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Abstract Book

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ORAL  
PRESENTATION  
ABSTRACTS

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Biological Sciences, Biological Sciences Ph.D., 2013

## Exploring the molecular and structural basis of melanopsin signaling Oral

The visual pigment melanopsin is expressed in a subset of retinal ganglion cells (ipRGCs). These cells are intrinsically photosensitive and their axons project to brain regions such as the suprachiasmatic nucleus (SCN) and the olivary pretectal nucleus (OPN). These regions regulate non-image forming functions such as circadian photoentrainment and the pupillary eye reflex. Therefore, melanopsin is unique compared to visual opsins, such as cone opsins and rhodopsin, due to its role in regulating non-image forming functions. Melanopsin is also unique at the molecular level; the most distinctive feature being its long intracellular c-tail. Previous work has shown that there are several residues on the intracellular tail that are necessary for deactivation of melanopsin. However, it's not clear if the tail mediates the activation portion of signaling. We hypothesize that residues 377, 380, and 382 on the proximal portion of the intracellular tail are interacting with residues on intracellular loop 3 via hydrogen bonds. This would result in a physical interaction that is necessary for proper activation of melanopsin. To test this, a mutant mouse melanopsin (3X mutant) was constructed with sites 377, 380, and 382 on the c-tail altered to prolines to disrupt the hypothesized interaction with intracellular loop 3. This 3X mutant was transiently expressed in human embryonic kidney (HEK) cells to test its response to light via calcium imaging assay. Using this assay, we observed a deficit in activation in the 3X mutant, suggesting that the tail is important for proper activation of melanopsin.

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Chemistry & Biochemistry, Chemistry Ph.D., 2012

## Biotemplated Nanostructured Materials for Li-Ion Batteries

### Oral

New generation of Li-ion batteries is required to deliver higher energy density and faster charge rates in order to meet the demands of novel technologies, such as electric vehicles and backup grid energy storage. Recent advances in Li-ion battery performance through the introduction of nanoscale materials into the composition of anode or cathode allow to achieve higher energy storage capacity and energy density owing to faster electronic and ionic transfer and large surface area of electrodes. However, nanostructured electrodes present limitations such as poor cyclability due to aggregation of active material upon lithiation/delithiation, complex synthesis procedure, and the need for conductive additives. Fabrication of nanostructured electrodes through biotemplating presents a novel, cost-effective, and eco-friendly approach, which will allow for precise control over arrangements of active materials into highly organized architectures at the nanoscale, as well as close contact between combined electrode materials with synergistic properties. In this study, we demonstrate the engineering of bifunctional peptides with one half of the peptide consisting of a sequence that has specific binding affinity for the cathode materials and the other half has binding sequence for multi-walled carbon nanotubes (MWNTs) in order to improve conductivity of the resulting nanostructure. These binding peptides for the material of interest are isolated via biocombinatorial selection method using M13 bacteriophage that is engineered to express more than billion random dodecapeptide sequences fused to the minor coat protein pIII. Currently, the performance of resulting biotemplated hybrid electrodes composed of an active material and MWNTs tethered by a bifunctional peptide is tested by assembling Swagelok cell with Li-metal foil as negative electrode and running multiple charge-discharge cycles at different rates to evaluate rate capability and capacity retention upon cycling. Ultimately, biotemplating of nanostructural electrodes for Li-ion batteries using multi-functional peptides imparts binding specificity for the target material, permits a simpler assembly methodology at ambient temperature, and potentially offers a stable system with higher capacity and improved cyclability at high discharge rates.

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Chemistry & Biochemistry, Chemistry Ph.D., 2011

## Understanding the mechanism of functional conformational changes in the Hepatitis C virus polymerase

Oral

Hepatitis C virus (HCV) is a wide spread health concern for which there is no vaccine available HCV contains a single-stranded RNA genome and replicates with the aid of the NS5B enzyme that is an RNA-dependent RNA polymerase. NS5B samples at least two different conformations: open and closed. Transitions between these two conformations play a crucial role in NS5B function. Our goal is to understand how the transition between these two states occurs, how this change impacts enzyme activity and how it is affected by the presence of inhibitors. This knowledge may be useful in identifying novel and more effective ways to inhibit the enzyme. To accomplish this goal we employ Molecular Dynamics (MD) simulations in conjunction with Temperature accelerated Molecular Dynamics (TAMD). TAMD is an enhanced sampling technique that allows us to more effectively study the conformational transition by applying increased temperature to specific collective variables in the enzyme. Our simulations reveal the free energy landscape explored by the enzyme as it interconverts between the open and closed conformations. The barrier between these two conformations seems to be relatively low. Our observations suggest that both conformations are sampled by the free enzyme in isolation and do not only occur when it is bound to RNA.

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## Adsorption and biodegradation of fluoroquinolone antibiotics in the activated sludge treatment

Oral

Fluoroquinolone (FQ) antibiotics are widely used in human and veterinary medicine to treat pathogens; consequently, these compounds have been frequently detected in different environmental compartments. Recently, we identified eight FQs in the Baltimore, Maryland aquatic environment with concentrations ranging from 2 to 1916 ng/L. Extensive use of FQs has led to a significant increase in antibacterial resistance, threatening human and ecological health. Among the different stages in wastewater treatment plants, the activated sludge process contains a great potential to remove FQs. The two main removal mechanisms, adsorption and biodegradation, were investigated for FQs in this study. Laboratory-scale batch reactors were established to determine the removal mechanisms of eight commonly found FQs in an aerobic process with raw wastewater and return activated sludge at environmentally-relevant concentrations. Results indicated that adsorption onto sludge acted as the dominant role to eliminate FQs from water. The adsorption coefficient  $K_d$  varied from 144 to 1984 L kg<sup>-1</sup> for different FQs in the temperature range of 4 – 37 °C. Biodegradation of FQs served as the secondary mechanism; experimental data fit a pseudo-first order reaction model ( $R^2 > 0.86$ ). The corresponding reaction rate constants changed from 0.003 to 0.016 h<sup>-1</sup> over the temperature range, indicating that the selected FQs had half-lives longer than 40 h. These findings indicate that removal efficiency of FQs can be improved in activated sludge processes by selecting operating conditions to enhance adsorption and biodegradation.

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## The effect of activated carbon amendment on bioaccumulation of PCBs in fish

Oral

In-situ sediment remediation with carbonaceous materials such as activated carbon (AC) has been introduced as an effective approach to sequester hydrophobic organic chemicals such as polychlorinated biphenyls (PCBs). However, a central challenge with in-situ remedies is the length of time necessary to observe impacts, particularly in fish. This study investigated the effectiveness of treatment on biouptake reduction in zebrafish after 45 and 90 days by evaluating how changes in PCB concentrations in untreated and treated sediment porewater and overlying water relate to concentration in fish. Results showed that porewater PCB concentration in PCB impacted sediment was reduced by two orders of magnitude upon amendment with 5% powdered AC, measured after 45 and 90 days. Zebrafish body burdens reflected the differences in porewater concentrations among sediment types. AC amendment did not change PCB concentration in sediment, but reduced the PCB concentrations in zebrafish by a factor of 9 after 90 days.

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## Photolysis of organoarsenicals in agricultural waste

Oral

Organoarsenicals added to animal feed are excreted mostly unchanged and are present in manure. Land-application of organoarsenical-contaminated manure represents an important mechanism for arsenic introduction to environmental systems. In this study, direct photolysis at 254 nm of four organoarsenicals (i.e. arsanilic acid, carbarsone, nitarsonic acid, and roxarsone) was investigated using a batch-recycle UV reactor system. Organoarsenical speciation affected the apparent molar absorptivity, which generally ranged from  $4 \times 10^3$  to  $3 \times 10^4$  M<sup>-1</sup> cm<sup>-1</sup> across the pH 2-12 range, and the rate of photolysis. Specific values of the quantum yield at 254 nm were lowest for the doubly anionic form of nitarsonic acid ( $\sim 10^{-4}$  mol/Einstein) and highest for the fully deprotonated form of roxarsone ( $\sim 10^{-3}$  mol/Einstein). The corresponding fluence-based pseudo-first order rate constants ranged from approximately  $2 \times 10^{-5}$  to  $3 \times 10^{-4}$  cm<sup>2</sup>/mJ; these parameters were used to model the apparent reaction kinetics as a function of pH. With these kinetics, 90% transformation of organoarsenicals in water at pH 7 would be achieved for UV doses on the order of 13–52 J/cm<sup>2</sup>. The effects of nitrate, phosphate, and dissolved organic matter extracted from chicken litter on photolytic transformation of organoarsenicals were also studied. The bulk reaction kinetics for organoarsenical transformation were affected by the presence of dissolved organic matter; however, nitrate and phosphate did not significantly alter the transformation kinetics of organoarsenicals by UV254nm.

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## Two-Dimensional Chromatography for Applications with Purification in Point-of-Care Manufacture of Therapeutic Proteins

Oral

Availability of therapeutic protein to war refugees, natural disaster victims, and aid workers stationed in remote areas and developing nations is highly limited. Developing a method to ensure therapeutic protein is readily available in these regions is critical. We propose the design for a novel device to rapidly synthesize and purify therapeutic protein on-site and on-demand. The device will be portable and small, comparable to the size of a laptop computer. After synthesis the therapeutic protein is purified, employing multidimensional chromatography. Several strategies for point-of-care protein purification in the device will be discussed and evaluated.

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CSEE, Computer Science Ph.D., 2007

## Human Sensor Network: A Social Media Observational Tool for Improved Modeling and Mitigation of Extreme Weather Events Oral

The fields of Storm modeling and Disaster Management are well established, however the use of social media in these fields is at its infancy and mostly focuses on a one way communication of "broadcasting the threat to the public". The aspect of listening to the response of the public in the social media framework is very minimal. Harvesting, analyzing and providing spatial and temporal maps from a variety of online media products available with geolocated features in near real-time to first responders during and after extreme weather events for mitigating the economic and human is currently non-existent operationally. We have developed a novel approach that views social media data as Human Sensor Network (HSN) where social media users are viewed as "sensors" and their posts are viewed as "observations". In this presentation, we focus on Superstorm Sandy and its aftermath impact. At present, emergency responders rely on the NOAA operational surge model SLOSH (Sea, Lake and Overland Surges from Hurricanes) for decision making in regards to response and mitigation of surge related disasters. SLOSH is a probabilistic geophysical model used to estimate the heights of the storm surge taking into account the weather forecast as well as the unique characteristics of the area where the storm makes the landfall, such as roads, rivers etc. However, there are some significant limitations to the model, since it doesn't take explicitly into account astronomical tide, river and stream flows during rain or storm events. We have collected over 8 million tweets and over 370 thousand Instagram images that mention hashtags related to the Sandy storm (e.g. #frankenstorm, #frankensandy, #hurricane sandy etc.) that were posted several hours before the storm made the landfall on Oct. 29, 2012 through Nov. 1, 2012. We have developed a hybrid system that assimilates Human Sensor data from Social Media outlets and the SLOSH model forecast outputs into a framework that integrates the geolocated products onto Google Earth based maps. Since many of the social media posts provide precise geolocation in addition to the time of the post, we can efficiently analyze the varying post storm concerns such as flooding, power outages, hospital evacuations, vandalism and other human needs and other problems. We demonstrate the usefulness of our system as a novel tool for decision makers and emergency responders that allows monitoring and analyzing tweets and Instagram photos as well as SLOSH model forecasts in the same framework. Our system also allows us to analyze, understand and extract prominent components of what people are sharing and posting on the online social media during situations of extreme hardships such as loss of home, power, lack of heat, food, and access to medical care. An important contribution of our system is in providing Emergency Responders with the ability to have an effective tool not just for broadcasting warnings but for monitoring the return channel of communication, i.e. being able to listen to what millions of affected people have to say about their distress and understand their needs based on their geolocation. Such an approach will also allow us to better understand the damage that results from the hurricanes, such as number of affected households, duration of power outages, regional sentiment of the public.



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## Empirical Evaluation of Strategy-Proofness of Majority Judgment Oral

There has long been a keen interest in the strategy proofness of different voting algorithms. Recently Michel Balinski and Rida Laraki proposed the Majority Judgment method and claimed that it was resistant to strategic manipulation. In this report we empirically compare the strategy proofness of Majority Judgment, Plurality Voting, Boorda Count, Range voting, Approval voting, and Kemeny-Young using a simple empirical model.

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## Distributed Approach for Reconnecting Disjoint Segments Oral

Due to low-risk and cost-effectiveness, Wireless Sensor Networks (WSNs) have become the primary choice for serving in inhospitable environments like battlefields or security surveillance. In these application setups, nodes operate in harsh conditions and become susceptible to failure. In addition, the environment makes it dangerous and sometime impossible to replace a node that depletes its energy or gets damaged. When multiple nodes fail at the same time the network may get partitioned into disjoint segments and its service may significantly degrade or even seize. Therefore, the network must self-heal using existing resources. The major loss of connectivity and the lack of centralized control leave distributed recovery procedures as the most appropriate option for recovery. In this paper we present DarDs, a distributed approach for reconnecting disjoint segments. The basic idea is to determine the position of the fewest relay nodes that enable the network to restore connectivity. Then, nodes are moved from the individual segments to the designated relay positions such that the total travel overhead is minimized. The performance of DarDs is validated through mathematical analysis and simulation.

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## Metamorphic Malware Classification

### Oral

Metamorphic malware tend to change its code structure, every time it infects a new host machine. This makes classification and subsequent detection of the malware very difficult. Unlike other viruses, metamorphic malware use code obfuscation techniques on the body of the malware and that way the malware structure does not exhibit a common signature. With the advent of advanced malware construction kits, it is easy to generate numerous metamorphic variations of the same malware. In spite of meticulously changing the code structure for every infection, the core functionality of the malware remains unchanged. In this paper, we present methods to classify and detect metamorphic malware by doing a static analysis of the opcode sequences in the malware specimens. The opcodes from the assembly files of the metamorphic malware are statically analyzed by aggregating the opcodes into topic distributions and word distributions for each metamorphic malware specimen. The topic distribution is constructed using the topic modeling technique, LDA. The question in consideration is, whether the metamorphic malware family classification done using word distribution or the classification done using topic distribution of opcodes provides better classification performance. We find that classification into malware families using the word distribution performs better and is also more robust than the classification using topic modelling of the opcodes. Further, experimental results show the significance of the word distribution for each metamorphic malware family and gives a more clear picture as to how the distribution of opcodes play a very important role in metamorphic malware family classification.

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## Measurement of Hearing Loss due to Perforated Tympanum using Image Processing Techniques

### Oral

The tympanic membrane (ear drum) is a thin tissue film that is stretched between the outer and middle ear. Sound waves travel from outside the ear, and strike the tympanic membrane resulting in its vibration. These vibrations amplify the sound waves and transmit them to the ossicles (auditory bones). The magnitude of amplification is directly proportional to vibrating area of tympanic membrane. Hence a perforation in this membrane would result in hearing loss. Pure-tone audiometry is the traditional procedure used to detect the amount of hearing loss in a patient. However, it is lengthy and less efficient, as it largely depends on the response of the patient to sound intensity and frequency of pure-tones. We present a relatively more efficient approach to determine hearing loss due to perforated tympanic membrane using image processing techniques. We describe an algorithm that uses unsharp masking to sharpen images of the perforations as well as the tympanic membrane. Then, it converts the image into a binary image using thresholding. A median filter is applied to get rid of the noise component in the image. The ratio of the area of perforation and total area of tympanic membrane will define the percentage of hearing loss. Our approach will eliminate the error introduced due to patient dependency as in the traditional method.

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## A Schema Free Interface for the Analysis of Semantic Datasets

Oral

DBpedia is a project aiming to extract structured content from the information created as part of the Wikipedia. DBpedia extracts factual information from Wikipedia pages, allowing users to find answers to questions where the information is spread across many different Wikipedia articles. DBpedia contains RDF data that is accessed using SPARQL query language thus making it difficult for naive users to retrieve the DBpedia contents. The current research in this field allows users to obtain information from DBpedia by manually inserting the entities and relationship names which interest them. It would be convenient though if we provide an interactive interface to naive users for accessing DBpedia data. We use the Lucene Api for further obtaining sorted information of the datasets that we query.

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Tiffany Branum, tbranum1@umbc.edu  
GES, GeographY & Environmental Systems Masters, 2012

## Union Market: A Story of People and Food in a Redeveloping Place

Oral

Public markets provisioned U.S. cities from the colonial era into the 20th century. These markets were the premier food establishments of their time and functioned as important civic spaces where societal values and identities were (per)formed. All strata of society from U.S. Presidents to enslaved people frequented markets, which served as places of proximity where people shared food, ideas, and space amid differences of identity. But markets declined as cars, supermarkets, and suburbanization changed the city's foodscape. After a period of disinvestment, markets are receiving renewed interest. Union Market in Northeast Washington, D.C. is undergoing redevelopment, but the effort seems disconnected from the socially inclusive dynamic of earlier markets. Pop-up restaurateurs selling \$13 cocktails and artisanal cheeses have displaced vendors who sold affordable produce and culturally meaningful sundries. This affluent "foodie paradise" and its gleaming white structure contrast dramatically with the surrounding marketplace. Rows of shabby warehouses partially inhabited by struggling businesses of color portray a disinvested and deindustrialized urban landscape, which tell a raced and classed story of redevelopment. However, this study explores the problems AND possibilities such change is bringing to D.C.'s evolving foodscape, and what lessons Union Market may hold for other redeveloping public spaces.

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GES, Geography & Environmental Systems Masters, 2012

## The Chickens' Grain: Understanding Contestations Around Land-Use Best Practices on Maryland's Eastern Shore

### Oral

In this the paper I argue that attitudes between Eastern Shore agriculturalists and non-farmers (regulators, environmentalists and scientists) around land-use expertise, the role of land-user responsibility concerning land-use best practices and agriculture's impact on Chesapeake Bay water quality are polarized. Issues regarding contestations around expertise consist of agriculturalist's distrust over land-use regulation administered, developed and championed by the State of Maryland and non-farmers. Additionally, there is incongruity between urban and rural actors regarding who is responsible for water quality pollution in the Chesapeake Bay. Lastly, polarization is also reflected in the utter disagreement over the magnitude of agriculture's impact on water quality between agriculturalists and non-farmers. These examples of polarization may have potential telling implications for the environmental management literature. Environmental management literature examines the role socio-economic and socio-ecological variables play in adoption of agricultural BMPs. However, environmental management investigation does not adequately consider the relationships that exist amongst diverse groups and their own particular attitudes towards agricultural BMPs and the relationship between these varying attitudes and drivers of land-use change. Therefore, environmental management literature can benefit from the inclusion of diverse actor attitudes towards agricultural BMPs alongside socio-economic and socio-ecological variables regarding adoption of agricultural BMPs. Chapter one examines how and why the Eastern Shore of Maryland became a concentrated area for broiler chicken production. I do so by examining land-use trends and land-use change over time on Maryland's Eastern Shore over the past 100 years. In this chapter I argue that the region's shift to broiler production can be attributed to four factors: 1) Eastern Shore's location to East Coast urban food markets, 2) industrial agricultural development, 3) post WWII government subsidies toward meat production and 4) chicken feed's (corn/soy) relationship with land-use and meat production are the four major reasons of why concentrated broiler production is ever-present throughout the Easter Shore of Maryland. Chapter two examines how diverse actors feel about agricultural Best Management Practices and the relationship between those attitudes and attitudes towards drivers of land-use change on the Eastern Shore of Maryland. In chapter two I argue that agriculturalists and environmentalists attitudes towards the impact of agriculture on water quality are extremely polarized. Additionally, I argue that this polarization is reflected in the contestations around expertise regarding agricultural Best Management Practices and drivers of land-use change. In chapter three I examine two significant environmental events that have impacted both farmer contestations around expertise and distrust around land-use regulation. The events are the so-called "Pfiesteria hysteria" of 1997 and the 2010 Assateague Coastal Trust V. Hudson Family Farm court case. Both events took place on Maryland's Eastern Shore and continue to influence farmer attitudes regarding nutrient management regulation, environmental activists and science based research.

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ENEE, Electrical Engineering Ph.D., 2010

## On the Effect of Imperfect Range Estimates on Base Station Anonymity in Wireless Sensor Networks

Oral

In recent years, Wireless Sensor Networks (WSNs) have become valuable assets to both the commercial and military communities with applications ranging from industrial control on a factory floor to reconnaissance of a hostile border. A typical WSN topology that applies to most applications allows sensors to act as data sources that forward their measurements to a central sink or base station (BS). The unique role of the BS makes it a natural target for an adversary that desires to achieve the most impactful attack possible against a WSN. An adversary may employ traffic analysis techniques such as evidence theory to identify the BS based on network traffic flow even when the WSN implements conventional security mechanisms. This motivates a need for WSN operators to achieve improved BS anonymity to protect the identity, role, and location of the BS. Location anonymity assessments depend on an adversary's ability to achieve accurate range estimates to map intercepted traffic to the target network's topology. These range estimates may suffer from a variety of errors depending on the specific RF propagation environment in which the target system operates. BS anonymity estimates in turn may be degraded depending on the severity of the ranging errors. In this paper we examine the effect of Gaussian distributed ranging errors on BS anonymity using evidence theory analysis and simulation.

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Information Systems, Information Systems Ph.D., 2010

## Improving Static SMS Spam Detection by Using New Content based Features

Oral

As the use of mobile phones grows, spams are becoming increasingly common in mobile communication such as SMS, calling for the research on SMS spam detection. Most of the existing detection techniques for SMS spams are adapted from other contexts such as emails and the web but ignore some unique characteristics of SMS in spam detection. Moreover, spammers are constantly developing more sophisticated tactics, rendering previous features and methods for spam detecting no longer effective. In this paper, we propose to incorporate different content features to improve the performance of SMS spam detection. The effectiveness of the proposed features is empirically validated using multiple classification methods. The results demonstrate that the proposed features can improve the performance of SMS spam detection.

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Information Systems, Human-Centered Computing Ph.D., 2011

## “Pray Before You Step Out”: Describing Personal and Situational Blind Navigation Behaviors

Oral

Personal navigation tools have greatly impacted the lives of people with vision impairments. As people with vision impairments often have different requirements for technology, it is important to understand users' ever-changing needs. We conducted a formative study exploring how people with vision impairments used technology to support navigation. Our findings from interviews with 30 adults with vision impairments included insights about experiences in Orientation & Mobility (O&M) training, everyday navigation challenges, helpful and unhelpful technologies, and the role of social interactions while navigating. We produced a set of categorical data that future technologists can use to identify user requirements and usage scenarios. These categories consist of Personality and Scenario attributes describing navigation behaviors of people with vision impairments. We demonstrate the usefulness of these attributes by introducing navigation-style personas backed by our data. This work demonstrates the complex choices individuals with vision impairments undergo when leaving their home, and the many factors that affect their navigation behavior.

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LLC, Language Literacy & Culture Ph.D., 2013

## Constructing a Common Core: Critical Discourse Analysis of the Common Core State Standards

Oral

The Common Core State Standards attempt to create unified language and objectives for student learning in the United States of America. However, a wave of widely varied opposition to the Common Core suggests the complexity of constructing a unified vision for student achievement. This moment of crisis has the potential to reveal and call into question mainstream ideology that shapes educational practice in the United States. It provides an opportunity to examine and expose varying conflicting ideologies and mental models regarding the purpose and process of education. Any examination of this conflict necessitates first analyzing the Common Core itself. The present study focuses on the introduction to the English Language Arts Standards and is part of a larger study of oppositional discourse surrounding the Common Core. Critical discourse analysis of the Common Core can illuminate the sources of the tension surrounding the Common Core and provide insight into the questions about education policy and practice that need to be a part of public discourse moving forward. Because educational policy has the potential to reflect and reify dominant discourse as well as shape and constrain teacher practice, it is important that curriculum writers, teachers, and the public engage in constructive conversations about potential ideological influences on the creation, interpretation, and implementation of the Standards.

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## Embracing New Media to Tell the Story of Volunteer Farm Workers Oral

Oral history represents a Venn diagram where people who may not otherwise meet, plan in advance to interact, and that act is captured on audio and/or video. My participants are not geographically collocated, but rather form an international diaspora of volunteer farmers. The unifying characteristics are where they volunteered - Japan - and their motivations - altruism and alternative tourism. This presentation outlines how embracing new media is what allows me to undertake this research at all: my first 30 participants live in 24 different cities across the globe. Using my dissertation research as a case study, I will provide concrete examples of how using video conferencing enhances the ability to collect the stories of volunteer farmers; and how mapping software and movie-making software provides a way to creatively present them. Embracing new technology maintains the foundational tenants of the field as well as high ethical standards while simultaneously increasing the usability of the interviews. These techniques introduce multiple layers of preservation - typed standalone transcripts, verbatim captioned audio, mapped visual representations of the stories - at the same time they provide dynamic and interesting storytelling techniques. High-quality background research and vetted transcripts are still a key component of the oral history process, and they can seamlessly combine with technology to make the interviews more accessible and potentially more desirable to researchers and archives.

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Mathematics & Statistics, Applied Mathematics Ph.D., 2011

## Time-stepping techniques to enable the simulation of bursting behavior in a physiologically realistic computational islet Oral

Physiologically realistic simulations of computational islets of beta cells require the long-time solution of several thousands of coupled ordinary differential equations (ODEs), resulting from the combination of several ODEs in each cell and realistic numbers of several hundreds of cells in an islet. For reliable and accurate solution of the non-linear reaction equations up to the desired final times on the scale of several bursting periods, a stiff ODE solver is necessary. Stiff ODE solvers necessarily require the Jacobian matrix of the system of ODEs. For sophisticated models of systems of several ODEs in each cell, it is practically unworkable to differentiate such intricate non-linear systems analytically and to manually program the resulting Jacobian matrix in computer code. This paper demonstrates that automatic differentiation can be used to obtain code for the Jacobian directly from code for the ODE system, which allows to account fully for the sophisticated model equations. When we combine this with modified memory management in the ODE solver, simulations on the realistic scale of one thousand cells in the islet become possible in the software Matlab that are on the order of 100 times faster than the original solver without an analytic Jacobian. The techniques suggested here are feasible in many programming languages and the conclusions apply to a wide range of systems of coupled, non-linear reaction equations.

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## The Proportional Odds Model

Oral

The proportional odds model is a classic statistical model for data with an ordinal categorical response. Ordinal categorical means that the values are discrete and ordered. The model assumes that the log odds of the cumulative probability for each response category is a linear function of the predictors, with a different intercept for each category but with the same "slope", that is, the same vector of coefficients of the predictors. We collect and examine the mathematical properties of the proportional odds model's likelihood function. We interpret these properties in order to give insight into the applicability of the proportional odds model to data with high dimensional predictors, and to give insight into extensions and generalizations of the model.

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## Extending the Fatigue Life of Aluminum Alloys

Oral

The most common type of failure or fracture of engineered components is fatigue. Fatigue fractures occur from cyclic stresses, or the repetitive loading and unloading of the component. These types of fractures are particularly hazardous because they can occur under normal service conditions and with no warning. Thus, there is a significant interest into methods to extending the service / fatigue life of engineered components. One of these methods is to introduce an overload into the system. These overloads have been shown to retard crack growth under constant amplitude cyclic loading conditions which are under the overload stress value. New studies are observing the effect of multiple overloads at varying amplitudes and their effect on the fatigue life of components. These results will then be used to develop a behavioral model and compared to the benefit of singular overloads.



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## The Contribution of Proteins Content on Crack Growth Resistance of Human Dental Enamel Oral

Human enamel is regarded as the most highly calcified and hardest tissue of the body. By weight the enamel is nearly 96% mineral, with the remainder comprised of complex proteins (1%) and water (3%). In this investigation the importance of the organic content (i.e. proteins) on the crack growth resistance of enamel was studied. Compact tension fracture specimens were prepared from the enamel of young patients and used in quantifying the incremental crack growth resistance. In selected samples the proteins were extracted from the microstructure by controlled exposure to potassium hydroxide. Results showed that the protein content is critical to the fracture resistance of enamel, with extraction of proteins resulting in substantial reduction to both the degree of crack growth toughening and the apparent fracture toughness. The mechanisms responsible for the changes in fracture behavior with loss of proteins will be discussed. (Supported by NIDCR DE016904)

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Physics, Applied Physics Ph.D., 2010

## Native Oxide Study of Atomic Layer Deposition Ta<sub>2</sub>O<sub>5</sub> on InAs(100) by X-ray Photoelectron Spectroscopy Oral

The current demands on the electronics industry to develop smaller and faster devices has led to ever-decreasing transistor dimensions. When the dimensions of these Si-based semiconductor devices reach the order of a few nanometers, problems such as high leakage current cause them to fail. Focus has now turned to developing devices consisting of high-k dielectrics on III-V semiconductors to take advantage of their superior electrical properties. However, III-V semiconductors have an inherent low quality native oxide layer on the surface that introduces problems such as low carrier mobility and dielectric constant. During film growth on III-V substrates, these oxides have been observed to remain unchanged or diffuse into the dielectric film, both of which are detrimental to device performance. It has been found that by using the atomic layer deposition (ALD) process, growth of high-k materials on III-V substrates has the beneficial effect of reducing the native oxide thickness. This “self-cleaning” mechanism is not yet fully understood and is the focus of this work. Here, Ta<sub>2</sub>O<sub>5</sub> films were deposited on native oxide covered and NH<sub>4</sub>OH etched InAs(100) using ALD with pentakis dimethylamino tantalum (PDMAT) and H<sub>2</sub>O. ALD is utilized because of its unmatched ability to grow highly uniform and conformal films with subnanometer thickness control. Two sets of samples with Ta<sub>2</sub>O<sub>5</sub> thickness of ~3 and 7 nm were prepared at the deposition ranging from 150 to 300 °C. X-ray photoelectron spectroscopy (XPS) was utilized to study the interface between the Ta<sub>2</sub>O<sub>5</sub> films and the InAs. Depositions at optimal temperatures (250-300 °C) of 3 nm films produce film stacks with very little interfacial oxide. Films grown on substrates etched in NH<sub>4</sub>OH to remove the native oxide prior to deposition remained practically clean for all temperatures. It is clear, however, that indium oxides diffuse into the dielectric without complete removal as evident by their detection in 7 nm films. Angle resolved XPS will be performed on thicker films to verify the location of these oxides.

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Physics, Applied Physics Ph.D., 2009

## In situ FTIR study of the surface reactions during the atomic layer deposition of HfO<sub>2</sub> on GaAs(100) surfaces

Oral

Atomic layer deposition (ALD) is a gas phase thin film synthesis method with unique advantages of growing uniform and conformal thin films with precise thickness control. The ALD of high dielectric constant dielectrics on III-V semiconductors has potential applications in the fabrication of high speed and low power consumption devices. However, these applications have been hindered by the poor quality of the native oxides of the III-V substrates. About a decade ago, it was observed that for the ALD of some high-k dielectrics on III-V semiconductor surfaces, the native oxide layer was thinned during the deposition. This process was also called interface "self-cleaning". By now, the interface self-cleaning phenomena have been widely observed for the ALD of various high-k dielectrics on III-V semiconductor surfaces. In spite of extensive study, the mechanism for the self-cleaning still remains poorly understood. The purpose of this work is to investigate the surface reactions, especially the self-cleaning mechanisms, during the ALD of HfO<sub>2</sub> on GaAs surfaces. HfO<sub>2</sub> was atomic layer deposited on chemical oxide and HF etched GaAs(100) surfaces using tetrakis(dimethylamino)hafnium (TDMAH) and H<sub>2</sub>O. The surface reactions were investigated by in situ attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR). The CH<sub>3</sub> and NC<sub>2</sub> stretching modes were observed after each TDMAH exposure and stretching modes from terminated OH bonds were observed after each H<sub>2</sub>O exposure. This confirms the surface ligand exchange process. For the deposition on chemical oxide GaAs surfaces, arsenic oxide removal was observed to be significant for the deposition above 250 °C while insignificant below 200 °C. For the deposition on HF etched GaAs surfaces, no interfacial arsenic oxide regrowth was observed during the deposition. Imine species were found to be produced at each H<sub>2</sub>O exposure and accumulate in HfO<sub>2</sub> film. The existence of the imine species in the film may contribute to the arsenic oxide removal during the deposition.

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Public Policy, Health Policy Ph.D., 2009

## The Seasonality of Medicaid Enrollment: Implications for Medicaid/Marketplace Planning and Outreach

Oral

This project seeks to identify and explain seasonality in Medicaid applications and enrollment for the purposes of interpreting Medicaid and Marketplace enrollment dynamics, including churning; refining enrollment projections; and informing outreach strategies. I am employing a mixed methods design with multiple strands. Using validated state Medicaid Statistical Information System (MSIS) data, I computed month-to-month changes in enrollment from 2000-2011 for the study populations, identified trends, and compared and contrasted them across sub-populations. Next I will conduct semi-structured interviews with state Medicaid eligibility leaders and perform multiple regression analyses using national and state-level economic and other data to develop explanations. I will am studying the entire Medicaid population and four sub-populations: non-disabled adults (who constitute most of the "newly eligible"); non-disabled children; the disabled; and the elderly. I will further analyze sub-populations by age and other characteristics. Initial findings show that there is strong evidence that Medicaid application and enrollment varies seasonably. Patterns are consistent across states and time periods.

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Public Policy, Public Policy Masters, 2012

## Smoke-free policies in multiunit housing in Baltimore City

Oral

The spread of smoke through the shared ventilation systems of multiunit housing (MUH) is a persistent cause of secondhand smoke exposure. While this exposure has serious health consequences for all populations, children are particularly at-risk for negative health outcomes. Secondhand smoke not only impacts the health and well-being of residents, but also poses significant property costs due to damages and fires. Because of this, there have been a growing number of state and city-level policies that propose or encourage smoke-free MUH. The proposed research seeks to understand how the underlying beliefs and feelings of decision-makers and implementers influence the sense of feasibility and barriers about such policies. A case study design will be used to examine these underlying notions and feelings through purposive, semi-structured, individual, in-depth interviews. The interviews will be conducted through a convenience sample of 3-5 decision-makers or implementers in the two smoke-free housing buildings in Baltimore City. Using qualitative methods will help to see the effects of tobacco policies anew and may uncover surprises from complex data. On a practical level, this research can inform building managers and policymakers about how best to create and implement smoke-free policies in order to achieve reduced exposure to secondhand smoke in MUH. Specifically, state and local governments can use the findings to encourage local MUH buildings to independently adopt smoke-free policies and tailor resources to support successful outcomes.

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Sociology & Anthropology, Applied Sociology Masters, 2012

**Attributing Blame: A Content Analysis of the  
Media's Portrayal of School Shootings**  
Oral

The current research employs a content analysis of newspaper media coverage of eight school shooting incidents from 2008 to 2011 in the United States. Analysis compares difference in coverage based upon White versus Non-White shooters as well as coverage differences in national news media compared to local news. The application of attribution theory in understanding if newspaper media attributes internal causes to Non-White shooters and external attributions to White shooters is also explored.

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Jonathan Teklu, jteklu1@umbc.edu  
Sociology & Anthropology, Applied Sociology Masters, 2013

**Building Social Capital to Serve a Food Desert:  
An Ethnographic Study of an East Baltimore Community**  
Oral

This study aims to evaluate how residents of a food desert relate to their food environment and assess the role of social capital to overcome barriers for participation in food desert intervention initiatives. The purpose is to develop insights in order to effectively design and integrate eating and health behavioral interventions into the cultural framework of a food desert community and positively affect health outcomes. This study will focus on the neighborhood surrounding the Census tract number 24510080500 in East Baltimore and evaluate the social capital that has been developed between the residents of this community, employees of local businesses, and various owners food outlets in that neighborhood.

**POSTER  
PRESENTATION  
ABSTRACTS**

Arya Ashok, arya1@umbc.edu  
Biological Sciences, Biological Sciences Ph.D., 2010

## A Transgenic Mouse Model for Inducible Inflammation in the Prostate Poster

It is estimated that as many as 20% of all human cancers arise as a result of chronic inflammation. In the prostate gland, Proliferative Inflammatory Atrophy (PIA) has been strongly associated with prostate carcinogenesis. The overall objective of this project is to develop and characterize an animal model in which the phenotypic and molecular consequences of abacterial prostate inflammation can be determined. We hypothesize that chronic inflammation will result in changes in DNA methylation and gene expression that may foster both benign and malignant changes in the prostate. Inflammation has recently been associated with aberrant DNA methylation changes in a mouse model of intestinal cancer. To generate a bi-transgenic system in which inflammation can be induced at will in the mouse prostate, a Hoxb13-rtTA strain expressing the Reverse Tetracycline Transactivator was bred to a responder strain carrying a Tet-Operator-driven IL-1 $\beta$  gene (TetO-IL-1 $\beta$ ). Upon administration of the inducing agent Doxycycline (Dox) to Hoxb13-rtTA+/ $\pm$ |TetO-IL-1 $\beta$ +/ $\pm$  doubly homozygous transgenic mice, profound acute inflammation was observed in all lobes of the prostate as early as one week post-induction, with 100% penetrance of the inflammatory phenotype. The inflammatory infiltrate was observed within the stroma, ducts, and epithelium. At six weeks, luminal epithelial cells in the ventral prostate appeared to be atrophic, with the overall appearance of the glands bearing a striking similarity to human PIA. Flow cytometric analyses revealed a chronic inflammatory phenotype consisting primarily of T cells, dendritic cells and B cells that persisted at 6 weeks, 9 weeks and 12 weeks post-induction. After 9 weeks of chronic inflammation, extensive remodeling of the prostate epithelium was evident. Nuclear atypia, consisting of enlarged nuclei and nucleolar prominence, was also observed. Laser capture microdissection studies to determine the effects of inflammation on global DNA methylation and gene expression were performed on 9 week inflamed and normal prostates. DNA and RNA were simultaneously extracted from the samples to perform RNA-seq to quantify gene expression and qMBD-seq to quantify global methylation. Differential expression was observed in 2178 genes and hundreds of regions were differentially methylated in the induced mice compared to the control. Further analyses of the molecular events that occur in response chronic prostate inflammation may provide mechanistic insights into the relationships between inflammatory infiltrates and prostate pathology.

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Biological Sciences, Biological Sciences Ph.D., 2010

Identification and characterization of  
protein kinase Pim1 substrates regulating protein synthesis  
Poster

Up-regulation of kinases facilitating cell growth is a hallmark of cancer and major target for intervention. Pim1 is one such oncogenic kinase that is deregulated in various hematopoietic and epithelial malignancies. Pim1 serves as an excellent target for cancer therapy because; it is constitutively active, has a unique kinase hinge structure and is dispensable for growth of most normal adult tissues. Inhibitors of Pim1 have been tested in preclinical trials for lymphoma and prostate cancer therapy. To date, very few substrates have been identified for Pim1. Thus, the physiological roles of Pim1 have not yet been fully characterized. Recent reports have identified Pim1 as a regulator of protein synthesis, in addition to its established role in apoptosis and cell cycle control. The aim of this research is to identify those novel Pim1 targets that regulate protein translation. The rationale supporting the aim is that these Pim1 substrates will identify foci for crosstalk with other signaling pathways and open avenues for co-targeting therapies, or these substrates will themselves act as targets for therapeutic intervention. Using reverse in-gel kinase assay we have identified Nucleolin and hnRNP A1 as two substrates of Pim1, which are known to control various aspects of ribosome biogenesis and mRNA processing, respectively. I hypothesize that phosphorylation by Pim1 affects the function of hnRNP A1 and Nucleolin, and thus regulates protein synthesis.

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Biological Sciences, Applied Molecular Biology Masters, 2013

Localization of Histone Methyltransferase, SET4, in *S. cerevisiae*  
Poster

Histone lysine methyltransferases are an important element in the cascade of events that determine the level of expression of a particular gene in the eukaryotic genome. These proteins are responsible for methylating lysine residues on histone proteins<sup>1</sup>. Of the many histone lysine methyltransferases that have been studied in *Saccharomyces cerevisiae* (budding yeast), this study will focus on characterizing the SET4 protein. SET4, a member of the SET super family, is composed of a SET domain that is thought to be responsible for the catalysis of methylation, and a PHD domain that reads the methylation signal and transmits it to biological processes<sup>2</sup>. Yeast cells that overexpress SET4 display reduced vegetative growth and increased invasive growth<sup>3</sup>. The following project will determine whether the SET4 protein is a nuclear or cytoplasmic protein, and in doing so the study will exploit SET4's reduced vegetative growth phenotype. Based on localization information of other SET proteins, it is hypothesized that SET4 is a nuclear protein that interacts with chromatin<sup>4</sup>. SET4 is not expressed under normal conditions, therefore, to determine where the SET4 protein is localized in the cell, inducible vectors containing SET4 fusion proteins were created, at both the amino and carboxy terminal ends. The N-terminal GFP tagged SET4 protein was visualized via confocal microscopy and results revealed that SET4 is localized to the nucleus. In order to confirm these findings, a cell fractionation assay will be done with N-terminal GST tagged SET4. Thus far the GST tagged SET4 has been expressed and successfully detected on a western blot.

Alison Jacques, alison4@umbc.edu  
Biological Sciences, Applied Molecular Biology Masters, 2013

## The Effect of a Mutant HMGB1 Protein on Inflammation Poster

Myeloid-derived suppressor cells (MDSC) inhibit both the adaptive and innate immune response, contributing to inflammation and tumor-induced immune suppression. MDSC are elevated in most tumor sites<sup>1</sup>. Several aspects of MDSC function are regulated by the receptors Toll-Like Receptor 4 (TLR4) and Receptor for Advanced Glycation End Products (RAGE)<sup>2</sup>. Signaling through either receptor will cause NF- $\kappa$ B transcription, leading to the production of pro-tumor cytokines, such as tumor-necrosis factor alpha (TNF $\alpha$ )<sup>3</sup> (Fig. 1). As an inflammatory DAMP (damage associated molecular pattern molecule), High Mobility Group Box 1 (HMGB1) is elevated in instances of inflammation and cancer. HMGB1 normally resides in the nucleus, however, pro-inflammatory stimuli can cause the release of HMGB1, amplifying the inflammatory response<sup>4</sup>. Preliminary studies by the Rosenberg Laboratory indicate HMGB1 promotes MDSC accumulation. To deduce HMGB1's primary binding receptor(s) in MDSC, mutant HMGB1 proteins were created lacking the TLR4 or RAGE binding sites. CHO cells are being used to express and collect these mutant proteins. Once a sufficient amount of protein is generated, functional assays examining HMGB1's ability to signal will be conducted in the form of TNF $\alpha$  ELISAs. Creating additional double-mutant HMGB1 molecules that are defective in critical cysteines and RAGE will further elucidate HMGB1's preferred structure and binding mechanism.



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Biological Sciences, Neurosciences & Cognitive Sciences Ph.D., 2013

## The Effects of Irritant Exposure on the Olfactory Behavior of Skn1a Knockout Mice Poster

The Main Olfactory Epithelium (MOE) in the nasal cavity detects thousands of inhaled odorants daily. However, mechanisms by which the MOE alters its sensitivity and function in order to protect itself against noxious substances such as odorous irritants and pollutants are poorly understood. Nonetheless, this underappreciated protective function is essential for protecting the MOE as well as the lower airway, lungs and brain. Our previous research demonstrated that TRPM5-expressing microvillous cells (TRPM5-MC's) can respond to odorous irritants and are capable of releasing acetylcholine (ACh) (Lin et al, 2008; Ogura et al, 2011). We hypothesize that these cholinergic TRPM5- MC's play a role in detecting harmful chemicals and modulating functional sensitivity of the MOE in response to noxious substances. Here, we used knockout mice for the POU transcription factor Skn 1/a to elucidate the role of TRPM5-MCs in MOE plasticity, as our recent experimental results have provided evidence that these Skn1a Knockout mice (Skn-1a -/-) lack TRPM5- MC's in their MOE (Yamaguchi et al, 2014). We exposed both Skn-1a -/- and WT mice to odorous irritants for 2 weeks and performed 2 standard olfactory behavior tests, i) the Buried Food test and ii) the Habituation-Dishabituation (H-D) test to assess olfactory function pre-, mid, and post-exposure. Initial data reveals that exposure decreases the time required to locate the food stimulus for both WT and Skn-1a -/- mice in the Buried Food test, although exposed Skn-1a -/- mice take more time to complete the task than exposed WT mice at week 2. After 2 weeks of exposure, Skn-1a -/- mice still exhibit a noticeable response to odorant presentations in the H-D test, whereas exposed WT mice sniff little at presented odorants in the H-D test and effectively lose the robust H-D response they exhibit pre-exposure. Thus, this preliminary data demonstrates that unlike Skn-1a -/- mice, WT mice show a decreased response to odorants with irritant exposure. These behavioral results support our hypothesis that cholinergic TRPM5-MC's are involved in modulating olfactory functional sensitivity in response to the irritant exposure. Given the rising pollution levels around the world, this research has potentially great implications for helping us understand the mechanisms underlying MOE protection in response to environmental insults.

Amanda Lo, alo3@umbc.edu  
Biological Sciences, Biological Sciences Masters, 2012

## The Genetic Effects on the Innate Immune System in *Drosophila melanogaster* Poster

Although immunosenescence, the decline in the immune system with respect to age, has been widely observed through physiological changes, little is known about its genetic basis. Therefore, for this study, we will observe the genetic effects of the innate immune system with respect to age in *Drosophila melanogaster*. In a recent study, 192 natural variant fly lines from the Genome-Wide Association Study (GWAS) in *Drosophila melanogaster* were infected with *Escherichia coli* and observed for bacterial clearance. The 192 fly lines varied from each other by a single-nucleotide polymorphism (SNP), a variation in a single nucleotide in the DNA sequence. For this study, the genes associated with each SNP were analyzed through gene ontology to find the top twenty candidate genes that may be involved with bacterial clearance. Using the GAL4-UAS system, we will knock down the top candidate genes and observe the genetic effects on the innate immune response at both early- and late-aged adult flies. If an effect is found, this study will increase our knowledge of which genes could potentially be influencing immunosenescence.

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Biological Sciences, Applied Molecular Biology Masters, 2013

## Functional Characterization of SET4 Histone Lysine Methyltransferase in *Saccharomyces cerevisiae* Poster

Histone methyltransferases are a class of proteins that modify histones by addition of methyl groups to arginine or lysine residues. These modifications in histones are known to play a prominent role in gene activation or repression. Lysine specific histone methyl transferases (KMT) can be divided into SET and non-SET domain containing proteins. The SET domain is a conserved protein domain that is known to be responsible for the methylation activity. The SET4 KMT present in *Saccharomyces cerevisiae* (budding yeast) is an uncharacterized protein in the SET domain containing family. SET4 is a paralog to SET3, a well-studied protein in the SET family and a potential ortholog to human MLL5 protein, known to be associated with Acute Myeloid Lymphoma. SET4 contains a SET domain and a PHD finger, an epigenetic reader that controls gene expression by molecular recruitment of multiprotein complexes of chromatin regulatory proteins and transcription factors. Overexpression of SET4 is known to be toxic to *S. cerevisiae* and to reduce vegetative growth. This project focuses on determining the regions responsible for the activity of SET4 by studying its toxic phenotype. Single and double point mutations were created in both SET and PHD domains in plasmids containing an inducible promoter driving expression of SET4. Over-expression assays were performed to determine their effect on vegetative growth. Certain mutations result in a decrease in toxicity. This suggests that the activity of SET4 is affected by the mutations in these sites. The data obtained from this project can be used to perform other phenotypic assays such as invasive growth and biochemical assays for assessing the methylation activity of the wild type and mutants to determine the substrate of SET4 protein.

Preethi Somasundaram, preethi2@umbc.edu  
Biological Sciences, Biological Sciences Ph.D., 2011

## Role of melanopsin phosphorylation in mouse behavior and physiology Poster

Melanopsin is a unique visual pigment, expressed in intrinsically photosensitive retinal ganglion cells (ipRGCs) of mammalian retina. It is a G-protein coupled receptor (GPCR) involved in photoreception for non-visual functions such as circadian photoentrainment and pupillary light reflex, and some visual functions. Recent work in mammalian vision show that melanopsin is a capable rescuing defects in simple visual abilities. This calls for a broader understanding of the kinetics and regulation of melanopsin activity. Melanopsin structure and in vitro data indicate that the activity of this visual pigment is regulated by phosphorylations of the receptor by a G-protein coupled receptor kinase (GRK) and a Protein kinase A (PKA) in light and dopamine dependent manners respectively. The working hypotheses for this project are that GRK mediated melanopsin phosphorylation controls the lifetime of the active protein by initiating deactivation of the receptor, and that PKA mediated phosphorylation contributes to ipRGC adaptation by modulating the activity of the receptor. I aim to demonstrate the impact of these phosphorylations on physiology and behavior of mice.

Melanopsin genes (*Opn4*) carrying targeted mutations of either GRK or PKA phosphorylation sites have been incorporated in the reverse orientation into an adeno-associated viral vector backbone flanked by lox-p sites, thus rendering them dependent on cre-loxp recombination for expression. A viral based gene delivery approach will used to introduce these floxed constructs into *Opn4*<sup>-/-</sup> Cre mouse line (a mouse line expressing Cre-recombinase from melanopsin locus) to generate transgenic mice. Packaging of the floxed constructs into suitable adeno-associated viral capsids is currently underway. These transgenic mice are expected to show abnormal circadian behavior and pupillary light reflex, and a deficit in ipRGC adaptation. This research could potentially demonstrate a previously unexplained mechanism underlying ipRGC photoreceptor adaptation and establish the significance of phosphorylation on organismal behavior in the context of non-image forming vision.

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Chemistry & Biochemistry, Chemistry Ph.D., 2009

## Flexible Nucleoside Analogs as Antivirals Poster

The need for new and more potent antiviral therapeutics is critical due to increasing reports of drug resistance, as well as emerging new viral diseases. It has been reported that Tenofovir, an FDA-approved flexible acyclic nucleotide, and Etravirine, an FDA-approved flexible heterobase analog, can adapt conformationally and positionally to resistance mutations encountered in the HIV reverse transcriptase (RT) binding site. This flexibility allows them to retain their potency against resistant strain. These findings are causing a paradigm shift in how medicinal chemists view flexibility in drug design. Related to these findings, a flexible "split" guanosine triphosphate analog developed in our laboratory not only retained full potency against binding site mutations in guanosine fucose pyrophosphorylase (GFPP), but the enzyme exhibited a clear preference for the Flex-GTP due to interactions with secondary amino acid residues not previously involved with the mechanism of action. As a result, exploitation of conformational and positional flexibility in the nucleobase scaffold can be viewed as a powerful tool for developing drugs that can retain their effectiveness against rapidly mutating viral targets. This project will explore how this novel flexibility, when combined with active nucleotide antiviral sugar scaffolds, affects viral polymerase binding and function through both in-vitro and computational studies. We predict that, unlike other unnatural nucleotides previously studied, (i) the flexible analogs will be more readily recognized by the polymerases; (ii) they will serve more effectively as substrates for DNA and RNA polymerases, and (iii) their flexibility will allow them to overcome resistance mechanisms related to point mutations in enzymatic binding sites.

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Danielle Schmitt, schdani1@umbc.edu  
Chemistry & Biochemistry, Chemistry Ph.D., 2012

## Characterization of a Regulatory Loop Between AMPK and the Purinosome Poster

The objective of this study is to understand a regulatory loop between AMPK and de novo purine biosynthesis. De novo purine biosynthesis is a ten-step process catalyzed by six enzymes in humans using phosphoribosyl pyrophosphate to make inosine monophosphate. The six enzymes catalyzing de novo purine biosynthesis have been found to cluster together when needed; forming a complex termed the "purinosome." An intermediate of purine biosynthesis, 5-aminoimidazole-4-carboxamide ribonucleotide (AICAR), is a well-characterized allosteric activator of AMP-activated protein kinase (AMPK) that is a master regulator of cellular energy homeostasis. However, it has not been investigated if the purinosome is influenced by cellular energetics. We hypothesize that a regulatory loop exists between AMPK and the purinosome, allowing AMPK to regulate purine biosynthesis and the purinosome to control AMPK activation during purine biosynthesis. Our preliminary data using fluorescence single-cell microscopy shows clustering of green fluorescent protein-tagged formylglycinamide ribonucleotide synthase (FGAMS-GFP) after a few hours of exposure to metformin, a small molecule AMPK activator, and AICAR in live HeLa cells. These results suggest that activation of AMPK by small molecules causes purinosome association. We will further elucidate our observation in both live HeLa cells and lung cancer cells, including all of the six enzymes involved in de novo purine biosynthesis. Since de novo purine biosynthesis has been a target of cancer therapeutics, we anticipate that a greater understanding of purinosome formation, especially in response to cellular energy needs, will lead to therapeutic intervention.

Kenneth Childers, kchilde1@umbc.edu  
Chemistry & Biochemistry, Biochemistry Ph.D., 2012

## Biochemical Analysis of the Heme Regulatory Domain and Active Catalytic Center in Soluble Guanylyl Cyclase

### Poster

Soluble guanylyl cyclase (sGC) catalyzes the conversion of GTP into cGMP and acts as the primary receptor for nitric oxide (NO) in smooth muscle cells. Binding of NO to the sGC heme moiety increases cGMP production several hundredfold. The NO-sGC-cGMP signaling pathway is crucial for homeostasis in the mammalian cardiovascular system via vasodilation and inhibition of platelet aggregation in blood vessels. Structurally, each chain of sGC carries four similar domains: the N-terminal Heme Nitric Oxide/Oxygen (HNOX) domain, the HNOX-associated (HNOX-A) domain, the coiled-coiled (CC) domain, and the C-terminal guanylyl cyclase (GC) catalytic domain. Dysfunctions in the NO-sGC-cGMP pathway, such as oxidation of the sGC heme co-factor and reduced NO bioavailability, have been linked to cardiovascular diseases. Understanding the molecular mechanisms regulating sGC activity will guide the design of novel classes of NO-independent small molecules to treat cardiovascular diseases. Structure-based drug design studies to target oxidized sGC have been hindered by the absence of an atomic structure of the mammalian heme regulatory domain. Furthermore, we and others have solved the structure of the inactive catalytic domains and proposed that conformational changes are needed to reach the optimal state of the catalytic center. To address these issues, I will use x-ray crystallography for the regulatory domain and the catalytic domains. First, I have successfully cloned and expressed the bovine heme regulatory domain with a C-terminal maltose-binding protein (MBP) tag to aid purification. I will solve the x-ray structure of this construct to guide future structure-based drug design. Second, I have mutated several residues in the catalytic domains that were shown to increase basal activity in full-length sGC. I will first determine whether these mutations also increase catalytic activity of the isolated GC domains. If successful, these mutants will be used for structure determination of the catalytic domains in their active conformation.

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Chemistry & Biochemistry, Chemistry Ph.D., 2008

## An Integrated Platform of LC-MS, HPAEC-PAD, and Bioinformatics for the Carbohydrate Profiling of Therapeutic Glycoproteins Poster

An Integrated Platform of LC-MS, HPAEC-PAD, and Bioinformatics for the Carbohydrate Profiling of Therapeutic Glycoproteins Andrea Gray<sup>1</sup>; Joshua Wilhide<sup>1</sup>; Shaunak Uplekar<sup>2</sup>; William LaCourse<sup>1</sup>; Govind Rao<sup>2</sup> <sup>1</sup>Department of Chemistry and Biochemistry, <sup>2</sup>Department of Chemical and Biochemical Engineering; University of Maryland, Baltimore County, Baltimore, MD USA In the biopharmaceutical industry, there is an increasing interest in monitoring the effect that carbohydrate components have on the structural and functional roles of a therapeutic glycoprotein. Glycosylation patterns of recombinant glycoproteins are influenced by factors including the expression and growth conditions. These patterns affect the biological activity of proteins, such as the immunogenicity and receptor binding, which may subsequently affect the efficacy and safety of the final product. The goal is to determine the carbohydrate composition of immunoglobulin G (IgG) monoclonal antibody, a model glycoprotein, produced in miniature bioreactors (mini-HTB) compared to bench-scale models. Work will be performed using the complimentary techniques of HPAEC-PAD and LC-MS for profiling and characterization. Accelerating biopharmaceutical development warrants decreasing the time frame for cell culture bioprocess development, as well as, dealing with increased cost of drug development. The introduction of mini-HTB addresses both of these issues. Since glycosylation is a process that is sensitive to environmental changes, the main goal to accomplish through glycoprofiling is to compare the cause and effect relationship on glycosylation between mini-HTB and bench-scale bioreactors. Calibration of monosaccharide standards yielded lines very close to a linear fit with correlation values above 0.9990. The monosaccharide profile of the IgG3 hydrolysate was determined to contain fucose, glucosamine, galactose, glucose, and mannose. Relative monosaccharide quantities will be calculated. The HPAEC-PAD method for the IgG3 glycan profile has been optimized. Three major glycan structures were found and characterized as asialo-fucosylated (G2F), asialo-monogalacto-fucosylated (G1F), and asialo-agalacto-fucosylated (G0F) biantennary glycans. Mass spectrometry sequencing experiments were performed for insulin and streptokinase using top-down and bottom-up approaches, and 100 percent sequence coverage was achieved through the bottom-up method. Full intact protein identification was verified with the top-down approach. These methods will be applied to IgG3 and other glycoproteins. Bioinformatics software was used for sequencing and data analysis. Future work will include adding a library of glycan modifications into the software data analysis. Although the mini-HTB is able to overcome the previously mentioned issues, it introduces the need to analyze relatively small volumes of sample. The methods of LC-MS and HPAEC-PAD offer the needed sensitivity to work with small sample quantities.

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Chemistry & Biochemistry, Chemistry Ph.D., 2011

## Resveratrol induces spatial colocalization of phosphofructokinase and fructose-1,6-bisphosphatase in living cells

Poster

Acetylation was recently shown to be a prevalent post-translational modification in the glycolytic/gluconeogenic pathways, where ten of the fourteen enzymes have one or more acetylated lysine residues. However, the role of acetylation in the localization-function relationship of these metabolic enzymes is not yet determined. We hypothesize that acetylation of metabolic enzymes is one of the cellular mechanisms to trigger cellular redistribution of the glycolytic/gluconeogenic enzymes in cells. To date, we have investigated the enzymes phosphofructokinase-1 (PFK), which catalyzes step three of glycolysis, and its gluconeogenic counterpart, fructose-1,6-bisphosphatase (FBPase), as they catalyze irreversible regulatory checkpoints in their respective pathways. Using fluorescence single-cell microscopy, we have found that fluorescent-protein-tagged human PFK (e.g. PFK-GFP and PFK-OFP) form distinct cytosolic clusters in HeLa and 578T cells. Additionally, PFK-OFP clusters not only induce, but spatially co-localize with FBPase-GFP clusters in the cytoplasm. Furthermore, site-specific mutations of PFK (i.e. lysine 689 residue to arginine or alanine) appear to abolish this clustering phenotype. We anticipated that activation of the NAD<sup>+</sup>-dependent deacetylase sirtuin 1 (SIRT1) might redistribute the PFK enzyme in the cytoplasm. Instead, however, colocalization of PFK and FBPase enzymes was significantly promoted in the presence of a small molecular SIRT1 activator, resveratrol. This spatial colocalization phenotype was found to be reversible upon resveratrol's removal from the media, providing evidence that the colocalization response is dynamic and transient in nature. We are currently working to understand resveratrol's mode of action on PFK and FBPase, and the significance and function of their spatial compartmentalization in the cell. Enzymatic spatial colocalization could represent a new tier in the regulation of glucose metabolism; our work will provide us with novel insights as to how its dysregulation may be tied to human diseases.

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Chemistry & Biochemistry, Chemistry Ph.D., 2011

## Synthesis of Flexible, Purine Analogue Inhibitors of NCp7 Poster

Drug design in virus inhibition has been notably challenging due to the virus' ability to easily mutate and develop immunity against commercially available drugs. The most common HIV-1 therapy drugs target the viral enzymes required for replication. Unfortunately, these types of drugs are plagued by resistance and novel solutions are required. The Seley-Radtke laboratory is investigating a new series of nucleoside drugs that possess inherent flexibility, named "fleximers," and may be able to withstand active site mutations; the idea is to develop compounds that can structurally adapt to the enzyme active site before and after mutations occur. Due to the resistance developed towards HIV-1 enzyme inhibitors, our group is investigating a different target site. The nucleocapsid protein of HIV-1, NCp7, was determined to be involved in HIV-1 reverse transcription and packaging, and is essential for proper HIV-1 replication. NCp7 contains a highly conserved zinc finger nucleic acid binding domain established to be a potential therapeutic drug target against HIV-1. Through computational analyses performed by our modeling collaborators in Italy, several guanine base fleximer analogues were determined to be potential inhibitors selective to this site. Interestingly, these compounds are predicted to not work by zinc ejection, which would endow them with significant advantages over the currently used zinc-ejectors, which suffer from a lack of selectivity and possess significant toxicity. Using various coupling techniques as well as linear synthetic methodology, we propose to synthesize several series of these fleximer base analogues from their respective pyrimidine and imidazole building blocks for biological testing against NCp7 specifically and HIV-1 as a whole.

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DeLauren McCauley, dmccaul@umbc.edu  
Chemistry & Biochemistry, Analytical Chemistry Ph.D., 2011

## Detection of Off-Flavor Compounds in Recirculating Aquaculture Systems using Headspace-Gas Chromatography Mass Spectrometry Poster

Aquaculture has become one of the world's largest growing branches of food production through the process of farming a variety of aquatic organisms. Recirculating aquaculture technology emerged to reduce environmental contamination from traditional aquaculture systems. Consequently, this improved system has highlighted off-flavor accumulation in the tanks and the finfish populations. The following compounds, isopropyl methoxypyrazine (IPMP), isobutyl methoxypyrazine (IBMP), methylisoborneol (MIB), and geosmin, potentially produced in RASs cause musty and earthy odors in fish resulting in decreased quality of the crop. A critical analytical assessment is needed for detecting and quantifying these off-flavored compounds at lower limits of detection than previously studied. Traditionally, vigorous, time-consuming, and expensive pre-concentration steps were required to detect the compounds. Here, we implemented a dynamic headspace sampling system coupled to a gas chromatography single quadrupolar mass spectrometer. Method development was configured to achieve the highest throughput possible for the previously mentioned off-flavor compounds. This simple and rapid method was used to obtain mass spectra for structure elucidation. Ultimately, the proper identification will allow mapping of the compounds amongst the RAS for possible correlation to system parameters. Keywords: aquaculture, dynamic headspace (HS), recirculating aquaculture system (RAS)



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Chemistry & Biochemistry, Chemistry Ph.D., 2011

### 3-Phosphoinositide-dependent protein kinase 1 (PDK1) and its role in de novo purine biosynthesis

Poster

Purine biosynthesis, in humans, occurs by two pathways – de novo and salvage pathways. The salvage pathway involves the formation of inosine monophosphate (IMP) in one step using phosphoribosyl pyrophosphate and hypoxanthine. The de novo pathway, in humans, is an elaborate process involving ten steps catalyzed by a total of six enzymes including three multifunctional enzymes. These enzymes form a reversible, transient multi-enzyme complex – “purinosome” under purine starvation. In this work, we show that pharmacological inhibition of PDK1 using GSK2334470 (i.e. (3S,6R)-1-[6-(3-Amino-1H-indazol-6-yl)-2-(methylamino)-4-pyrimidinyl]-N-cyclohexyl-6-methyl-3-piperidinecarboxamide) leads to the formation of purinosomes in HeLa Cells. Consequently targeting two of the downstream proteins of PDK1 – protein kinase C (PKC) and p70 ribosomal S6 Kinase (S6K) using small molecule inhibitors Gö6983 (i.e. 3-[1-[3-(Dimethylamino)propyl]-5-methoxy-1H-indol-3-yl]-4-(1H-indol-3-yl)-1H-pyrrole-2,5-dione) and PF-4708671 (i.e. 2-((4-(5-Ethylpyrimidin-4-yl)piperazin-1-yl)methyl)-5-(trifluoromethyl)-1H benzo[d]imidazole), respectively, we indeed observe the purinosome formation. It appears that the PDK1 and its downstream signaling pathways negatively regulate purinosome formation. We work toward detailing the PDK1 associated signaling network and their role in the de novo purine pathway. Taken together, our work has the potential to demonstrate the functional role of PDK1 on de novo purine biosynthesis in human cancer cells, thus providing a novel mechanism for anti-cancer drug discovery.

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Chemistry & Biochemistry, Chemistry Ph.D., 2011

### Enzyme Architecture: Structure-Function Relationship Studies of Soluble Guanylate Cyclase

Poster

Soluble guanylate cyclase (sGC) is a heterodimeric ( $\alpha/\beta$ ) protein comprised of two subunits, each containing four domains: a Heme Nitric oxide OXYgen binding (HNOX) regulatory domain, a PAS-like domain, a Coiled Coil (CC) domain, and a Guanylate Cyclase (GC) domain. sGC is a protein of interest for its role in cardiovascular health. Acting as the body's main nitric oxide (NO) sensor, sGC binds NO via a ferrous heme within the  $\beta$ HNOX regulatory domain. The binding of NO to the heme increases the catalytic activity of sGC several hundred fold as compared to basal levels, but the exact mechanism for this dramatic activation is still unknown. The goal of this project is two-fold, (1) elucidate the NO induced mechanism of activation and (2) characterize the structure of individual protein domains to determine their effect on regulation and signal propagation. To elucidate the mechanism of NO induced activation, we aim to perform structural analysis of the regulatory HNOX domain in the absence and presence of NO. This study focuses on truncated  $\beta$  subunit sGC variants,  $\beta$ HNOX and  $\beta$ HNOX-HNOXA. We have observed that the presence of the HNOXA domain assists in heme stability, diminished in constructs containing only the HNOX domain. Thus, the  $\beta$ HNOX-HNOXA variant may provide a better mimic of full-length sGC heme behavior. Individual domain characterization will employ x-ray diffraction and scattering techniques on constructs of one or multiple domains. Our current studies are focused on the two aforementioned constructs as well as their  $\alpha$  subunit counterparts and constructs of the  $\alpha$  and  $\beta$  CC domains.

Opeyemi Ajayi, opeajay1@umbc.edu  
CBEE, Chemical and Biochemical Engineering Ph.D., 2013

## Staphylococcus Aureus Biofilm Formation on Micropatterned Surfaces Poster

Biofilms are communities of sessile bacterial cells encased within an extracellular polymeric substance the cells produce. Staphylococcus aureus biofilms cause cardiovascular infections such as infective endocarditis and sepsis, and pathogenesis is initiated by the adhesion of planktonic cells to host tissue or implant device materials. When biofilms form in the case of infective endocarditis, they are typically interspersed with platelets from the host organism that can alter the biofilm morphology compared to platelet-free biofilm structures. The broad goal of this study is to characterize and quantify the morphology and architecture of *S. aureus* biofilms that are grown on micro-patterned protein substrates as a function of independent variables such as shear rate and pattern dimensions in order to determine the influence of these parameters on biofilm structure. We will then further develop an understanding of the effects of platelets and blood plasma on biofilm architecture under physiologically relevant shear conditions. An understanding of these phenomena may eventually lead to a deeper understanding of staphylococcal infection development and subsequently, improved therapeutic approaches that minimize or eliminates the use of antibiotics. The adhesion of planktonic *S. aureus* cells will be controlled and localized into groups of varying surface areas and spacing on protein patterns developed using photo- and soft-lithography. The shear environment for adhesion of cells and growth of the biofilm will utilize a parallel plate flow chamber, and the structures will be visualized using confocal scanning laser microscopy and analyzed quantitatively by Image Structure Analyzer.

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Sheniqua Brown, sbrown12@umbc.edu  
CBEE, Biochemical Engineering Masters, 2012

## Non-Invasive Glucose Sensor using a Fluorescent Labeled Glucose Binding Protein Poster

This project focuses on developing a non-invasive glucose sensor that uses fluorescent labeled glucose binding protein to detect glucose on the skin versus the commonly used glucose blood test. The goal is to develop a commercial sensor that can monitor glucose levels in individuals suffering from diabetes, specifically neonates. The initial steps include the production and analysis of GBP, the sensor, which involves cell culture and fermentation of modified *E. coli*, extracting GBP from cells, fluorescent labeling protein and purifying GBP using size exclusion and ion exchange columns. This presentation will focus on the sensor and the work that has been done to analyze newer plasmids that contain the gene of interest. It will also discuss the current sampling and testing protocol for glucose levels on the skin and result from adult subjects.

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CBEE, Environmental Engineering Masters, 2013

## Ozone treatment of oxybenzone: Transformation kinetics and removal of UV absorbance

Poster

The fate of active ingredients in personal care products (PCPs) in the environment is of increasing concern. Active ingredients in PCPs include a wide range of compounds from UV filters to antiseptics and preservatives. Oxybenzone (OXY) is a UV filter used in PCPs to protect against UVA and UVB light. While oxybenzone protects from UV light, the chemical provides a unique threat to ecological health due to the potential for various toxic effects, including estrogenic and androgenic activity. To preclude lasting effects to human and ecological health, advanced water and wastewater treatment processes are required to successfully treat PCPs. In this research, oxybenzone was treated using concentrated aqueous ozone solutions (~16-40 mg/L as O<sub>3</sub>), which were generated by bubbling gaseous ozone into DI water. Based on fundamentals of ozone chemistry, we propose that oxybenzone contains one site that will demonstrate rapid reaction with ozone – the phenolate functionality. The pK<sub>a</sub> associated with this group is 8.1, with phenol dominating at lower pH and phenolate dominating at higher pH. Ozone reacts rapidly with the phenol/phenolate functionality (~10<sup>3</sup> to 10<sup>9</sup> M<sup>-1</sup>s<sup>-1</sup>). Oxybenzone concentrations were measured using liquid chromatography tandem mass spectrometry (LC-MS/MS). The second order rate constant for oxybenzone ranges from 3.11×10<sup>2</sup> to 3.35×10<sup>6</sup> M<sup>-1</sup>s<sup>-1</sup> across pH 5-9. The apparent reaction kinetics were modeled by applying specific rate constants to protonated/deprotonated species. Experimentation also focused on describing the effective UV absorbance of treated solutions. A baseline absorbance map was created to show the UV absorbance of oxybenzone across wavelength (220-500) and pH (5-9). These original solutions were serially treated with ozone, corresponding to effective doses of 0-12 mol O<sub>3</sub>/mol OXY. After each treatment step the effective UV absorbance was measured over the 220-500 nm range. The findings of this work demonstrate that the transformation of oxybenzone is highly reactive with ozone. The effective UV absorbance of treated solutions provides insight for how ozone removes the UV absorbance associated with solutions containing UV filters. Ultimately these results inform treatment of oxybenzone using the ozone process and indicate an ability to concomitantly measure concentration and UV absorbance (i.e., the main property of this class of PCPs).

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CBEE, Chemical and Biochemical Engineering Ph.D., 2008

Beta-amyloid fibrils and their interplay in Alzheimer's disease through  
physico-chemical, signaling, and epigenetic mechanisms  
Poster

Alzheimer's disease is a neurodegenerative disorder that affects millions across the world. No effective treatment or preventive measure has yet been identified for AD because we don't understand its intricacies. In our work, we apply analytical techniques and engineer new tools to better understand the cellular mechanism of this disease. We focus on aggregated A $\beta$  peptide which is the chief proponent implicated in it. We first identify how it interacts with cells and what are the possible sites of this interaction. We find that this interaction is influenced by both biological and electrochemical factors, and that certain residues play a bigger role than others. We next focus on understanding the signaling pathways that are activated by Ab peptide upon binding to the cell. Using kinetic modeling, we investigate the effect of beta-amyloid peptide on a set of signaling pathways and identify a plausible mechanism. These findings help understand how to develop therapeutics that target beta-amyloid and inhibit its toxic activity. A number of recent studies point to the role of DNA methylation, as an epigenetic cause or even a symptom of beta-amyloid's toxic effect on cells. We attempted to develop a novel technique to detect methylation changes in DNA and were partly successful. We also examined global and sequence specific methylation changes in neuroblastoma as well as neural stem cells upon exposure to A $\beta$ . The work could lead to the development of more effective stem cell therapies for use in AD and elucidate the impact of epigenetics in AD.

Prajit Kumar Das, prajit1@umbc.edu  
CSEE, Computer Science

## Efficient, Context Aware Privacy and Security on Mobile Platforms Poster

In today's mobile driven world, our smartphones contain enormous amounts of private data provided by the user or obtained from their embedded sensors. For example, smartphones can collect sensitive user information, such as information about her workplace, user location, or activity data. Meanwhile, corporations across the world are adopting the practice of Bring-Your-Own-Device (BYOD), creating new issues because sensitive corporate data is now on devices that they do not control. Thousands of mobile apps from unknown sources, some of them with malicious intents, could possibly use loopholes to steal sensitive information. In these circumstances, a system capable of learning the privacy and security policies of a user depending on their context is important. Some of the approaches found in the literature propose to pre-define all possible privacy policies for a user that map to a specific context of the user. However, the dynamic nature of user context makes it difficult to apply such a solution. Other approaches have employed user feedback to decide when and how the user wants to share their location. Nevertheless, there exists other sources of user data beyond location information. In addition to that, none of these approaches deal with an important problem in mobile computing: energy consumption. Any such system should be conscious of the overhead that it causes. We are proposing a system that efficiently adapts to the context of the user to select the appropriate privacy policy when sharing data with mobile apps. Our proposed work will make two key contributions: First, the system learns new policies and modifies current policies to control the data flow between the sensors and the apps on the device. The rule-learning process is based on information obtained from device actions and context for policy selection and uses user feedback to improve the policy applied. The policies are defined using Semantic Web principles and technologies. Second, we modify the policies and the reasoning engine so that the policy rule execution is done in a manner to consume the least energy. We are working on a prototype of the system for Android devices, which leverages our previous work on energy modeling on smartphones and semantic privacy policies.

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Sunil Gandhi, sunilga1@umbc.edu  
CSEE, Computer Science Masters, 2012

## Generating hierarchical structure from time series data Poster

Applications as diverse as manufacturing, medicine, earth science, and finance generate massive amounts of temporal or spatio-temporal data. More specifically, information about moving objects, events, and atmospheric measurements that are geo-referenced may be derived from high-resolution satellites, sensors, ground and aerial imagery, GPS, and RFID. Such data present challenges to current approaches for mining time series data, many of which are based on hidden Markov models (HMM). HMMs are less expressive than context free grammars and thus cannot capture certain kinds of patterns. In this paper we model times series data as context free grammars with normal distributions as terminals and non-terminals as mixtures of the corresponding terminals. This representation is compact and allows comparison between two time series, enabling us to perform machine learning tasks like clustering, classification, and anomaly detection. We evaluate our algorithm by measuring the performance of clustering algorithm using our distance measure and compare it with HMM based measures.

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CSEE, Computer Science Ph.D., 2012

## Longitudinal Tracking of Medical Concepts in Electronic Health Records Poster

As computer-readable clinical health data becomes increasingly available through the use of Electronic Health Records (EHRs), the potential to mine this data for health safety, quality of care, surveillance, and clinical decision support (CDS) systems is very great. Most Natural Language Processing (NLP) systems developed for extracting medical concepts have focused on extracting data from medical literature and rely on the grammatical structure of the formal text. However, these systems do not work well for text taken from EHR systems. The free-form clinical text entered by physicians, nurses, and other health professionals is less formal and is often times grammatically incorrect or incomplete. It is also filled with many nonstandard abbreviations as well as semi-structured text such as lab results and questionnaires. This research focuses in applying a combination of machine learning and NLP techniques for the longitudinal tracking of medical concepts through a sequence of EHR clinical notes. The prototype system focuses on tracking pain phenotypes for the identification, quantification, visualization, and surveillance of pain as a medical concept through time.

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Anil Jangam, anilj1@umbc.edu  
CSEE, Computer Science Masters, 2013

## User-Centered, Device-aware Multimedia Content Adaptation for Mobile Web Poster

Multimedia content in websites pose a variety of problems to mobile web users, such as content incompatible with mobile devices or failing to meet the accessibility needs of users with disabilities. This study proposes and evaluates a user-centered, device-aware approach to multimedia content adaptation for mobile Web to address those problems. It uniquely takes into consideration not only users' preferences and accessibility needs, but also capabilities of multimedia support of individual mobile devices. Evaluation shows that the proposed approach is accurate and efficient. This study provides insights for research on context-aware mobile computing, adaptive interfaces, and mobile HCI.

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CSEE, Computer Science Masters, 2013

## Controversial Opinions of the "Mom Community" on YouTube Poster

YouTube reaches more US adults ages 18-34 than any cable network and has a growing mom community. Educational and opinionated videos within the mom community are transforming the way adults are informed about important parenting decisions. There is an increase in “crunchy moms” who believe that mainstream practices such as disposable diapers and formula feeding are less beneficial for babies and the environment. However, there is backlash from other members of the community that believe some “crunchy” practices are inappropriate and even dangerous. The research goal is to collect data about controversial videos from the mom community on YouTube, such as comments, video statistics, and user demographics to determine how the opinions are divided.

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Lisa Mathews, math1@umbc.edu  
CSEE, Computer Science Ph.D., 2010

## A Collaborative Approach to Situational Awareness for Cyber Security Poster

Intrusion detection and prevention systems (IDPSs) are one way to safeguard the cyber-systems we use, but they have limitations. Current state-of-the-art IDPSs perform a simple analysis of host or network data and then flag an alert. Only known attacks whose signatures have been identified and stored in some form can be discovered by most of these systems. Many times an attack is only revealed after some amount of damage has already been done. Also, traditional IDPSs are point-based solutions incapable of utilizing information from multiple data sources and have difficulty discovering newly published or zero day attacks. Botnets are another type of devastating attack that work by having bots perform various malicious activities while under the control of a botmaster. To address these issues, we are developing a semantic approach to intrusion detection that uses traditional as well nontraditional sensors collaboratively. Leveraging information from these multiple sources leads to a more robust, situational-aware IDPS that is better equipped to detect complicated attacks such as botnets.

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CSEE, Computer Science Ph.D., 2013

## A Study on Facebook: Spam Apps and Privacy Poster

Collaborative and communicative activities of millions of users have made online social network (OSN) extremely popular. In the wrong hands, it has also become a new vector for hackers and spammers to spread spam and malicious activities among the users. So the security and privacy threats become big issues for OSN specially when users share personal information to the friends and public. This exploratory study aims to achieve knowledge on present privacy and security conditions of Facebook. It finds out some privacy leakages due to spam apps, malicious links and weak privacy settings. It then provides analytical solutions to protect the privacy leakages. It also presents comparative findings due to installing spam apps and liking malicious links.

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Jennifer Sleeman, jsleem1@umbc.edu  
CSEE, Computer Science Ph.D., 2009

## Entity Type Recognition for Heterogeneous Semantic Graphs Poster

We describe an approach for identifying fine-grained entity types in heterogeneous data graphs that is effective for unstructured data or when the underlying ontologies or semantic schemas are unknown. Identifying fine-grained entity types, rather than a few high-level types, supports coreference resolution in heterogeneous graphs by reducing the number of possible coreference relations that must be considered. Big Data problems that involve integrating data from multiple sources can benefit from our approach when the data ontologies are unknown, inaccessible or semantically trivial. For such cases, we use supervised machine learning to map entity attributes and relations to a known set of attributes and relations from appropriate background knowledge bases to predict instance entity types. We evaluated this approach in experiments on data from DBpedia, Freebase and Arnetminer using DBpedia as the background knowledge base.



Richard Bowers, bowers1@umbc.edu  
Economics, Economics of Policy Analysis Masters, 2012

Accounting for Cost Reductions and the Role for Subsidies in Emerging  
Energy Technologies  
Poster

Wind energy is still an emerging technology in the renewables energy sector at early stages of development. The need to bring renewables into the market to replace more traditional sources in order to reduce greenhouse gas (GHG) emissions are great, and will only increase over time. Virtually all of these renewable energy sources and associated technologies, such as wind, solar photovoltaic (PV), electric drive for vehicles, and fuel cells, currently have high costs relative to traditional energy sources. However, it is common for costs for new products to decline over time as the technology and manufacturing processes mature. Costs can decline due to factors within a firm such as scale economies and within firm learning, but there can also be learning or “spillovers” from other firms and industries. It is important to understand how much costs fall, and why they may be fall. It can indicate whether an emerging technology is likely to be competitive in the longer term, and it suggests whether subsidies policies will be effective. Subsidies are more appropriate when there are spillovers that are not captured individual firms, subsidies have been suggested as a correction “market failures” which lead to spillovers created in certain situations of; 1) learning-by-doing, 2) research and development (R&D), and 3) network externalities. Externalities on the demand side of the market can also affect costs and these will also be discussed. We also examine the empirical evidence from the wind energy industry about the possible presence of “market failure” caused spillovers, the appropriateness of subsidies, and of magnitude of efficient subsidies for the wind industry in California.

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Samuel Dupre, sdupre1@umbc.edu  
GES, Geology & Environmental Systems Ph.D., 2013

Transportation Options in Rural Ghana: Development Challenges  
Poster

In cooperation with the Yonso Project, a non-governmental organization, we surveyed households in 3 towns in Ghana, West Africa to investigate impressions of existing transportation options in an attempt to determine if rural rental bicycle use would be a viable option for rural residents. International NGOs have proposed the use of bicycles for a carbon-neutral transportation mechanisms for years, in this study we investigate barriers to this concept and identify barriers which must be addressed for such initiatives to be successful in Central Ghana.

Molly Van Appledorn, mvanapp@umbc.edu  
GES, Geography & Environmental Systems Ph.D., 2009

## Regional correspondence of riparian plant functional traits subject to different flood regimes

Poster

Understanding of hydrologic and ecological interactions in floodplain forests has been largely informed by detailed observations at a limited number of sites. Regional analyses have the potential to contextualize interpretations of local studies, yet have not been used to understand the relationship between flood hydroperiod and distributions of plant functional traits, limiting inference across regions. There is a need for a greater understanding of among-site variability in flood dynamics and ecological responses, particularly across broad geographic areas where varying species pools inhibit translation of species-specific findings. The objectives of this study were to 1) quantify patterns of flood dynamics and functional trait distributions for riparian forests across two disparate regions representative of eastern deciduous forests in North America (Maryland and Michigan's Lower Peninsula), and 2) compare trait-environment domains to evaluate the transferability of inter-regional riparian studies. Flood frequency, intensity and duration were characterized using long-term discharge data for over 200 Maryland and Lower Michigan rivers. Species lists were obtained from riparian inventories throughout each region and were related to functional traits representing growth, competition, regenerative processes, and disturbance resistance and resilience. We found that floods in Maryland tend to be less frequent and more energetically intense than in Lower Michigan, where high baseflow yields or low gradients lead to longer duration floods and less tractive power. A comparison of convex hulls encompassing hydrologic variation revealed that less than 1% of Lower Michigan's hydrologic space was shared with Maryland; about 30% of Maryland's space was contained within Michigan's hull volume. In contrast, functional trait distributions had a high degree of overlap between Maryland and Lower Michigan despite differences in species composition and environmental settings. Measures of functional diversity were similar and not statistically different from null models (FDisMD = 0.143 and FDisMI = 0.161). This study describes an approach for cross-regional comparisons of floodplain forest dynamics, flood regimes, and demonstrates that shifts in regional hydrologic domains between Maryland and Lower Michigan are not matched by corresponding shifts in functional trait distributions. Instead, trait occurrence frequencies show a high degree of overlap between regions.

Dong Cailing, dongcai1@umbc.edu  
Information Systems, Information Systems Ph.D., 2011

## Topical Diversity Measurements on Web Spam Detection Poster

Web search engines have been widely adopted by users to retrieve and rank relevant web pages. Due to the fact that high-ranked popular web pages could bring huge business opportunities, spammers have utilized many spam tricks with the purpose of increasing the rankings of their targeted pages in the web search results. Current web spam detection techniques mainly utilize web content and web link structures. Link spam tries to manipulate link-based rankings in web search engines (e.g., PageRank), and existing link-based features have been shown effective for identifying link spam. Content spam targets at affecting content-based rankings in web search engines. The existing content-based features mainly extract statistics of words within pages. However, these word-level statistics may not capture various characteristics of contents well enough in those spam pages. We propose to use topic-level statistics of web page content for effective content spam detection. Different from word-level statistics of web pages, which ignore the semantic relatedness between words, we believe that topic-level statistics can capture linguistic features hidden in text and understand the underlying intention of spam meaningfully. Taking WEBSpam-UK2007 as our benchmark dataset, we build a Latent Dirichlet Allocation (LDA) topic model for each single web page, and conduct a thorough analysis on content spam. To quantitatively capture the unique characteristics about the topics of spam and non-spam pages, we defined 2 groups of topical diversity measurements: distribution-based topic diversity measurements and semantic-based topic diversity measurement. To capture distribution-based topic diversity, we focus the variance of topic distribution and the local/global Kullback-Leibler divergence between the top-k topic-word distribution and the basic distribution of these words. On the other hand, we define average topic similarity, maximum topic similarity, and LSI (Latent Semantic Indexing)-based topic diversity to be the semantic-based topic diversity measurements. Our results clearly showed that by integrating the proposed topical diversity measurements, the existing web spam detection algorithms could be greatly improved. Besides, our experiments also proved the superiority of our topic-based features on small training dataset, which is a promising and applicable finding on web spam detection.

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William Easley, easley1@umbc.edu  
Information Systems, Human Centered Computing Masters, 2013

## Developing a Mobile Assistive Technology to Help Blind People Improve their Quality of Life Through Regulating their Medication Management Poster

Medication management can often times be a difficult or confusing task. According to an Institute of Medicine report from 1999, at least 7,000 people die per year due to medication errors. In order to alleviate these issues many different medication management systems have been developed to assist users with the adherence and consumption of medication. These systems, often times do not cater to the needs of the blind however. Many blind people address the difficulties with medication management with homemade solutions. Quick "hacks" that use everyday objects such as rubber bands (for tactile feedback) to assist with the identification and remembering to take medications. There is no universal solution for everyone and limited useful data that has been gathered regarding this problem. This project examines current methods used by the blind to identify medications and the challenges associated with these methods.

Gloria Opoku-Boateng, gopokub1@umbc.edu  
Information Systems, Human Centered Computing Masters, 2013

## Feasibility Analysis vs. requirements Analysis in Large Complex Systems: Which Comes First?

Poster

In a large complex system design, both of the following statements can be considered true for the design life cycle: Feasibility analysis should always be done before requirements analysis; Requirements analysis should always be done before feasibility analysis . This research explores what has been done in the past, why and when feasibility should come before requirements analysis and vice versa, and if they can( and are sometimes) merged. Finally, there is an attempt to analyze all information and come out with an algorithm for deciding whether to proceed with Feasibility Analysis first or Requirements Analysis for large complex system designs.

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Saadi Habib, sahabib1@umbc.edu  
Mechanical Engineering, Solid Mechanics Masters, 2012

## Anisotropy, asymmetry and strain rate sensitivity of magnesium alloy ZEK100 sheet

Poster

Mechanical response of magnesium alloy ZEK100 in sheet was tested under uniaxial (tension and compression) loading along the rolling direction (RD), 45° to rolling direction (DD), and transverse direction (TD) at strain rates of 10<sup>-4</sup> to 2.4x10<sup>3</sup> s<sup>-1</sup> and at temperature of 25 and 150°C. Magnesium alloy sheet has hexagonal close packed (HCP) crystal structure and crystallographic texture due to material sheet forming causing strong anisotropic and asymmetric behavior. Data shows yielding and strain hardening which is dependent on strain rate and temperature in addition to orientation. The yield strength is the greatest along the RD and decreases towards TD. Jump test and monotonic test where also used to find strain rate sensitivity (SRS) along three different directions. Results show SRS to vary depending on strain, strain rate jump and direction of loading.

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Mathematics & Statistics, Applied Mathematics Ph.D., 2011

## Coupled PDEs with Initial Solution from Data in COMSOL 4

Poster

Many physical applications require the solution of a system of coupled partial differential equations (PDEs). In most cases the analytic PDE solution does not exist for this system and we need to solve the problem numerically using the finite element method in COMSOL. This paper presents information on techniques needed in COMSOL 4 to enable computational studies of coupled systems of PDEs for time-dependent nonlinear problems. Furthermore, we demonstrate how to use data files as input for initial conditions. To illustrate the techniques, we consider a system of two time-dependent non-linear PDEs from mathematical biology.

Cherre Jefferson, chejef1@umbc.edu  
Mathematics & Statistics, Applied Mathematics Ph.D., 2013

The Existence of Mild Solutions to Semi-linear Fractional Diffusion  
Equations  
Poster

This research is devoted to developing conditions under which a mild solution for some semilinear fractional diffusion equation could be found. We use an appropriate definition of a mild solution due to El-Borai. The results are obtained using the Banach's Fixed Point Theorem. They generalize a recent work by G. Mophou.

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Physics, Atmospheric Physics Ph.D., 2011

A Study of the Air-Sea Interaction Off Coast Maryland with NOAA Buoy  
Measurement Records  
Poster

The National Oceanic and Atmospheric Agency (NOAA) operates a large array of buoys across the ocean that measure air and sea temperature, wave speed and height, and wind speed and direction. Buoy 44009 is positioned off the coast of Ocean City, MD near the location of a future wind turbine farm, and has been collecting data since 1984. This study looks at the interaction of the lower atmosphere and sea surface in this region, with a focus on certain stability regimes. Diurnal and periodic variations are shown, as well as correlations between various atmospheric and oceanic conditions.

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Physics, Atmospheric Physics Ph.D., 2011

A Motion Compensation Prescription for Offshore Doppler Wind Lidars  
Poster

Accurate wind measurements at the height of MW scale wind turbines (~ 100m) are required for assessing the offshore wind resource and for planning wind farm layout. Offshore wind development in the Mid-Atlantic is expected to move ahead in the next decade, but there are few actual measurements of winds at turbine heights in the development regions, approximately 20km offshore. Currently, winds are estimated using weather models or vertical extrapolations from near-surface anemometer data on buoys. Offshore meteorological towers are expensive, provide wind information at a single location, and are limited to heights that are not able to sample the top of the rotor blade (150m). For these reasons, there is increasing interest in using Doppler wind Lidar (Light Detection and Ranging) to measure the offshore wind vertical profile. One of the challenges in the use of lidar on a marine platform is to correctly remove the motion of the platform from the Doppler wind measurement. The method is described and applied to wind lidar collected during an offshore wind measurement campaign conducted by UMBC researchers during Summer, 2013. High precision ship translational and rotational data were used to correct the lidar data and examples of wind profiles measured along the vessel track will be presented.

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## Initial Results Obtained from a Differential Absorption Lidar (DIAL) to Measure Tropospheric Ozone Poster

Tropospheric ozone profiles have been retrieved from the new ground based Differential Absorption Lidar (DIAL) system at the NASA Goddard Space Flight Center (Greenbelt, MD 38.99° N, 76.84° W, 57 meters ASL) from 500 m to 10 km ASL. Current atmospheric satellite instruments cannot peer through the optically thick stratospheric ozone layer to remotely sense boundary layer tropospheric ozone. In order to monitor this lower ozone more effectively, NASA has funded the ground based Tropospheric Ozone Lidar Network (TOLNET) which currently consists of five stations across the US. The Goddard instrument is based on the Differential Absorption Lidar (DIAL) technique, which currently detects two wavelengths, 289 and 299 nm. Ozone is absorbed more strongly at 289 nm than at 299 nm. The DIAL technique exploits this difference between the returned backscatter signals to obtain the ozone number density as a function of altitude. The transmitted wavelengths are generated by focusing the output of a quadrupled Nd:YAG laser beam (266 nm) into a pair of Raman Cells, filled with high pressure hydrogen and deuterium. Stimulated Raman Scattering within the focus generates a significant fraction of the pump energy at the first Stokes shift. With the knowledge of the ozone absorption coefficient at these two wavelengths, the range resolved number density can be derived. An interesting atmospheric case study involving the stratospheric-tropospheric exchange (STE) of ozone is shown to emphasize the regional importance of this instrument as well as assessing the validation and calibration of data. These results, as compared to a coincident ozonesonde measurement yield a precision of 4-17% (0-1.5 km), 2-14% (1.5-3 km) and 2-26% (3-12 km). There are currently surface ozone measurements hourly and ozonesonde launches occasionally, but this system will be the first to make routine tropospheric ozone profile measurements in the Washington, DC - Baltimore area.

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**“You can stop eating when I say you’re full”: A qualitative examination of  
Chinese immigrant U.S. mothers’ feeding practices  
Poster**

In Western societies, controlling feeding practices have been associated with children’s weight status and dietary behavior (Farrow & Blissett, 2013). However, this association was not found among Chinese-Americans (Huang et al., 2012) despite the fact that Chinese parenting is often described as highly controlling (Pomerantz & Wang, 2009). Thus, the present study used a qualitative approach to better understand parental feeding practices (specifically, mothers’ level of control) among Chinese immigrant U.S. parents, in light of rising rates of overweight children in this population (Tarantino, 2002). Twenty-two first-generation Chinese immigrant mothers (CIMs) with 3-to-5 year old children in Maryland, U.S. participated in focus groups. Four groups of 5-6 participants discussed a set of topics regarding child-feeding practices derived from existing feeding questionnaires (e.g., “How do you make sure your child eats the types of foods you want him/her to eat?;” Birch, 2001; Musher-Eizenman, 2007). Sessions were audiotaped, transcribed, and translated to English by bilingual researchers. Two researchers independently coded mothers’ responses into feeding themes on the continuum of granting child autonomy to parental high-powered/coercive practices. Coding differences were discussed until a consensus was reached. Themes previously identified in feeding questionnaires as well as culturally-unique themes arising from mothers’ responses were created and implemented across groups. Despite being previously characterized as highly controlling, we found that CIMs most frequently mentioned practices that were supportive of their children’s autonomy in their own feeding. However, CIMs also simultaneously indicated that they maintained control over most aspects of their children’s diet, with regard to the appropriate types, amounts, and ways to feed (e.g., “I won’t force him to finish his food if he already had a decent amount. If I give him a little food and he still cannot finish it, then I will force him.”) Moreover, we identified culture-specific feeding practices not previously captured in the literature. Many CIMs reported spoon-feeding their children if they indicated that they were no longer hungry but mothers believed that they needed to eat more. This physical means of pressuring the child to eat is not considered developmentally appropriate for preschool and kindergarten-aged Western children. Mothers also frequently emphasized the importance of fostering specific eating habits and schedules from a young age (e.g., eating at the same times each day; maintaining a balance of “hot” and “cold” foods). Our findings can inform the development of culturally-appropriate intervention programs to support the healthy development of CI children (Musher-Eizenman, 2007).

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Parental Autonomy Support and Depressive Symptoms in European- and  
Asian-American Emerging Adults: The Mediating Role of  
Self- and Social-Acceptance  
Poster

Parental autonomy support (PAS) can be defined in terms of promotion of independence (PI; autonomy without reliance on parents) or promotion of volitional functioning (PVF; autonomy through exploration of personal values and interests). PAS is generally positively associated with well-being in emerging adults between 18 and 25 years of age (Soenens et al., 2007), but parental PI and PVF may play unique roles. The cultural-relativistic perspective suggests that the effects of PI might be culture-dependent (Markus & Kitayama, 2003), with Asian cultures placing greater emphasis on interdependence and Western cultures valuing independence. In contrast, the universalistic perspective maintains culturally-invariant positive effects of PVF on mental health because volitional functioning represents a universally critical need (Deci & Ryan, 2000; Soenens et al., 2007). Moreover, the underlying mechanisms that can explain the effects of PAS on emerging adults' well-being across cultures are poorly understood. Thus, we examined the mediating roles of self-acceptance, which is particularly valued in independence-focused Western cultures (Uchida & Ogihara, 2012), and social-acceptance, which may be more emphasized in interdependence-focused Eastern cultures (Markus & Kitayama, 1991) in the present study. Specifically, we: (a) compared European- and Asian-American emerging adults' parental PI and PVF, self-acceptance and social-acceptance; (b) investigated the mediating effect of emerging adults' self- and social-acceptance on the associations between their parental PI and PVF and their depressive symptoms; and (3) examined whether the mediating pathways differed by ethnicity (European- versus Asian-American). European-American ( $n = 162$ ,  $M_{age} = 20.54$ ,  $SD = 1.83$ ) and Asian-American ( $n = 158$ ,  $M_{age} = 20.16$ ,  $SD = 1.73$ ) college students completed an online survey assessing parental PI and PVF, self-acceptance, social-acceptance, and depressive symptoms. European-American EAs reported significantly higher parental PI,  $t(318) = 2.51$ ,  $p = .012$ , PVF,  $t(318) = 6.19$ ,  $p < .001$ , and self-acceptance,  $t(318) = 4.00$ ,  $p < .001$ , than Asian-American EAs. Parental PVF (but not PI) was positively associated with EAs' self-acceptance ( $\alpha_{\text{self-acceptance}} = -1.37$ ,  $p < .001$ ) and social-acceptance ( $\alpha_{\text{social-acceptance}} = -0.87$ ,  $p = .004$ ), which were in turn negatively associated with depressive symptoms in both groups. Multi-group analysis indicated that this mediating pathway was not moderated by ethnicity,  $\Delta X^2(6, 320) = 5.09$ ,  $p = .532$ . The higher parental PI, PVF and self-acceptance found among European-American EAs compared to their Asian-American counterparts is consistent with Western cultures' focus on independence, exploration of values, and psychological characteristics. However, the significant role of PVF and not PI in both cultural groups supports the universalistic perspective that parents' encouragement of children to act upon their true interests and values may be particularly important for EAs' development of positive sense-of-selves and social acceptance by others, and consequent positive mental health, regardless of the cultural context.



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The role of child temperament, parental stress and life satisfaction  
in authoritarian parenting style among  
Korean and Korean immigrant mothers in the U.S.  
Poster

Korean mothers and U.S. Korean immigrant (KI) mothers are generally characterized as having an authoritarian parenting style (Chao, 1994), thought to result from their shared collectivistic and hierarchical Confucian cultural heritage (Kim & Cain, 2008). Mothers of children with difficult temperaments report higher parenting stress (Kim & Moon, 2007) and more authoritarian parenting (Park & Jun, 1996). Moreover, mothers with low life satisfaction are more likely to practice authoritarian parenting (No & Lee, 2003). However, few studies have systematically examined the role of these different factors in predicting Korean versus KI mothers' engagement in authoritarian parenting. Thus, we aimed to examine (1) the mediating role of parenting stress in the association between perceived difficult child temperament and authoritarian parenting, and (2) if maternal life satisfaction moderated the link between parenting stress and authoritarian parenting.

Participants included Korean mothers in Seoul, Korea (N=269; M=35.78 years old, SD=3.45) and first-generation KI mothers (N=165; M=35.76 years old, SD=3.85) in Maryland, U.S. with 3-to-6 year old children. Mothers reported on their child's difficult temperament (Crnic & Booth, 1991), parenting stress (Crnic & Booth, 1991), life satisfaction (Diener et al., 1985), and authoritarian parenting style (Robinson et al., 2001). The hypothesized model fitted the data well,  $\chi^2(4) = 4.834$ ,  $p = .30$ , CFI = .99, RMSEA = .03. In both groups, parenting stress partially mediated the effects of child difficult temperament on mothers' authoritarian parenting style,  $\alpha\beta_{\text{Korean}} = .14$ ,  $p < .05$ ;  $\alpha\beta_{\text{KI}} = .15$ ,  $p < .05$ . There was also significant direct effect of temperament on authoritarian parenting,  $\beta_{\text{Korean}} = .18$ ,  $p < .05$ ;  $\beta_{\text{KI}} = .19$ ,  $p < .05$ . Moreover, the association between parenting stress and authoritarian parenting was moderated by mothers' life satisfaction only in the Korean sample,  $\beta_{\text{Korean}} = .16$ ,  $p < .01$ . Specifically, parenting stress was associated with authoritarian parenting only for Korean mothers with low and median levels of life satisfaction. The present study partially supported the mediating role of parenting stress between perceived child temperament and parenting style in both the Korean and KI contexts (Shin, 2011). However, the protective role of high maternal life satisfaction between parenting stress and authoritarian parenting consistent with previous research was found only for Korean mothers. As immigrants who may lack resources and support networks in the new social context, KI mothers' own psychological well-being may be less important than other relational or contextual factors as compared to Korean mothers who may be less dependent on their social context. The significance of the socio-cultural context of parenting for immigrant and non-immigrant mothers is highlighted and discussed.

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## The implications of love withdrawal and guilt induction for Chinese-American children's reticent and prosocial behaviors

### Poster

In Barber's (1996) initial conceptualization, psychological control was conceived as a multidimensional intrusive parenting construct. However, subsequent studies often reduce psychological control to a unidimensional structure when documenting its associations with children's maladjustment (e.g., Barber et al., 2004; see Nelson et al., 2013 for an exception). Some researchers have recently suggested that certain dimensions of psychological control may not have detrimental effects on child outcomes in interdependent cultures that place greater priority on accommodating others in social interactions (Fung & Lau, 2012). Two key dimensions of psychological control are love withdrawal (manipulate feelings of parental acceptance) and guilt induction (induce shame and guilt). Love withdrawal, according to Parental Acceptance-Rejection theory (Rohner et al., 2005), may threaten the parent-child bond and thus have negative effects on individuals' psychological and behavioral adjustment, regardless of variations in culture. Alternatively, guilt induction may foster children's greater sensitivity to others and social competence, and thus lead to certain positive child outcomes in specific cultural contexts (Fung & Lau, 2012). The present study explored whether Chinese-American mothers' self-reported love withdrawal and guilt induction (Olsen et al., 2002) were related to their children's (N=165; M=4.52, SD=0.90; 47% girls) teacher-rated reticent and prosocial behaviors (Hart & Robinson, 1996). Factor analysis indicated that though highly correlated as dimensions of psychological control, love withdrawal and guilt induction could be statistically differentiated,  $\chi^2(1, N=165)=17.56, p<.001$ . Structural equation modeling for the associations among the latent constructs achieved a good model fit,  $\chi^2(146, N=165)=174.49, p=.054, RMSEA=.034, \text{ and } CFI=.986$ . Love withdrawal was related to more reticence ( $\beta=.41, p=.021$ ) and less prosocial behavior ( $\beta=-.43, p=.006$ ), whereas guilt induction was related to less reticence ( $\beta=-.56, p<.001$ ) and more prosocial behavior ( $\beta=.39, p=.011$ ). Our findings support the view that love withdrawal denotes parental hostility through an unhealthy manipulation of the parent-child relationship (e.g., being less friendly if the child does not meet their expectation), and thus is related to child maladjustment across cultural contexts (e.g., Nelson & Crick, 2002). However, when Chinese parents use guilt induction to elicit empathy in the child by presenting themselves as victims of the child's misbehaviors, such culturally valued inductive discipline may motivate the child to reciprocate their parents' sacrifices and efforts through proper social conduct (Fung & Lau, 2012). Moreover, the acquirement of self-regulation, empathy, and attunement to others' thoughts and feelings (Mascholo et al., 2003) may equip Chinese-American children with better social competence within the peer group.

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**Emergency Department Use Among Working-Age and Older Adults Dually  
Eligible for Medicare and Medicaid  
Poster**

There are roughly 9 million Medicare-Medicaid dual eligible beneficiaries (duals) who are more likely to be poorer and sicker than other Medicare beneficiaries and tend to have high health care utilization. In terms of enrollment, the duals comprise of 21 percent of the Medicare population and 15 percent of the Medicaid population. However, in terms of expenditure they account for 36 percent (\$299 billion) of the Medicare fee-for-service spending and 39 percent of the total Medicaid spending (\$311 billion) annually. Thus, this population puts a disproportionate burden on Medicare and Medicaid expenditure. In addition to income levels, the dual eligible population differs in demographic composition and health care needs. I would mainly use the Medical Expenditure Panel Survey (MEPS) data to derive and compare the demographics and insurance utilization of duals and non-duals. At a time when our public health care programs are becoming unsustainable, this analysis would be useful in suggesting ways to coordinate care between Medicare and Medicaid and control cost of care.

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**A legal analysis to guide the drafting of juvenile curfew laws  
Poster**

Curfew laws seek to provide general protection to and from youth by restricting the times that children of certain ages are allowed to occupy public places or streets. These laws often contain exemptions such as for youth accompanied by an adult, responding to an emergency, or traveling to or from school, work, or a religious service. However, the actual language used and exemptions included vary by locality. As a result, the courts have reached different results with several courts upholding curfew laws as constitutional while others overturned these laws. This poster will give a history of the curfew laws and discuss the reasons that localities have cited for enacting these laws. It will also list the three main arguments that people have with curfews, mainly, that these laws are: a) unconstitutional; b) ineffective; and, c) poorly implemented. The poster will include an analysis of the case law and statutes debated. This will include a discussion of the reasons the judges gave for overturning or upholding the curfew laws as well as an analysis of the language and provisions included in the different laws. Finally, this poster will provide guidance for policy-makers on how to propose and draft these laws to prevent the courts from overturning them and discuss how curfew laws should be one part of a broader enforcement strategy.