good (UMBC, Biochemical Engineering). After we have identified which Cu:Aβ complex has the largest effect on neuron survival, we will determine its structure using site directed spin labeling. Correlation of neurotoxicity with Cu:Aβ structure will aid drug intervention strategies for AD.

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The Role of Thymidine Kinase and Thymidylate Synthase in the Response of Tumor Cells to 2'-F-ara-deoxyuridine

Casey M. Daniels, *Phillip Shelton[1], Pornima Phatak[1], Colette Burgess[1], Karthika Natharajan[1], Patrica M. LoRusso[2], Angelika M. Burger[1]*
[1]University of Maryland School of Medicine
[2]Wayne State University, Detroit, MI
Angelika M. Burger, Associate Professor, University of Maryland, School of Medicine

Prodrugs enhance the solid tumor selectivity of anticancer drugs, addressing a need faced by many of today's patients. 2'-F-ara-deoxyuridine (FAU) is a suicide prodrug which has to be phosphorylated by thymidine kinase (TK), and methylated by thymidylate synthase (TS) in tumor cells before it can be incorporated into their DNA causing cell death. Therapeutic approaches exist which target the enzyme TS such as 5-fluorouracil (5-FU). Resistance to 5-FU stems from an up-regulation in TS. FAU could offer a targeted treatment to patients with high levels of TS. Studies of TS protein and mRNA revealed an inverse relationship between TS expression and a cell's responsiveness to 5-FU. To assess whether sensitivity of cancer cells to FAU is related to TK or TS levels, we analyzed protein expression by immunohistochemistry and Western blot, and mRNA expression by RT-PCR, in eight human cancer cell lines. Those cells which had low TS were resistant to FAU, while those with exquisite amounts of TS expression proved sensitive. While low TK expression appeared sufficient for effective phosphorylation of FAU, high TK levels seem to increase FAU cytotoxicity. Our data suggests that FAU may be useful as an alternative therapy for cancer patients and warrants further investigation.

This work was supported by the Maryland Cancer Research Fund and U01-CA62487: P.M. LoRusso (PI).

Black Women's Attitudes on Interracial Dating: A Qualitative Study

Ebony L. Davis
Laura Ting, Assistant Professor, Department of Social Work

Literature suggests that black women are less likely than any other racial group to date interracially (Qian, 2005); however, as increasing numbers of black women become more highly educated than black men, there are fewer available, educated black men for them to date (U.S. Census, 2007). This study interviewed 14 black women, between the ages of 22 and 55, of various educational backgrounds, to understand their attitudes and beliefs toward interracial dating and spousal selection. Data was transcribed and analyzed using line-by-line coding to determine common themes. The study showed that half of the women would date interracially because they considered themselves to be "color blind," while the other half would not date interracially because they felt that other races would not understand them. Concerns regarding racial identity, child rearing practices, and marriage are additional themes. Who black women will date has ramifications for who will raise black children and has implications on what the black middle class will become. Recommendations and future research goals are discussed.

This research was supported by the Ronald E. McNair Post-Baccalaureate Program at UMBC and the Summer Research Institute.

Study of Kurt Kren and Experiments in Structural Film

Evan Devine
Faculty Mentor: Fred Worden, Assistant Professor, Department of Visual Arts

This study explored the work of experimental filmmaker Kurt Kren and the processes he used to create his structural films. Kren's films can be seen as precursors to the possibilities of new digital media to explore reality and visual perception using the powerful software tools available to artists today. Contemporary painting and sculpture influenced Kurt Kren's approach to film, more so than mainstream narrative cinema. Having studied his films, as well as researching the techniques Kren used in the production of his films, I produced a film using similar approaches. I experimented with exposing film multiple times and obscuring the camera's lens, amongst other techniques to create my film. I focused on Baltimore's public surveillance cameras with flashing blue lights, which is similar to films Kren had made where the observer becomes the observed. In addition to my film, I will present a lecture on Kurt Kren's work, followed by a screening of selected Kren films sometime in late May.

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

National Identity in Monuments – Analysis of Interactions between Russia's Youth and Moscow's Public Monument Sites

Matthew J. Dolamore
Elaine Rusinko, Associate Professor, Department of Modern Languages and Linguistics

Public monuments erected in the world's capital cities hold unique significance in the formation of the historical awareness and ideology of a particular society. In Russia, national identity has been in flux since the 1991 break-up of the Soviet Union. April, 2007 saw a violent debate erupt in reaction to the removal of a Soviet World War II memorial from Estonia's capital. Tensions flared over historical and emotional ties to the monument, dividing the country's ethnic Estonian and Russian populations. This study analyzed the relationship between Russian citizens and established monument sites throughout Moscow's public space, focusing on peoples' physical and overt emotional interactions with the monuments. I observed dynamic and interactive relationships and expressions, including those of mourning, pride, disdain and indifference, which provided evidence of the contemporary Russian national identity. Collected data included photographs, interviews, news media, and other literature. Following the data analysis, individual ideological differences were noted in regards to, among other themes, the memorialization of World War II, the Soviet legacy, and the national cultural heritage. Completed during the Fall 2007 semester while I was studying abroad at Moscow State University, my research presents evidence of a significant generational divide in the character of a nation in the midst of a controversial election year.

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

Outside the Inside

Carly F. Engelke
Doug Hamby, Professor, Department of Dance

This dance explores the issue of body image, and how people are constantly judging themselves based on their reflection the mirror. As a woman and a dancer I grew up constantly evaluating my body, as did many of my peers. I wanted to create a dance that would put impossible dreams of perfection into perspective. To reach this goal, I attended Pro Danza Italia in Castiglioncello, Italy for three weeks in the summer of 2007. I took numerous technique, composition, and improvisational classes with dance experts from around the world. These composition and improvisation classes dealt a lot with partnering techniques, and approaches to choreography. Partnering was extremely important in my final creation because of the use of two large frames representing mirrors, and the use of body manipulation. I used my newly gained knowledge to help the dancers partner each other in perfect unison forming mirror images, and for contact and lifts throughout the piece. The dance is designed to resonate with everyone because it suggests that no one is perfect and perfection is impossible. I believe people should love themselves and other people for what is on the inside, not the outside.

Hispanic Heritage Month and Hispanic Identity

Anastasia R. Feaster
Denise D. Meringolo, Assistant Professor, Department of History

"Hispanic Heritage Month and Hispanic Identity" explores the political effectiveness of the term "Hispanic." The paper examines uniting and dividing forces within the Hispanic community, focusing in particular on the ways in which various communities interpret Hispanic Heritage Month. Hispanics have become the largest minority in the United States, yet they are constantly struggling to ameliorate common stereotypes. Though the term "Hispanic" has been largely imposed on members of the community by American government and media, the term is now engrained in American culture. Thus the term has historically proven to be both a roadblock and a vehicle by which diverse communities can achieve social, cultural and political viability. This paper suggests that Hispanic Heritage Month should offer an opportunity for Hispanics to shape Hispanic image and identity. Through its celebration by the governmental and educational systems, Hispanic Heritage Month has the potential be a tool for the portrayal of Hispanics as an essential and vital part of United States history and culture. Unfortunately, many celebrations of Hispanic Heritage Month serve either to divide the community or to reinforce stereotypes. This paper concludes that an overhaul of many such programs is necessary as a first step in shaping a positive identity for the Hispanic community.

Exploring Patient Characteristics in Treatment Decision-making among Black and White Physicians in the United States

Julie C. Fields*, Shedra A. Snipes*[1]*, Vence Bonham*[2]
[1]The University of Texas, MD Anderson Cancer Center
[2]National Institutes of Health – NHGRI
Vence Bonham, Associate Investigator, Social and Behavioral Research Branch

Little is known about the importance of race and other patient-level socio-cultural characteristics on clinical decision-making. To remedy this gap in information, our study used qualitative methods to explore physicians' views about the importance of race and social history of their patients, for treatment decision-making. Ten race-concordant focus groups were conducted in five different metropolitan areas with 90 self-identified black and white board-eligible or -certified general internists. Participants were presented with a brief clinical vignette and asked to discuss the relevance of race to the vignette and other information they needed to treat the hypothetical patient. NVivo 7® was used to code and qualitatively analyze the vignette transcripts by physician race, and academic vs. non-academic practice setting. All physicians believed that medical history, family history, and weight/BMI were important to the patient's treatment. Further analysis indicated that black physicians were more likely to consider the patient's race and to discuss the importance of the patient's beliefs about illness and socioeconomic factors. Furthermore, whether the physicians practiced in an academic environment or not also influenced how they perceived the importance of patient race, beliefs, and socioeconomic factors.

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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 translating 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, thereby regulating translation. The purpose of this project is to isolate mutations in the L4 and L22 r-proteins in *Escherichia coli* by selecting for resistance to the antibiotic tylosin. Thus far, I have isolated four mutations in L4 that confer tylosin resistance. Previously, our laboratory had isolated two of the mutations but two are new: an arginine to serine mutation at amino acid 69, and a proline to threonine and alanine to glycine double mutation at amino acids 65 and 66. A number of characterization assays have been performed with the novel mutations including temperature sensitivity, cross resistance to other antibiotics, sucrose density gradients, and an erythromycin binding assay. 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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Functional Characterization of RNase MRP in the Absence of XRN1 in order to further Elucidate Ribosomal RNA Processing

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

Proteins are synthesized by ribosomes. Ribosomes contain RNA subunits that are processed from a long precursor while becoming a part of the final ribosome. Ribosomal RNA is cleaved internally by RNase MRP at the A2 and A3 sites of Internal Transcribed Spacer-1. RNase MRP interacts with a protein that cleaves 5'>3' named Xrn1p. Previously, we have succeeded in deleting a major part of the *XRN1* gene, while attempts to delete the entire gene have failed. This putative interaction between RNase MRP and the Xrn1p incited an additional attempt to delete the entire *XRN1* gene. We repeated the experiment by replacing the *XRN1* gene with a PCR fragment containing a kanamycin-resistance (KanR) gene flanked by upstream and downstream regions of *XRN1*. Sequencing the junction between KanR and yeast chromosome DNA proved the *XRN1* gene was replaced. We introduced a gene for a temperature-sensitive RNA subunit of RNase MRP and eliminated KanR by site-specific recombination. Future experiments will test the ribosomal RNA processing of a double mutant containing both the temperature sensitive RNase MRP and a complete deletion of *XRN1*. We conclude that XRN1 can be deleted from the yeast chromosome, even in the presence of temperature sensitive RNase MRP.

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Nine

Glen R. Fortner*, David T. Porter*
Fred Worden, Assistant Professor, Department of Visual Arts

"Long descent into an electronic nightmare" is the first phrase I jotted down in a Word document with the title "ideas for my third film project." I started by listening to some electronica by *Nine Inch Nails*. I then invented visuals to go along with the music, and after a weekend of shooting, I manipulated the visuals with a variety of editing software. Instinct prevailed in the editing room. For a certain shot, I got the feeling that a green sky would work well, so I pressed a few buttons and it was done. I knew that this transformation worked, but I didn't know why. While the editing helped establish the surreal state, a feeling of panic arises after a man in a purple trench coat shoots an icy glare at the camera. The character might be out for revenge, or he could be mentally disturbed, but either way he is out to get you. This film is a nightmare played out on the silver screen. Dreams don't follow any kind of understandable logic, and they tend to focus on negative emotions. With *Nine* I have chosen dreams over reality.

The Forms of Goal Orientation and its Relation to Fear of Failure: A Correlational Study

Andrew T. Fritz
Diane L. Alonso, Program Director, Department of Psychology at USG

Based on past research conducted by Silver, Dwyer, and Alford (2006), this study investigates whether people who have a performance avoidance goal orientation also have a fear of failure. This study will also determine if people whose behavior falls into the other two subcategories of goal orientation, learned and performance-approach, experience fear of failure. Using a sample of 50 students from Universities at Shady Grove in Rockville, Maryland, the researcher expects to see a positive correlation between fear of failure and performance-avoidance goal orientation, and a negative correlation between fear of failure and each of the other two goal orientations. Results of this study will support past research declaring that fear of failure is only found with people who experience performance avoidance.

Effects of High-Level Troleandomycin Resistance in the 23S Ribosomal RNA of *D. radiodurans* on Ribosome Function

Shilpa Gadwal*, Janice Zengel, Lasse Lendahl*
Janice Zengel, Senior Research Scientist, Department of Biological Sciences

I am studying troleandomycin resistant mutations in the 23S ribosomal RNA (rRNA) of *Deinococcus radiodurans.* 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 23S rRNA gene. 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. I am seeking to identify mutants containing mutant copies of both 23S genes. To do this, I isolated mutants grown at very high levels of the antibiotic and then sequenced the 23S genes to determine if they both carry the same mutation. I isolated eight such mutants of the 23S gene in *D.radiodurans*. I tested the ribosomes containing only the mutant 23S rRNA by conducting erythromycin binding assays. We found that at certain locations in the 23S rRNA gene, a mutation affects whether erythromycin binds. At positions 2041, 2042, and 2589, we observed erythromycin binding, whereas, at positions 2040 and 2590 there was no erythromycin binding. In the future, we seek to characterize the effects of the nucleotide changes on cell growth rate accuracy of protein synthesis and assembly of ribosomes.

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The Effect of Pertussis Toxin on Mouse Airway Macrophages

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

The bacterium *Bordetella pertussis* can cause infection of the human respiratory tract and a disease known as whooping cough. It has been shown that infection of cultured human bronchial epithelial cells by *B. pertussis* up-regulates intercellular adhesion molecule-1, an important component of the inflammatory response, by activating the transcription factor, nuclear factor-kappa B (NF-κB). Furthermore, this up-regulation is inhibited by pertussis toxin (PT). This study aims to determine whether PT, a protein secreted by *B. pertussis*, has an inhibitory effect on NF-κB activation in mouse airway macrophages. To assess the role of PT in inhibiting immune responses, we used MH-S cells treated with different doses of *E. coli* LPS. Then we conducted a time-course experiment of IκB degradation by western blotting whole cell lysates with anti-IκB antibody. We also plan to test the inhibitory effect of purified PT, wild type *B. pertussis,* and PT-deficient strains in primary mouse airway macrophages. This study will further our understanding of how *B. pertussis* inhibition of the NF-κB pathway contributes to infection, in the hope that treatments may be developed to combat whooping cough.

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Pyrosequencing to Detect Resistance-conferring Mutations in *Plasmodium falciparum*

***Amber D. Gaither**, Malathi Vadla[1], Shannon Takala[1], Miriam K. Laufer[1], Christopher V. Plowe[1]*
[1]Dept. of Geographic Medicine, University of Maryland Baltimore, School of Medicine
Christopher Plowe, Professor of Medicine, University of Maryland School of Medicine

Malaria infects 350-500 million people annually and causes approximately 1 million deaths worldwide, mostly in sub-Saharan Africa. Antimalarial drugs are used to treat and/or prevent malaria but parasites develop resistance that compromise drug efficacy. Resistance to the antifolate drugs, pyrimethamine and sulfadoxine, is encoded by mutations in *Plasmodium falciparum* dihydrofolate reductase (*dhfr*) and dihydropteroate synthetase (dhps), respectively. These molecular markers are strongly associated with treatment efficacy. Our goal is to establish a high throughput method to assess these molecular markers. Pyrosequencing is a real-time sequencing method that detects pyrophosphate release during nucleotide incorporation by an enzyme cascade that generates light proportional to the nucleotides incorporated. This method sequences short stretches of nucleotides surrounding known polymorphisms. Preliminary studies have been successful in amplifying the regions surrounding *dhfr* codons 51, 59, 108, and 164 and *dhps* codons 436, 437, 540, 581, and 613. These amplified DNA fragments will be analyzed through Pyrosequencing. We hope that this method will be useful for analyzing specimens for sulfadoxine-pyrimethamine resistance to learn more about the emergence and spread of drug resistance.

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Lonely Girl

Daphne I. C. Gardner
Fred Worden, Associate Professor, Department of Visual Arts

Lonely Girl is a narrative film that follows a young girl's evolving relationship with a pillow. The film is a study of the natural tendency of humans to avoid painful realities by substituting the inanimate and the imaginary for real experience. The main character in the film suffers multiple rejections and compensates by romancing an inanimate object, a giant pillow. The film was shot in 16mm black and white using Bolex cameras from the UMBC film cage. The film was cut, spliced and edited on a Steinbeck machine. The musical pieces that accompany the film are *Claire de Lune* and *Deux Arabesques No. 1 in F minor* both by Claude Debussy. I conceived, shot, starred in and edited the film myself with the help of many friends. Evolving from its original conception as a self-deprecating view of my own personal relationships, the story of *Lonely Girl* finished as an optimistic look at how one can deal with the physical and emotional pain that are so often a part of real relationships.

Analyzing the Function of RlsA, a Paralog of the Master Cell-type Regulatory Protein RegA in *Volvox carteri*

***Anna Gitterman**, Alicia Howard, Evan Cameron*
Stephen M. Miller, Associate Professor, Department of Biological Sciences

Volvox carteri, a spherical green alga, provides an excellent opportunity to gain insights into the evolution of multicellularity because it evolved from a unicellular ancestor only fifty to seventy million years ago. *V. carteri* possesses only two cell types: ~16 immortal reproductive gonidia, and terminally differentiated motile somatic cells. The *regA* gene maintains the somatic cell fate by preventing reproductive function, most likely through transcriptional repression. Several *rls* (*regA* like sequence) genes have recently been identified in *V. carteri,* and we believe they, like *regA*, may regulate cellular differentiation and may have been important for its evolution. To test the first part of this hypothesis, we are characterizing one *rls* gene, *rlsA*, by creating gene constructs that encode epitope-tagged versions of RlsA. This strategy should allow commercially available antibodies to recognize RlsA in western blot and immunofluorescence analyses, so that we can determine when and where it accumulates during *V. carteri* development. Transgenic lines that express one tagged version of RlsA have been obtained, and lines that express a second tagged version should soon be available. Here we report our progress and preliminary results concerning RlsA expression and function.

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Reconfigurable Swarm Robotics

John S. Glaros, Chad Flanders, Charles Lohr*, Don Miner*
Tim Oates, Associate Professor, Department of Computer Science and Electrical Engineering

In "Swarm Robotics," several individual mobile robots work together to accomplish a goal. In "Reconfigurable Robotics," a single robot composed of many units, which are not individually mobile, reconfigures itself to achieve complex locomotion movements. This work was intended to combine the best of both fields of robotics to provide a new platform for creating new intelligence algorithms and techniques. A team of swarm robots communicate each other's positions and current statuses among one another to formulate the best plan of action to move closer towards finishing a goal. With the added mobility of reconfiguration, the robots have more options when confronted with difficult terrain. Through the use of infrared and ultrasonic sensors, the robots can detect objects and plan a path around them or, in some cases, over them. Swarm Reconfigurable Robotics is the future of difficult search and rescue missions as well as interplanetary exploration.

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

Latin American Trade Alternatives for the 21st Century

Christina M. Hawkins
Tim Gindling, Professor, Department of Economics
Devin Hagerty, Associate Professor, Department of Political Science

The issue of trade remains one of the many ongoing and controversial facets of U.S.-Latin American relations today, and it is currently experiencing several disparate trends within the region. Coming from the United States, the trend follows a pattern of bilateral free trade agreements or small regional trade agreements such as NAFTA and CAFTA. Coming from the socialist Venezuelan President Hugo Chávez and his close allies seems to be quite a different alternative, fittingly entitled, *La Alternativa Bolivariana para la Américas* (ALBA). Resulting primarily from deteriorating relations between President Chávez and the Bush Administration, ALBA completely excludes the United States from participating, thus allowing weaker countries to produce their own manufactured goods, rather than extenuating their dependency on the U.S. for their capital-intensive and high-priced goods. However, can ALBA live up to its promise of promoting growth and economic sustainability through the implementation of inter-dependent trade solely among the given capital and resources of its few signatories? My conclusions provide an answer to this question, by taking into account both a contextual and qualitative analysis of empirical facts as well as scholarly literature, in addition to the firsthand research conducted just one month ago during my trip to Venezuela.

Violin Performance Studies

Michael Herder
Airi Yoshioka, Assistant Professor, Department of Music

Last summer I strengthened my skills as a violinist by attending the Killington Music Festival in Killington, Vermont. This experience enabled me to make a positive contribution to the UMBC orchestra and chamber groups, my students, and my future as a violinist. I was in a small chamber group that performed every three weeks which gave me invaluable experience. I learned that in order to make music in any kind of chamber group there must be a communication without words between the players. At any given time during a piece of music, one player must lead and the others must learn to fit themselves in to the harmony. Learning how to function in a musical group helped me to be more knowledgeable in the roles that I fulfill for the UMBC orchestra. Since my experience at Killington I have been both concertmaster and principle second violinist. In both positions I function as a helper and a leader for the other violinists in my section. Also I had a private lesson every week with one of the teachers at Killington. In taking lessons with different teachers I received different opinions, methods of learning and styles of playing which not only helped me as a performer but helped me to be a better teacher as well.

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

Consumer Feeding Interacts with Selective Tree Species Loss in Streams: Consequences for In-Stream Ecosystem Processes

Aubrey L. Hillman*, Kaitlin Coolahan, Kayleigh Somers*
Christopher M. Swan, Assistant Professor, Department of Geography and Environmental Systems

We are currently experiencing the sixth major mass extinction in Earth's history. Ecological theory suggests that species loss should alter rates of ecosystem processes which change under different conditions. The purpose of this study was to determine if the selective removal of dominant tree species (e.g., due to logging) could affect organic matter decomposition in adjacent stream ecosystems. Many factors control leaf litter decomposition in streams, notably tree species that are present and the feeding activity of specialized aquatic invertebrates. When overstory trees go extinct or are removed, the amount and type of leaf litter in the stream changes. In Fall 2007, we determined the dominant tree species via the species-specific input rate of leaf litter to a small stream. We followed with a field experiment where we manipulated litter species composition in small cages placed in the stream and the presence/absence of invertebrate consumers to learn the decay rate of litter. This revealed that species loss of dominant trees in eastern Piedmont forests potentially interacts with in-stream ecological communities to alter rates of organic matter decomposition. This work highlights the potential for complex ecological interactions among species provided by small, headwater streams.

This work was funded, in part, by the UMBC Department of Geography and Environmental Systems.

The Intracellular Trafficking Pathway of MHC II Molecules is Altered in the Absence of Invariant Chain

Uzoma K. Iheagwara, *Jacobus J. Bosch, Bruce R. Ksander[1], Suzanne Ostrand-Rosenberg*
[1]The Schepens Eye Research Institute and Department of Ophthalmology, Harvard Medical School
Suzanne Ostrand-Rosenberg, Professor, Department of Biological Sciences

We are developing cell-based vaccines for the treatment of metastatic uveal melanoma. The vaccines consist of tumor cells that are transduced with genes encoding MHC Class II (MHC II) α and β chains and the costimulatory molecule CD80. *In vitro* studies indicate that the vaccines are effective because they do not express the MHC class II-associated accessory molecule Invariant Chain (Ii), which plays a key role in intracellular trafficking. These observations have led us to hypothesize that in the absence of Ii, the normal trafficking pattern of newly synthesized MHC II molecules is altered and may involve non-traditional compartments. To visualize the intracellular trafficking pathway, we have created a retroviral vector encoding MHC II α and β chains with a green fluorescent protein (eGFP) fused to its cytoplasmic domain. Confocal microscopy indicates that MHC II molecules in the Ii^- vaccine cells are present in endosomal compartments. However, their distribution within these compartments differs from that observed in Ii^+ cells. These results suggest that although MHC II molecules of Ii^- uveal melanoma vaccine cells traffic intracellularly via the endosomal route, the absence of Ii perturbs the micro-distribution of the MHC II molecules.

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Non-Covalent Interactions between Naphthalene Imide Compounds and Proteins

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

The refinement of chemical systems to probe the structure of biological macromolecules 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 associate with DNA, and can photo-induce DNA cleavage. Studies have shown that the cleaved site may be controlled by the substituent on the naphthalimide. For example when intercalative or groove-binding naphthalimides are bound to DNA, they are, respectively, capable of recognizing either guanine or thymine and cleaving these sites. Our laboratory studies the interactions of naphthalimide compounds with proteins. Changes in the UV absorption spectrum were monitored to assess the naphthalimide-protein interactions. We performed a time-test to determine the optimum reaction time for the interactions. The protein was successfully titrated into the naphthalimide at concentrations 0μM to 80μM. Current results show that the alanine-substituted naphthalimides bind to bovine serum albumin and lysozyme. Results on the substituent-dependent binding constants with a series of proteins will be presented. Future research will develop an understanding of how the ligand structure governs the protein binding properties.

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Taste Preference Test in Mouse Deficient Acetylcholine Receptor

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

The sense of taste is essential for animals because it allows them to detect substances that are nutritious or toxic. Previous studies show that acetylcholine receptors are present in taste receptor cells. These receptors are known to play important roles in the nervous system. However their function regarding taste reception is still unknown. The purpose of this study is to determine if acetylcholine receptors play an important role in the sense of taste, and to examine if dysfunction will perturb taste preference. In this behavioral study we compared taste preference in acetylcholine-receptor-deficient and normal wild-type mice. Taste preference was examined by two-bottle taste preference test; the mice were able to choose between two drink bottles, one containing control solution (water) and the other containing test solution with different substances for each taste. The volume of solution was measured every 24 hours and the preference was calculated using a ratio of volume of test solution consumed to total volume consumed. The test was repeated with sweet, salty, bitter, sour, and umami (MSG) tasting substances at different concentrations. Comparing results of normal mice with acetylcholine receptor-deficient mice, we will determine whether acetylcholine receptors regulate taste reception.

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Parasitoid Host Choice: An Evolved or Learned Behavior?

Ruby I. Jackson-Atogi, *Theresa K. Delaney*, *Jeff W. Leips*
Jeff W. Leips, Associate Professor, Department of Biological Sciences

Leptopilina clavipes is a parasitoid wasp that uses larvae of flies in the genus Drosophila as a host for their development. Selection of a suitable host species is critical for the fitness of the female wasp as an inappropriate host choice will reduce the number of successful offspring produced. An unresolved question is whether host preference is an innate or learned behavior. A previous study examining the host choice of *L. clavipes* with prior oviposition experience on *D. melanogaster* revealed that female wasps preferred *D. melanogaster* and *D. simulans* as hosts over *D. affinis*. In this study I examined the host preference of *L. clavipes* with prior ovipositioning experience on *D. affinis* to test the hypothesis that prior oviposition experience influences subsequent host choice. Naïve female *L. clavipes* were first allowed to oviposit on *D. affinis* larvae. We then tested female host choice using larvae of *D. affinis*, *D. melanogaster*, and *D. simulans*. Higher attack preference for *D. melanogaster* would suggest that host choice is an evolved innate preference. However, wasp preference for *D. affinis* would imply host choice is a learned behavior. This study will increase our understanding of the influence of learning on the evolution of host choice.

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Gas Sensing with Photoacoustic Detection

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

Explosive devices often give off trace gas particles of a deadly compound. Photoacoustic detection is an increasingly popular method for determining the identity of such gaseous molecules. This method is an ideal gas sensing mechanism since it does not require a large gas sample. In this study, we describe the construction and evaluation of a photoacoustic gas sensing device. The gas sensor works by first diluting the gas sample numerous times. Then infrared light from a laser excites the gas's constituent atoms, causing each molecule to vibrate. A photoacoustic cell picks up the sound of the vibrations via very sensitive microphones. A Fourier Transform Infrared (FTIR) Spectrophotometer is then used to generate a graph of the sound caused by the vibration of the different wavelengths of the laser's infrared light. Based on the peaks caused by light absorption of the different components in the gaseous compound, the material can be identified. The system was used to successfully identify gaseous methanol and acetone. We hope to continue testing the gas sensor system, using trinitrotoluene (TNT) as our next gas sample.

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Christina Stead's Religion of Love and the New Science of the Mind

Cheryl L. Jaworski
Piotr K. Gwiazda, Assistant Professor, Department of English

The purpose of my project was to examine the unpublished papers of the modernist Australian author Christina Stead as background material for a literary analysis of two of her novels—*The Man Who Loved Children* (1940) and *For Love Alone* (1944)—from the viewpoint of a new field in literary studies known as Darwinian literary criticism (also known as "adaptationist" or "evolutionary" literary criticism). In my research, I attempted to take a fresh perspective on the work of an original, difficult, and seldom understood author and to give a fuller, more detailed understanding of these novels than has been given in previous analyses. In particular, I attempted to address a specific need in the field—that is, to assess individual literary works as the expressions of the unique, individual identities of their authors within specific cultural ecologies. More generally, I believe that the unique tools an adaptationist approach has to offer literary analysis will help bridge the gap between the sciences and the humanities, ultimately creating a self-reinforcing and truly consilient body of knowledge.

Funding for this project was provided by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

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

Brandon J. Johnson*, Ricardo Pinto*
Tim Topoleski, Professor, Department of Mechanical Engineering

Total joint replacement is one of the most successful treatments for arthritis. Poly(methylmethacrylate) (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 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 resistance to fracture and fatigue. With the help of the Rohm and Haas Company, new bone cements have been created by adding novel particles with sizes on the micro- and nano-scale to existing bone cements to improve the microstructure. Fracture toughness tests have been performed on several modified samples to serve as an initial indicator of performance compared to standard medical bone cement. In addition, scanning electron microscopy (SEM) imaging has been used to analyze the fracture surface and crack propagation. Eventually, cyclical loading tests will be used to determine fatigue life characteristics and will serve as the primary determinant of performance. Longer fatigue life for bone cement will ultimately result in longer operational life of cemented prosthetics joints.

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Emulating an Acoustic Instrument Using Advanced Sampling Software

Christopher R. Johnson
Alan A. Wonneberger, Director of Recording Services, Department of Music

The goal of this research was to accurately emulate an acoustic marimba using current sampling software. Though samplers have been used for decades, their limitations made it practically impossible to create a natural sounding replica of an acoustic instrument. Most samplers use the same sample for every note. This causes the instrument to sound robotic compared to an acoustic instrument, which has a different timbre depending on which note you play and how loud you play it. However, using Reason's NN-XT Advanced Sampler I was able to record five different samples for every note on the marimba, each played at a specific volume. Once the samples were programmed into the sampler, a velocity-sensitive MIDI keyboard was used to control the software. MIDI, or Musical Instrument Digital Interface, is a digital protocol that determines the placement, pitch, duration, and velocity (volume) of notes played. Once a library of samples is created, it can be downloaded by anyone. This allows anyone with a basic understanding of music to play any instrument they want. The hope is that a skilled engineer can compose and create a complete movie score, combining samples from any instrument, without ever having to hire a single musician.

Investigating Potential Second Site Suppressors in the Amp A Pathway in *D. discoidium*

Vovanti Jones*, Jessica Sazma, Daphne D. Blumberg*
Daphne Blumberg, Associate Professor, Biology Department

A *Dictyostelium* protein, AmpA plays a role in cell adhesion and migration. AmpA null mutants have increased adhesion, decreased migration and delayed development. AmpA overexpressers arrest development during the mound stage and have decreased substrate adhesion. To identify components interacting in the AmpA pathway, second site suppressors that can overcome the primary mutation are created using restriction enzyme mediated integration (REMI). Using REMI a blasticidin-resistance cassette was inserted randomly into the genome and gene disruptants that suppresed the phenotype of the primary mutation were selected. Second site suppressors of the AmpA overexpressing mutant were isolated. Current work has focused on two aspects of these second site suppressor screens. 1) A blastocidin resistant bacterial strain that can be used to grow REMI mutants in the presence of blastocidin was created. OE and knockout cells were mutagenized using REMI and transformants were plated directly on blasticidin resistant bacteria, and observed for suppression phenotypes. 2) KO mutants were initially generated by the addition of a floxed-blasticidin cassette within the Amp A gene. Work has focused on introducing cre recombinase to remove this cassette in order to isolate second site suppressors of the AmpA knock-out mutants using REMI with the blasticidin cassette.

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What's in a Name?: Using DNA Barcoding to Identify Species of Oriole

Dorothy A. Kenny*, Frode Jacobsen*
Kevin Omland, Associate Professor, Department of Biological Sciences

The complexity of species limit is the sticking point when taxonomists try to define a unique organism. Morphological, genetic, and behavioral data is often factored into this definition, and so it is easy to see why using a single mitochondrial gene, cytochrome c oxidase I (COI), as a universal ID tag, or 'barcode,' has been a source of contention. The aim of *What's in a Name* has been to test the COI gene as an effective identification tool for the New World orioles, a closely related and taxonomically confusing genus. The twenty five recognized oriole species were sequenced at the Laboratory of Analytical Biology (LAB) at the Smithsonian Research Facility and the percent of divergence between and within sequences calculated. These percentages were then measured up to the one percent divergence threshold set on the Barcode of Life Dataystem (BOLD), within which two organisms would be considered the same species. Preliminary data has shown that of 14 species sequenced, four of them were distinct by these BOLD standards. This makes us question the use of COI as an identification tool, but it also poses an important metaphysical question: what makes a species?

Funding for this project was provided by an Undergraduate Research Award from the UMBC Office of Undergraduate Education.

The Effects of Perceived Control over Acute Pain on *in vivo* Catastrophizing

Yasmeen Khaskia*, Lacy Mayes, Lynanne McGuire*
Lynanne McGuire, Assistant Professor, Department of Psychology

Pain is the most frequent reason for doctor visits in the U.S. Pain catastrophizing, a negative emotional and cognitive response to pain, is among the most robust predictors of pain outcomes. The objective of the current study was twofold: to determine whether perceived control over pain changes during anticipation of and exposure to acute laboratory pain, and to determine whether perceived control over pain predicts *in vivo* catastrophizing during pain. Young, healthy adults completed the cold pressor task. Perceived control over pain was measured retrospectively, in anticipation of pain, and during exposure to acute pain using the Survey of Pain Attitudes. Pain catastrophizing was assessed during acute pain using the Pain Catastrophizing Scale. Perceived control significantly decreased from retrospective report to report during exposure to acute pain. Higher perceived control was associated with lower *in vivo* pain catastrophizing, and the strength of the association was strongest when perceived control was assessed during exposure to pain. These findings suggest interventions that target perceived control over pain may be used to lessen pain catastrophizing and improve pain outcomes.

This work was funded by a UMBC SRIS.

Reconstructing Evolution of Cacique Carotenoid Color

***Lynna M. Kiere**, Christopher M. Hofmann[1], J. Jordan Price[2], Thomas W. Cronin, Kevin E. Omland*
[1]University of Maryland, College Park [2]St. Mary's College of Maryland
Kevin E. Omland Associate Professor, Department of Biological Sciences

Colors created by carotenoid pigments are important in animal communication, yet little is known about how they vary across species or whether overall evolutionary patterns differ across genera. To address these questions we examined carotenoid evolution in caciques, a genus of Central and South American blackbirds, and compared their evolutionary pattern to the closely related New World orioles. Caciques have color patches that appear either yellow or red, with no orange intermediates. To objectively test this observation, we used a reflectance spectrometer (machine that measures color numerically) to measure these patches. Like visual observation, spectrometer data define two distinct groups that correspond with yellow and red-feathered taxa, and suggests that cacique coloration has evolved in jumps from one color to another (discretely) rather than gradual shifts (continuously). Ancestral state reconstructions infer a yellow ancestor and two changes to red. This pattern differs from that of orioles because oriole coloration, with its full continuum of yellows, oranges, and reds, most likely evolved continuously. This study is the first of our knowledge to highlight such a contrast and emphasizes the importance of discrete versus continuous evolution in ancestral state reconstruction.

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Gene Knockdown Model for PKCI/HINT1 Protein in PC12 Cells

***Jung Kim**, Stefania Porta[1], Jia Bei Wang[1]*
[1]Department of Pharmaceutical Science, University of Maryland School of Pharmacy
Jia Bei Wang, Professor, Department of Pharmaceutical Science

Protein Kinase C Interacting Protein/Histidine Triad Nucleotide Binding Protein I (PKCI/HINT1) is a member of the ubiquitous and highly conserved Hit protein family; despite being widely expressed in the mammalian brain, the function of PKCI/HINT1 in CNS is still unknown. To investigate the molecular function of PKCI/HINT1 in CNS, PC12 cell lines were used to establish a knockdown model for this protein using RNA interference (RNAi). To construct a knockdown cell line, the PKCI/HINT1-3' UTR were cloned in a TA vector, then subsequently digested and linearlized. In vitro transcription was performed to synthesize single stranded RNA (ssRNA) then annealed over night into double stranded RNA (dsRNA). RNAase III was used to digest the long dsRNA into 18-21 bp small interfering RNA (siRNA), suitable to be transfected to PC12 cells. The efficacy of the siRNA knockdown decreasing the protein expression was confirmed by western blot. RNAi was examined at 30, 60, and 70 hours after transfection and found effective in the 60-72 hour time frame. The neuronal knockdown model will be use in future experiments to investigate molecular function of PKCI/HINT1.

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Toward the 3D Structure of the Core Encapsidation Signal, a Critical Component for Replication of a Model Retrovirus

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

As a step towards determining the high-resolution NMR structure of $(\Psi^{CES})_2$ of the Moloney Murine Leukemia Virus, we have enzymatically prepared an isolated extended duplex (B-duplex), which forms the central spine in the context of the $(\Psi^{CES})_2$ dimer. Several Bduplex constructs were prepared incorporating different NMR active isotope enrichment strategies (fully-^{1}H-Bduplex, $AC^{13/15}$-Bduplex, and $GU^{13/15}$-Bduplex), where the superscripts refer to NMR active C and N isotopes, respectively. The samples were subjected to a battery of homo and heteronuclear 2D NMR experiments to complete base assignments and derive NMR local and global restraints. Determination of large RNA solution structures by NMR requires the use of both local and global restraints. For Bduplex, local restraints were derived by NOESY and TOCSY based NMR experiments. Experimentally, global restraints are usually derived from measurements of RDCs and RCSAs. A recently developed NMR method partly alleviates the technical challenges of large RNA measurements by allowing direct measurement of RDCs and pseudo-CSAs. By bootstrapping, the RCSA can then be calculated. The aforementioned NMR method has been successfully applied, and RDC and RCSA restraints were measured for Bduplex. This information is crucial for the high-resolution structure of the $(\Psi^{CES})_2$, making it the largest nucleic acid solved by NMR.

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Ten Reasons Biotechnology Will be Important to the Developing World

Elizabeth A. Kudirka, *Mike S. German*
Richard Wilson, Lecturer, Department of Philosophy

By the year 2050, the world population will pass nine billion. If agricultural productivity does not increase there will not be enough food to feed everyone. With the proven slowdown in productivity gains from the Green Revolution, Martina McGloughlin, a professor of Plant Pathology at University of California, Davis, states that "biotechnology is, by default, the best and maybe only option to feed the growing population." In our research, we initially looked at McGloughlin's paper, which was written nearly 10 years ago. To help support McGloughlin's claims we also looked at current research in the field of biotechnology. We evaluated the ethical implications of using biotechnology crops in developing countries. The ethical theories used to evaluate this potential solution to world hunger were Consequentialism, which focuses on achieving the most positive outcome for the most people; Buddhist Ethics, which is centered upon the central beliefs of the Buddhist religion; and Feminist Ethics which focuses on the idea of a nurturing relationship among the parties involved. Based on these ethical theories and our research, biotechnology was found to be effective in increasing productivity and thus essential in solving the issue of food shortages in developing countries.

Elizabeth Kudirka is a Phi Theta Kappa Scholar supported by UMBC. Mike German is a University Scholar supported by UMBC.

Investigation of the Value of the Dependable Strengths™ Workshop for UMBC Alumni

Charlene C. Kuo
Susan C. Martin, Coordinator for Assessment and Research, Division of Student Affairs

The purpose of this project was to understand the value and impact of Dependable Strengths™ Training on UMBC alumni and to better understand career issues alumni are facing. Dependable Strengths™ Training is used by UMBC's Career Services Center to help individuals discover their pattern of core skills (Haldane, 1989). Two broad research questions were addressed: What impact has Dependable Strengths™ Training had on UMBC alumni? What career changes have Dependable Strengths™ Training participants made as a direct result of the workshop and if no changes were made, why not? This study was qualitative and based on semi structured interviews. Participants from the April and November 2007 Dependable Strengths™ Training workshops were invited to participate. Those who chose to participate were interviewed. Interviews were taped and transcribed. Data were coded to elicit themes related to the overarching research questions. Aliases were used to protect confidentiality of participants. This presentation will summarize the preliminary findings from this qualitative research project.

The Correlation between Air Pollution and Mental Health

Tatiana Lary*, David Lary*
Laura Stapleton, Assistant Professor, Psychology Department

Air pollution has been found to be related to respiratory and cardiovascular conditions. This study examines the link between air pollution and selected mental health issues. By combining data from the EPA's road side Air Quality System (EPA's repository of ambient air quality data) and non-confidential ambulatory care file for Emergency Department admissions in Maryland for 2002, we examined the hypothesis that the number of admissions to Baltimore City emergency rooms with psychologically and mentally related issues increase when the level of air pollution increases. The study yielded some interesting results, showing a correlation between certain air pollutants (i.e., particulate matter) and specific types of schizophrenia (Code 295.9).

Data for this study were provided by the University of Maryland School of Nursing and EPA Air Quality System (AQS) data repository of ambient air quality.

Oscar Wilde: Degenerate or Revolutionary?

Sarah Lichtner
Orianne Smith, Assistant Professor, Department of English

Most research on Wilde focuses on his homosexuality, on specific instances of his plagiarism and the original sources, and on Wilde's perspectives on art and the artist. Wilde's excessive plagiarism is not frequently mentioned in classrooms, questioning the legitimacy of Wilde as a leading figure of Victorian literature. My research analyzes the causes of Wilde's exaggerated and extensive plagiaristic tendencies. The combinations of the conceptual approach to originality and plagiarism in the late 19th century, theories of criminality and degeneration, and Wilde's own writings serve to illustrate Wilde's deviant presence within the decadent society of London at the *fin-de-siecle.* He symbolizes decadence as he flaunts arrogance and ego-mania, furthering his presence as a member of the artistic elite, while rejecting the normalized societal notions of art as the creation of something new and testing whether new forms of art can be created in immoral plagiaristic ways. I will also seek to approach Wilde from a Lacanian psychoanalytic perspective, demonstrating that some of Wilde's own issues with identity are similar to that of his character of Dorian Gray. By exploring Wilde's many societal influences and his calculated and extensive plagiarism, Wilde becomes more of a revolutionary figure than the degenerate of his contemporaries.

Protein Diffusion from Poly(Ethylene Glycol) Vinyl Sulfone Scaffolds

Nirvana A. Maharaj*, Silviya Petrova, Jennie Leach*
Jennie Leach, Assistant Professor, Department of Chemical and Biochemical Engineering

The successful strides in the development of protein drugs have led to an increased need in the development and characterization of new drug delivery vehicles. The disadvantages of the current methods include denaturing of protein during encapsulation and the need for systemic administration. With the advances in synthetic scaffolds, preservation of the protein activity and controlled drug release for an extended time period is possible. Our experiments dealt with the diffusivity of model protein bovine serum albumin (BSA) from synthetic poly(ethylene glycol) vinyl sulfone (PEG-VS) scaffolds. PEG was chosen because it is hydrophilic, resistant to protein adsorption, and biocompatible. To fabricate these synthetic gels, we used 4-Arm PEG-VS crosslinked with PEG-dithiol. Our research focused on control of the protein diffusion by varying the molecular weight of the PEG-dithiol crosslinker and polymer density, and comparing methods of protein loading. It was found that the protein diffusivity increases proportionally to the molecular weight of the cross-linker, increases when the protein is loaded into the gel after polymerization, as opposed to presoaked in protein solution, and decreases with increasing polymer density. In the future, we will continue diffusion studies by using degradable crosslinkers and determining protein release as a function of scaffold degradation.

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A Transcription Model

Amber Mahmood
Mariajose Castellanos, Assistant Professor, Department of Chemical and Biochemical Engineering

Our work consists of using computational tools to describe the biological processes of transcription in bacteria. Transcription is the synthesis of RNA under the direction of DNA. Our transcription model takes into account initiation (sigma factor and helicase open the strand of DNA to be duplicated), elongation (RNA polymerase duplicates the DNA strand into RNA) and termination (Rho factor recognizes the end point where the RNA polymerase releases itself from the strand). We have taken biological information and turned it into mathematical equations to analyze the transcriptional system. One of the challenges has been that mathematical models require a number of parameters and although some of the published literature has an abundance of enzyme mechanisms that serve a starting guide for our model, there is a lack of parameter values. The model consists of a number of differential equations that are solved using Polymath. To solve the problem of lack of parameters currently we are working on a sensitivity analysis to identify an acceptable range for the parameters values. The model has produced preliminary results that agree with the biologically expected trend. Our future work is to extend this model to also include translation (RNA to protein).

One-Dimensional Diffusion of Gene 32 Protein along dsDNA

Matthew A. Malinowski
Richard Karpel, Professor, Department of Chemistry and Biochemistry

The focus of the experiments was on the gene 32 protein (gp32) of bacteriophage T4 to determine if it was capable of one-dimensional diffusion along dsDNA. Gene 32 protein is a single strand specific DNA binding protein. In most genomes single stranded regions are few and far between, and exist only when the DNA is under repair, replication or recombination. As a result it is highly improbable that any gp32 that collides with the DNA will attach to single stranded DNA (ssDNA). Therefore, it is believed that the protein will weakly bind the double stranded DNA (dsDNA) it encounters and then move along the dsDNA until it finds an area of ssDNA to which it can bind. To determine if this occurs, the rates of reaction between gp32 and ssDNA, dsDNA, and hybrid dsDNA/ssDNA substrates have been measured and compared. These rates have been determined by observing changes in protein tryptophan fluorescence through the use of a stopped-flow instrument in order to determine whether or not gp32 is capable of one-dimensional diffusion along dsDNA.

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

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

***Jessica A. McGrath**, Cassiah Smith, Michael F. Summers*
Michael F. Summers, Professor, Department of Chemistry and Biochemistry

Feline Immunodeficiency virus (FIV) is a retrovirus that is distantly related to Human Immunodeficiency Virus (HIV) and Simian Immunodeficiency Virus (SIV). Gag is the major structural polyprotein that facilitates the assembly and budding of retroviruses, such as FIV. The interaction between the N-terminal Gag Matrix (MA) domain and the plasma membrane is a key process in viral maturation. The Gag MA must be co-translationally myristoylated to achieve this membrane interaction enabling the virus to mature and become infectious. We have isolated myristoylated and unmyristoylated FIV Matrix protein (FIV MA) to better understand how the myristoyl group targets the Gag protein to the membrane. FIV MA was isolated by amplifying and cloning it into a co-expression vector containing the yeast N-myristoyl transferase gene. 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 the plasma membrane.

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The Effect of Toll-Like Receptors on the Activity of Antigen-Presenting Cells

***Gabrielle J. McRae**, Smita Chandran[1], Donna Farber[1]*
[1]University of Maryland Baltimore School of Medicine
Donna Farber, Associate Professor, Department of Surgery

The innate and adaptive responses of the immune system are linked by antigen presenting cells (APCs), most notably dendritic cells (DC), which take up antigens to process and display them for recognition by lymphocytes. It has been shown that initial contact with an antigen is established through pathogen-associated molecular patterns (PAMPs) recognized by Toll-like receptors (TLRs) on DCs. These intermediary cells secrete cytokines that influence the variety and magnitude of lymphocytes that become activated. This study will investigate the activation properties of APCs stimulated by distinct TLR agonists, which are synthesized models of PAMPs. This work includes isolating DCs, cultivating these cells with specific TLR agonists, and analysis via flow cytometry. Results have shown that differential activation does indeed lead to the production of explicit responses from DCs that correspond to distinct TLR engagement; the expression and magnitude of surface proteins differed distinctively in response to specific TLR agonists. This suggests that DC activity including cellular adhesion, production of costimulatory molecules and peptide presentation can be based on TLR engagement. We will later use the differentially activated DCs to activate antigen-specific T-cells in order to investigate the role that differential activation has on T-cell priming.

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The Role of Chemosensory Organs in Food Selection by the Caterpillar Tobacco Hornworm, *Manduca sexta*

***Arpit S. Mehta**, Will Gretes*
Frank E. Hanson, Professor, Department of Biological Sciences

Insects are well known pests, destroying more than 20 percent of the world's crops, causing billions of dollars in damages by their feeding. Our research involves the feeding behavior of a model insect, the tobacco hornworm. The chemosensory organs of the caterpillar are believed to be important for the detection of food and water. Plants have loads of chemicals in them, some are deterrents, while some are stimulants to the caterpillar feeding. When given ground cherry, *Physalis pruinosa* (a host plant) the caterpillar ate at a very fast rate, but when given lettuce (a non-host plant), it ate at a slower rate. Current evidence indicates that the chemicals in the plants are detected by the caterpillar's chemoreceptors on the maxilla, the antennae and the epipharynx. Assuming this, the surgical removal of these organs should allow the caterpillar to eat any kind of plant, host or non-host. Our results do support this hypothesis and we conclude that the chemosensory organs in the caterpillar play an important role in detecting the stimuli. Future testing of this hypothesis will be performed with a wider variety of host plants (potato, tobacco, tomato, pepper etc.) and non-host plants (cowpea, rape, etc.).

This work was supported, in part, by the Department of Biological Sciences Designated Research Fund.

Malaria and Insecticide-treated Bednets in Ishaka, Uganda

***Kasebaoth Mekonnen**, Mary L. Fryman*[1]
[1]*University of Memphis*
Sarah Chard, Assistant Professor, Department of Sociology and Anthropology
Julia Hanebrink, Department of Behavioral Sciences/Anthropology, Christian Brothers University

Malaria education is a fundamental tool to prevention and transmission of the number one killer disease in Uganda. This research is a follow-up study assessing the effectiveness of malaria sensitizations given during the summer of 2006 and the utilization of ITNs within Bushenyi district. 33 of the participants were sensitized by us (MHIRT) in 2006, 32 have never been sensitized and 11 were sensitized by other organizations. When asked the cause of malaria, 24 of the participants answered "mosquito" only, while 47 participants responded that malaria was transmitted by mosquitoes and at least one other source. Five participants did not include mosquitoes as the cause of malaria. Forty-two of the households interviewed had LLITNs, while eight households owned no bednets. The remaining households contained untreated nets, ITNs requiring retreatment, or did not report their bednets. From the data gathered through the follow-up interviews, retention of information received via sensitizations the previous year (2006) seemed to be a great issue. Most participants did not remember or were unaware of causes/prevention methods of malaria. While participants were aware of the value of ITNs, their distribution among households varied widely, which increases the chance of transmission among the unprotected.

This work was funded by the NIH and sponsored by Christian Brothers University and the University of Memphis.

Application of Scheduling Algorithms in Assigning Advisors during UMBC New Student Orientation Advisement

Matthew A. Morrison
Henry Emurian, Associate Professor, Department of Information Systems

An internet-based program is presented that assigns advisors to newly admitted UMBC students during New Student Orientations by amalgamating the efforts of the Offices of Admissions and Academic and Pre-Professional Advising through application of an innovative scheduling program. The scheduling program significantly reduces man-hours allocated to advisor assignment and eliminates errors. The University of Maryland, Baltimore County annually conducts orientation programs for newly admitted freshman and transfer students before commencement of the fall and spring semesters. During these programs, faculty members will advise students and grant them registration authorization. The current procedure to assign a student to an appropriate faculty member is extremely time consuming and outdated. Scheduling algorithms involve solving for the optimal schedule under various objectives and characteristics of the project. In this instance, the primary objective is to assign a student to an advisor based on the student's declared major upon admission, the advisor's department, and their mutual attendance on the date of the orientation program.

Sex Differences in Glia Morphology in Rat Cerebellum

Bettel A. Mussie*, Shannon Dean[1], Margaret M. McCarthy[1,2]*
[1]Department of Physiology, University of Maryland, Baltimore School of Medicine
[2]Department of Psychiatry, University of Maryland, Baltimore School of Medicine
Margaret M. McCarthy, Professor and Assistant Dean for Graduate Studies, Department of Physiology and Psychiatry

Neurological disorders such as autism and attention deficit hyperactivity disorder (ADHD) are associated with cerebellar pathology. These disorders are more prevalent in males than females, and males are also more susceptible to the disruption of cerebellar development via a variety of environmental factors (Nguon et al. 2005). The reason for this difference in vulnerability is unknown, but sex differences in expression of glial proteins have been observed. Glia are emerging as critical regulators of synaptogenesis and neuronal functioning. In this study we explore the possibility of sex-specific morphological differences in cerebellar glia. Specifically, we are utilizing immunocytochemical staining of glia fibrillary acidic protein (GFAP) and the Neuroclucida program to determine morphological differences in glia present in the anterior and posterior cerbellar hemisphere and vermis of postnatal 15-day-old male and female rats. These preliminary results will allow us to further examine sexual differentiation in other areas of the cerebellum as well as the role of steroid hormones in cerebellar glia morphology.

*This investigation was supported, in part, by UMBC through the NIH/HIGMS National Research Service Award GM 08663 to the MARC U*STAR Program at UMBC.*

Will Ferrell Films and Male Undergraduate Masculinity

Vanessa L. Nakoski
Dabrina Taylor, Lecturer, Department of American Studies

This research focused on the representations of various masculinities seen in Will Ferrell films and the ways in which male undergraduates use quotes from these films in their performance of masculinity. It attempted to better understand the nature of dialogue and interaction between college men. As one of the most beloved comedians among college students, his work has potential as a text which both reflects and influences male undergraduate culture. Studies have begun to speak of masculinities, as opposed to masculinity, and this research hoped to further clarify the interplay of hegemonic and non-hegemonic masculinity at UMBC. This research was conducted using an analysis of the films' texts, as well as the responses of male UMBC undergraduates. The results of this study show that Will Ferrell films offer representations of masculinity that are occasionally contradictory and that male undergraduates quote these films frequently. However, the text was used by fans in different ways in their performance of masculinity. Future research along this line of inquiry might expand the data set to include either all films within the genre or Will Ferrell's performances during Saturday Night Live.

The Role of Economic Development Indicators in the Electoral Patterns of Two Eastern European Transitional Democracies

Ari D. Ne'eman
Carolyn Forestiere, Assistant Professor, Department of Political Science

My research analyzed the electoral patterns of the Slovak and Czech Republics, correlating that data with economic development indicators provided by the World Bank's databases. This analysis is intended to note direct and inverse relationships between economic factors and electoral patterns in transitional democracies. This will provide a useful contribution to the growing literature on governance studies relating to transition to democracy. Each political party in the Slovak and Czech Republic is classified into clientelist, programmatic or charismatic categories, based on the methods they utilize to attract popular support. Clientelist parties gain support by promising specific things to specific constituent groups. Our hypothesis was that these parties would succeed under situations where there was extensive government intervention in the economy. Programmatic parties possess a broad ideology that they seek to have motivate their governing strategy. Our hypothesis is that they will succeed where economic conditions are relatively positive, based on the indicated cross-section of development indicators. Charismatic parties are generally elected based on the personal appeal of a single, charismatic leader. Our hypothesis was that these parties will succeed when economic conditions are extremely negative.

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

Appeasing Whom? The Use of Unilateral Initiatives and Inter-Korean Relations

Douglas E. Nivens, II
Cynthia A. Hody, Associate Professor, Department of Political Science

This study assessed the efficacy of South Korea's engagement policies with North Korea vis-à-vis its use of unilateral initiatives, the offering of a concession without an expressed promise of reciprocity. During the Kim Dae Jung administration (1998-2003), South Korea relied on the Sunshine Policy to guide its reconciliation efforts with North Korea. This policy reversed decades of heightened distrust and brinkmanship in inter-Korean relations. This study considers the extent to which South Korean engagement policies can be considered appeasement. An examination of the events surrounding the 1999 and 2002 naval clashes at the disputed Northern Line Limit was used to identify the limits of unilateral initiatives in motivating reciprocity. Furthermore, this study used international relations theory to frame South Korea's engagement policies in analytical terms. Specifically, have they merely appeased North Korea or are they working to facilitate change in North Korea's military posture?

Neighborhood University Initiative: A Strategy for Redevelopment of West Baltimore

Simran Noor
Edward Orser, Professor, Department of American Studies

The Neighborhood University Initiative (NUI) is a position paper that outlines a redevelopment strategy for a neighborhood in West Baltimore (specifically the area bounded by North Avenue, Hilton Parkway, Gwynns Falls and Warwick Avenue). This neighborhood represents the challenges and opportunities associated with revitalizing urban areas nationwide. While the neighborhood has a unique history and strong social networks, disinvestment, crime and drug activity have caused its downward decline. Modeled after best practices in the field of community revitalization, NUI is a collaborative proposal, tailored to this community, which integrates physical improvement (building of housing, attracting commercial investment, etc.) and the building of social capital (grassroots leadership development, resource sharing among community members, etc.). Coppin State University, which is located in this area, serves as an anchor, an institution able to leverage its notability to attract investors to the area and invest in community programs for the benefit of the community that surrounds their campus. Along with Coppin, the plan encourages resident and city engagement while also pitching to the private sector the potential value of investing in the neighborhood. The overall goal of the plan is to revitalize this neighborhood into a community of opportunity and choice for all residents. In a high-opportunity community of choice historically underserved residents are connected to city services, employment and a host of resources while also protected from the forces of gentrification through programs that ensure affordability.

Flexibility – Not Just for Gumby Anymore

Olubukola, B. Ojewoye, *Joshua Sadler, Katherine Seley-Radtke*
Katherine Seley-Radtke, Associate Professor, Department of Chemistry and Biochemistry

Nucleosides are ubiquitous molecules that perform functions within numerous biological systems ranging from encoding genetic information to participating in gene regulation. Consequently, modified nucleosides have become a primary target for medicinal chemists in their search to discover effective, therapeutic compounds that possess anti-cancer, anti-viral, and anti-bacterial properties. Unfortunately, some nucleoside analogs are prone to rapid degradation in the body thereby failing to achieve their therapeutic goal. One successful modification is the use of carbocyclic nucleosides where the furanose oxygen is replaced with a methylene group. These compounds have a great advantage over naturally occurring nucleosides due to their increased stability. Another successful modification that has been pursued involves a class of flexible nucleosides ("fleximers") that have been shown to have interesting anti-viral and anti-cancer activity due to their flexible nature. The combined aspects of the carbocyclic sugar and the fleximer base scaffold should result in a synergistic effect and produce a compound with improved activity in one or more biological systems. The design and synthesis of a novel carbocyclic fleximer is presented herein.

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A Quantitative Model of Rho GTPases Network

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

Rho-GTPases, molecular switches of the Ras family, are involved in cell adhesion, migration and proliferation**.** Mediate various extracellular signals in biological systems that bind to specific receptors on the surface of target cells. Rho-GTPases regulate essential cellular processes such as transcription, actin (cytoskeleton) dynamics and mitosis progression. Rho-GTPases can exist in three states: activated, inactivated and complex. The guanine nucleotide exchange factors (GEF) are mediators for transforming the inactive Rho-GTPases to the active state. Active forms of Rho-GTPases (Cdc42, Rac, and RhoA) form a complex state with other proteins where they act as enzymes on other proteins or themselves. We developed mathematical models of the interactions of Rho-GTPases through kinetic and enzymatic equations. Analyzed model behavior was dependent on the maximum velocity, Michealis-Menten constant and concentration of proteins. Results consist of different behaviors exhibited by activated, inactivated and complex states of the Rho-GTPases. These mathematical models will be used to evaluate the effect of the GTPases protein; Cdc42, Rac, and RhoA on neighboring proteins and virulence factors of pathogens. The goal is to create predictive models and unravel the relationship between bacterial virulence factors and Rho-GTPases.

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Sexual Differentiation in the Developing Amygdala

Frances U. Onyimba*, Desiree Krebs-Kraft*[1]
[1]Department of Physiology, University of Maryland, School of Medicine
Margaret McCarthy, Professor, Department of Physiology

Individuals suffering from autism and schizophrenia commonly exhibit deficits in social, cognitive, and emotional behaviors. These behaviors are regulated, in part, by the amygdala, a sexually dimorphic brain region. Astrocytes, a type of glial cell, aid in synapse formation and provide support to neurons in the amygdala. Interestingly, data suggests that females have greater levels of the astrocytic marker glial fibrillary acidic protein (GFAP) in the mature medial amygdala than do males. However, astrocytes in the developing amygdala remain understudied. Based on preliminary data showing more GFAP protein in neonatal female amygdala, we hypothesized that females would have more astroctyes in different subnuclei of the developing amygdala than do males. The number and morphology of astrocytes in the baso-lateral (Bla) and medial amygdala (MeA) of both sexes were analyzed using GFAP immunohistochemistry on brain sections from rats on postnatal day three. No sex differences in the number of GFAP positive cells were detected in the developing Bla or MeA; however, more GFAP positive cells were observed in posterior sections of the MeA. We are currently looking for sex differences in astrocyte complexity based on an established classification system. Future studies include investigating hormonal modulation of astrocyte number and morphology.

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The Task-evoked Pupillary Response: A Measure of Cognitive Effort

Chinwendu Opara, *Tepring Piquado*[1]*, Arthur Wingfield*[1]
[1]Volen Center for Complex Systems, Brandeis University
Arthur Wingfield, Professor, Department of Cognitive Neuroscience, Brandeis University

The use of pupil dilation as a robust physiological measure of cognitive effort in today's scientific community is one that has evolved over time. Hess and Polt (1963) first demonstrated increased pupillary response while solving multiplication problems of increasing difficulty. Later, Kahneman and Beatty demonstrated that pupil diameter increased during the encoding of digits and reached a maximum diameter before recalling the digits (Kahneman and Beatty, 1966). The purpose of this study was to replicate the past experiments in which the task-evoked pupillary response was an independent measure of cognitive effort. The tasks included within-task variation: encoding and recalling, as well as between-task variation: digit lists of varying sizes. Pupil dilation was seen to increase during encoding and reached its maximum values at the beginning of recall. Dilation then decreased systematically as each digit was recalled and eventually returned to baseline. Dilation as a result of the task-evoked pupillary response increased with increasing load and is therefore indicative of the difficulty of the task administered as well as one's effort. The results support the hope for the use pupillary response as an index of increasing effort in young and older adults with good and poor hearing profiles.

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

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

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

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

'Great Sofas in Vast Cathedrals': Space and Moral Perception in Three English Country-House Novels

Matthew J. Poland
Raphael Falco, Professor, Department of English

My project focused on how the space of the English country house influences perception in three novels: *Howards End* by E.M. Forster (1910), *Between the Acts* by Virginia Woolf (1941), and *Atonement* by Ian McEwan (2001). I found that space affects a number of discourses – class, gender, history, politics, among others – and, more importantly, the way characters perceive their actions and comport themselves with others. The project allowed me to combine my interests in literature, history, and moral philosophy. I was also able to experience these spaces myself when I traveled to four country houses in rural southern England during the summer of 2007. Through research and experience, I have examined how the country-house novel evolved over the twentieth century, and how the country house, certainly an ideologically significant space, may be seen as a morally significant one. I was especially interested in how McEwan's *Atonement*, a recent and popular novel, situates itself in the social and cultural history of the time it depicts and within the county-house novel tradition, even as it brings the genre into the twenty-first century. In these country-house novels I have found evidence not of a tired, old-fashioned genre, but of the continuities of human experience within the tradition.

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

A Coordinated Approach to Playing the Drum Set

Ben Potok
Joseph Morin, Professor, Department of Music

"A Coordinated Approach to Playing Drum Set" is a software-based instructional program for the drum set. The software is a compilation of traditional drum-set instruction and original combinations of coordination exercises. The project's objective is to design a progressive pedagogy to cultivate drum-set players who are versatile and creative. While standardization and tradition are immensely valuable in that they provide foundation for progress, often drum-set instructional materials acknowledge standard practices as an absolute truth inhibiting a student's ability, creativity, and individuality. Through extensive collection and examination of existing drum-set instructional materials, some fundamental playing techniques as well as universal symbols and vocabulary were identified. Coordination exercises have been created that utilize all possible combinations of particular drums within certain musical time and value limitations. The software is designed for a beginning player in that it presents a recommended instructional course, rooted on prerequisite knowledge and difficulty, through its database like structure. This structure allows the more advanced drum-set player to customize their learning by exploring any section, information, or exercise contained in the software at any time. A notable advantage of computerized instruction is the simultaneous interaction of text, pictures, audio, and video to answer every question and offer multifaceted, comprehensive explanations.

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

Predicting Adolescent Mothers' Confidence from Social Support and Parenting Knowledge

Kau M. Queeglay
Charissa S.L. Cheah, Assistant Professor, Department of Psychology

This study examined two predictors of adolescent mothers' self-concept regarding the parenting role, specifically, their knowledge of child development and the quality of relationships with specific individuals (i.e., maternal grandmother, best friend, and partner) in their social network. Participants were approximately 70 low-income pregnant and parenting adolescents residing in Baltimore City. The findings will contribute to intervention programs (i.e., parenting classes) to educate adolescent mothers about child developmental milestones and the importance of establishing and maintaining secure relationships in helping the adolescent mother adjust successfully to her parenting.

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

The Effect of Down Syndrome Cell Adhesion Molecule on the Cellular Immune Response of *D. melanogaster*

***Amanda A. Reamy**, Jeff Leips*
Jeff Leips, Associate Professor, Department of Biological Sciences

The fruitfly, *Drosophila melanogaster*, provides an ideal system to study the genetic basis of biological processes. This experiment examines the role of the gene *Down Syndrome Cell Adhesion Molecule* (*DSCAM*) in directing the behavior of blood cells during an immune response. *DSCAM* has been implicated in the immune response but the functional role of this gene in immunity is unknown. This experiment tests the importance of *DSCAM* in orchestrating the cellular immune response. Parasitoid wasps use *Drosophila* as hosts by injecting their eggs into fly larvae. The evolution of an encapsulation response by fly larvae serves to prevent the wasp embryo from hatching. This *Drosophila* – parasitoid relationship was used to test the effect of a knock-down mutation in *DSCAM* on the encapsulation response. I exposed control and mutant fly larvae to *Leptopilina sp.,* a species of parasitoid wasp. All larvae were dissected to score for the presence of live wasp larvae, indicating a poor immune response, or an encapsulated egg, considered a good immune response. The data did not support *DSCAM* as an essential gene required for immunity. Currently, I am re-testing with a different species of wasp, *Aphereta sp.,* to validate these findings.

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

The Effect of Road Salt on Competition between Gray Tree Frog (*Hyla versicolor*) Tadpoles

***Rebecca A. Reeves**, Robin J. Van Meter, Christopher M. Swan*
Christopher M. Swan, Assistant Professor, Department of Geography and Environmental Systems

This study used experimental mesocosms to test the effect of road salt on competitive interactions among Gray Tree Frog (*Hyla versicolor*) tadpoles. Intraspecific competition among tadpoles inhabiting the same space often results in large size differences in members of the population. *Hyla versicolor* are arboreal frogs, but reproduce in vernal pools that could be greatly affected by saltwater runoff from spring snowmelt. We hypothesized that salt stress would reduce the effects of competition among the tadpoles and would result in a smaller size ratio among the individuals, since environmental stress often reduces the intensity of ecological interactions. The results of this study were supportive of our hypothesis, and we concluded that salt stress reduced the effects of competition among tadpoles, resulting in a smaller size ratio between individuals. These results suggest that road-salt runoff might not be lethal to amphibians, but results in unnatural patterns in species interactions.

This work was funded, in part, by a National Science Foundation LTER REU.

Reading beyond the Lines: The Discourse of Gender Violence in Spain

Amanda L. Rosenbush
Denis Provencher, Assistant Professor, Department of Modern Languages and Linguistics

This study critically analyzed the language surrounding gender violence in Spain in order to better understand the reality of the imperative social issue. Written discourse creates a social boundary defining what can be said about a given topic; for example, newspapers and other media generally utilize language in a way that determines which topics are "newsworthy" and which are seemingly less important or even not discussed. This research is intended to shed new light on discourse as a pivotal means of positioning societal views of gender violence. The project is a discourse analysis that examined how written texts from various genres (politics/government, media, education, and women's studies) construct social thought about gender violence in Spain. Focusing on the ways that social and political domination are reproduced through language, the points of discourse analysis were the manner of production, subject positioning, layout, intertextuality, and fixedness of each text. While attention to the discourse of gender violence is no substitute for other approaches to ending violence, it is significant as discursive practices are themselves socially controlling. In providing understanding of the linguistic construction of gender violence, this study may help politicians, mental health care workers, and advocates to see the problem from a new perspective.

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

Sasan Salimian*, Hua Lu*
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 very 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 at identifying novel defense related genes in *Arabidopsis*. This screen was based on the unique defense-dependent size change in a mutant called "*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. A mutation in *HTA8* suppressed *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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Isolation of Erythromycin-sensitive *Saccharomyces cerevisiae* by UV Mutagenesis and Nystatin Enrichment

***Anam Salman**, Ananth Bommakanti, Lasse Lindahl, Janice Zengel*
Lasse Lindahl, Professor, Department of Biological Sciences

In *E. coli*, a mutation from Adenine to Guanine in the 25S rRNA at the position A2058 causes erythromycin resistance. Yeast *Saccharomyces cerevisiae* has a Guanine at the equivalent position, but mutating this position from G to A does not cause erythromycin sensitivity in yeast. Therefore this position, believed to be critical for erythromycin resistance, is not sufficient to account for the resistance of yeast to macrolide antibiotics. We are trying to use nystatin to select an erythromycin-sensitive strain of yeast. Nystatin only kills growing yeast by destroying the cellular membrane. To optimize conditions for use of nystatin the G2058 A mutated yeast was exposed to nystatin in complete medium and under conditions of uracil starvation. We found that at concentrations between 0.2 mg/ml to 0.6mg/ml growing cells were killed, but uracil-starved cells were not. We now plan to isolate erythromycin sensitive strain by UV mutagenesis and enrich them from erythromycin resistant strains by nystatin treatment. If an erythromycin sensitive strain is isolated, it will be analyzed for the changes in the rRNA or ribosomal L4 and L17 proteins implicated in macrolide resistance.

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Converting Phylogenetic Differences between Species into Time

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

Through time, the rate at which DNA sequences evolve has proven to be relatively constant under a certain set of conditions. This constancy allows biologists to use DNA as a "molecular clock" that can be used to date divergence of populations. We were focusing on six different populations of the Western Cutthroat Trout which is a species that is considerably non-nomadic. These populations were separated from one another by waterfalls that span either side of a major river basin in western Washington State. Our goal was to use the genetic distances between these populations to estimate divergence times by comparing genetic estimates of divergence times with geological estimates. To accomplish this, we chose to amplify cytochrome B which has been used in several phylogenetic studies making it a considerably dependable mark of evolution. Once the rate of genetic evolution was determined we converted the molecular changes into time based on calibrated molecular clocks from other coldwater fish species. These estimates were then compared to geological estimates of population separation to determine if the two lines of evidence concur. On a broader scale this experiment aims to address larger evolutionary questions concerning geological structures and the rate at which they change through time.

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Probing the Counterion to the Protonated Schiff Base in Melanopsin

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

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

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Structural Development of Unknown *Streptococcus Pneumonia* Polysaccharide through NMR Spectroscopy Analysis

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

This research project centers upon discovering the true structure of a polysaccharide on the cellular surface of a particular strain of the *Streptococcus Pneumonia* bacterium. The polysaccharide called "*Streptococcus Pneumonia* 10F" has been proposed to have a structure containing three beta sugars, two alpha sugars and one ribotol; however, the genetic sequence of the polysaccharide gene cluster suggests that the actual structure maybe quite different. The gene cluster proposes that the structure of the polysaccharide is more closely related to the already-studied polysaccharide "*Streptococcus Oralis* C104." To confirm these new findings, two-dimensional H1 and C13 NMR spectroscopy proves to be an extremely useful tool. By extracting data through the employment of various NMR spectra such as COSY, TOCSY, NOESY and HMBC, we will determine a definite molecular structure of this polysaccharide. Ultimately, our findings may help in the creation of new vaccines or treatments against the *Streptococcus Pneumonia* strain.

How does TRAIL affect T Cell Function?

***Shayla Shorter**, Vinh Nguyen[1], Violeta Rus[1]*
[1]Department of Rheumatology and Clinical Immunology, University of Maryland, School of Medicine
Violeta Rus, Assistant Professor, Department of Rheumatology and Clinical Immunology

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 plays a non-apoptotic role in systemic lupus erythematosus (SLE), an autoimmune disease characterized by auto-reactive T and B cell proliferation and autoantibody production. Using the chronic graft-versus-host disease (cGVHD) model of lupus, we showed that disease parameters 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 demonstrate the effect of TRAIL on T cell proliferation *in vitro*, we cultured T cells in the presence or absence of TRAIL. Finding that TRAIL increases T cell proliferation would support our hypothesis of how TRAIL may increase the severity of the cGVHD model. Increased T cell proliferation would provide sustained support for autoantibody production by B cells, thus heightening disease activity.

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Component-based Electronics and their Relevance in Historical Recording Methods

Trevor M. Simpson
Alan Wonneberger, Director of Recording Services, Department of Music

The purpose of this research was to develop a technical ability and greater understanding of component electronics involved in the building, repairing, and maintaining of traditional recording equipment. Throughout the history of recorded music, engineers have relied completely on electronic devices for every step of the recording process. Microphones, preamplifiers, compressors, speakers, and nearly every other relevant tool one may use are all comprised of very complex circuits and components that are seemingly foreign to most engineers today. Unfortunately, many of these components, especially those found in some of the best sounding and most expensive vintage pieces, have a tendency to fail and must be replaced every so often. I have engaged in a study of traditional recording electronics by which I have been able to create an authentic series of "vintage" recordings predominately with equipment I have built and/or repaired. I have analysed the response of these recordings versus the response of identical recordings to a contemporary digital medium in order to provide a scientific means to analyse my work. This study has not only offered me the invaluable ability to repair and improve my own equipment for years to come, but has also served as a historical study of the methods and equipment used in recording studios during the "Golden Age" of recording, ca. 1950-1980.

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

Relationship between Distress and Duration of Procedure in Pediatric Cancer Patients

***Megan E. Sipes**, Lynnda M. Dahlquist, Karen E. Weiss*
Lynnda M. Dahlquist, Professor, Department of Psychology

The current study was part of a larger study conducted by Lynnda Dahlquist at Texas Children's Hospital Hematology-Oncology Clinic. Children with cancer are required to experience a number of painful medical procedures as part of their treatment. In the current study, the relation between exhibited distress and duration of the medical procedure in pediatric cancer patients was examined. Intramuscular injections (IMs) and lumbar punctures (LPs) were the targeted procedures. Using the Observation Scale of Behavioral Distress, children's behavior was coded to assess their distress level. The primary hypothesis that as the duration of a procedure increased, the child's distress would also increase was not confirmed. However, correlations previously established in the literature were found in the current study, such as the negative correlation between age and distress. Further exploratory analyses were carried out which demonstrated a positive correlation between age and duration of procedure for IMs, but no significant correlation for LPs. Possible implications and future directions are discussed.

This work was funded through a National Cancer Institute grant (R01CA52634).

A Novel Buprenorphine Application Method for the Treatment of Opioid Dependence

***Erica L. Smearman**, Ryan K. Lanier[1], Joseph A. Harrison[1], Elie S. Nuwayser[2], Annie Umbricht[1], George E. Bigelow[1]*
[1]Behavioral Pharmacology Research Unit, Johns Hopkins School of Medicine
[2]Biotek, Inc., Wellesley, MA
Joseph A Harrison, Clinical Trials Specialist, Department of Psychiatry and Behavioral Sciences

The therapeutic potential of a transdermal buprenorphine formulation (patch) was clinically assessed for the treatment of opioid dependence. Buprenorphine is approved by the Food and Drug Administration (FDA) for opioid dependence treatment and has benefits over the use of methadone such as a longer duration of action, reduced potential for opioid intoxication, and less respiratory depression. Currently, buprenorphine is only available in sublingual (under the tongue) tablet form. Drawbacks to this form include the need for repeated administration, compliance issues, and the potential for illicit use. Physically dependent opioid users (n=12) were enrolled in a 10 day detoxification study to assess the benefits of a buprenorphine transdermal patch. Each participant received a single patch which remained in place for seven days. Assessments (withdrawal self report and observer ratings, withdrawal rescue medication needed, and vital signs) were performed four times daily. Peak buprenorphine blood levels occurred at 48 hours. Withdrawal ratings significantly declined within 24 hours and did not reappear. Overall, the patch was found to be safe, well tolerated, capable of delivering clinically beneficial buprenorphine levels, and effective for treating withdrawal symptoms. Patch advantages include potential increased compliance, extended relief of withdrawal symptoms, and reduced likelihood for illicit use.

This work was funded through NIDA/NIH grants R01DA08045, T32DA07209, R44DA15573, and contract N01DA-3-8829.

The Evolution of Gender Representations in Switzerland: A Content Analysis

Kacie L. Smith
Jason Loviglio, Professor, Department of Media and Communication Studies

Using a model based on Erving Goffman's method of content analysis, this qualitative, exploratory study aimed to uncover the visual mechanisms behind the historical evolution of female gender stereotyping in Switzerland. Switzerland was the country of focus because, while it is a nation built on social democratic traditions, there are contradictions within the government, such as the fact that women were not officially granted the right to vote until 1971. Thus, I sought to discover the nature of images in Swiss print media in relation to the changing social trends in Swiss culture. I studied advertisements from the June 1965, June 1985, and June 2007 issues from one news magazine and one fashion magazine circulated throughout Switzerland. The results suggest that while no explicitly repressive or liberating trend has emerged within the visual representation of women, specific components of images are significantly altered in times of social change, such as the official recognition of a woman's right to vote. These transformations may redefine how stereotypes are conceptualized. For instance, rather than deliberately affecting society, the creators of visual representations may be reacting to society instead.

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

The Community-building Function of Modern Coffeehouses

Lauren M. Snyder
Warren Belasco, Professor, Department of American Studies

In a time of declining public space, the locations in which people choose to socialize become increasingly culturally significant. This research focuses on the central role coffee plays in facilitating social interaction and creating communities. The author aims to explain the reasons communities form around various types of modern coffeehouses and coffee stands, as well as the nature and purposes of these communities. An emerging demographic consistently utilizes these spaces to participate in and navigate the public sphere. The creation of an environment in which the exchange of information is unregulated results in disparate uses of this space. Through a thorough analysis of the physical environment, examination of patron activity and interaction, and participant observation on the part of the author, this study utilizes a comprehensive approach to explain how modern coffeehouses provide a sense of physiological comfort and support in an environment that encourages socialization.

'Dirt and Confusion': Nature in Jane Austen's Novels

Kayleigh A. Somers
Orianne M. Smith, Assistant Professor, Department of English

Many scholars have overlooked the importance of landscape and natural scenery in Jane Austen's novels. My study focused on Austen's approach to nature, and I argue that she takes advantage of both the Neoclassical and Romantic traditions. My argument calls into question the tendency to associate Austen with the earlier period, although she penned her novels in the Romantic era. The nature present in Austen's novels clearly illustrates an amalgamation of periods and shows that literary texts can often be better understood from multiple perspectives than from a view constrained to one arbitrarily defined period. To show and examine this, I used textual analysis and close reading techniques on a variety of passages from Austen's novels. I combined these findings with contextual material and critical scholarship on Austen, which was gathered from two archives, one at Chawton House in England and the other at the Julia Rogers Library at Goucher College in Maryland.

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

Teaching Pragmatics to High-Functioning Individuals with Autism: An Outline for a Computer Learning Program

Christianna E. Stavroudis
Thomas T. Field, Professor, Department of Modern Languages and Linguistics

Researchers recognize that one of the greatest challenges in teaching socialization to individuals with autism often stems from a lack of motivation and interest in engaging with others. If the individual is comfortable in his or her private world, what would motivate him or her to leave it and venture into the group? Research carried out in the fields of applied linguistics and intercultural communication reveals that human language interactions are rule-governed and systematically organized. Given the fact that individuals with autism crave concrete information, this project hypothesizes that a presentation of these rules might inspire curiosity and fascination in the individual with autism. This project synthesizes research from the fields of neurolinguistics, intercultural communication, second language acquisition, psychology, and computer science to propose an outline for a computer program that could present pragmatics (or social communication) in an organized and direct way.

UMB24 Analogs as Potential Metamphetamine Treatments

Tesia N. Stephenson*, Susan L. Mercer[1], Andrew Coop[1]*
[1]Department of Pharmaceutical Sciences, University of Maryland, School of Pharmacy
Andrew Coop, Associate Professor, Department of Pharmaceutical Sciences

Sigma receptors are a pharmacologically distinct class of receptors located in high concentrations in the brain and heart; two subtypes, sigma-1 and sigma-2 exist. Sigma selective antagonists have been shown to attenuate the stimulant and neurotoxic effects of methamphetamine. Therefore, they serve as current targets for the development of metamphetamine abuse medications. A sigma-1/sigma-2 receptor antagonist, N-phenethylpiperadine (AC927) is known to reverse the behavioral effects of metamphetamine. Since sigma-1 antagonism only attenuates the stimulant effects of metamphetamine, it is likely that sigma-2 selective antagonists reverse the neurotoxic effects. The addition of a piperazine ring at the 4-position of the piperadine ring of AC927, greatly increased the preference for sigma-2 receptors over sigma-1. This piperazine analog of AC927, 1-phenethyl-4-pyridylpiperazine (UMB24) was shown to be a sigma-2 antagonist and consequently serves as the lead compound for the development of sigma-2 selective antagonists. This study was aimed at investigating the effects of increased alkyl chain length on UMB24 analogs. The synthesis and characteristics of analogs are discussed.

*This work was funded in part, by NIH/HIGMS MARC-U*STAR T34 08663 National Research Service Award to UMBC and NIDA R01 (DA 13978, A. Coop and R. Matsumoto).*

The Food Allergy Diagnosis and Maternal Perceptions

Rebecca L. Stern*, Emily F. Law, Karen Weiss, Lynnda M. Dahlquist, Carrie Vibbert[1], Mary Elizabeth Bollinger[1]*
[1]University of Maryland School of Medicine
Lynnda M. Dahlquist, Professor, Department of Psychology

In the chronic illness literature, a mother's report of her child's illness severity has been regarded as an accurate measure of actual severity. However, studies have failed to examine if psychological factors influence the accuracy of a mother's perception. This study aimed to examine maternal perceived illness severity and its relation to maternal anxiety, maternal reported worry (allergen-specific), and other medical factors. Thirty-one children with food allergy between the ages of three and seven years (M = 4.88, SD = 1.18) were sampled from a larger study examining the impact of food allergy on the child and family. Objective illness severity ratings were obtained from medical chart review. Perceived severity ratings were obtained from maternal report. Preliminary analyses indicated significant relations between maternal trait anxiety and perceived illness severity (r = -.39, p <.05), and between perceived illness severity and allergen-specific worry (r =.69, p <.01). Final analyses will investigate the degree to which anxiety proneness, physical symptoms, and medical history contribute to mothers' emotional reactions to their child's food allergy. The results have implications for the clinical identification of anxious mothers who may be at risk for overprotection.

This study was partially funded by The Department of Human Development, Washington State University.

Indirect Speech Act Comprehension in Patients with Asperger Syndrome: A Formal Logic Approach

Melissa D. Stockbridge
Thomas T. Field, Professor, Department of Modern Languages and Linguistics

Asperger syndrome is an autism-spectrum disorder in which patients exhibit difficulty in social communication, impairment of social interaction, and impairment of social imagination, with an absence of significant delay in cognitive development. The deviations in Asperger behavior occur particularly in the inability to correctly infer information from indirect communication. In his book *Expression and Meaning: Studies in the Theory of Speech Acts*, John Searle outlines a set of generalizations in an attempt to explain how indirect speech acts are formed and an accompanying set of deductive steps illustrating how these indirect speech acts successfully fulfill communicative functions in neuron-typical speakers. By translating Searle's hypothesized steps into a comprehensive deductive approach to language understanding, a new strategy for teaching indirect communication has been posited that shows promise for the Asperger population by capitalizing on one of that population's known strengths: logical and systematic literal deduction. The method has been compared with a wide spectrum of currently practiced methods for addressing indirect communication in patients with Asperger syndrome. After pre-trial review by professionals in speech pathology, the proposed deductive approach to indirect speech acts has a promising outlook for efficacy in this population as well as successful application.

Modeling Flagellar Growth as a Stochastic Process

Yuriy Sverchkov
Muruhan Rathinam, Assistant Professor, Department of Mathematics and Statistics

The question of what mechanisms cells use to regulate the size of organelles is currently an important question in cell biology. We looked at a one-dimensional example of such size regulation, the growth of a eukaryotic flagellum, as a stochastic process, and compared and contrasted the behavior of the stochastic model with a deterministic model based on an ordinary differential equation for the flagellum length. We considered the growth of a eukaryotic flagellum as a discrete-state continuous-time Markov Chain, and programmed a Monte Carlo simulation to model the process. We then proceeded to explore what additional details a stochastic model can reveal. Since our initial model was very complex in terms of its state-space and the number of random variables involved, it was of interest whether it could be approximated by a simpler model. Using the central limit theorem for renewal processes we obtained a scalar nonlinear stochastic differential equation (SDE) model. We were able to further approximate the nonlinear SDE model by an exactly solvable linear SDE model which enabled us to obtain a simple relationship between the mean and the variance of the flagellar length which agreed well with the computer simulation of the more complex original model.

Research funded in the summer of 2007 by NSF grant DMS-0309647.

Were the 20 Amino Acids Randomly Chosen by Life?

Rahilla A. Tarfa*, Stephen J. Freeland*
Stephen J. Freeland, Associate Professor, Department of Biological Sciences

Our project considers the origin of the standard 20 genetically encoded amino acids. We hypothesize that they were not randomly selected from the distribution of amino acids that was likely available to early life. To test this idea, we first wrote a program in ANSI C that takes a Monte Carlo approach: it picks random samples of amino acids from a pool of options that we provide. Our study defines several different such pools according to different scenarios for the origin of life. Although there is no way of knowing for sure what amino acids were present as life first evolved, we consider those implied under several scenarios, including the amino acids found in meteorites, those formed by hydrothermal vents and those produced by simulations of a pre-biotic atmosphere. Measuring key properties of these samples (such as their biochemical diversity, defined in terms of fundamental molecular descriptors, like charge, size and hydrophobicity) allows us to quantify the notion of "random" for different circumstances. This in turn allows us to compare nature's reality. Our results thus contribute to bigger questions, such as whether life on earth was a predictable outcome, and the properties we might expect to find in life that originates elsewhere.

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

Economic Diversity Decreasing in Planned City: Columbia, Maryland

Nancy K. Tewell
Edward Orser, Professor, Department of American Studies

Columbia, Maryland, a planned city located between Baltimore, Maryland and Washington, D.C., was developed in the mid 1960s to be not just a suburb, but a real city boasting residents from a variety of economic and racial backgrounds. In the midst of the civil rights movement, founder and pioneer James Rouse wished to racially integrate his new city, a novel idea at the time. Forty years later, the city has become increasingly exclusive. With fewer apartment complexes, less subsidized housing, and the introduction of gated communities, Columbia has fallen short of its original goals. A social history was conducted in which census data from 1970 to 2000 was analyzed, focusing primarily on income, race, and home ownership rates. Some census tracts were found to be more racially or economic homogenous than others. This is important research because it shows that even in a progressive place conceived to be inclusive, class separation has ensued. The way this town was originally envisioned, with economic and racial integration as its main targets, may not be a chief goal today. This study investigates the shift from the town's inclusive atmosphere in 1967 when the first family moved in to one of increasing exclusivity in 2008.

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

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

Spiramycin is a macrolide antibiotic with a 16-member lactone ring used for treating bacterial 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 in *Escherichia coli* occur in the L4 and L22 ribosomal proteins. Resistant colonies were isolated from *E. coli* strain AB301 on plates containing spiramycin at 1.5 mg/ml, and their L4 and L22 genes were amplified by PCR and sequenced. Thus far, one mutation, G64V, has been found. Current experiments are being conducted using a derivative of AB301 with a deletion in the *tolC* gene that results in sensitivity to lower concentrations of spiramycin. The aforementioned mutation and others found in L4 or L22 will be used to determine how mutations affect the 50S subunit. This information will further our understanding of L4 and L22, which are known to affect the peptide exit tunnel structure and will also contribute to our understanding of ribosomes, which are essential to the process of translation.

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

Video Game Development: Exploration into 3D and 2D Gaming Experiences

UMBC Game Developer's Club
President/Programmer: ***Charles Lohr***
Vice President/Artist: ***Arthur Gould***
Art Director: ***Lesa Wilcox***
Programming: ***Kiran Sudhakara, Benjamin Dailey, Matthew Song, Paul Oliver**, David Chapman*
Art: ***Joel Bowers, Jonathan Pack, Helen Zhang, Tim Brosius, Megan Zlock***
Marc Olano, Assistant Professor, CSEE

The Game Developer's club has set out this year to produce multiple projects. All of our projects require creativity and ingenuity from members with art and computer science backgrounds and embody their technical and artistic achievement. All are year-long projects that involve multiple members of the club. Each project requires different skills and talents. In **GWAIN**, a 2D platformer, our artists needed to produce sprites for every asset in game and programmers needed to work very carefully to ensure the game would be able to run on Windows, OSX, Linux and on the PlayStation 3. **Commanders** required the artists to work with 3D modeling and programmers needed to work with very basic building blocks in order to build a full first person real time strategy. Our third project, **Under the Weather** required more 2D artwork from the artists and allowed our members to explore a new technology from Microsoft called XNA, allowing the game to operate on the XBOX360 as well as Windows.

Beneath the Ink: The Revelation of Tattoos

Seth O. Vacek
Shawn M. Bediako, Assistant Professor, Department of Psychology
Karen L. Freiberg, Lecturer, Department of Psychology

This research was conducted to gain insight into the reasons why an individual gets tattooed; the personal or social reason. The method of research was through archival sources along with typed anonymous surveys, which were sent to tattoo artists throughout the United States as well as individuals that had tattoos, who were willing to participate in this research. The results indicated that the majority of individuals that have been tattooed had a personal or special meaning for getting tattooed. From the social aspect, this research showed that tattoo artists were discriminating about what they would tattoo on their clients. The importance of this research is to try to erase some of the negative stigma felt by the general public about tattoos. Tattoos are more than just images on the skin. They express one's identity and the majority of them have a story, which lies beneath the ink.

This work was funded, in part, by Lynette J. Curtis.

Human Rights: Use of Human Beings in Unethical Clinical Research in Developing Nations

Jacquiline W. Wanjohi
Andrea L. Kalfoglou, Assistant Professor, Department of Sociology and Anthropology

This study reviews the literature on unethical clinical trials conducted in developing nations, looking for common themes. In 1964, the Declaration of Helsinki sets forth international guidelines for the ethical conduct of clinical research. Chief among these ethical principles is the right not to participate in research unless you have given your informed consent. This means that participants know they are agreeing to be research subjects, have been given information on the risks and benefits, and know they have the right to withdraw. Additionally, there is an expectation that the study has been reviewed and approved by a community-based ethics board. This paper discusses examples of five unethical clinical trials where participants were not completely informed about the study, and therefore, did not give informed consent. These kinds of violations of basic human rights must be exposed and addressed in a transparent way, as this is the only way to maintain public trust in the research enterprise and ensure that people continue to participate in research. Because research participants from developing countries may be particularly vulnerable (language barriers, literacy issues, potential to be exploited), extra care must be taken to ensure that they are not abused by the research enterprise.

Investigations of the Temperature Elevation during Magnetic Fluid Hyperthermia: an *in vitro* Experimental Study

Dianne L. Weeks, *Maher Salloum*
Liang Zhu, Associate Professor, Department of Mechanical Engineering

Magnetic nanoparticle hyperthermia has been used for cancer treatment. In this method, magnetic nanoparticles are delivered to the tissue and exposed to an alternating magnetic field. This induces localized heating 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 performed *in vitro* experiments on commercially available tissue. Nanoparticles were injected at the center of cubical shaped specimens of tissue. We then measured the temperature elevations at different locations along the three axes of symmetry of the specimen. We examined the effects of the nanoparticles injection rate and the variance of the amount of the injected nanofluid on the temperature distribution. Temperature elevations of more than 7^{o}C were observed at the center of the specimen when 0.2cc of nanofluid was injected at a 5μl/min injection rate. Temperature rises measured by thermocouples have shown that the nanoparticles distribution in the specimen is not uniform. A spherical distribution of the temperature elevations has been demonstrated by the measurements. Based on the temperature distribution pattern, a theoretical model will be developed to extract the expression of the specific absorption rate induced by the nanoparticles.

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

Modeling the X-ray Continuum in Seyfert Galaxies

Eric J. Wieczorkowski
Ian M. George, Associate Professor, Department of Physics

The modeling of the X-ray emission from Seyfert galaxies is not fully agreed upon by Astronomers today. At the center of these galaxies, circling a putative black hole up to ten billion times more massive than our own sun, lies an accretion disk which creates intriguing effects in various energy bands. In the X-ray band, a continuum has been observed, generated from collisions and interactions of atoms, electrons, and photons. Specifically, prominent iron emission lines due to interactions of high energy photons have a large influence on the several different models used to fit the spectra. Since the interactions happen in this disk region circling the supermassive black hole, the lines are subject to Doppler and relativistic effects, distorting and broadening their appearance. The research studied the effects of broadening of these iron lines as well as the effects adjacent media have on the ability to characterize these lines. Proper modeling of the X-ray continuum and line emission will test both the unified models of Seyfert galaxies as well as our fundamental laws of physics in a highly general relativistic regime.

SCHOLARLY ORGANIZATIONS REPRESENTED AMONG TODAY'S PRESENTERS

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

Center for Women in Technology
Tawny Barin

Dresher Scholars
Cheryl Jaworski
Anastasia Feaster

France/ Merrick Award
Simran Noor

Goldwater
Devin Burns

Golden Key International Honour Society
Bridget Armstrong
Brook Asamenew
Olufolakemi Awe
Caryn Bell
Samantha Bier
Sarah Blusiewicz
Brandon Borde
Devin Burns
Ramon Cabrera
Elizabeth Campbell
Whitney Fields
Tiffany Fleet
Andrew Fritz
Shilpa Gadwal
Aubrey Hillman
Uzoma Iheagwara
Ruby Jackson-Atogi
Hasina Jamal
Cheryl Jaworski
Tamika John
Brandon Johnson
Vovanti Jones
Yasmeen Khaskia
Benyam Kinde
Sarah Lichtner
Bettel Mussie
Vanessa Nakoski
Simran Noor
Frances Onyimba
Amanda Reamy
Anam Salman
Tanu Sharma
Megan Sipes
Erica Smearman
Lauren Snyder
Tesia Stephenson
Melissa Stockbridge
Yuriy Sverchkov
Stephen Tuyishime
Dianne Weeks

HHMI Scholarship Program
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Benyam Kinde
Jessica McGrath
Gabrielle McRae
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Benyam Kinde
Elizabeth Kudirka
Charlene Kuo
Sarah Lichtner
Vanessa Nakoski

Ari Ne'eman
Elise Pohl
Rebecca Reeves
Amanda Rosenbush
Lauren Snyder
Kayleigh Somers
Christianna Stavroudis
Melissa Stockbridge
Yuriy Sverchkov
Rahilla Tarfa
Seth Vacek
Eric Wieczorkowski

Humanities Scholars
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Cheryl Jaworski
Dorothy Kenny
Sarah Lichtner
Matthew Poland
Kayleigh Somers
Christianna Stavroudis

Imaging Research Center Fellows
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Timothy Brosius
Evan Devine

IRC Fellow
Timothy Brosius

LRC and SSS Tutors
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Destiney Buelto
Yuriy Sverchkov

Linehan Artist Scholars
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Daphne Gardner

MARC U*STAR
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Brook Asamenew
Olufolakemi Awe
Caryn Bell
Abraham Beyene
Brandon Borde
Ramon Cabrera
Nancy Chiles
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Oluwaseun Olayiwola
Frances Onyimba
Sasan Salimian
Tanu Sharma
Shayla Shorter
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Steven Tuyishime
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Melissa Stockbridge

Phi Kappa Phi
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Vovanti Jones
Yasmeen Khaskia
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Frances Onyimba
Matthew Poland
Megan Sipes
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