University of Maryland, Baltimore County

37th Annual

GRADUATE RESEARCH CONFERENCE

March 25, 2015

Conference Program

A Message from the Conference Planning Team:

It is our pleasure to invite the UMBC community to our 37th Annual Graduate Research Conference (GRC), a collaborative effort of the Graduate Student Association (GSA), the Office of Graduate Student Life (OGSL), and the GSA Senate. The 2015 Planning Team redesigned GRC to serve as an intellectual, creative, and safe space for graduate students to share their work, provide and receive feedback, interact with the campus, refine their research skills, and partake in professional development opportunities.

Graduate students at any stage of their graduate work will present in an interdisciplinary setting. Diverse presentation formats, including poster presentations, work in progress, artist talks and more provide the opportunity for graduate students in all programs to share their work.

Faculty, staff, and alumni/alumnae will serve as reviewers of graduate student presentations. GRC reviewers provide constructive feedback to graduate researchers and contribute to making the conference an intellectually fruitful and socially meaningful event.

We invite the UMBC community to enjoy a day filled with rich and rewarding experiences, including research presentations, a keynote panel of interdisciplinary researchers, professional development workshops, and a reception featuring a research information fair.

Welcome!

Romy Hübler
Tahira Mahdi
Eva Piera Escriva
Teneil Wells
Jennifer Mayo
Inte'a DeShields
Jenness Hall

Conference Schedule

8:00am – 9:00am: Registration, *UC Ballroom Foyer*

9:00am – 10:15am: Session I

10:30am – 11:45am: Session II

12:00pm – 1:30pm: Lunch and Keynote Panel, *UC Ballroom*

1:45pm – 3:00pm: Session III

3:15pm – 5:00pm: Reception and Research Information Fair,

Flat Tuesdays

College of Engineering and Information Technology:

College of Arts, Humanities, and Social Sciences:

Human Services Psychology

Session I
9:00am - 10:15am

University Center 310

Industry Careers Meet-Up Panel
(Featured Professional Development Workshop)
Coordinated with the Career Center

Are you interested in pursuing a career or an internship in industry? Find out from a panel of experts what it takes to jump-start your career! The panel will be interactive, where you can ask questions in between the presentations/discussion, and will be followed by a hands-on networking activity that will give you insights into developing an elevator speech, translating your research to people outside of your field, and follow-up expectations.

The Commons 318

Sarah Monti - Biochemistry (Oral Presentation)
The Effect of the 7-Methylguanosine Cap on the Structure of the HIV-1 5'-Leader

The human immunodeficiency virus (HIV) remains a serious global health concern with 1.5 million deaths due to HIV in 2013 alone and approximately 35 million people currently living with HIV illustrating the need for an improved understanding of the virus and the creation of new therapeutics. The 5'-leader of the HIV genome is the most highly conserved region of the RNA genome and also controls a number of important processes in the HIV life cycle. Research has shown that the 5'-leader acts as a structural switch, existing in a monomeric conformation, which controls splicing and translation of the genome, and a dimeric conformation, which is selectively packaged into new viral particles. Recent data suggests that the presence of the 7-methylguanosine cap on the HIV-1 5'-leader stabilizes the monomeric conformation of the RNA. Additional studies suggest that the base pairing of residues at the base of the predicted PolyA hairpin influence the monomer-dimer equilibrium. Together these data suggest that the cap may interact with residues at the base of the PolyA hairpin to influence the monomer-dimer equilibrium. NMR studies will be conducted to elucidate the interactions between the cap and residues in the 5'-leader. The structural role of the cap may also influence nuclear export and translation mechanisms utilized by the HIV-1 RNA.

Johan Melendez - Chemistry (Oral Presentation)
Rapid Microbial Lysing and DNA Fragmentation by Microwave Focusing

Bacterial infections are a major health problem. Identification of disease-causing organisms by cultures is time-consuming and often lacks sensitivity. Molecular approaches such as PCR and Microwave-Accelerated Metal-Enhanced Fluorescence (MAMEF) assays, are more sensitive and faster than culture-based approaches, but require DNA isolation. In order to determine the effect of both boiling and microwave irradiation on microbial lysing and DNA fragmentation, cultures of Neisseria gonorrhoeae and Listeria monocytogenes (108 CFU /mL) were either boiled (40° - 70°C) or lysed in a 900-watt microwave on isolator-mounted microscope slides, both with and without the assistance of disjointed antenna gold bow-tie structures. The temperatures of cultures were obtained prior to and after lysing and the resulting lysate cultured on selective agar plates. DNA fragmentation was determined by gel electrophoresis and PCR. N. gonorrhoeae lysed at a lower temperature (ºC) than L. monocytogenes. Microbial lysing and DNA fragmentation was more effectively carried out in the presence dis-jointed gold triangle structures, but only when small sample volume were used. Standard boiling was successful for bacterial lysing and DNA fragmentation, but required higher temperatures and longer times than microwave focusing. PCR results suggest that low power microwave irradiation is ideal for PCR methods while higher microwave powers are required to generate DNA fragments ideal for MAMEF analysis. Microbial lysing and DNA fragmentation can be achieved by either boiling or microwave, but microwave lysing is more efficient for DNA fragmentation and is significantly faster. Microwave lysing is the recommended method when rapid isolation and DNA fragmentation is required.

Ke He - Chemical and Biochemical Engineering (Oral Presentation)
Simultaneous Determination of Antibiotics, Estrogens, and UV Filters in Two Subwatersheds Near Baltimore

Antibiotics, estrogens, and UV filters, have been widely used in medicine, domestic, veterinary, and industrial for many years; consequently, these compounds have been frequently detected in different environmental compartments. The appearance of these emerging contaminants has drawn increasing attention for the possible impact on both human and ecological health. Recently, a sensitive analytical method based on liquid chromatography tandem mass spectrometry with proper sample pretreatment has been developed and applied to determine 34 antibiotics, three estrogens, and four UV filters in a highly urbanized subwatershed – Dead Run and a less urbanized subwatershed – Baisman Run (BARN) near Baltimore. For the water sample collected from BARN and six water samples collected from Dead Run, up to three antibiotics, one estrogen, and three UV filters were detected. Specifically, ofloxacin was detected in one of the water samples collected from Dead Run with the concentration at 9.5±2.9 ng/L; Clarithromycin was found in two water samples collected from Dead Run with concentration of 42.6±2.8 ng/L and 4.3±0.8 ng/L; Sulfamethoxazole was detected in five water samples with the concentration ranging from 0.75±0.04 to 1318±18 ng/L respectively; Only one estrogen – estrone, was found in two water samples collected from Dead Run; Benzophenone-3 and Octocrylene were detected in all of the seven water samples with concentration ranging from 5.8±0.1 to 55.6±7.6 ng/L while octinoxate was detected once with its concentration below the limit of quantitation. All of these findings confirm the ubiquitous appearance of these emerging contaminates and further investigation on the impact is merited.

The Commons 327

Evan Bates - Mechanical Engineering (Oral Presentation)
Development of a Bitter-type Magnet System

A 10 Tesla water cooled Bitter-type magnetic system is under development at the Dusty Plasma Laboratory of the University of Maryland, Baltimore County (UMBC). We present here an optimization technique that uses differential evolution to minimize the omhic heating produced by the coils, while constraining the magnetic field to a user defined value. The code gives us the optimal dimensions for the coil system needed for preliminary designing. Finite element parametric optimization is then used to establish the optimal design for placement of water cooling holes on the Bitter conductors. The resulting subsystems, such as the pressure vessel and vacuum chamber, are then built around or accommodate the coil design. Our analysis accounts for the magnetic forces, radial and clamping, that act on the copper alloy and insulating disks, as well as other supporting material inside the pressure vessel to ensure the system is not compromised during operation. The proposed power and cooling water delivery subsystems that drive and cool the magnet are also presented. A 1/10th magnetic field scaled model of the magnet is currently being constructed. Upon completion and testing of the prototype magnet system the large scale model will be produced. Planned experiments include the propagation of magnetized waves in dusty plasma crystals under various boundary conditions, and viscosity in rotational shear flow, among others in a 10 Tesla field on a time scale of 10 seconds.

William Rivera - Mechanical Engineering (Oral Presentation)
Mass Spectrometry of 3D-printed Materials in Vacuum

We present the design and preliminary results of a mass spectrometry system to assess vacuum compatibility of 3D-printed parts. The setup consists of a two-section vacuum chamber with a residual gas analyzer (RGA), a radiation heater, windows, and an access port for quick sample exchange. The signal from the RGA is analyzed by creating a system of equations that uses the calibration signal from a large number of molecules (cracking patterns) and the measured spectra. The equations are then inverted to find the most likely elements in the chamber. The vacuum chamber is set up so samples can be inserted and retrieved without contaminating and compromising vacuum in the system. We perform this by having two connected chambers with independent vacuum pumps, and using one for sample access at atmospheric pressure, and then transferring the sample to the main chamber once vacuum is equalized. The equipment will be used as part of the Dusty Plasma Experiment at UMBC, since many of the plasma facing parts are 3D-printed. Mass spectra of electroplated plastic parts, which have a much better vacuum

compatibility than non-plated plastic parts, will also be obtained and compared to those without electroplating, to assess ultra-high vacuum compatibility and plasma facing survivability.

Mitchel Zavala - Mechanical Engineering (Work in Progress)
Covetics: A New Class of Materials

Covetics are a "new" class of materials with high carbon content in excess of their solute solubility. These hybridized materials have been formed from base metals, such as copper (Cu), which are supersaturated with carbon (C) (up to ~10 wt. %). Literature on covetics has revealed increased mechanical properties and higher corrosion and oxidation resistance in comparison to their corresponding base metals. Most of the physical and mechanical properties of covetics have not been well characterized, and the role of the carbon incorporation on the properties still needs to be explained. Previous reports have been published on some of the properties of covetics, but systematic studies with samples prepared under controlled conditions are lacking. The focus of this research investigates the implications of C incorporation, the structure of covetics, and presents a fundamental understanding of how this structure is linked to the covetics' mechanical properties. The mechanical properties of covetics are determined via microtensile specimen (gage section of 250μm X 250μm) and mesotensile specimen (gage section of 3mm X 1.5mm) testing in order to understand the role of C on mechanical response. This work measures key mechanical properties of Cu covetics, evaluates deformation mechanisms, microstructural observations, and atomic bond analysis to phenomenologically explain unique mechanical behaviors exhibited by Cu covetics.

The Commons 328

Maria Müller - Intercultural Communication (Oral Presentation)
Intercultural Dating

According to the Federal Open Doors data, college campuses are significantly more diverse than ten years ago. In fact, statistics show that an increasing number of college students grow up in families with parents in interracial and intercultural relationships or marriages. Moreover, an increasing number of students are willing or seem interested in dating a person from another country or one who has a different cultural background. The diverse definitions of dating are not always well communicated between partners and can easily cause miscommunication in many ways. Each person has a particular definition of dating, an individual way of communicating that definition to their significant other and, a unique way of approaching romantic relationships. In the paper that I will be presenting I did a discourse analysis, which enables the reader/ listener to study and observe the diverse definitions of "dating" and the miscommunications it can bring. This topic is important because there is little existing research about intercultural dating. With the increasingly diverse student population on U.S. campuses, research in this field stands to benefit the needs of the growing intercultural population. Many misunderstandings occur between couples but are often not addressed because of a lack of research regarding communication in intercultural relationships. Any inclusive, support-centered university offers workshops for international students to help assimilate American language and culture, including shared knowledge, norms, and values within the speech community in colleges. However, there are only a few services available for students that offer information about intercultural dating.

Tahira Mahdi - Human Services Psychology (Oral Presentation)
The Relation of "Need for Cognition" to Graduate Students' Career Plans, Fields of Study, and Graduate Level

Research shows that need for cognition, a construct that reflects enjoyment of and inclination to engage in effortful cognitive activity, has implications for academic achievement and career choice. These studies, including those demonstrating need for cognition's significant, positive relation to level of education and to course grades, have typically involved college undergraduates. The present study used a graduate student sample from a PROMISE-AGEP event and a UMBC Graduate Student Association Social event to examine the relation of need for cognition to graduate level of education (master's versus Ph.D.), field of study (Science, Technology, Engineering, and Math [STEM] versus non-STEM), and desire to enter the professoriate. Results indicated no significant between-group differences in need for cognition among these primary variables, but secondary analyses yielded differences based on ethnicity, as well as significant relations among other variables, such as interest in the professoriate, age, and

field of study. Implications include the need to examine perceptions of faculty careers among STEM graduate students and the value of exploring multicultural interpretations of the Need for Cognition Scale. This study, completed for a master's thesis, was developed following the investigator's 2010 Undergraduate Research Award-funded study at UMBC in 2010 entitled "Deconstructing the Nerd: Need for Cognition in a Sample of Adults."

Eryka Boyd - Human Services Psychology (Oral Presentation)
Unexpected Relationship Between Perceived Ethnic Discrimination and Pain in Young Adults: A Pilot Study

Ethnic group differences in pain have been widely reported in the literature. Given the unique sociocultural experiences of ethnic minorities, social factors may contribute to ethnic differences in pain, as suggested by a report that higher lifetime experiences of discrimination are associated with greater bodily pain in older African American men. However, few studies have investigated social mechanisms underlying ethnic differences in pain. This study examined the relationship between perceived discrimination (PD) and experimental pain measures in young adults. We hypothesized that higher levels of PD would be associated with lower pain thresholds, lower pain tolerance, and poorer function of pain inhibitory systems, measured using a conditioned pain modulation (CPM) paradigm. Thirty-six healthy adults (mean age=23.7 [SD=7.1]; 58% male; 36% White, 31 % Asian American, 17% African American) completed the Perceived Ethnic Discrimination-Community Version and Perceived Stress Scale questionnaires. Psychophysical tests measured heat pain thresholds and tolerance, and CPM magnitude using a heat test stimulus and pressure-cuff conditioning stimulus. Surprisingly, multiple regression results revealed that higher PD scores were associated with greater pain inhibition, above and beyond the effect of general stress levels ($F(1,34) = 12.16$, p

The Commons 329

Frank Anderson – Applied Sociology (Work in Progress)
Poetry Informed Education Research

The sociology of education examines variables that affect student achievement, and works to create positive outcomes. These variables are both innumerable and complex, and it is out of respect for this complexity that my research takes a different approach. Instead, I use poetic inquiry as a tool for looking at the sociology of education through a wide-angled lens. This interdisciplinary approach allows for a theoretical space where several variables may coexist, and where the researcher may examine them holistically as they play out their different roles in affecting a student's achievement. In my own work, I used poetry as a mode of understanding at-risk student behavior in a public middle school. I interviewed instructors about middle school students who come to school each day, but figured out ways to navigate between the systems of learning and discipline that the school had in place. In other words, they were in school, but they were neither in class, nor in trouble. In conceptualizing this behavior, I turned to poetry. I was interested in how poets adhere to structures while subverting them at the same time—how they show up to a form or tradition, but navigate it in ways that create new spaces and experiences. I compared what I found in poetry to what I found in teacher interviews about student behaviors. My work was a pilot study for a qualitative research course, but I discovered a new way of capturing teacher and student experiences, and hope to explore this much further.

Ann Kellogg - Public Policy (Work in Progress)
Collaborating for Success: The UMBC Student Success Network

Postsecondary institutions are being asked to increase student graduation rates at a time when state and federal funding for institutional operations are in decline. Scarce resources and limited staffing may foster intra-institutional collaboration to address many of the challenges faced by students as they progress toward graduation. Intra-institutional collaboration gives rise to social networks as actors come to rely upon each other for information and resources to address complex student problems. Identifying and documenting social networks allows an institution to shift organizational priorities, redirect resources to increase effectiveness, and mobilize the network to address broader objectives. The application of social network theory is common to the study of collaboration in public

administration, non-profit management, and business operations; however, these theories have rarely been applied to study collaboration in a university settings. This research will expand the application of social networking theory by documenting and analyzing the student success network at UMBC to explain both the structure of the network and the consequences of the structure at both the node and group levels. Specifically, this research aims to identify and document the formal and informal relationships that shape the network, the central actors and key players that control and direct resources within the network, and the structural holes that may impact network cohesion.

Christopher Wong - Human-Centered Computing (Work in Progress)
Integrating Real-World Scenarios into Laparoscopic Cholecystectomy Skills Training

Laparoscopic Cholecystectomy (lapchole) is a minimally-invasive surgical procedure (MIS) for removing the gallbladder. Lapcholes are becoming increasingly prevalent; however, one of the current problems is a need for new training method for surgical skills. The traditional apprentice-based approach is no longer effective due to reduced continuous working hours and high cost for training residents. One of the more successful methods to come into prevalence has been the use of simulators. These allow residents to practice MIS maneuvers in computer-based virtual environments. Use of this method has been shown to enhance performance in trainees in the OR and reduce the number of surgical errors made. A new generation of surgical simulators are in development to train users in more complex procedures. These simulators can train users for a number of different scenarios, but are modeled after ideal anatomy. Aberrant anatomy and other common contingencies are often ignored. After observing 10 recorded lapcholes, we found that these contingencies often resulted in significantly longer and more error-prone surgeries. For that reason, we have developed a method for interpreting real-world scenarios into training data. First, we conducted a conversation analysis to categorize the typical interactions between attending and resident. Then, we created a Hierarchical Task Analysis (HTA) to break down the tasks that occur within an idealized real-world lapchole. Finally, we incorporated both of these analyses into a timeline analysis to examine how speech and actions deviate in non-ideal situations. By doing this, we hope to quantify how contingencies are addressed.

The Commons 331

Dorothy Borowy - Geography and Environmental Systems (Work in Progress)
Urban Ecosystems: Identifying the Processes that Drive Patterns

Ecological theory depicts dispersal as stochastic process that often differs merely by the distance at which a species can move. Yet numerous studies have shown that real ecosystems do not easily conform to core models and explanations of coexistence because multiple biotic and abiotic factors, acting in concert, drive species assembly patterns. In addition, community-level dynamics have been found to change, often drastically, when human-induced landscape modifications are considered. Yet, most studies fail to view areas of human settlement in the context of an ecosystem, resulting in an array of research opportunities in these environments. As a result, the proposed study will experimentally compare seeded local species pool (LSP) and regional species pool (RSP) communities of herbaceous plants in five different habitat locations within Baltimore City, MD, in order to identify the relative importance of specific seed dispersal mechanisms and local effects in structuring plant communities within the urban environment. Untangling these complex interactions and identifying key patterns of assembly will provide insight into the role humans play in shaping communities on multiple levels, as well as understanding of how these communities ultimately function and the services they provide. This study will contribute experimental evidence for the processes driving community assembly in a highly modified urban ecosystem. The results will subsequently serve to educate local residents, via volunteer networks and community garden programs, about the importance of maintaining natural processes and biodiversity urban environments.

Rukiya Wideman - Human Services Psychology (Work in Progress)
Caregiver Characteristics as Predictors of Successful Transitioning from Inpatient Care to the Home

Estimates are that between 2 – 20% of school aged children have an emotional and behavioral disorder (EBD), and many parents of these children are troubled by their behavioral challenges. At times, due to severe behaviors, psychiatric hospitalization is the best option. Among all illnesses, the population of children with EBD has a greater

risk of readmission, with the most elevated risk within the first three months. The transitional period is stressful for youth and their families, and if not managed properly, this stress could potentially compromise progress made in the hospital. Thus, it is critical to understand what facilitates and impedes successful transitioning. The challenges faced by youth with EBD and their caregivers are formidable, but the literature indexes several factors that impact the successful transitioning of youth with EBD back home, including high levels of stress, support, and empowerment, in addition to the effects of coping styles. The present study grows out of the School Transition Program (STP), an exploratory, pilot study of an intervention for youth and their families discharged from an inpatient psychiatric setting. It examines how caregivers' coping styles, social support, sense of empowerment, and levels of strain relate to risk of readmission in the sensitive 3-month window of hospital discharge.

Cristan Smith - Gerontology (Work in Progress)
Drug Use History and Well-Being at and Beyond Mid-life

Concern for illicit drug use has traditionally focused on younger adults, as it has commonly been accepted that drug use declines as people age. However, recent data depicts illicit drug use as an emerging health issue for older adults as well. According to data from the National Survey on Drug Use and Health, 4.8 million adults over age 50 used marijuana, cocaine, hallucinogens, heroin or prescription drugs illegally in the past year. Even more alarming, 5.7 million adults over age 50 are expected to have a substance abuse disorder (alcohol/illicit drug dependence or abuse) by 2020. Despite extensive data, which project the increase of substance abuse among older adults in coming cohorts, there is a dearth of literature related to the relationship between lifetime drug use and later life health outcomes including mental and physical functioning among older adults. This is an important area to study because of the increasing aging population and the differences in drug use histories of cohorts entering later life. The purpose of this presentation is to examine the theoretical foundation used in a dissertation that will address this gap. More specifically, the life course and the lifestyle and aging perspectives will be presented as a theoretical framework used to examine the ways that individual-level and community-level factors might be associated with health and well-being at and beyond mid-life by integrating the research's focus on time, human agency and the environment.

The Commons 332

Farhoud Kabirian - Mechanical Engineering (Oral Presentation)
Development of Magnesium Alloys for Body and Power-Train Applications: Challenges and Solutions

Use of light-weight magnesium alloys in production of vehicles has drawn enormous attention to tackle the energy crisis and curb CO2 pollution. However, the automotive industry is still cautious in investing on these materials. This is mostly due to their poorer mechanical properties and higher cost of production compared to steel and aluminum alloys. Further development of magnesium alloys in the transportation industries needs to deal with two other major hurdles. These two challenges are: 1) Poor formability and 2) Crashworthiness. The present work present solutions to these issues through characterization of mechanical responses and texture evolution of an extruded magnesium alloys provided by General Motors Company over a wide range of temperature and deformation rate. In this research, an extruded magnesium alloy is subjected to uniaxial and multi-axial loading at different temperatures and deformation rates. From these mechanical experiments, the best possible strain rate and temperature for forming of magnesium parts are offered. In order to provide industrial users with accurate predictions of the part geometrical features and post-forming characteristics (e.g. residual stresses) and possible defects and failures on the basis of the chosen process parameters, the correlation between microstructure of magnesium alloy and its mechanical was modeled. Using the model predictions, critical decisions in process design can be taken.

Yatish Joshi - Computer Engineering (Oral Presentation)
Straight Skeleton Based Reconnection in a Wireless Sensor Network

Decreasing costs and increasing functionality of embedded computation and communication devices have made Wireless Sensor Networks (WSNs) attractive for applications that serve in inhospitable environments like battlefields, planetary exploration or environmental monitoring. WSNs employed in these environments are

expected to work autonomously and extend the network lifespan for as long as possible while carrying out their designated tasks. The harsh environment exposes the individual nodes to high risk of failure, which can potentially partition the network into disjoint segments. Therefore, the network must be able to self-heal and restore lost connectivity using available resources. The ad-hoc nature of deployment, harsh operating environment and lack of resources makes distributed approaches the most suitable choice for recovery. In this paper we present SSBR, a straight skeleton based distributed approach for reconnecting a WSN partitioned into disjoint segments. The basic idea of SSBR is to decompose the network area into two dimensional set of paths that can be used for recovery. Mobile nodes are deployed by surviving disjoint segments along the paths until connectivity is reestablished. The performance of SSBR is validated through mathematical analysis and simulation.

Neetika Sharma - Applied Physics (Oral Presentation)
Physical Conditions in the X-ray NLR of Seyfert 2 Galaxy NGC 1068

Seyfert galaxies are a subclass of Active Galactic Nuclei (AGN) which remain a major area of study since their discovery in 1960s. As their name suggests AGN reside in the centers of many (10%) galaxies and they are active in the sense that their spectra exhibit a broad (from radio to gamma-rays) non-stellar continuum which exceeds the luminosity of the host galaxy. AGN spew copious amount of energy from a very small region (<< 3 light years) at the center of the host galaxy. It is widely believed that the source of the tremendous energy output from AGN is due to the accretion of matter onto a supermassive black hole (BH; of mass $10^6 - 10^9$ times the mass of the Sun). The luminosity of AGN can far exceed that of a normal galaxy. For instance, the bolometric luminosity of our Milky Way extending across a distance of 90 thousand trillion miles is about 10^{43} ergs/s as compared to the luminosity of AGN within the range of $10^{43} - 10^{47}$ ergs/s from a very small volume of <<< trillion miles cubed. Unfortunately since all this activity takes place in such a relatively small region, the central region of even the closest AGN cannot be imaged directly with current technology. Nevertheless, spectroscopic observations can help us constrain the conditions of the gas very close to BH. My research focuses on constraining the physical conditions in the circumnuclear regions (X-ray NLR) of Seyfert 2 galaxy NGC 1068 to understand its overall structure.

Erin Balsamo - Applied Physics (Oral Presentation)
Creating a Virtual Pulsar to use in NICER Simulations

The upcoming Neutron star Interior Composition Explorer (NICER) mission will investigate the extreme physics naturally occurring in neutron stars. As a member of the NICER team, I am working on a simulation of a future millisecond pulsar observation and have created a virtual pulsar to use as the target, the latter of which I will describe here. In order to properly simulate a NICER observation, I've required the virtual pulsar to contain information of observed flux in the form of energy-dependent light curves and phase-dependent spectra. The radiation from a millisecond pulsar is dominated by thermal emission at the magnetic poles while rotating about an independent spin axis. The properties of the emission can change depending on the stellar surface composition and presence of an atmosphere. Therefore I've chosen to use an atmospheric emission model that solves the radiative transfer equation to produce a simulated anisotropic emergent spectra, which I use as the emission from neutrons star's magnetic poles in my code. I have oriented the poles relative to the spin axis and the spin axis to observer's line of sight (LOS). During rotation, the angles between the poles and LOS fluctuates which directly affects the observed flux over phase. I've also considered the stellar mass and radius, distance from observer, spin period and apparent emission spot sizes for the gravitational light bending and rotational Doppler effects to calculate the observed flux. With complete control of the stellar geometry and emission, I have a useful tool to complete my NICER simulations.

Sherman Hall 308

Kiranmayi Mangalgiri - Environmental Engineering (Oral Presentation)
Fate of Antibacterial Pharmaceuticals Present in Poultry Litter During Phosphate Recovery Processes

Poultry litter is rich in nutrients (nitrate and phosphates) making it a good source of fertilizer by land application. Since land application rates are based on nitrogen requirement of soil, land application of poultry manure leads to a

buildup of excess phosphorus in soils. Agricultural runoff from such soils ultimately cause algal and impairment of water quality. Hence, recovery of phosphorus from poultry litter not only reduces environmental impact of land application, but also provides valuable product, recovered phosphorus which is used as a single nutrient fertilizer. However, poultry industry uses antibacterial pharmaceuticals as feed additives to prevent diseases and increase feed efficiency. Previous studies have shown that the ingested pharmaceuticals are excreted unmetabolized, and that land application of poultry litter contaminated with antibacterial compounds spreads antibiotic resistance in the environment. The purpose of this study was to investigate the fate of antibacterial pharmaceuticals in phosphate recovery process. Phosphorus recovery was performed in batch mode, using citric acid extraction and calcium hydroxide precipitation. It was observed that most of the antibacterial pharmaceuticals in the poultry litter were released to the effluent and did not precipitate with the recovered phosphorus, resulting in settled solids that are phosphorus-rich and pharmaceuticals-free. Additionally, the phosphate recovery process demonstrated the ability to transfer pharmaceuticals from solid phase to aqueous phase which can be easily treated by established methods (such as advanced oxidation), ultimately reducing the impact of pharmaceuticals used in poultry industry.

Kenneth Childers - Chemistry (Oral Presentation)
Structural Studies of Soluble Guanylate Cyclase

Soluble guanylate cyclase (sGC) is a ~150 kDa heterodimeric enzyme that plays a crucial role in the cardiovascular system by catalyzing the conversion of GTP into cGMP, a secondary messenger whose downstream effects include vasodilation and inhibiting platelet aggregation. Using a heme prosthetic group located at the β N-terminus, nitric oxide (NO) binds to sGC and induces a conformational change, increasing catalytic activity several hundred-fold. Inhibition of sGC activity through oxidative stress and NO-scavengers has been linked to cardiovascular disease. Due to a lack of structural data, how sGC transitions between basal and active states remains largely unknown. The ultimate goal in our lab is to provide a detailed structural mechanism for sGC activation to guide structure-based drug design of novel small molecule sGC activators to treat cardiovascular diseases. We have recently solved the structure of the catalytic heterodimeric wild-type αβGC. Activity assay results showed that this construct only displays ~ 0.01% of full-length sGC basal activity, suggesting that additional sGC domains are required to align active site residues in a catalytically-competent position. Our efforts are now focused on strategies to overcome this limitation and obtain the structure of the active conformation of the heterodimeric catalytic domain.

Amanda Lo - Biological Sciences (Work in Progress)
The Role of Genes in the JAK-STAT Pathway on the Innate Immune System and
Immunosenescence in Drosophila Melanogaster

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. In my study, I will observe the genetic effects of the innate immune system with respect to age in Drosophila melanogaster. In a previous study done in our laboratory, 192 natural variant fly lines from the Genome-Wide Association Study (GWAS) in Drosophila melanogaster were infected with Escherichia coli and observed for their ability to clear bacteria (unpublished data). These fly lines varied from each other by single nucleotide polymorphisms (SNPs), variations in a single nucleotide in the DNA sequence. The genes associated with these SNPs were analyzed through functional clustering analysis. The highly enriched genes were involved in developmental processes. For my study, I focus on the candidate genes associated with one developmental pathway, the Janus-kinase-signal transducer and activator of transcription (JAK-STAT) pathway, to further research whether the JAK-STAT genes are associated with immune defense. Using genetic tools, I study the knock-down effect of the candidate genes on the ability to clear E. coli at both 1-week-old flies and 5-weeks-old flies. Through this study, we hope to gain a better understanding about which genes have an effect on the innate immune system and immunosenescence.

-Poster Presentations-

University Center 312

Prajit Das - Computer Science
FaceBlock: Semantic Context-Aware Privacy for Mobile Devices

Wearable computing devices like Google Glass are at the forefront of technological evolution in smart devices. The ubiquitous and oblivious nature of photography using these devices has made people concerned about their privacy in private and public settings. The Face-Block (http://face-block.me/) project protects the privacy Glass users by making pictures taken by the latter Privacy-Aware. Through sharing of privacy policies, users can choose whether or not to be included in pictures. However, the current privacy model of FaceBlock only permits simple constraints such as 'allow' versus 'disallow' pictures. In this paper, we present an extended context-aware privacy model represented using OWL ontologies and SWRL rules. We also describe cases of how this model can help FaceBlock to generate Privacy-Aware Pictures depending on context and privacy needs of the user. The goal of the enhanced system is to allow more granularity in policy definition by leveraging the contextual nature of privacy needs. That is, we may trust someone or some device in an environment which is not critical for us. However, at critical locations or during critical activities we might want to keep things private. For example, one might not want to be photographed in the gym or a bar. The pervasive nature of the Google Glass category of devices are allowing these possibilities of surreptitiously being photographed by strangers. Therefore, this system allows people around a Google Glass user the choice to selectively but automatically control whether they want or need privacy-aware pictures using fine-grained context-aware policies.

Ari Rapkin Blenkhorn - Computer Science
Real-time GPU Rendering of Atmospheric Glories

The "glory" is a colorful phenomenon which resembles a small circular rainbow, seen on the front surface of a cloudbank when the sun is directly behind the observer. Mie theory provides a mathematical description of the color banding. Mie theory computes the intensity of scattered light for a single wavelength and angle. It must be repeated for hundreds of wavelengths to produce a stable simulation of the glory. I use the general-purpose parallel capability of the GPU (graphics processing unit) to calculate each wavelength for each pixel of the resulting image, with the goal of real-time results. The Mie scattering and color calculations, as well as the final image render, are performed entirely on the GPU, avoiding GPU-CPU data transfer costs. I further reduce the number of wavelengths required by a factor of ten over the uniform dense sampling used by the physics community by using importance sampling, which dedicates more effort to wavelengths which are strongest in sunlight. The radial symmetry of the glory permits significant additional optimization. The resulting algorithm computes proceeds in four steps: Mie scattering is computed for one radial slice of the glory at 16x resolution; the per-wavelength intensities are converted to color values using perceptual color-matching functions; a full single-resolution image is constructed from the 16x color slice; then this image is rendered to the screen. Current performance is 12ms per scattering wavelength. Additional importance sampling enhancements are expected to further reduce the number of wavelengths required.

Tanmay Kulkarni - Electrical Engineering
Palladium Nanowire Based Enzymatic Biofuel Cell

A simple energy harvesting strategy has been developed to selectively catalyze glucose in the presence of oxygen in a glucose/ O2 fuel cell using highly ordered palladium (Pd) nanowire array electrodes. Glucose-based biofuel cells consist of a bioanode and a biocathode at which oxidation-reduction reactions occur in the presence of glucose. The biofuel cell circuit is completed with an external load to allow the conduction of electrons from the bioanode to the biocathode. Therefore, the choice of the anodic and cathodic material highly depends on several factors including but not limited to the biocatalyst to catalyze the electrode reactions and the integration of the biocatalyst with the appropriate physicochemical transduction element for harvesting energy from the various concentration of glucose. The Pd nanowires synthesized were 5.6 μm in length and 64 nm in diameter. The anode consists of glucose oxidase and catalase immobilized on Pd nanowires and the cathode is constructed from laccase immobilized on Pd nanowires. The glucose/ O2 biofuel cell was studied in phosphate buffer saline containing various concentration of glucose at a temperature of 37 °C. The cell is characterized according to its open-circuit voltage, polarization profile, and power density plot. Under these conditions, the glucose/ O2 biofuel cell possesses an open-circuit voltage of 506 mV and delivers a maximum power density of 72 μW/ cm2 at a cell voltage of 291 mV operating in 10 mM glucose.

Such low-cost lightweight glucose/ O2 biofuel cells have a great promise to be optimized, miniaturized to power bio-implantable devices.

Robert Weiblen - Electrical Engineering
Increased Laser Damage Threshold in As2S3 Motheye Structures

Motheye structures are a microstructured anti-reflective surface structure that are effective at reducing Fresnel reflections. In the long wavelength limit, they work by providing a gradual change of the effective refractive index as light propagates across the air-glass interface. They are especially useful for high-index materials, such as most mid-IR materials, including chalcogenide glasses like As_2S_3. Reducing Fresnel reflections from optical interfaces is extremely important in mid-IR applications where high power and low loss are needed. It has been experimentally observed that motheye anti-reflective microstructures at the end of As_2S_3 fibers have an increased laser damage threshold relative to thin-film anti-reflective coatings. In this work, we computationally study the irradiance enhancement in As_2S_3 motheye anti-reflective microstructures in order to explain the increased damage threshold. We show that the irradiance enhancement occurs mostly on the air side of the interfaces and is minimal in the glass. We found qualitatively similar results for both positive and negative motheye structures. However, positive structures showed greater enhancement localization. Enhancement was also greater out of the plane of the input electric field. We give a physical explanation for this behavior in terms of Maxwell's equations and the associated boundary conditions, which state that the normal electric displacement is continuous across a boundary, leading to an increase in the electric field strength in the low-index dielectric.

Hager Samie - Information Systems
Using Emotiv Headset in Detecting Bio Signals

In this paper, we are investigating a noninvasive tool for recording and measuring brain activity while performing more than one basic bio-movement. A commercial EEG Emotiv neural headset and its SDK, researcher edition, are used in detecting brain waves. The main aim is measuring the ability of EEG to accurately detect brain activity using the headset during different body movements are performed. EEG data is trained to distinguish at least two different bio signal models -emotional or physical movement. Different machine learning algorithms are used to measure the quality of the extracted corpus. A manual annotated data recording for the body movements corresponding to the EEG recorded data using a computer video camera. Measuring the performance of an EEG neural headset requires testing the accuracy of the fourteen electrodes of this headset. .In addition, we compared the accuracy of each brain hemisphere (left and right). Each dataset was spitted into 2 sub-datasets in which each dataset represented left or right brain hemisphere. We collected data from two users, each in a separate dataset. Each dataset consists of 16 attributes.

Maxim Serebreni - Mechanical Engineering
Modeling of Fatigue Crack Growth in 4340 Steel

Fatigue crack growth is important to understand in order to predict the life cycle of load bearing components to prevent failure. AISI 4340 steel is used in applications requiring higher strength such as aircraft landing gear. Such components are subjected to cyclic loading that promote crack growth, which can eventually lead to unexpected failure of the critical component. Numerous crack propagation models have been developed ranging from crack closure to strip yield models with varying degree of accuracy to predict the life cycle of components. However, no single model can accurately predict fatigue crack growth under different loading configurations. In this presentation empirical predictions from several fatigue crack growth models are compared with published and new experimental data. The models include the Paris, Forman, Gurevich and Khan-Paul equations, and some of their modified forms. These models are used to correlate fatigue crack growth data in case of plane stress and plane strain specimen geometries. In addition, empirical formulas are compared to crack growth data of varying stress intensity factor range. The Khan-Paul equation is shown to be more accurate than the other fatigue crack propagation models, especially in case of plane stress case.

Saadi Habib - Mechanical Engineering

Utilization of Newly Developed Magnesium Alloy ZEK100 Sheet for Automotive and Aerospace Industry

Magnesium alloy is a highly sought after material due to its light weight and strength properties. It's about 75% lighter than steel and about 35% lighter than aluminum. However, magnesium alloy sheet has a limited number of slip planes at room temperature and where twinning is a significant contributor to deformation due to hexagonal close packed (HCP) crystal structure. Also, it shows strong crystallographic texture due to material forming which causes strong anisotropic and asymmetric behavior. Magnesium alloy ZEK100 sheet shows significant improvement in crystallographic texture due to the addition of rare earth elements. The results of the weaker crystallographic texture are an increase in ductility. To be able to use this material in automotive and aerospace industry, mechanical response of the material under different load speeds and temperature must be tested. Mechanical responses of ZEK100 Magnesium alloy under uniaxial (tension-compression) loadings along the rolling direction (RD), 45° to rolling direction (DD), transverse direction (TD) and normal direction (ND) at the strain rate and temperature ranges of 10^{-4} - 3200 s^{-1} and 23°C & 150°C are presented. The mechanical response of the material will help in understanding how the material reacts in metal forming, under load and under impact. The material is dependent on strain rate, temperature and orientation. The yield strength is greatest along the RD and decreases towards TD whereas elongation is highest in the TD and decreases in the RD.

Sumin Seong and Christopher Mullen - Mechanical Engineering
Non-linear Energy Harvesting Design

Energy harvesting from vibration has been initiated from the linear vibration principle, which utilizes a single frequency to obtain power. Unfortunately, linear energy harvesters do not yield appreciable power because of the random nature of vibration in the real world. In order to overcome the weakness of linear harvesters and account for the arbitrary nature of vibration, multiple nonlinear vibration energy harvesters have been developed and studied. This research presents a parametric study on the design of a nonlinear vibration energy harvesting device that utilizes a snap-through mechanism to obtain high power from broadband excitation frequency. The device is comprised of a cantilever beam with a curved shell implemented in the middle of the beam. When vibrating, the curved shell causes snap-through buckling and the nature of vibration becomes nonlinear. For practical purposes, a broadband frequency vibration input is used to optimize the energy harvester design. Design variables are assigned and optimized in order to create optimal design of the energy harvester, which maximizes power output. The presented design will have a positive effect by providing means to practically capturing wasted vibration energy in consideration of its broadband frequency utilization.

Muhammad Rahman - Computer Science
Semantic Information Extraction from RFP Documents

Businesses of all sizes use requests for proposals (RFPs) to understand available business opportunities. Because these documents are semistructured or unstructured texts, they are normally reviewed by staff for suitability, which takes valuable time and energy away from generating revenue. The evaluation is based on a number of other organization-specific factors and results in a decision to pursue or abandon an opportunity. We present our work with RedShred, a bwtech@UMBC incubator startup, to develop novel analysis techniques to help automate the review of RFPs based on customer-specific criteria. Analyzing RFPs by a machine is a hard problem due to the needs of extensive background knowledge to interpret the meaning of words through the context. As a human being, it is much easier to understand the contextual meaning of any word in an RFP but not for a machine. Our research is at the crossroads of a number of trending areas in big data and artificial intelligence research including question answering, information extraction, information retrieval, knowledge-base population, natural language processing, and machine learning. The outcome of our research helps companies to understand RFPs and to decide which RFPs are a good match for their business.

Scott Riley - Chemistry
Bio-Inspired Electrode Construction: Building Bridges with Biology

In the modern world there exists an ever increasing demand for more efficient forms of energy storage. Electrochemical cells are the most widely used form of portable energy storage and are possible candidates for application on larger scales. From mobile devices to cars, batteries are integrated into many facets of daily life, yet little improvement in their performance is being recognized. While batteries have been improving over the years, the growth is slow and staggered. An improvement similar to the discovery of lithium ion batteries needs to be made in order to keep up with demand. My work is centered on maximizing battery performance by interfacing biology and batteries. My research is focused on using an approach involving an array of interdisciplinary techniques to address performance issues commonly found in batteries. I use the technique of phage display to isolate Solid Binding Peptides (SBP) that bind to lithium cathode materials, specifically Lithium Cobalt Phosphate (LCP). This technique has yielded two peptides that bind to LCP. These peptides are utilized in several ways to synthesize LCP and then bio-tether it to conducting Carbon Nanotubes (CNT). This method of electrode construction will enhance multiple aspects of battery performance including capacity, cyclability, and power.

Rose Belanger - Applied Developmental Psychology
MINEE (Mothers of Infants in the NICU Emotions & Experiences) Study: Support needs; mothers of infants requiring NICU care

Mothers experience postpartum depression (PPD) or anxiety more often than any other problem during pregnancy or after having a baby. Most mothers, who have PPD, do not receive a diagnosis, or any treatment. Many harmful outcomes, at the individual, family and national level, are associated with PPD and anxiety. Mothers, of infants treated in a Neonatal Intensive Care Unit (NICU), may be at particularly high risk for developing PPD or anxiety. Infants, who received NICU care, and whose mothers experience PPD, may be at very high risk for difficulties in school and in relationships with peers and teachers. Participants, in the MINEE study, were mothers (*N*=148), of infants, who were treated in a NICU. Mothers completed multiple surveys. In addition, mothers responded to the questions: "Please tell us what is helping you most right now? "If you could choose one more thing that would be helpful … what would it be? Mothers, (27%) reported that receiving support from their partner, their mother or other family was helping them the most. Many mothers (30.8%) reported receiving support from at least two sources. Mothers also reported that staying active (2.3%), their baby doing well (2.3%), and information on what to expect, were helpful (3.0%). In addition, the "one more thing" that mothers wished they had, included; a better financial/employment situation (26%), a better living situation (14%), such as owning their own home, or their family having their own living space, and more sleep (10%).

Shelby Jones - Applied Developmental Psychology
The Mediating Role of Parenting Styles in European-American and Asian-American Emerging Adults' Self-regulation Ability

Self-regulation, or the ability to control one's behavior, emotion, and attention, is associated with positive developmental outcomes in the health, behavioral, and academic domains. Although authoritarian parenting may undermine children's development of self-regulation, authoritative parenting may foster self-regulatory abilities that facilitate their transition into adulthood. The extent to which self-regulation is related to parenting styles across different ethnic groups has yet to be evaluated among emerging adults (EAs); individuals between 18-25 years old. Across both parenting types, Asian-American EAs scored significantly lower on self-regulation ability than European-American EAs, t (1, 387) = -2.69, $p < .01$. Parenting style mediated the associations between ethnicity and self-regulation ability. Consistent with previous research, compared to European-American parents, Asian American parents used significantly less authoritative parenting, t (1, 387) = -3.33, $p < .001$, and significantly more authoritarian parenting, t (1, 387)= 6.47, $p < .001$. For both European-American and Asian-American participants, authoritative parenting was significantly associated with high levels of self-regulation, t (1, 387) = 4.45, $p < .001$, whereas authoritarian parenting was significantly associated with lower levels of self-regulation, t (1, 387) = -3.19, $p < .01$. This information highlights similar associations between parenting style and self-regulation ability across ethnicities and demonstrates how parenting remains an important aspect of their child's development throughout emerging adulthood. Finally, these findings can reveal strengths in parenting styles across cultural groups that can be targeted in intervention programs aimed to promote children's self-regulation in culturally appropriate ways.

Allison Hyde - Applied Sociology

The Effects of Ethnicity/Race on Doctor-Patient Communication about Obesity

As talk of the "obesity epidemic" in the US persists, research has found that blacks and Hispanics are more likely than whites to be considered obese according to standard body mass index (BMI) measurements. At the same time, research shows that the US healthcare system provides lower quality care to patients of racial/ethnic minorities than to white patients, raising the question of whether providers consider the role racial, ethnic and cultural differences might play in a person's weight and ability to lose weight, and whether physicians tailor their communication and advice to patients with respect to these factors. This qualitative project was designed to explore these issues. Convenience sampling was used to recruit eight general practice physicians and nurse practitioners in the mid-Atlantic to participate in one-on-one semi-structured interviews examining provider views of communication with overweight and obese patients. A preliminary analysis of results indicates that a patient's race, ethnicity and culture do not influence the recommendations of providers; however, providers in this sample report that they believe low socioeconomic status (SES) increases a person's chances of being overweight and impedes their ability to lose weight due to associated factors such as lack of quality insurance, low levels of health literacy, inability to buy healthy foods, little or no access to safe places to exercise, and healthy eating being a low priority when compared to other daily stressors. Providers believe their most effective practice for facilitating weight loss in patients is setting regular, small attainable goals and using positive reinforcement.

Hui Jun Lim and Merve Balkaya - Applied Developmental Psychology
The Role of Parental Promotion of Volitional Functioning and Ethnic Cultural Competence in Asian-American Emerging Adults' Adjustment

Parental promotion of children's volitional functioning (PPVF) is proposed to be important for emerging adults' adjustment across cultures, such that PPVF has been found to be associated with more positive psychological and behavioral outcomes. However, this association has not been explored among Asian-Americans emerging adults (AAEAs). AAEA's maintenance of cultural competence in their heritage cultures (Ethnic-CC) may indicate greater filial behaviors and less valuing of autonomy than Western peers. However, although PPVF may seem to contradict the maintenance of traditional Asian cultural knowledge and skills emphasizing interdependence, Ethnic-CC may be uniquely and interactively beneficial for the positive functioning of Asian-American ethnic minorities in the larger U.S. culture, especially during emerging adulthood. Thus, we examined: (1) the role of PPVF in predicting AAEAs' filial behaviors (FB), psychological well-being (PWB) and depressive symptoms (DS), and (2) the moderating role of Ethnic-CC. Asian-American college students (N=245, Mage=20.55 years, SD=2.07) completed an online survey assessing their demographic characteristics, PPVF, Ethnic-CC, FB, PWB, and DS. PPVF was positively associated with Ethnic-CC, FB and PWB, and negatively associated with DS. Ethnic-CC was positively associated with FB, and negatively associated with DS. PPVF and Ethnic-CC uniquely and negatively predicted DS; however, the interaction was non-significant. Ethnic-CC significantly moderated the associations between PPVF and (1) FB and (2) PWB. These positive associations were significant across all levels of Ethnic-CC but stronger at higher levels of Ethnic-CC. The importance of both volitional functioning and heritage cultural competence for AAEAs' healthy behavioral and psychological functioning adjustment will be discussed.

Session II
10:30am - 11:45am

University Center 310

Nonprofit and Government Careers Meet-Up Panel
(Featured Professional Development Workshop)
Coordinated with the Career Center

Are you interested in pursuing a career in the non-profit or government sectors? Find out from a panel of experts what it takes to jump-start your career! The panel is followed by a Q&A session and a hands-on networking activity

that will give you insights into developing an elevator speech, translating your research to people outside of your field, and follow-up expectations.

The Commons 318

Shariece Johnson - Public Policy (Work in Progress)
Predictors of Parental Adherence in Toddler Obesity Prevention Programs

The prevention of obesity in the United States has become a serious public health concern, especially among children. In 2013, it was estimated that there were 23.9 million children in the U.S. ages 2 to 19 who were overweight or obese. Since overweight and obese children are at high risk for becoming obese adults that will suffer from serious chronic disease, addressing the issue of preventing childhood obesity should be a top priority. One important barrier to overcome when trying to develop childhood obesity prevention programs is addressing parental adherence to such programs. Childhood obesity prevention programs often deal with low parental adherence to program protocols, which can lead to diminished program results. Exploring factors that predict parental adherence will help to increase childhood obesity prevention program adherence levels, which in turn will lead to better program outcomes. Using the Health Belief Model as a theoretical framework, this research will explore factors that predict parental adherence to a toddler obesity prevention program conducted in a rural area of Maryland and an urban area of Maryland. A logistic regression analysis will be used to develop a model that predicts factors closely related to parental adherence in toddler obesity prevention programs. The information obtained from the data analysis will be used to create a foundation of research that will help address issues of parental adherence in toddler obesity prevention programs in order to obtain more successful program outcomes.

Kimberly Feldman – Language, Literacy, and Culture (Oral Presentation)
Beyond the Teachers Lunchroom: Professional Identity, Teacher Voice, and Education Reform

Influenced heavily by the dominant narratives and cultural myths about teachers, education policy in the United States has created bureaucratic burdens that constrain teacher practice, fundamentally change what it means to be a teacher, and raise alarming concerns about the future of the profession. Within the safe space of their professional community, teachers speak passionately about the negative impact current education reform has on teaching and learning. Unfortunately, there is a fundamental disconnect between the professional community of teachers and the businessmen and politicians that shape education policy. Because of the feminization of the profession, the vilification of teachers in the media, and prevailing positivist perspectives of research, those in power devalue the craft knowledge, experience, and expertise of teachers, failing to give teacher voice a place in policy making. In seeking to explore possible avenues for addressing this absence in policy conversations, teacher voice must be validated. This study draws on theory and research related to identity, collective action, and resistance to analyze a series of semi-structured interviews of secondary teachers. Preliminary findings suggest that the marginalization of teacher voice in policy-making stems from lack of time, recognition, discourse, and access. These findings also suggest possible avenues for strengthening teacher voice by providing teachers with the time and space to foster communities of practice and collective action, allowing them to work collaboratively to shift the narrative and challenge prevailing cultural myths about their work.

Pradeep Guin - Public Policy (Oral Presentation)
Impact of Exposure to Natural Disasters on Children's Health and Education Outcomes

Natural disasters can have terrible negative effects on human beings. For a variety of reasons, children may be especially vulnerable. Early exposure to natural disasters can adversely affect children's physical, emotional, and psychological well-being, which can lead to both short and long term impacts. This paper investigates whether exposure to natural disasters during childhood has an impact on early health and education outcomes. Despite the fact that natural disasters are expected to occur more frequently in the future, very little is known about the health and education effects of natural disasters on children. In this paper, I attempt to advance our understanding of impact of disaster exposure using data from a national sample of kindergarteners in the U.S. I combine several datasets for analysis purpose. Specifically, I use data on children, their families, school, and neighborhood from five waves of the Early Childhood Longitudinal Study, Kindergarten class of 1998-99 (ECLS-K); natural disaster data

from the Spatial Hazard Events and Losses Database for the United States (SHELDUS™); and county-related (i.e., FIPS code, population) data from the U.S. Census Bureau. I use regression analysis to study the effects of four types of natural disasters on children's education (math and reading scores) and health (height-for-age, weight-for-age, and BMI-for-age) outcomes. Preliminary findings indicate no significant impact on child's outcome measures due to various types of disaster exposure. However, there is evidence that disasters that lead to especially large economic losses can reduce students' performance on math assessments.

Shreyasi Deb - Public Policy (Oral Presentation)
Socio-Economic Predictors of Prescription Drug Access Among Working Age Individuals with a Mental Health Disability

Working age individuals with a mental health disability are poorer, have less education, are more likely to be female and belong to a minority race and ethnicity as compared to their peers without such a disability. These individuals are also more likely receive public health insurance and report poorer health status. Individuals with disabilities who belong to a minority group are regarded as 'doubly underserved'. In this article, I ask if being female and belonging to a minority race or ethnic group interact with mental health disability to have an additive effect on prescription drug utilization. I found that having a mental health disability, being female and belonging to a non-Hispanic Black or Hispanic group significantly predict delay and inability to acquire prescription drugs. However, I do not find statistically significant interactions of race/ethnicity and gender with mental health disability in predicting such delay or inability. More research is required using specific medication groups and mental health status measures to inquire into this question.

The Commons 327

Arunendra Saha Ray - Chemistry (Oral Presentation)
Multifunctional Gold Nanoparticles for Drug Delivery

Currently there are several challenges in chemotherapy including increased efficacy, potency and systemic toxicity. The multiple side effects along with increased drug resistance against traditional chemotherapeutic agents have been an ongoing challenge in cancer therapy. At the present time several novel drug delivery systems (theranostic) are being investigated into by various research groups across the nation. One of the most promising among the aforementioned is the use of nano-vectors due to their inherent versatility and high multivalency. In my research, the nanovector is comprised of three unique components: nanometer sized gold core, therapeutic agents like cisplatin, docetaxel, prednisone and tumor recognition component like monoclonal antibodies. In my research gold nanoparticles (<50nm) is used for the nontraditional dendrimer core due to its inherent biocompatibility. Careful size regulation allows the thus synthesized gold nanoparticles from being eliminated through renal filtration. Furthermore, incorporation of PEG molecules on Au surface allows for longer circulation time and greater "stealth" capabilities of these nanoparticles. Lastly functionalized library of dendrons allows for incorporation of various complementary therapeutic agents on the gold surface. Through research it has been well established that PEG molecules slows down the uptake of synthesized nanoparticles by macrophages. Furthermore, dendrons and dendrimers (synthetic spherical polymeric molecules with tightly regulated geometry) have shown great potential for therapeutic use. Presently I am using the abovementioned scaffold to generate multifunctional gold nanoparticles that can be tested in vitro and invo.

Stacey Sova - Chemistry (Oral Presentation)
Naphthalimide Derivatives Selective Interactions with Proteins

The potential of naphthalimide derivatives with oxidizable amino acid substituents (NI-Alanine, NI-Tyrosine and NI-Dopa) as photoaffinity labels have been studied. These selectively excitable compounds oxidatively crosslinked up to 5 lysozymes together upon photolysis for thirty minutes via a radical mechanism as shown by SDS-PAGE. NI-Tyrosine and NI-Dopa, which are non-fluorescent, contain natural substrates for mushroom tyrosinase so as to target the active site of this enzyme. Upon interaction between tyrosinase and the naphthalimides, the fluorescent intensity increased 5 times in just 2 hours from oxidation of the naphthalimide derivative, causing a disruption of a photoinduced electron transfer. Kinetics also suggest the naphthalimides are substrates for mushroom tyrosinase

indicating these compounds can specifically target the active site. A longer peptide chain was added to the naphthalimide, alanine-tyrosine, to minimize steric hinderance by the naphthalimide moiety.   The addition of the peptide increased the fluorescence quantum yield to 0.015 from 0.0052 as compared to NI-Tyrosine. Kinetic studies are being continued to determine mushroom tyrosinase's affinity for the peptide substituted naphthalimide as compared to the previous naphthalimides. Further research will determine if these naphthalimides have the capability to oxidatively crosslink to the active site of mushroom tyrosinase and be utilized as a photoaffinity label.

Ester Sesmero - Chemistry (Oral Presentation)
Characterization of Functional Conformations of HCV Polymerase

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. 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.

Danielle Schmitt - Chemistry (Oral Presentation)
Real-time Dynamics of the Purinosome Governed by AMPK-associated Signaling Network

Human *de novo* purine biosynthesis is a ten-step process catalyzed by six enzymes, converting phosphoribosyl pyrophosphate to inosine monophosphate. These enzymes have been found to compartmentalize together in the cytoplasm upon purine depletion; forming a transient metabolic complex termed the "purinosome." Recently, there has been growing interest in elucidating signaling networks associated with purinosome dynamics to understand the biological significance of purinosome assembly in cells. Although a metabolic intermediate of purine biosynthesis, 5-aminoimidazole-4-carboxamide ribonucleotide (AICAR), is a well-characterized allosteric activator of AMPK, human *de novo* purine biosynthesis has not been explored as part of AMPK-mediated signaling networks. In this study, we investigated the effect of AMPK activation on purinosome dynamics by monitoring green fluorescent protein-tagged formylglycinamidine ribonucleotide synthase (FGAMS-GFP) as a purinosome marker under fluorescence live-cell microscopy. Dynamic clustering of purinosomes is observed in HeLa cells by the addition of AICAR. Subsequently, we reveal that the biguanides, metformin and phenformin, also induce clustering of FGAMS-GFP in HeLa cells, respectively. As a control, we also found higher doses of AICAR were unable to induce clustering of hypoxanthine guanine phosphoribosyltransferase tagged with fluorescent protein, which is involved in purine salvage pathway. These data support our hypothesis that AMPK controls purinosome assembly as a mean to maintain cellular energy homeostasis. As *de novo* purine biosynthesis has been a validated target of cancer therapeutics, we envision that a greater understanding of purinosome dynamics, especially in response to cellular energy needs, possesses high potential to be translated into better chemotherapeutic intervention.

The Commons 328

Josephine Namayanja - Information Systems (Oral Presentation)
Change Detection in Evolving Computer Networks: Changes in Densification and Diameter Over Time

Large-scale attacks on computer networks usually cause abrupt changes in network traffic, which makes change detection an integral part of attack detection especially in the final stages of an attack. Such changes in traffic can be defined in terms of sudden absence of key nodes or edges, or the addition of new nodes and edges to the network. These are micro level changes. This on the other hand may lead to changes at the macro level of the network such as changes in the density and diameter of the network that describe connectivity between nodes as well as flow of

information within the network. Our assumption is that, changes in the behavior of such key nodes in a network translates into changes in the overall structure of the network since these key nodes represent the major chunk of communication in the network. In this study, we focus on detecting changes at the network-level whereby we sample the network and select key subgraphs associated to key nodes. Our objective is to study selected network – level properties because they describe a generic picture of underlying events in the network.

Cailing Dong - Information Systems (Oral Presentation)
Predicting Privacy Behavior on Online Social Networks

Online Social Networks (OSNs) have come to play an increasingly important role in our social lives, and their inherent privacy problems have become a major concern for users. Can we assist consumers in their privacy decision-making practices, for example by predicting their preferences and giving them personalized advice? In order to accomplish this, we need to study the factors that affect users' privacy decision-making practices. In this paper, we intend to comprehensively investigate these factors in light of two common OSN scenarios: the case where other users request access to the user's information, and the case where the user shares this information voluntarily. Using two social network datasets and three location-sharing datasets, we identify behavioral analogs to psychological variables that are known to affect users' disclosure behavior. The variables include trustworthiness of the requester/ information audience, sharing tendency of the receiver/ information holder, sensitivity of the requested/shared information, appropriateness of the request, as well as some contextual factors. Based on these factors we build a privacy decision making prediction model. Privacy decision-making is a trade-off between the potential benefit and risk. Our privacy decision-making prediction model combines several important psychological and contextual factors that influence this tradeoff, and learns their functionality by building a binary classifier. The proposed privacy decision making prediction model produces good results based on the five identified factors, and can be used to assist users to protect their privacy in online social networks.

Neha Sardesai - Electrical Engineering (Oral Presentation)
Development of a Smart Optical Sensor for Measurement of Bio-process Variables

The main bioprocess variables that are continuously measured are pH, dissolved oxygen (DO), and dissolved carbon dioxide (DCO2). Recently, pH and DO optical chemical sensors are being developed in the form of patches, due to their small form factor, and convenience in use. These sensors are typically interrogated using a lab grade spectrometer, or with the help of a low-cost, tailor-made opto-electronic transducer designed to read measurements from these chemical patch sensors. In this contribution, we are presenting a new class of optical sensors by combining the patch sensors and opto-electronic transducers. The opto-electronic transducers are capable of monitoring several different patch sensors without the need to switch the optics or hardware when changing the type of chemical patch sensor. This allows flexibility closer to the lab-grade devices at a price point of a dedicated sensor. In this presentation, we are demonstrating a universal optical platform capable of monitoring pH or DO patch sensors. The platform is capable of seamlessly switching between these two modes. It is also capable of auto recognition of the patch sensor type. The platform can operate directly with a patch sensor or a fiber optic cable can be used to reach the source of fluorescence emission. The platform has measurement accuracy of about 0.05 pH units and approximately 3\% air saturation with oxygen. The described platform has been tested in actual bioprocesses and has been found adequate for continuous bioprocess monitoring.

The Commons 329

Muhammad Rahman - Computer Science (Oral Presentation)
Open Information Extraction and Topic Modeling on Academic Profiles

Open Information Extraction (Open IE) is a research paradigm that develops information extraction systems to read arbitrary text from any domain on the web. The objectives of these systems are to automatically process and extract relevant facts to cope with the diversity of documents. Topic models are a suite of statistical algorithms used in natural language processing and machine learning to group, search and summarize text documents, whereas clustering is a process of grouping similar objects in the same category. In this research, we implemented and analyzed unsupervised techniques topic modeling and clustering on facts as well as on unstructured text data from

academic profiles. We used OpenIE 4.0 for extracting facts. For pre-processing of academic profiles, we used different machine learning and NLP frameworks such as apache-tika, sentence-splitta and scikit-learn. We applied Non- negative Matrix Factorization (NMF) topic modeling algorithm, k-means and mini batch k-means clustering algorithms. Our results show that topic modeling and clustering on facts are more meaningful than that of unstructured text data. The results also show that topic modeling is more significant than clustering. Our research has produced a JSON object that includes facts and relevant information from academic profiles, which can be used as a data set for machine learning and NLP research. This research will incorporate semantic similarity and named entity recognition (NER) on academic profiles.

Vladimir Korolev - Computer Science (Oral Presentation)
PROB: A Tool for Tracking of PRovenance of Big data Computational Experiments

Quality of research is highly dependent on reproducibility of computation and data provenance. Unfortunately, despite the past efforts, it is still very hard to reproduce computational experiments with high degree of certainty. The rise of popularity of interactive exploratory computing tools such as Matlab and R exacerbate the issue. These tools allow researchers to comb through large datasets using advanced analysis methods, but once the desired result is achieved they make it hard to trace analysis back to the source datasets. With the explosion of Big Data the situation looks even worse. Moreover, for the researchers who work with data that involves human subjects it is nearly impossible to exchange the original datasets due to regulatory restrictions. In this work, we propose a tool that helps researchers to improve reproducibility of their experiments through automated keeping of provenance records. The tool is built specifically for the workflows that use PIG and Hadoop frameworks. However, techniques used by the tool could be applied to any computation workflow tool. The tool consists of modified PIG interpreter that monitors interactive sessions and stores the records of manipulations performed on the data. In addition the tool takes the fingerprints of all datasets involved in the computation. The records are kept in standard semantic web format called PROV. The PROV records form directed graph, which makes it possible to trace the computations back to the original datasets. Keeping the fingerprints of datasets allows independent researchers to verify each other's computation without direct data exchange.

Jennifer Sleeman - Computer Science (Oral Presentation)
Improving Entity Disambiguation for Wild Big Data Through Contextualization and Fine- Grained Entity Type Recognition

Often in natural language processing (NLP), textual documents are processed and entities mentioned in sentences are identified and matched across documents. For example, a news article by the Washington Post, may mention 'Camden Yards' and a news article by the New York Times may mention 'Oriole Park'. The NLP technique would decide if the two entities mentioned are the same. A step in identifying an entity is to identify the entity type, known as entity type recognition. For example, the mention 'Camden Yards' would be identified as a place. Our work extends entity type recognition by identifying fine-grained types. For instance, 'Camden Yards' may be recognized as a place, a sports complex, a ballpark and a stadium. By identifying fine-grained types we are able to provide additional evidence to support matching entities across documents. Using our approach we are also able to build a conceptual understanding of each entity. For example, 'Camden Yards' can be associated with baseball, Baltimore, and the Orioles. Using a large known data source, for example Wikipedia, and topic modeling, we associate a set of topics with each Wikipedia-defined entity type. For new documents from unknown sources, we then create mappings from unknown entities to known entity types. Since we do not assume prior knowledge of the documents we process, we can support data from various domains and data from multiple sources. This is a key advantage of our work, related work often constraints the problem to a known set of documents.

The Commons 331

Erin L. Berry - Language, Literacy and Culture (Work in Progress)
Embodied & Disembodied Social Spaces: An Analysis of Sociolinguistic Self- Presentation Training Programs at HBCUs

The digital landscape is pervasive and fluid and it operates as a multi-modal terrace for people to engage and disengage rhizomatically with their computers, tablets, and smartphones to post, comment, like, tweet, or re-tweet their and other's views. In considering the strategic and purposeful development of these multi-modal spaces and their application to individual lives, the covert and overt contextual consequences of forced and voluntary use and its possible impact in and outside of the digital must be recognized. Younger generations, including the millennials, have grown up in an era in which digital communication and self-expression is the norm. While much scholarship has been focused in the areas of digital and multi-modal voice, presence, and perception of users, senders, and receivers, not enough of it focuses on the impact that (disembodied) social media identity construction has on the (embodied) practices of Black students at Historically Black Colleges and Universities (HBCUs). This presentation will provide a review of online sociolinguistic self-presentation training programs that exist for Black millennials at HBCUs, what these programs accomplish, what they do not accomplish, and the ways that they can prepare Black millennials with a critical skillset of sociolinguistic self-presentation in social media environments as they embark on post-graduate careers.

Molly Lemoine - Intercultural Communication (Work in Progress)
Symbolic Violence and the Baltimore Bus System

The intent of this analysis is to demonstrate how inequalities in the transit system in Baltimore, MD, specifically with respect to the bus system, constitute various forms of Pierre Bourdieu's concept of Symbolic Violence. Given the shifting trend in American urban geography that favors extensive highway networks connecting cities to suburban peripheries, the landscape of cities has transformed to accommodate an increasing population of suburban elites. This has had an adverse effect on public transportation systems within cities, particularly in the case of Baltimore's bus system. Elements of race, socioeconomic class, and geopolitics will be explored to provide possible explanations for the inequalities that exist in the city as they relate to transportation, all rooted in the context of historical processes and the domino effect of systemic racism. These factors will be analyzed primarily through the theories of Pierre Bourdieu, Immanuel Wallerstein, and Moril Toi, all of whom focus on the reproduction of an arbitrarily identified system of value that contributes to an inherently unequal distribution of capital and infrastructure development. Urban geographer and anthropologist David Harvey will be included as well, with a particular focus on his work expanding Karl Marx's theories on bourgeois ownership of time and space and its subsequent reproduction of capitalist inequality. Additionally, writer and urban activist Jane Jacobs will be analyzed in terms of the value placed on urban resident voices, and who identifies the function of urban culture and institutions.

Ibrahim Er - Language, Literacy and Culture (Work in Progress)
Quantitative Analysis of Scoring in TV Series Adaptations: A Comparison of Monk and Galip Derviş

Ever since 1894, when the Edison Company first attempted to produce a sound film, media scholars have discussed the effect of scoring in motion pictures. Some have seen it as merely supplementary to narrative image, whereas others have gone so far as to call it a narrative by itself that delivers intangible messages of its own. Built upon this contentious debate, this paper brings a new perspective to the analysis of scoring as a narrative by focusing on TV series adaptations in general, and comparing the US and Turkish version of the US television series *Monk* in particular. It will incorporate quantitative data based on relative sequence length, scoring length, and type of music and sound. Additionally, it will explore their differing interplay with the narrative image within their individual cultural setting. To accomplish this, this paper analyzes the first episodes of both TV series, entitled "Mr. Monk and the Candidate" and "Başkana Suikast" ("An Assassination Attempt on the Mayor"). The two episodes share an almost identical story line, location, and characters. However, the Turkish adaptation contains some additional scenes and characters, as well as scenic changes to address cultural proximity issues such as chastity and politics. The biggest divergence occurs in terms of music scoring. Using quantitative data, the paper will compare their interrelationship with the overall narrative structure and content. It will illustrate how this divergence in scoring creates a difference in the overall meaning of the episodes.

Mary Laurents - Language Literacy and Culture (Oral Presentation)

An Expanded Interpretation of Melucci's Concept of Negotiated Collective Identity and its Application to the 19th Century English Public Schools

In *Nomads of the Present*, Alberto Melucci describes the development of collective social phenomena – including what he terms collective identity or the 'collective actor' – as a result of processes that bridge the gap between individual and group identity and action. Melucci defines collective identity as a set of behaviors and a set of values through which a group defines itself. He further sees the formation of collective identity as a process of negotiation between individuals and the group – with the individual adopting group behaviors and values in return for the benefits of group membership. While Melucci's groundbreaking analysis was focused on developing an understanding of the formation and development of (largely Left Wing) socialist activist groups in the 1970s, I believe that the processes that he describes are generalizable and can be applied to analyses of historical situations as well as current or recent socio-political ones. My work focuses on the role of upper class collective identity in supporting the resilience of the British upper class socio-political hegemony in the 19th and early 20th century and seeks to expand the current interpretation of Melucci's analysis to show how the processes he described can be applied to explain the maintenance of that collective identity. The 19th century English Public Schools served as training grounds for upper class men and can be seen as a critical element in the negotiation process underlying the establishment and transmission of collective identity. My work uses 19th and early 20th century "schoolboy" literature as well as memoirs and biographies to show examples of the working of the processes / mechanisms described by Melucci as underlying the establishment and maintenance of upper class collective identity and, by association, of upper class socio-political hegemony.

The Commons 332

Lutfi Nimer - Applied Physics (Oral Presentation)
Terahertz Photoconductive Response in Atomically thin MoS2

We used time-resolved terahertz spectroscopy (TRTS) to measure the frequency dependent photoconductivity for MoS_2 in its bilayer form. MoS_2 is a transition metal dichalcogenide (TMD), and in its monolayer form has a direct band gap. This is a useful property when constructing semiconductor devices that are required to work in short time scales. This study focuses on the bilayer form of MoS_2 to understand the transition of optical and electronic properties in going from the monolayer to the bulk. We quantified the conductivity of the bilayer form of MoS_2 at frequencies up to 2 THz, by photoexciting it at various wavelengths in the visible spectrum. We found that at low terahertz frequencies, the real part of the conductivity does not approach some constant value, indicating that the photoexcited products do not freely move as they would in a Drude like material. Instead, we believe that the photoexcited carriers are bound exctions with an associated binding energy, which can be modeled with a Lorentz oscillator.Analysis of the photocarrier dynamics show that the charge carriers fully recombine after initial photoexcitation, which has not been previously seen in the literature. In addition, the decay times for the different wavelengths were found to range from 450 fs to 650 fs. THz spectroscopy on TMDs can provide further understanding to the conductive properties that are essential in the construction of ultrafast next generation semiconductor devices.

John Sullivan - Atmospheric Physics (Oral Presentation)
An STE Event Resolved in Ft. Collins, CO Using the GSFC TROPOZ DIAL During DISCOVER AQ 2014

The evolution of a summertime Stratospheric-Tropospheric Exchange (STE) event from 04-07 August 2014 at Ft. Collins is described in depth. It was resolved by the Goddard Space Flight Center TROPospheric OZone DIfferential Absorption Lidar (GSFC TROPOZ DIAL) and multiple ozonesondes during NASA's 2014 DISCOVER AQ (Deriving Information on Surface Conditions from Column and Vertically Resolved Observations Relevant to Air Quality) campaign. To analyze seasonal variability, a STE event with similar upper level meteorology has also been identified in the remaining seasons of 2014. The Real-time Air Quality Modeling System (RAQMS) output agrees well with the ozone lidar observations and the RAQMS ozone to potential vorticity ratio is used as a tracer for stratospheric air residing in the troposphere. This method is extrapolated to simultaneously estimate the residence

time and occurrence of STE events throughout 2014. From this relationship, stratospheric air in the troposphere can be classified as Very Recent, Recent, Aged, Very Aged and Well Mixed. It was found that a majority of the stratospheric air, regardless of season, occurred within 12 hours of the initial intrusion (Very Recent), indicating shallow STE events dominate. Although STE events may often dissipate after several hours, their high occurrence contributes to a semi-permanent stratospheric ozone reservoir in the free troposphere, which may alter the chemical and radiate budget at Ft. Collins. This work also indicates the increase in occurrences of STE events in the Fall season which may be attributed to the weakening of the jet stream due to anomalously warmer tropopause temperatures.

Alexandra St. Pé - Geography and Environmental Systems (Oral Presentation)
Using Doppler Wind Lidar to Assess Meteorological Features on Offshore Wind Power Generation

Offshore wind energy is a burgeoning industry and offers a viable option for a low-carbon energy future. There is enormous potential to harness the kinetic energy of offshore wind and produce power; however many uncertainties are introduced in this process, due in part to limited high-resolution observational networks and a poor understanding of the complexity of the marine atmospheric boundary layer. To overcome data limitations, available offshore surface wind data is extrapolated, using the power law method, to estimate wind speed at a turbine's hub-height. However, the power law technique is limited, as it assumes a logarithmic or neutrally stable atmospheric wind profile. Since a turbine's power output varies in proportion to the cube of wind speed at hub-height, a relatively small over or underestimation, introduced from a non-neutral wind profile, translates to a significant error in expected power production. The UMBC Atmospheric Lidar Group deployed Doppler wind lidar during the Maryland Energy Administration sponsored geophysical survey (July-August 2013), collecting vertical wind profiles throughout the State's offshore Wind Energy Area (WEA). The objective of this research is to investigate the impact of meteorological features on power generation within the State's WEA. Understanding meteorological features impact on power curve performance is critical for reducing uncertainty in offshore wind energy projects as it may contribute to a more accurate estimation of offshore wind energy production, provide insight into optimal wind farm layout and turbine design strategies, as well as improve the wind industry's weather models used for short-term wind forecasting.

Sherman Hall 208

Marilena Flouri - Statistics (Oral Presentation)
Tolerance Limits and Confidence Limits for Cost-Effectiveness Analysis

Cost-effectiveness analysis is a highly important methodology in the hands of policymakers, since it merges information about health outcomes and costs, and helps them to allocate their resources in the most gainful way. In order to quantify cost-effectiveness, several measures have been proposed in the literature. The most common criteria are the Incremental Cost-Effectiveness Ratio (ICER) and the Incremental Net Benefit (INB). In this talk, we discuss criteria that can bring out features not captured by summary measures such as ICER and INB. Features such as: how does the difference between the costs compare with the difference in effectiveness? For a majority of the population, is the increase in cost too large compared to the effectiveness gain? These are clearly natural questions for a policymaker. In order to address these questions, we consider random variables motivated by the definitions of summary measures such as ICER, INB, etc., and discuss the computation of tolerance limits for the distribution of these random variables, using data from a 2-arm Randomized Clinical Trial (RCT) with patients being randomized to two treatments. In particular, inference on the medians and percentiles of these random variables will be addressed.

Maria Barouti - Applied Mathematics (Oral Presentation)
Monitoring Distributed Data Streams through Node Clustering

Monitoring data streams in a distributed system has attracted considerable interest in recent years. The task of feature selection (e.g., by monitoring the information gain of various features) is an example of an application that requires special techniques to avoid a very high communication overhead when performed using straightforward

centralized algorithms. Motivated by recent contributions based on geometric ideas, we present an alternative approach that combines system theory techniques, clustering and statistical approaches. The proposed approach enables monitoring values of an arbitrary threshold function over distributed data streams through a set of constraints applied independently on each stream and/or clusters of streams. The clusters are designed to adapt themselves to the data stream. A correct choice of clusters yields a reduction in communication load. Unlike many clustering algorithms that attempt to collect together similar data items, monitoring requires clusters with dissimilar vectors canceling each other as much as possible. In particular, sub–clusters of a good cluster do not have to be good. This novel type of clustering dictated by the problem at hand requires development of new algorithms, and this study is a step in this direction. We report experiments on real-world data that detect instances where communication between nodes is required, and show that the clustering approach reduces communication load.

Jonathan Graf - Applied Mathematics (Oral Presentation)
Numerical Solution of Partial Differential Equations through High Performance Computing on Modern Architectures

Partial differential equations (PDEs) are used to model many phenomena in our world. However equations of this type can very rarely be solved analytically due to their complexity. For this reason methods are developed to solve PDEs numerically. We investigate the numerical solution of time-dependent parabolic PDEs using modern computational architectures. In particular we solve reaction-diffusion equations of different complexity using the finite element method through a method of lines discretization. To solve the corresponding system of ordinary differential equations we use a generalization of the backwards differentiation formula methods called the NDFk method. This method is appropriate given the stiff system of ODEs and we take advantage of the fact that the method is variable order and implements adaptive time step selection. Accordingly, a Newton method is used for the non-linear solver. A fully parallel implementation is used. The computational resources used in this research are part of the High Performance Computing Facility (HPCF) at UMBC which includes the 240-node distributed-memory cluster maya. The newest part of the cluster are the 72 nodes with two eight-core 2.6 GHz Intel E5-2650v2 Ivy Bridge CPUs and 64 GB memory that include 19 hybrid nodes with two state-of-the-art NVIDIA K20 GPUs (graphics processing units) designed for scientific computing and 19 hybrid nodes with two cutting-edge 60-core Intel Phi 5110P accelerators. We compare the performance of the different hardware on the different reaction-diffusion PDEs.

Sherman Hall 145

Jon Ward - Electrical Engineering (Oral Presentation)
Distributed Beamforming Relay Selection to Increase Base Station Anonymity in Wireless Sensor Networks

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. In most applications, the sensors act as data sources and forward information generated by event triggers to a central base station (BS) that may also perform network management tasks. The critical role of the BS makes it a target for an adversary's attack. Even if a WSN employs conventional security primitives such as encryption and authentication, an adversary can apply traffic analysis techniques to find the BS. Therefore, the BS should be kept anonymous to protect its identity, role, and location. Previous work has demonstrated distributed beamforming to be an effective technique to boost BS anonymity in WSNs; however, the increased anonymity and corresponding WSN energy consumption depend on the quality and quantity of selected helper relays. In this paper we present a novel, distributed approach for determining a set of relays per hop that boosts BS anonymity using evidence theory analysis while minimizing energy consumption. The identified relay set is further prioritized using local wireless channel statistics. The simulation results demonstrate the effectiveness our approach.

Yin Huang - Computer Science and Electrical Engineering (Performance/Media Presentation)
An Eigensolver for large sparse graph with Accumulo and D4M

With the advent of big data, it becomes a challenge to store, process, analyze and make sense of the data to reveal interesting patterns and thus make wise decisions. Take social media for example, finding similar users based on certain criteria and group them together could benefit advertise companies to target potential customers. The problem is existing implementation of clustering algorithms, such as spectral clustering, could not handle matrix with dimension up to one million. Hadoop is currently the most popular open source software to handle big data problems, which consists of the following two components: (1)HDFS (Hadoop distributed file system) where the data is stored and replicated (2) MapReduce, the easy to use parallel framework for batch processing on top of HDFS. HEIGEN is currently the only solution for clustering large sparse graph using Hadoop. HEIGEN, however, suffers from long delays processing the data due to fetching data for processing through mappers. Iterative graph algorithms make it worse. Our computation model tackles this problem by pulling the data stored in a NoSQL database through queries, rather than waiting data to be pushed through mappers. In addition, our model can be extended to other iterative graph algorithms. Experimental results have shown significant improvement for calculating eigenvalues and eigenvectors for large sparse graph.

Abhay Kashyap - Computer Science (Oral Presentation)
Rapalytics: When Data Science meets Rap!

Rapalytics (rapalytics.com) is a project aimed at applying text analysis techniques over Rap Lyrics. The project aims to identify and quantify features critical to the quality of a rap song composition like rhyming word density, vocabulary, similes/metaphors and sentiment. From the perspective of Rap music and culture, these analytics can provide valuable insights into variations of compositional style across different time periods, regions and sub-genres of rap. From a computer science perspective, this provides a way to evaluate the fragile nature of popular trained text analysis algorithms, when subjected to unfamiliar/unformatted text. Largely a work in progress, currently, the completed elements of this project include the implementation of the backend framework, website design and data collection/cleaning. A beta release is scheduled for the first week of February that will feature analytics (rhyming density, similes, vocabulary/information content, sentiment) for about 100-150 popular Rap artists. A potential future application in the pipeline is a semantic music recommendation service that aims to include the meaning and the sentiment polarity of lyrics as features while recommending music. This is more relevant for genres like Rap that are largely lyrical with a mostly monotonous beat.

Zheng Li - Computer Engineering (Oral Presentation)
Tongue-n-Cheek: Non-contact Tongue Gesture Recognition

Tongue gestures are a key modality for augmentative and alternative communication in patients suffering from speech impairments and full-body paralysis. Systems for recognizing tongue gestures, however, are highly intrusive. They either rely on magnetic sensors built into dentures or artificial teeth deployed inside a patient's mouth or require contact with the skin using electromyography (EMG) sensors. Deploying sensors inside a patient's mouth can be uncomfortable for long-term use and contact-based sensors like EMG electrodes can cause skin abrasion. To address this problem, we present a novel contact-less sensor system, called Tongue-n-Cheek, that captures tongue gestures using an array of micro-radars. The array of micro-radars act as proximity sensors and capture the reflected Doppler shifted signal, which generated by cheek and supra hyoid muscle movements when the patient performs the tongue gesture. Tongue-n-Cheek then converts these movements into gestures using a novel signal processing algorithm. Furthermore, our system is implemented on embedded device with 8MHz speed and 1K Bytes RAM. Under this condition, the entire process of recognizing a single tongue gesture only consumes 2.1us, measuring from fetching the first bit to making the final gesture classification decision. We also demonstrate the efficacy of Tongue-n-Cheek and show that our system can reliably infer gestures with 95% accuracy.

Sherman Hall 011

DeLauren McCauley - Chemistry and Biochemistry (Oral Presentation)
Development of a Sensitive Headspace-Gas Chromatography Mass Spectrometry Method for Off-Flavor Compounds in Water

Off-flavor compounds are described as water-borne, organic chemicals that are deposited into surface water sources causing undesirable tastes and odors. These compounds have been recognized as a worldwide concern since the late 19th century, particularly affecting surface water sources such as streams, rivers, lakes, wetlands, and oceans. Additionally, attention has been increasing toward the effects off-flavors have in aquaculture. The following compounds, isopropyl methoxypyrazine (IPMP), isobutyl methoxypyrazine (IBMP), methylisoborneol (MIB), and geosmin, potentially produced in aquaculture systems cause musty and earthy odors in fish resulting in decreased quality of the crop. The overall goal for this research is to develop and validate an analytical method for the quantitation of specific off-flavor compounds at lower limits of detection than previously studied. Traditionally, vigorous, time-consuming, and expensive pre-concentration steps were required to detect the compounds. This study has implemented a unique pressure-balance headspace sampling system coupled to a gas chromatography mass spectrometer. The headspace technique eliminates the need for organic solvents, reduces sample carryover, and incorporates trapping capabilities for maximum extraction. Resulting data has simultaneously separated and detected all four analytes of interest in less than 7 minutes. Also, further method optimization of trapping parameters was configured to achieve limits of detection below 1 ppt. The proper identification for the analytes of interest will allow future profiling of the compounds amongst aquaculture systems for possible correlation to a definitive source.

Sasan Sharee - Biochemical Engineering (Oral Presentation)
Effect of Lowered Oxygen Concentration (Hypoxia) on Neural Stem Cell (NSC) Proliferation and Differentiation

Stroke is the leading cause of long-term disability and the third most prevalent cause of fatality in industrialized countries. Rehabilitation techniques in stroke patients have resulted in significant improvements in restoring lost daily life skills. However, recovery, depending upon the severity of brain damage, could involve months or years of rehabilitation. Neural stem cells (NSCs) show a very promising regenerative potential in order to facilitate the recovery of patients. However, the amount of cells needed to treat patients significantly exceeds the availability from donors. Therefore expansion of NSCs in large quantities in laboratories remains a crucial need. Utilizing growth factors is a conventional method of NSC expansion in laboratories. However, growth factors are very expensive and their utilization for large-scale expansion of NSCs is economically impractical. We have used lowered oxygen concentration (hypoxia) for expansion of NSCs in lab. Conventionally, atmospheric oxygen concentration or normoxia (21%) has been utilized in NSCs culture. However, actual O_2 concentrations in human brain are an order of magnitude lower (3-4%) and human brain is a hypoxic environment. Our results show that hypoxia increases the NSCs growth (~25%) compared to normoxia. Furthermore, NSCs cultured under hypoxia tend to show a higher differentiation into neurons which are lost after stroke. Oxygen, in comparison to growth factors, is less expensive, widely available, and easily scalable. Therefore, it provides a very useful tool for NSC-mediated therapy of neurodegenerative diseases such as stroke.

Adil Zuber - Chemical Engineering (Oral Presentation)
Capture-Step Chromatography for Application with Purification in Point-of-Care Manufacture of Therapeutic Proteins

Current technologies for therapeutic protein production are extremely expensive and time-consuming. They require industrial-sized manufacturing facilities involving large-scale fermentation followed by protein purification, formulation, and packaging. A massive transportation infrastructure is also necessary to support distribution of the drug to retail. Given the lengthy time period for production and distribution, it is not improbable that some individuals may have limited access to therapeutic protein. This situation is increasingly likely for war refugees, natural disaster victims, and aid workers stationed in remote areas and developing nations. Emergency situations (e.g. natural disasters, war , etc.) may unexpectedly develop, breaking supply lines of essential therapeutic proteins and rapidly depleting local stockpiles. Given the strong demand for therapeutic protein in these areas it is critical to develop a methodology for ensuring that therapeutic protein is readily available. We propose the design for a novel device to rapidly synthesize and purify therapeutic protein on-site and on-demand. This device will be portable and small, comparable to the size of a laptop computer. After synthesis the therapeutic protein is purified from the reaction mixture. Initial purification employs a capture-step chromatography column to remove the majority of impurities. Trace impurities and substances closely related to the therapeutic protein (e.g. mistranslated variants,

misfolded variants, protein aggregates) are present within the protein solution. Removal of these materials is performed by subsequent polishing chromatography columns. Several strategies for point-of-care protein purification in the device will be discussed and evaluated.

Sondheim 103

Piyush Waradpande - Computer Science (Work in Progress)
Use of Doppler Radars in Activity Recognition

Activity recognition has been an area of wide research since a long time now. It has not only been used for making smarter homes by using techniques like occupancy monitoring, presence detection, gesture recognition but also in diverse fields like sociology, medicine and military. These recognition techniques are usually sensor-based techniques that cater to single-user, multi-user or group activity recognition. Most of the recognition techniques require use of intrusive techniques such as cameras, presence sensors etc., which require direct line of sight with the object. Camera based techniques require complex image processing and also might pose serious privacy concerns. Newer techniques such as Wi-Fi based activity recognition eliminate this problem, although there are some challenges associated with these techniques too. A fundamental problem in Wi-Fi-based activity recognition is user location estimation. Also labeling a particular human is challenging with Wi-Fi based techniques. Another major problem is changing signal profile with ambient environmental changes. In this research, we discuss use of continuous and pulse Doppler radars for activity recognition. Radar based techniques can provide potential solutions for most of the above-mentioned problems. Due to their small size it is easy and feasible to use multiple radar sensors for better accuracy. They could provide information about accurate location of the subject and also provide fingerprinting of particular human subject by monitoring bodily functions such as heart beat rate. Usage of radar is definitely a promising new possibility.

Genaro Hernandez - Computer Science (Work in Progress)
Toward Category Detection for Physically-Grounded Language

As robots become more ubiquitous and capable, it is important for untrained users to be able to easily interact with them. Natural language is an intuitive way for humans to interact with robots, but it is challenging to build robots that understand natural language. One desirable type of human-robot interaction (HRI) is one where robots can keep up with the changing categories of language in a conversation. Physically grounded language is language that is tied to the physical world. Category detection for physically grounded language – that is, determining what a sentence is about – has been explored with predefined categories. For example, the sentence "these blocks are green", has category "color". To the best of our knowledge, general category detection (not using predefined categories) has not been achieved. Our work-in-progress seeks to develop a method for general category detection of physically grounded language about objects in HRI. Our approach aims to combine language and vision modalities, employ unsupervised learning, provide general category detection, and possess high accuracy.

Jorge Teixeira - Electrical Engineering (Work in Progress)
Advantages and Improvements of BER/WER Performance Evaluation of Error Correcting Codes Using Dual Adaptive Importance Sampling (DAIS)

Trends of increased digital data production and consumption have led to improvements in the reliability of communication systems, achieved by using powerful forward error correction (FEC) codes. However, evaluating the performance of error correcting codes in the low noise region is difficult, as traditional techniques are either too slow or do not provide enough specific information. A recently introduced technique, dual adaptive importance sampling (DAIS), provides substantial performance improvement over standard Monte Carlo (MC) simulations (which can take months, years, or more) and considers the existence of error-floors, unlike asymptotic-based tools, such as density evolution or extrinsic information transfer (EXIT) charts. Importance Sampling (IS) is a technique that biases the probability density function (pdf) underlying a MC simulation to achieve the same confidence levels in less simulation time, but finding the right bias is not trivial. The DAIS technique goes beyond simple IS by implementing an iterative way to compute that bias for certain channels and FEC codes with little a priori information. This presentation summarizes the comparison between DAIS and other techniques, including

preliminary simulation results and analysis justifying its usage, and paving the way for further enhancements currently being researched, such as the choice of the control variable to use during the iterative search for the optimal bias, and its influence on different codes and channels.

Deepak Krishnankutty - Computer Engineering (Work in Progress)
Multi Vantage Point Analysis of Power Supply Signatures

Power supply transients of numerous encryption devices have been analyzed from the perspective of performing attacks to extract secret key or confidential information. Such attacks are based on exploiting the correlation of the power consumption with the underlying logic operations on an integrated circuit. The power traces, independently, do not reveal the placement of hardware elements that contribute to fluctuations in power levels. Most common packaging designs incorporate multiple power supply pins along each bank of an integrated circuit. However, the placement and arrangement of these pins are never correlated with the power analysis datasets derived using Side-Channel techniques. Furthermore, the multi-dimensional positional co-ordinates of Side-Channel probing devices in relation with the placement of core elements in an integrated device logic are never taken into account. In this work, we present the characteristics of datasets derived from Side-Channel Analysis performed over multiple power pads and demonstrate the relationship between the power transients and placement of core logic slices on a SPARTAN 3E FPGA. For the purpose of analysis, a custom board was designed to incorporate a master data collection device (SPARTAN 6) and the Device Under Test (SPARTAN 3E). A 64-bit implementation of the DES crypto-system within the SPARTAN 3E served as a primary target for our observations of the power transients. The simulations performed over datasets obtained from each power pad clearly show the possibility of extrapolating positional data by correlating the power probe co-ordinates in relation with the DES logic slices on the SPARTAN 3E.

-Poster Presentations-

University Center 312

Khoa Tran - Biological Science
Functional Analysis of Set4 in Saccharomyces Cerevisiae

Chromatin is a nucleoprotein complex consisting of histone proteins and DNA, which is known to play an important role in the processes of both activating and repressing gene transcription. The repeating units of chromatin are nucleosomes, which differ from each other by a wide range of variations that influence chromatin structure, such as Post-translational modifications of histones. Therefore, several processes acting on DNA such as transcription, replication, recombination, and repair could be greatly affected by post-translational modifications of histones. Among different histone modifications, lysine methylation has been shown to play a role in modulation of chromatin structure, leading to transcriptional activation or repression. Methylation in eukaryotic cells is catalyzed by enzymes called methyltransferases. In the Green lab, we are interested in a candidate methyltransferase, Set4. Set4 is a SET domain containing protein among 12 SET domains proteins present in the genome of the S. cerevisiae. Although the SET-domain enzymes known to date are all protein lysine methyltransferases, Set4 and its paralog, Set3, have not been reported to have methylation activity. Based on our preliminary results of investigation of the biochemical function and biological role of Set4 in budding yeast, we hypothesize that Set4 plays a role as a histone lysine methyltransferase that regulates gene expression in response to changing environmental conditions. We will present data demonstrating Set4's histone methyltransferase activity in biochemical assays and a genetic characterization of Set4-dependent phenotypes in yeast.

Preethi Somasundaram - Biological Science
The Role of Melanopsin Phosphorylation in Mouse Behavior and Physiology

Melanopsin is a unique visual pigment, expressed in intrinsically photosensitive retinal ganglion cells (ipRGCs) in the mammalian retina. It is a G-protein coupled receptor (GPCR) involved in photoreception for functions such as circadian photo-entrainment, pupillary light reflex, certain visual functions, and recently described in photo-

relaxation of blood vessels. Melanopsin's role in a broad spectrum of functions calls for a deeper understanding of the regulation of its activity. Melanopsin structure and in vitro data suggest that its activity may be regulated through phosphorylations by a G-protein coupled receptor kinase (GRK) and a protein kinase A (PKA) in light and dopamine dependent manners respectively. The working hypotheses of 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 activity of the receptor. I aim to demonstrate the impact of these phosphorylations on physiology and behavior of mice. Transgenic mice expressing a melanopsin gene that either has mutations in GRK or PKA phosphorylation sites will be generated using an AAV2 gene delivery method. GRK phosphonull mice have been generated using this approach. These mice show successful viral transduction as seen by the expression of a reporter gene in their retinas. Behavioral analyses with these mice are currently underway. I hypothesize that these mice will show abnormal circadian behavior and pupillary light reflex, and a deficit in ipRGC adaptation. This research will establish the significance of phosphorylation in non-image forming vision.

Afsoon Saadin - Molecular and Cell Biology
Identification and Characterization of a New Component of the JAK/STAT Signaling Pathway that Regulates Cell Migration

The Janus Kinase and Signal Transducer and Activator of Transcription (JAK/STAT) signaling pathway is involved in essential biological processes including cell fate determination, cell migration, cell proliferation and normal function of immune system in mammals and fruit flies. We are particularly interested in cell migration since it is not only required for normal embryonic development but can also lead to detrimental outcomes, such as tumor metastasis. Migration of a cluster of cells termed border cells in the Drosophila ovary is an excellent example of collective cell migration, which resembles metastasis of some carcinoma cells. Availability of several tools for genetic manipulation and in vivo imaging in Drosophila, makes this organism a suitable model to study cell migration. Border cells arise within the follicular epithelium, and are required to migrate to the oocyte to contribute to a fertilizable egg. The requirement for some components of the STAT signaling pathway, including the activating cytokine, its receptor, JAK, STAT, APONTIC and SLBO during border cell migration is well-studied, however, the functions of other potential regulators of the pathway during this process are not yet known. To find new components of the pathway that govern cell migration, we knocked down predicted STAT modulators using RNAi expression in follicle cells, and assayed for defective cell movement. We have shown that BRAHMA (BRM), the Drosophila counterpart of yeast SWI/SNF, functions during cell invasion. Epistatic analysis indicated that BRM genetically interacts with STAT during border cell specification and migration.

Natasha Wilson - Chemical and Biochemical Engineering
Developing Novel Tools Toward β-amyloid-Neuron Interaction Discovery

We are interested in identifying receptor-mediated pathways induced by β-amyloid (Aβ), the primary protein component of senile plaques associated with Alzheimer's disease (AD) histopathology. Because of Aβ's longstanding implication in the initiating events leading to AD pathology in in vitro and in vivo experimental preparations, it is commonly considered the causative agent of AD. Yet, though well studied, there still exists a lack of consensus concerning Aβ's interactions with neurons and resulting alterations in neuronal signaling. We hypothesize that this lack of consensus is due to an incomplete framework for interpreting experimental data arising from a complex, networked system. In particular, by simulating signal propagation through a hippocampal neuronal signaling network, consisting of over 500 proteins and over 1200 interactions, we have observed that the effects of pathway cross-talk, receptor trans-activation and feedback mechanisms may play a role as confounding factors in experimental results. To demonstrate this on a smaller scale, we have simulated a known pathway: a Corticosterone-ligand-induced pathway consisting of one ligand, two receptors, 19 signaling proteins and 28 reactions, where trans-activation of one receptor by another is included in the mechanism. Utilizing this kinetic model, we will demonstrate that receptor trans-activation can play a role in confounding experimental results if not adequately controlled. This work could inform future experimental designs for discriminating between Aβ-induced receptor-mediated events and subsequent changes in other pathways involved in the signaling cascade.

Janae Baptiste - Biochemistry

Characterization of Feline Immunodeficiency Virus Matrix Protein Assembly to the Plasma Membrane

The human immunodeficiency virus (HIV) remains a global health concern. Drug resistance and non-compliance to current treatment demonstrate the necessity for novel therapeutics, but development of new treatment has been limited by the absence of an appropriate animal model. Because of the strong resemblance between the feline immunodeficiency virus (FIV) and HIV, felines are a tenable animal model for HIV in humans. Previous work has shown that the matrix domain (MA) of the Gag polyprotein is essential for efficient viral assembly and release and that HIV MA binds to the plasma membrane via phosphatidylinositol-(4,5)-bisphosphate [PI(4,5)P2]. While FIV MA has been shown to target PI(4,5)P2 in vivo, the mechanism by which FIV MA binds to PI(4,5)P2 has yet to be exploited. This work investigates FIV MA assembly to the plasma membrane by utilizing liposomes as mimetic membranes. Interaction between FIV MA and liposomes is characterized by means of nuclear magnetic resonance spectroscopy (NMR). Because the size of liposomes exceeds the detection limit of NMR, observation of the free (unbound) protein signal is monitored. Characterization of FIV MA membrane targeting will allow for comparison to that of HIV MA, potentially giving rise to a plausible drug target to advance current HIV treatment.

Evgenia Barannikova - Chemistry
Design of Multifunctional Peptide to Create Nanostructured Electrodes

The ability to control the assembly of nanostructured materials at the nanoscale is a very important task for several applications, such as electronics, sensors, catalysis, etc. Biotemplating presents a unique bottom-up approach in regulating the interactions of nanoscale materials via biological molecules exhibiting various naturally occurring functional groups. My research project aims to develop a peptide-templated approach that can be utilized to create nanostructured materials with applications in energy storage and conversion devices, specifically, Li-ion batteries. Recent improvements in the performance of Li-ion batteries have been achieved via fabrication of nanostructured electrodes, which offer several advantages over the bulk material, such as shorter Li-ion and electron diffusion path and larger surface area for potential electrode/electrolyte interactions. However, inherent poor conductivity of the electroactive material requires the addition of conductive agents in order to improve electrode kinetics. During the cell cycling, electroactive and conductive materials become isolated due to morphological changes associated with Li-ion intercalation/de-intercalation processes, as well as the formation of solid-electrolyte interface between active material and electrolyte. This results in loss of conductivity, which adversely affects the performance of the battery. The utilization of solid-binding peptides (SBPs) isolated via phage display procedure will allow the control the positions of electroactive and conductive materials in intimate proximity at the nanoscale. My recent progress involves isolation of SBP for one of the promising high-voltage cathode materials LiNi0.5Mn1.5O4 (LMNO), and design of multifunctional peptide to combine LMNO and multiwalled carbon nanotubes as conductive agents, which will be discussed in my presentation.

Andrea Gray - Chemistry and Biochemistry
An Integrated Platform of LC-MS, HPAEC-PAD, and Bioinformatics for the Carbohydrate Profiling of Therapeutic Glycoproteins

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 compared to bench-scale models. Work will be performed using the complementary techniques of HPAEC-PAD and LC-MS for profiling and characterization. HPAEC-PAD glycan profile analysis used enzymatically cleaved glycans from IgG3 by PNGase F and isolated with carbon top-tips. The monosaccharide sequence of glycans will be characterized via LC-MS fragmentation studies using a carbohydrate mixed-mode column. Three major glycan structures were found and characterized as asialo-fucosylated, asialo-monogalacto-fucosylated, and asialo-agalacto-fucosylated 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. 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.

Tonya Santaus - Chemistry
Isolation, Fragmentation and the Detection of Listeria DNA from Ground Beef

Listeria is a gram-positive, rod shaped deadly food borne bacterial pathogen with a mortality of 20-30% of those who get infected. People with a compromised immune system and women who are pregnant are more likely to suffer the effects of Listeriosis. The Listeria bacterium can grow under many extreme conditions such as low pH and high temperatures and is most likely to be transmitted through many steps in food processing plants. Once Listeria is contracted in the human body, it can cross in to the blood, through the blood brain barrier, and into the cerebral spinal fluid. Current detection such as PCR methods are slow and costly and the extraction methods to see if Listeria is present is blood work, spinal tap, or a biopsy of the placenta. We show that Listeria DNA can be efficiently and rapidly extracted and lysed from ground bovine meat. Our microwave based lysing approach has the particular advantages in that it can fragment the Listeria genome to much smaller DNA fragments, which is ideal for rapid detection using the MAMEF (Microwave-Accelerated Metal-Enhanced Fluorescence) platform, as well as diminishing the effects of DNases due to the elevated lysing temperatures. A developed three piece detection assay is implemented for the specific detection of lysed DNA from Listeria.

Michael White - Chemistry
Dynamics of Glyceraldehyde-3-Phosphate Dehydrogenase Interfacial Regions Affect Binding to AU-Rich RNA

The homotetrameric protein glyceraldehyde-3-phosphate dehydrogenase (GAPDH) has been shown to possess many functions aside from its role in glycolysis. Of particular interest is its role in post-transcriptional regulation. Despite lacking a canonical RNA binding motif, GAPDH has been shown to bind to many mRNAs and subsequently alter their translation. Most of these protein-nucleic acid interactions have been shown to occur by GAPDH binding to Adenine-Uridine Rich Elements (AREs) within the 3' untranslated regions (UTRs) of specific mRNAs. While much evidence has been gathered in determining the means of RNA binding, the exact site and mechanism of binding still remain elusive. Variables that may be key to elucidating these two facets of RNA binding include the effects of posttranslational modifications, oligomerization, cofactor binding, and structural dynamics, of GAPDH. Herein, it is demonstrated for the first time that GAPDH binds to the core AREs of the tumor necrosis factor-α mRNA 3'UTR via a sequential two-step mechanism. As well, a single point mutation at the GAPDH dimer interface results in a reduction in binding affinity in the second step and an alteration in the bound RNA structure. In contrast to previous studies, it is shown here that this mutation does not affect protein oligomerization, but induces dynamic changes in protein regions localized along the P axis of the GAPDH tetramer. Based on our results, we propose a novel model for GAPDH binding to ARE-containing RNA that may be regulated by GAPDH post-translational modifications.

Juan Valdez - Biological Sciences
The Role of the Melanopsin C-tail in Signaling and Internalization

Visual pigments are comprised of opsins, which are specialized G-protein coupled receptors that are sensitive to light and convert it into a cellular signal. The visual pigment melanopsin is expressed in a subset of ganglion cells in the mammalian retina and is involved in the light-based regulation of non-image forming visual tasks such as the pupillary light reflex and photoentrainment of circadian rhythms. We are interested in the molecular features of melanopsin that are critical for its function. Firstly, this study elaborates the role of the melanopsin carboxyl tail (C-tail) in maintaining proper activation and deactivation. We explore this question by transiently expressing mutated melanopsin constructs in human embryonic kidney (HEK) cells. Then, using a calcium imaging assay to measure signaling kinetics via a fluorescent calcium-binding dye, we provide evidence of twelve important phosphorylation sites and a 9th helix on the proximal region of the C-tail that are vital for melanopsin signaling. Secondly, we aim to examine if melanopsin is internalized after signaling. We aim to explore this by visualizing trafficking of

fluorescently labeled melanopsin expressed in HEK cells using confocal microscopy. We show that we successfully synthesized two melanopsin chimeric constructs that will be used in this internalization study.

You Jung Seo - Applied Developmental Psychology
The Role of Child Temperament and Observed Maternal Behaviors in Korean-American Children's Socio-Emotional Outcomes

The present study examined the mediating role of observed maternal behaviors in the association between Korean Immigrant (KI) children's temperament and socio-emotional outcomes. Although both children's temperamental characteristics and the quality of parent-child interactions have been found to contribute to children's socio-emotional outcomes (Lee et al., 2010; Zhou et al., 2010), the associations among these variables have not been explored within KI families in the US. Seventy-five first-generation KI mothers (M=36 years, SD=3.86) with preschoolers (M=52.63 months, SD=12.93) in Maryland, US were videotaped during a 15-minute free-play task, and the observed maternal behaviors related to negative control and encouragement were coded. Mothers reported on their children's temperamental anger/frustration, and teachers rated children's prosocial behavior and socio-emotional/behavioral difficulties. The study's results revealed that children's higher anger/frustration was associated with more maternal use of negative control and encouragement. In turn, higher negative control was associated with less child prosocial behavior, whereas higher encouragement was associated with more child prosocial behavior. Moreover, higher child anger/frustration was associated with more maternal use of encouragement, which in turn was associated with less socio-emotional/behavioral difficulties. Interestingly, KI children's anger/frustration did not directly predict their teacher-rated outcomes but was indirectly related to different outcomes through its associations with coercive or supportive parenting behaviors. The study's findings highlighted the importance of KI mothers' perceptions of children's temperament on parenting behaviors, which impacts children's positive and negative outcomes in school settings. The implications for culturally-sensitive parenting interventions to promote the positive socio-emotional development of KI children were also discussed.

Eyad Musallam - Emergency Health Services
Syrian Refugees in Hashemite Kingdom of Jordan: The Impacts on Health Care Services and Healthcare Outcomes

An estimated 9 million Syrians have fled their homes since the outbreak of civil war in March 2011, taking refuge in neighboring countries or within Syria itself. Jordan is the country hosting the third largest number of Syrian refugees, with 618,508 refugees as of November 10th 2014. In providing health care for refugees', critical questions always arise regarding health care policy and services provision levels: How to provide health care services in the best way? And how does refugee hosting impact the national (host) population? AIMS: The aims of this paper are to: 1) Describe the health care needs for the Syrian refugees in Jordan .2) Evaluate the ability of the Jordanian model to handle these needs in the upcoming 5- 10 years. STUDY DESIGN In a retrospective descriptive design, a secondary data analysis based on UN High Commissioner for Refugees UNHCR and Jordanian Ministry of Health (MOH) epidemiological reports are used to evaluate the health needs and health care utilization. RESULT: Around 10 % of the non-camp refugees have had at least one visit to a primary care provider (consultation); 71% of these consultations were for acute illness and 2% for mental health. There are 93,694 registered Syrian refugees at Za'atri camp, around 7.7% of the refugees have had at least one visit to a primary care provider (consultation). An average weekly consultation was 13,881; 55% of these consultations were for acute illness and 2% for mental health.

Jamila Torain - Gerontology
Educating Elderly African Americans to Restore Sound

Educating Elderly African Americans to Restore Sound (EARS) is an age-related hearing loss educational program that was developed to educate elderly African Americans with limited income in Baltimore City. The literature suggests that there are a limited number of programs that are designed to educate elderly African Americans about age-related hearing loss. This program was specifically constructed to be culturally sensitive by using educational materials that were understandable and employing program volunteers of similar cultural backgrounds and ethnicities as suggested in prior research. The program aimed to increase knowledge about the causes, signs, and symptoms of age-related hearing loss and to increase awareness of programs that help subsidize the cost of hearing

aids. This program took place at three different senior citizen housing complexes in Baltimore City in the spring of 2014. Health education was the main emphasis of the program. Prior to the program, the MPH student educator visited each site in order to encourage participation in the program. A pre and post assessment was implemented during the educational program. There was an increase in knowledge indicated by a show of hands and approximately 11% (6/54) of the total participants utilized health services due to knowledge gained from the program and have since obtained hearing aids. As inferred from the literature, a culturally sensitive environment may have the potential to be effective in increasing awareness in elderly African Americans with lower incomes.

Kathy Vu - Applied Developmental Psychology
A Qualitative Exploration of When Chinese Immigrant and European-American Mothers Express Warmth

Parental warmth refers to expressions of affection, love, appreciation, kindness, and regard. Chinese mothers are often described as being less warm than European-American mothers (EAMs). Culturally-emphasized ways of expressing love have been reported among Chinese-immigrant mothers (CIMs). However, the key situations when mothers believe it is important to express warmth are unknown, although such information can elucidate the cultural motivations and potential effectiveness of these practices. Thus, we assessed and compared CIMs and EAMs' conceptualizations of the specific situations in which they expressed warmth towards their children. First-generation middle-class CIMs (N=40) and EAMs (N=40) with preschoolers were interviewed regarding the specific situations when they expressed warmth. Qualitative coding revealed that CIMs emphasized expressing warmth when their children are facing emotional difficulties, setbacks, or problems in their social relationships, which reflects their cultural emphasis on providing guidance to improve children's social competence. Additionally, CIMs may aim to foster interdependence by encouraging the child to rely on them during times of need. In contrast, European-American culture values emotional expressivity, leading EAMs to report infusing warmth into daily activities and parent-child interactions through open communication. Also, EAMs tended to show warmth during child-focused activities, which reflects a cultural emphasis on providing enjoyable life experiences for children to promote positive affect. Importantly, CIMs and EAMs similarly reported expressing warmth in three situations, signifying culturally-shared socialization priorities of expressing warmth during moments of physical intimacy and when reinforcing positive child performance and learning. The importance of understanding parental warmth within cultural contexts was discussed.

Dan Neeley - Human-Centered Computing
Evaluating 3D Modeling Software for Special Education Populations

I describe a need for accessible open-source three-dimensional (3D) modeling software, and discuss general procedures and strategies to find existing products with little or no need for modification, or the potential to apply DIY modification later. An overview of goals and expected challenges will be followed by a schedule of expected workflow. Such goals include identifying as many eligible 3D modeling software packages as possible, developing a criteria-centric evaluation model for evaluating the 3D software, acquiring and practicing using screen reading software (yet to be determined), and drawing a comparative analysis of the 3D software as evaluated by the developed rubric. In this study, eligible 3D modeling software is any software package that is either free or open-source, and has some initial addressing factor towards accessibility. Expected challenges will be overcoming the learning curve using both 3D modeling and screen reader software, identifying perspectives of target demographic population including visual and cognitive impairments, and recommending future work based results and comparative analysis for a diverse population with varying ability and context.

Library 7th Floor

Shaokang Wang - Electrical Engineering
Soliton Wake Instability in a SESAM Modelocked Fiber Laser

Optical frequency combs have a wide range of applications including spectroscopy and GPS systems. One can obtain a frequency comb from a passively modelocked laser, which produces a periodic train of highly coherent ultrashort pulses. In the frequency domain, such a periodic pulse train corresponds to an optical frequency comb that

consists of equidistant lines. Recently, a highly robust and transportable fiber laser comb source that operates at 1.55 μm has been reported. It is built with telecom-grade polarization maintaining (PM) components, including highly nonlinear PM fiber (HNLF), a highly-doped erbium-doped fiber (EDF), and a semiconductor saturable absorber mirror (SESAM). In our simulation we focus on a time duration that includes a single pulse. We are able to obtain a stable stationary pulse, and the difference between the computation and the experimental results are confined within 25%. The SESAM is a slow saturable absorber that creates a gain window right after the pulse in propagation. As a consequence, background noise can grow unstably in the wake of the pulse. This instability leads to the generation of a new pulse that steals the energy from the original pulse and ultimately replaces it. This behavior repeats periodically or quasi-periodically. The appearance of this wake instability sets a lower limit on the magnitude of the chromatic dispersion and an upper limit on the pulse power.

Yuanyuan Feng - Information Systems
Taxonomy of Instructions Given to Residents in Laparoscopic Cholecystectomy

Laparoscopic simulation-based training has been focused on surgical skills training. The purpose of this study was to identify and categorize the explicit directional instructions made by attending surgeons to their residents in the operating rooms (OR) in order to make recommendations for further simulation systems design. We analyzed video recordings of ten laparoscopic cholecystectomies, including three different attending surgeons and three different PGY4 residents in different combinations of the two groups. Of the total 2269 directional instructions given in the ten cases observed, the guidance in OR-based training was classified into two categories – the instrument-control guidance (42.04%) and the gaze guidance (57.96%). The result of Wilcoxon signed-rank test on the frequencies of instructions normalized by the duration of each case showed that the frequency of gaze guidance was significantly higher than that of the instrument-control guidance ($p=0.005$), with a large effect size ($r = 0.61$). These findings indicate that OR-based laparoscopic surgery training is focused more on instructing residents in how to view and understand the laparoscopic video. Our results suggest that the focus of laparoscopic simulation-based training should include gaze guidance as well as surgical skills guidance and that novel approaches should be designed to support gaze guidance by attending surgeons in the OR.

Isaac Mativo - Computer Science
Clinical Predictive Modeling with Patient Reported Data

Machine learning techniques have been utilized in clinical practice to create predictive models for diseases with impressive success. In personalized medicine, these models have helped identify patients with various risk factors using both genomic and clinical data. However, these predictive models do not contain information extracted from patient reported outcomes. Part of the lack of patient reported data is the difficulty involved in capturing, processing, and extracting information from patient reported sources. Research has shown that patient-reported data contains useful information that can be used to create a safety risk profile for each individual patient. The purpose of my research is twofold. First, I create a machine learning algorithm that incorporates patient-reported data as an input. Patient data sources can include narratives in electronic health records, information contained in patient surveys, or patient reported information in social media such as Twitter. Second, I use this algorithm to predict safety events with improved accuracy over existing systems. A safety event is a situation where best or expected practice does not occur. Predicting safety events can help avoid them, therefore improving patient outcomes and experience cost savings. As a second proof of concept, I investigate the effectiveness of using the algorithm to predicting safe antibiotics to use for hospitalized patients.

Yichuan Gui - Computer Science
A Pairwise Algorithm to Overcome the Local Minimum Problem in Training

For training multilayer perceptrons (MLPs), proper use of the normalized risk-averting error (NRAE) criterion has been shown to avoid nonglobal local minima effectively in the mean squared error (MSE) criterion. It has been found that the convexity region in the weight space that does not have a local minimum of the NRAE criterion expands strictly to the entire weight space as the risk-sensitivity index (RSI) increases to infinity. A gradual deconvexification (GDC) method has been proposed, which chooses a very large RSI and gradually decreases it during the training process until a global minimum of the NRAE criterion or a good generalization capability is

achieved. However, the NRAE training sessions in the GDC method only work on the batch mode, which is inefficient for training large dataset. In this paper, a pairwise algorithm for the NRAE criterion similar to the widely used least mean square algorithm for the MSE criterion is proposed. The GDC method employing this pairwise algorithm is tested on examples with built-in nonglobal local minima that are difficult to avoid and on recognition of handwritten numerals with the MNIST dataset. Numerical experiments show that the pairwise algorithm for the NRAE criterion is computationally more economical than the corresponding batch algorithm and delivers MLPs with better performances than training methods based on the MSE criterion.

David Harris - Computer Science
Developing User Interface Frameworks to Facilitate Usage Amongst Technologically Under-Served Populations

This research project seeks to address the challenges of low awareness on novel technologies by minority populations by creating a collection of best practices for application development that is informed by the collaborative input from under-served groups in society. In today's rapidly digitizing world there are many new impactful technologies appearing everyday with high potential for growth. Unfortunately, during the development of these emerging technologies, many minority populations are left out of the conversation and do not provide input into the developmental discussions and design processes. These left out groups are usually the ones who would be well served by the benefits that these technologies bring. Minority populations can become technologically under-served for a variety of reasons such as constraints on time and resources. Unfamiliarity can lead to negative views of technology resulting in resistance to their use and moreover, not gaining their promise and beneficial impact. Our research seeks to bridge this gap with a collection of best practices developed through querying sample minority populations through voluntary surveys for their views on interacting with novel technologies. Incorporating this influx of ideas into an application design framework should prove invaluable for the wider impact and future prospects of these new technologies.

Hsiao-Chi Li - Electrical Engineering
Progressive Band Processing of Orthogonal Subspace Projection in Hyperspectral Imagery

Progressive band processing (PBP) processes data band by band according to the band sequential (BSQ) format used by hyperspectral imaging sensor. It can be implemented in real time in the sense that data processing can be performed whenever bands are available without waiting for data completely collected. This is particularly important for satellite communication when data download is limited by bandwidth and transmission. This paper presents a new concept of processing a well-known technique, orthogonal subspace projection (OSP) band by band, to be called PBP-OSP. Several benefits can be gained by PBP-OSP. One is band processing capability which can allow different receiving ends to process data whenever bands are available. Second, it enables users to identify significant bands during data processing. Third, unlike band selection which requires knowing the number of bands needed to be selected or band prioritization PBP-OSP can process arbitrary bands in real time with no need of such prior knowledge. Most importantly, PBP can locate and identify which bands are significant for data processing in a progressive manner. This progressive profile on OSP performance is the best advantage that PBP-OSP can offer and cannot be accomplished by any other OSP-like operator.

Young-Hwan Lee - Electrical Engineering
Online Optimal Power Flow with Renewables

Optimal Power Flow (OPF) is a crucial task for reliability and efficiency of power system operation. A substantial increase in the fraction of electricity from inherently uncertain renewable energy sources sets up the platform for vital challenges in the development of future power systems. In this paper, we propose an online approach, which is a model free hedging strategy, yet is able to provide a verifiable performance guarantee, for the OPF with renewables in order to cope with these difficulties that impose volatility and uncertainty on the grid. A two-state setup is considered. The output levels of the conventional generator are determined in the first stage before the renewable output is revealed. Then, spot market transactions follow, i.e. the additional cost or profit can be assessed depending on the spot market to buy or sell power to make up for the imbalance. Simulated tests were performed using a 30-bus IEEE test case. They show that the proposed hedging scheme is more advantageous than a static

alternative, which solves two OPF problems per time slot, when the renewable generation fluctuates significantly. In our future research, tests based on real data will be performed and compared with a 30-bus case.

Lisa Mathews - Computer Science
A Collaborative Approach to Situational Awareness for CyberSecurity

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.

Yu Wang - Computer Science
Isosurface Smoothing using Marching Cubes and PN-Triangles

When sampling and reconstructing a continuous signal, two factors determine the quality of the reconstruction, the sampling rate and the reconstruction kernel. In image processing, reconstruction kernel choices include linear, piecewise polynomial, sinc, Gaussian, Lanczos, and many more. We interpret the marching cubes algorithm for rendering isosurfaces of a volumetric field as a sampling and linear reconstruction: continuous attributes (such as density), are sampled uniformly across the volume and a surface is reconstructed with triangles. Triangle meshes extracted from marching cubes often require computationally expensive smoothing to remove triangles with high aspect ratios and give them smooth appearance. Many of these algorithms require knowledge of neighboring geometries, making them ill-suited for real-time processing. Curved PN-triangles is a fast way of generating smooth surfaces using just per-vertex positions and normals. Using a closed-form cubic surface with quadratic normals, the PN-triangles surface representation is able to capture geometry with strict inflections. We apply the PN-triangles algorithm in a graphics processing unit (GPU) tessellation shader as an improved reconstruction kernel for marching cubes to improve isosurface smoothness and quality. Our contribution is a pure-GPU solution for smoothed isosurfaces, combining GPU isosurface extraction with tessellation shaders for PN-triangles. In addition, we also evaluate the quality of linear interpolation and cubic patch approximation by evaluating the surfaces at tessellated vertices, and extend the PN-triangles algorithm by adaptively controlling the tessellation level in each patch to reduce the count of triangles with high aspect ratios.

Yue Hu - Electrical Engineering
Impact of the Coulomb Interaction on the Franz-Keldysh Effect in a High-Current Photodetector

A photodetector is a device that absorbs light and converts it to an electrical current. High-current photodetectors play an important role in RF-photonic systems that include radar systems and systems for frequency generation and time transfer. A linear output current response of the device to the input optical field is important. The output current is determined by the absorption coefficient of the material and electric field in the device. However, the absorption coefficient is not a constant and oscillates when the electric field changes. So, this effect leads to oscillations in the responsivity of the photodetector, which is the ratio of the output electrical power to the input optical power. Prior theoretical work only considered the electric field without considering the Coulomb interaction between electrons when calculating the absorption coefficient and derived a simple analytical expression for the absorption coefficient. This formula does not always yield good agreement with experiment, since Coulomb effects significantly affect the nonlinear response of the device. Without the Coulomb interaction in the simulation, we cannot obtain agreement when the incident light wavelength is equal to 1560 or 1580 nm. In this work, we take into account the Coulomb interaction and calculate the nonlinear response of a high-current photodetector, and we show that this model yields excellent agreement with experiments at all wavelengths.

Hadis Dashtestani - Computer Science
Massively Distributed Online Neuroscience for Improving Virtual Experience

Recent successful applications by neuroscientists at UCSD employing independent component analysis (ICA) to non-invasive Electroencephalographic (EEG) signals have yielded tremendous insights into brain processes that underlie human cognition. We propose to extend their ICA analysis to ensembles of human participants. We will engage dozens of volunteers wearing EEG helmets in a virtual world social activity called Virbela, and record, process and analyze the ensemble of brain activity in response to different types of behavior activities. An initial application of ICA will first be used to remove most of the data artifacts from the EEG signals such as blinking. We have scaled ICA to address the big data algorithm performance for ensembles of participants and of sensors when conducting collaborative activities in response to identical virtual digital stimuli. The algorithm provides an online brain–computer interface (BCI) including an automatic procedure for selecting independent components of interest (ICi) among the participants, enabling new research areas to be explored. We focus first on improving the near real time data processing by implementing the ICA algorithms on an Nvidia Kepler GPU interfaced with an IBM power 8 on a PureFlex system. We further develop a cloud-based assimilation system on the iDataPlex system to integrate the ensemble of brain recordings of helmets. The system employs the Hadoop MapReduce parallel programming approach and Hbase/JSON for the unstructured data mining. We plan to conduct a variety of sensitivity experiments for optimizing the ICA algorithm for the GPU and its execution in a cloud.

Gloria Opoku-Boateng - Information Systems
Emotional Design: Can Frustration With HIT Interfaces Be Explained?

User frustration research has been one way of describing clinicians' technology use and interaction. In order to understand how Human-Computer Interaction (HCI) research in frustration explains and applies to clinician frustration during Health Information Technology (HIT) use, there is the need to explore HCI literature that addresses both frustration and HIT use. In the past three decades, HCI frustration research has increased and expanded. Researchers have done a lot of work to understand user frustration alongside emotional design and affective computing. This paper takes a step back to review the origins of frustration research through literature study, as well as presents a research problem; Can HCI research on frustration explain clinician frustration with HIT interfaces? The goal of this research paper is to be able to point out some HCI literature and their findings on frustration as well as draw conclusions from them. Results from the literature review pointed out that HCI literature can indeed explain user frustration. There are also approaches from HCI literature that will help frame HIT user frustration research as well as inform HIT system design. The paper concludes with a suggested direction as to how future design and research could take based off findings in HCI literature.

Abdullah Ali - Human-Centered Computing
Notification Design for Adaptive User Interfaces

There are many reasons such as illnesses, old age, or injuries that could cause pointing problems, which include difficulty clicking on or navigating towards targets, dragging and dropping, or motion control of the mouse and cursor. The work is intending to evaluate the design of a notification system for computer users with pointing problems. The notification system aims to alert users of changes in their pointing performance via displaying a message, or showing an indicator informing them that their pointing performance has changed. The purpose of the notifications is to be used as part of a future system that adapts the computer interface based on the user's performance for improved usability. This work was done to improve upon familiar notification techniques which can be disruptive, and try to find designs that strike a balance between visibility and disruptiveness. The evaluation of the notification system is done through participatory design sessions with users of varying pointing abilities, ages, and computer skills. In these sessions participants were shown video clips of multiple notification designs and asked to provide feedback. It was found that the participants preferred designs that were personal, comprehensible with medium to high visibility.

Lunch
12:00pm-12:30pm

UC Ballroom

Welcome Speeches:

Ms. Romy Hübler — *GRC Chair; Doctoral Candidate, Language, Literacy and Culture, UMBC*

Dr. Janet Rutledge — *Vice Provost and Dean of the Graduate School, UMBC*

Dr. Philip Rous — *Provost and Senior Vice President for Academic Affairs, UMBC*

Keynote Panel
12:30pm-1:30pm
UC Ballroom

Topic: Have you ever wondered what your research would be like if you collaborated with folks from other disciplines? This panel gives you the opportunity to get answers to your questions! Panelists will discuss their work, share insights, and give advice. Don't miss this chance to envision where you can take your research.

Moderator:

Ms. Rachel Carter — *Doctoral Candidate in Language, Literacy and Culture*; *Member, UMBC Interdisciplinary Activity Taskforce*

Panelists:

Dr. Judah Ronch — *Dean of the Erickson School, UMBC*

Dr. Lee Blaney — *Assistant Professor Chemical, Biochemical, and Environmental Engineering, UMBC*

Dr. Michelle Stefano — *Visiting Assistant Professor, American Studies, UMBC; Assistant Director, Maryland Traditions*

Mr. Lee Boot — *Associate Director, Imaging Research Center, UMBC*

Session III
1:45pm - 3:00pm

University Center 310

Entrepreneurship Careers Meet-Up Panel
(Featured Professional Development Workshop)
Coordinated with the Alex. Brown Center for Entrepreneurship

During this session the panelists will give a brief overview of their entrepreneurial experience and field questions from the audience….You can learn everything you wanted to know about entrepreneurship and more! Vivian Armor will also provide a brief overview of the initiatives offered by the Alex. Brown Center for Entrepreneurship. At the

conclusion of the session participants will be given a self-assessment tool to evaluate their own entrepreneurial tendencies.

The Commons 318

Tymofey Wowk and May F. Chung, Language, Literacy and Culture; Claire Hempel - Statistics (Oral Presentation)
Understanding the Classroom Context of Latino English Learners and Its Influence on their Social-Emotional Development

This presentation examines the social-emotional development of young Latino English learners (ELs) compared to Latino English speakers, Whites, and Blacks, and the influences of socioeconomic status (SES) and their classroom context by using a newly released national dataset, the ECLS-K: 2010/11. We know that social-emotional development influences academic success. In addition, there are four new social-emotional measures as reported by teachers in this dataset: attentional focus, inhibitory control, conflict, and closeness. It is also important to investigate dimensions of the classroom context, specifically average classroom SES, teacher satisfaction, and classroom climate. Preliminary results indicate that after controlling for SES, teachers reported that Latinos ELs had higher attentional focus and inhibitory control, and lower conflict than Latino English speakers, Whites, and Blacks; however, teachers reported that they felt more closeness with Whites than with Latino ELs. Latino ELs were also rated higher on readiness beliefs than Whites, had more satisfied teachers than Blacks, and attended kindergarten with the lowest average SES among peers in the same classroom. Multi-level model strategies and regression approaches will be used to disentangle the influence of classroom factors on social-emotional development. The findings from this study may be useful in increasing our understanding of, and developing interventions targeted for, the most predominant minority group in U.S. schools, Latino English learners.

David Balosa - Language, Literacy and Culture (Oral Presentation)
Political Discourse Analysis as a Research Methodology in Intercultural Communication Study

The argumentation of the political elites about their support for language domination, such as English monolingualism in the U.S., has perpetuated social inequality and the violation of the right of democratic participation of minorities in the United States' political actions. The deconstruction of this hegemonic language politics needs a research methodology that analyzes speech that masks dominant mindsets. Through various examples that previous PDA's research across institutions and nations-states, PDA provides the insight and tools that students and established scholars in intercultural communication and related disciplines need if their research is to shed light on how hegemonic ideologies function. It also provides orientation about the way one can counterattack these ideologies to eradicate symbolic violence towards minority languages, establish language use legitimacy in compliance with human rights and promote unity within diversity. I draw from sociolinguitics, moral and sociopolitical philosophy, and social psychology to evaluate the critical contribution of PDA for intercultural communication research. I conclude that employing PDA as an approach for intercultural communication research may constitutes an avenue for the radical transformation of the actual political argument that sustains cultural disparagement and mischaracterization of the United States' interculturality into a dialectical discourse of cultural reciprocal recognition and mutual empowerment for a common humanity.

Satarupa Joardar - Language, Literacy and Culture (Oral Presentation)
Twitter and mainstream media discourses of a social movement: An exploratory case study of the Indian anti-corruption movement of 2011

World events of 2010-2011, commonly known as the Arab Spring, led scholars to conduct prolific research about "Facebook revolutions" and "Twitter protests." However, the complete picture and the ground reality of the influence of technology and social media on protest movements is much more complicated and nuanced. Social media cannot and have not caused protests; people have caused these events, with the help of technology and my dissertation research aims to find out how. Therefore, I investigate how the 2011 Indian anti-corruption movement or the Anna Hazare anti-corruption movement was able to use mass media and online social media to play a crucial

role in helping social movement activists and organizers broadcast their movement's appeals and needs. Access to the Internet in India is highly fragmented and stratified with only 10% of the nearly 1.2 billion population having access. A larger percentage of Indians, about 70% have mobile phones with potential access to the Internet. The Anna Hazare movement, for the first time in India's rich history of social movements, was able to harness mobile and media technologies to generate offline and on-the-ground support for its cause. My dissertation explores the ways in which this movement was able to accomplish the successful dissemination of the movement's ideology and goals by examining the discourses surrounding the movement in the various media. Specifically, I focus my examination on the discourses that occurred on Twitter, two pan-Indian English language newspapers and the testimonies of a few organizers of the movement.

The Commons 327

Ali Abdolrahmani - Human Centered Computing (Oral Presentation)
Determining the Situationally Induced Impairments Experienced by Individuals who are Blind

Thanks to the development of assistive technologies such as screen readers and navigation applications for mobile devices, individuals who are blind can now take advantage of these devices for various purposes and in different situations. However, contextual factors such as surrounding loud noise, having one hand encumbered to hold white cane while navigating, and being involved in cognitively demanding task of focusing their attention on the environment for a safe navigation may impact their desirable mobile interaction. These factors challenge individuals who are blind when performing tasks such as listening to mobile screen reader, when inputting text or voicing commands, and when interacting with the screen using one-hand. In this work, we describe a range of scenarios, which are challenging for individuals who are blind to interact with their phones as expected. To conduct this study, we interviewed eight legally-blind participants who use mobile devices on a regular daily basis. Workarounds are described to help users address issues associated with privacy, safety, input accuracy, and ambient noise. Design implications resulting from the work are described to better inform mobile interface designers about ways to support. Our long-term goal is to develop solutions to better address the needs of these individuals when experiencing situational impairments.

William Easley - Human Centered Computing (Oral Presentation)
Making 3D Printing Accessible for Individuals with Intellectual Disabilities

Throughout the course of one semester, a case study was conducted to assess the feasibility of developing a 3D print shop on campus which is run by individuals with intellectual disabilities. This project was done in collaboration with an intern from the University of Maryland, Baltimore County SUCCESS program, a four-year, post-secondary educational program for individuals with intellectual disabilities. During this process, the SUCCESS intern was introduced to various 3D printing concepts, the Tinkercad computer aided design platform, and the Printrbot Simple Metal 3D printer. The primary goal for project semester was for the SUCCESS intern to be able to operate the printer independently. Various methods such as repetition and visual aids were used as tools to help us reach this goal. Upon the completion of the project, the SUCCESS intern was able to independently design, download, and print 3D models, calibrate and perform simple maintenance tasks on the on the printer, and troubleshoot basic problems that may occur. Multiple areas in which current technologies can be improved were also identified. While this project was limited in scope, the lessons learned from can be applied to future work.

Nilavra Pathak – Information Systems (Performance/Media Presentation)
Acoustic Based Appliance State Identifications for Fine Grained Energy Analytics

Fine-grained monitoring of everyday appliances can provide better feedback to the consumers and motivate them to change behavior in order to reduce their energy usage. It also helps to detect abnormal power consumption events, long-term appliance malfunctions and potential safety concerns. Commercially available plug meters can be used for individual appliance monitoring but for an entire house, each such individual plug meters are expensive and tedious to setup. However, fine-grained events (e.g., appliance malfunctions, abnormal power consumption, etc.) remain undetected and thus inferred contexts (such as safety hazards etc.) become invisible. We note that the appliance power states have distinct correlation with its mechanical signatures as generated by its vibration, sound, or lighting

factors. In this work we correlate an appliance's inherent acoustic noise with its energy consumption pattern individually and in presence of multiple appliances. To further improve the accuracy of our energy disaggregation algorithm, we propose a probabilistic graphical model, based on a variation of Factorial Hidden Markov Model (FHMM), for multiple appliances energy disaggregation. We combine our probabilistic model with the appliances acoustic analytics and postulate a hybrid model for energy disaggregation. Our approach helps to improve the performance of energy disaggregation algorithms and provide critical insights on appliance longevity, abnormal power consumption, consumer behavior and their everyday lifestyle activities. We evaluate the performance of our proposed algorithms on real data traces and show that the fusion of acoustic and power signatures can successfully detect a number of appliances with 95% accuracy.

The Commons 328

Marwa El-Sayed - Chemical Engineering (Oral Presentation)
Direct atmospheric evidence for the irreversible formation of aqueous secondary organic aerosol (aqSOA)

This ambient study focuses on reversible partitioning of secondary organic aerosols (SOA) formed through the aqueous phase. In Baltimore during September, water soluble organic carbon (WSOC) in both the gas- (WSOCg) and particle (WSOCp) phases increased exponentially during the day with the increase in temperature, highlighting the effect of photochemistry on SOA production. The fraction of WSOC in the particle phase, Fp, increased with increasing relative humidity (RH) during the nighttime. These observations suggest that SOA formation occurred during the night through the absorption of semi-volatile organic compounds (VOCs) in liquid water (aqueous SOA - aqSOA). An enhancement of 71% in Fp values (0.161 to 0.275) was observed with the increase in RH from 55% to 85%, emphasizing the influence of particle water on the formation of SOA. To characterize the reversibility of aqSOA partitioning, the WSOCp measurement was alternated through an unperturbed (ambient) channel and through a channel where the sample was dried to ~40% RH. The WSOCp, dry to ambient ratio was unity under all ambient conditions: it did not exhibit any statistical difference with increasing RH in either the daytime or nighttime. This indicates that SOA formed through the uptake of water-soluble organic gases into aerosol liquid water remains in the particle phase upon the evaporation of aerosol water. This suggests that the observed aqueous SOA undergoes further heterogeneous reactions in the aerosol phase inhibiting the reversibility of these particles from partitioning back into the gaseous phase.

Michael Battaglia Jr. - Chemical Engineering (Oral Presentation)
Development of a Novel Instrument for the Continuous, On-line Measurement of Aerosol Acidity

We present the development and validation of a novel instrument for the rapid, continuous, and on-line measurement of aerosol acidity. The new instrument integrates a particle-into-liquid sampler (PILS) for the on-line collection of aerosols into a liquid stream, with semi-continuous analysis by both ion chromatography and small-volume pH sampling. The aerosol acidity in atmospheric particles can be computed directly from this measurement. This method allows for the rapid (~20 min) sampling of aerosol acidity, and simultaneous analysis of water-soluble inorganic species. The acidity of atmospheric aerosols has been shown to impart detrimental effects on both human health, and freshwater and terrestrial ecosystems. Additionally, aerosol acidity controls a number of important chemical processes. It is a dominant factor controlling halogen activation and cycling in marine and coastal environments. The sulfur cycle, including the formation of sulfurous and sulfuric acids, is also affected. Nighttime chemistry of nitrogen oxides and their corresponding radical budget, the gas/particle partitioning of aerosol components, and the presumed fate and transformation of volatile organic compounds are also affected by aerosol acidity. Despite the known effects on health and atmospheric chemistry, obtaining highly time resolved data to measure and track aerosol acidity is lacking. Present sampling methods for measuring aerosol acidity suffer from a number of shortcomings, most notably the long collection time (typically 12-24 h) requirement of direct filter sampling methods. Interesting and important diurnal changes in aerosol acidity driving the aforementioned atmospheric chemical processes are lost in the aggregate collection of these sample methods.

Kayla Lemons - Neurosciences and Cognitive Sciences (Oral Presentation)

TRPM5-Expressing Microvillus Cells Are Involved in Modulation of Olfactory Function After Irritant Exposure

The main olfactory epithelium (MOE) in the nasal cavity detects inhaled odorants with high sensitivity. During inhalation, harmful microorganisms, pollutants, and irritants may also be introduced into the MOE. Mechanisms for detecting these substances in the MOE and regulating olfactory activity are poorly understood. We previously demonstrated that a set of microvillous cells (MCs) in the MOE expressing the transient receptor potential channel M5 (TRPM5) are responsive to harmful substances. Furthermore, these cells are capable of releasing acetylcholine (ACh), which alters intracellular calcium levels in neighboring cells. We hypothesize that cholinergic TRPM5-MCs play a role in the detection of foreign substances in the MOE and subsequently modulate olfactory activity. To investigate this, we continuously exposed Skn-1a knockout mice (Skn-1a-/-) which lack TRPM5-MCs in the MOE to odorous irritants for two weeks, and used behavioral assays to assess olfactory function. Under normal housing conditions, Skn-1a-/- and wild type mice perform similarly in finding buried food. After two weeks of continuous exposure, irritant-exposed Skn-1a-/- mice take longer to locate buried food than vehicle-exposed Skn-1a-/- mice, whereas the performance of wild type mice is unaltered by irritant exposure. Moreover, olfactory preference tests indicate that wild type mice avoid high concentration odorants to a greater extent after irritant exposure, while the tendency to avoid these stimuli is unchanged by irritant exposure in Skn-1a-/- mice. These behavioral alterations suggest that TRPM5-MCs contribute to the modulation of olfactory function in response to inhaled irritants.

The Commons 329

Sai Kumar Popuri - Statistics (Oral Presentation)
Bayesian Analysis of a State-Space Model for Daily Precipitation Using MIROC5

Downscaling is the process of bringing the data provided by Global Climate Models (GCM) from a coarser resolution (~100km) to a finer resolution (~10km). It is an important step in applications that assess the impact of large scale climate changes on local conditions. In this paper, we use statistical methods to improve the quality of spatially interpolated downscaled precipitation for prediction purposes. We discuss the results from an ongoing research on analyzing the daily precipitation time series at a location in the upper Missouri River Basin (MRB) by fitting a state-space model with the spatially interpolated daily historical simulated data provided by MIROC5, a Global Climate Model, as an independent variable using a Gibbs sampling scheme. The time series is from a mixed distribution with positive Probability of zero precipitation and shows strong seasonality. We fit a standard Tobit model as the observation process to the time series suitably transformed to achieve censored normality. The time series is deseosonalised prior to model fitting and the seasonal pattern is replicated for predictions. We demonstrate that using a modest implementation of Gibbs sampler, the method has reasonable predictive power at the monthly level. Some of the issues pertaining to k-day ahead prediction are also illustrated.

John Panek - Systems Engineering (Oral Presentation)
Using Simulation to Evaluate Intelligent Traffic Control Algorithm Performance

This presentation shows how simulation is used to evaluate potential solutions to the real-world problem of automobile traffic. In many areas, traffic volume has increased to the point where intersections are technically classified as "failing" by the Department of Transportation. The solution space to this problem is limited, since funding for increasing roadway size is not a viable option. Therefore, municipalities are investigating the use of intelligent traffic systems (ITS) to create a more efficient flow of traffic. The goal of an ITS is to feed live traffic data to traffic flow algorithms that can control the traffic lights at a series of intersections, thereby improving the flow of high volume traffic. The overall objective of this research project is to use simulation to compare the performance of several ITS control algorithms to improve traffic flow along the Route 3 corridor in the Crofton area. The approach uses an agent-based simulation tool, called NetLogo, to simulate the flow of traffic along Route 3 using traffic control algorithms. The project development plan includes steps to identify the simulation tool, define the simulation environment, identify traffic control algorithms, simulate the algorithms, and compare the performance results. Several alternative algorithms were evaluated including single-intersection control and multi-intersection synchronized flow. The initial results show a significant performance difference between the control

algorithms. However, simulated traffic conditions need to be validated, along with further model refinements, before a final assessment of the algorithm performance can be made.

Chayutra Pailom - Computer Science and Electrical Engineering (Oral Presentation)
Hybrid Authentication for VANET Using Certificate Authorities and Reputation System

VANET (Vehicular Ad-hoc Network) is an emerging technology which has received significant attentions in recent years. VANET enables vehicles to share information to improve on-road drivers' experience and safety. The ah-hoc networking of diverse set of vehicles necessitates the use of authentication primitives to prevent fool plays. However, the dynamic memberships and the potential for a vehicle to be driven by different drivers make the authentication process unconventionally challenging. In this paper, we tackle these challenges and propose a novel technique for authenticating nodes. The technique, which is called VANET Hybrid Authentication (VAHA), uses certificate issued by a certificate authority (CA) and a reputation system to classify vehicles in order to establish trust. Upon admission a new vehicle will be only given a temporary key that can be used to report data to others in the network, i.e., only half duplex communication is allowed. Based on the correctness of the report events, other vehicles will elevate the reputation of a new member and allow it to become a trusted member that can use the session key for full duplex communication with the rest of the network. The CA is used for key management, e.g., changing the session key after the eviction of misbehaving nodes. To increase the efficiency of the network admission process and overcome the intermittent connectivity to the CA, we employ some of the existing vehicles as Certified Endorsers (CEs).

The Commons 331

Eva Piera-Escriva - Intercultural Communication (Work in Progress)
Revisiting Spanish Democracy through Social Media Networks: From 15m to Podemos

On May 15, 2011, the future of Spain transformed through the power of its citizens and their ability to mobilize a democratic idea through the power of social media. Feeling disenfranchised and neglected for years, the demonstrations that occurred sparked the formation of a new social movement that eventually would set the ground for a new political party that met the needs of the population. Social networking systems such as Facebook and Twitter have proved invaluable tools for the democratization of a country such as Spain. This provided a paradigmatic landscape of dialogue and consensus, a situation that had no precedent in the Spanish society. This paper revisits the components of a "real" democracy and its implementation in Spanish society thanks to the use of social media platforms. For the first time, Spanish citizens have participated in the creation of a candidacy and its nominations for general elections. Spanish citizens have been given the opportunity to suggest and discuss the premises of the political program of a party, making sure it is tied to the people's necessities. The society has been characterized by the vertical approach of two political parties, Partido Popular (PP) and Partido Socialista (PSOE) that have been disregarding people's necessities for three decades. This new horizontal approach has given birth to a new wave of collective thinking, organized rebellion and assembled spirit where every citizen is welcome to participate in the rethinking of a "real" democracy.

Abdulhadi Al Ruwaithi - Emergency Health Services (Work in Progress)
Dengue Infection in Jeddah: The Demographics of Infected People

Dengue is an endemic infection to Jeddah's area in the Kingdom of Saudi Arabia, and in some years, the reported dengue cases number exceeds the endemic level to an epidemic level. Dengue infection resurged sharply in Jeddah during 2013. In the two neighboring cities: Jeddah and Makkah, the cases rose to 4411 reported cases in 2013, four times higher than the number of cases that was reported in 2012. This proposed case – control study tries to examine the association between different people's demographic features and dengue in Jeddah. All cases in this study will be confirmed by a laboratory test. The laboratory test will be checked and confirmed by the health facilities where the case were diagnosed and treated. Controls will be selected from cases' relatives, hospital visitors, and the general community who are confirmed never have been infected with dengue. All study participants will have direct interviews with the researchers in order to fill out the study questionnaire. A multi-variable analysis will be conducted to examine the association between dengue fever and different demographics: sex, race, age, the

educational level, socioeconomic status, and the residential area. The null hypothesis suggests no difference among Jeddah people's demographics regarding dengue incidences. The study results could reveal some important characteristics about who are more vulnerable to dengue infection and why, within the context of Western Saudi Arabia.

Lukas Glos - Public Policy (Work in Progress)
The Impact of Piped Drinking Water Supply on Childhood Health: Evidence from Peru

This study analyzes the impact of piped drinking water on childhood health as measure by diarrheal episodes, severe stunting and mortality using a dataset from DHS for Peru. Employing a spatial/time fixed effects regression methodology, this paper shows that access to piped drinking water within a household's dwelling significantly reduces the exposure of children to diarrheal episodes and malnutrition. Estimation results also suggest that additional benefits can be achieved with domestic water supply networks that provide piped drinking water continuously (24x7) and have no scheduled or unscheduled interruptions of one day or longer. Continuous and reliable provision of piped drinking water is shown to reduce diarrheal episodes and prevalence of malnutrition most effectively. No effects, however, could be shown on child mortality. All regression results ascertaining the relationship between piped drinking water and mortality were statistically insignificant. Moreover, results suggest that piped drinking water obtained from public standpipes and communal piped networks within buildings have no effect on childhood health at best and might have even adverse effects. This has important public policy implications: First, the provision of piped drinking water in low- and middle income countries might potentially have no health benefits for the targeted populations if the networks are merely provided to neighborhoods as public standpipes or communal water taps within buildings. Second, networks that provide piped drinking water to households within their dwelling, should provide this water continuously (24x7) and without and major interruptions to achieve full health benefits for children under the age of five.

Jiselle Providence - Language, Literacy and Culture (Work in Progress)
The Ricochet of Resistance: The Cultural Reproduction of Violence in Trinbagonian Mores

This paper takes a critical approach to the problem of violence in the country of Trinidad and Tobago. In this instance the paper identifies violence as a common form of diasporic resistance. The paper identifies violence as a means through which social supremacy, power and attention were achieved throughout the history of the twin-island republic and proves that violence has become and is still currently an acceptable aspect of Trinbagonian culture; deeply embedded within the fabric of cultural knowing. The paper firstly traces the use of violence as a means of control which was adopted by early colonists and further identifies the ways in which violent acts were used to establish social, political and economic supremacy. Secondly, the paper focuses on violence as a form of resistance which was adopted by the sub-altern population against colonial control. It also highlights the positive outcomes of these acts of violence and the successes which the change agents themselves were able to attain through the use of violence. Thirdly, the paper highlights the re-production, re-enactment and normalization of acts of violence and identifies these acts in various aspects of Trinbagonian culture today. To this end, the paper identifies violence as a reliable, results-oriented act of resistance which is inherent and highly culture driven in Trinbagonian society.

The Commons 332

Holly Roumeliotis - Texts, Technologies, and Literature (Oral Presentation)
Misinterpretations of Female Evil in Gothic Novels

The Gothic novel provided a unique opportunity for British writers to express social opinions by suspending the constraints of reality in order to propose new possibilities. The rights of women were a primary concern to many of these writers, and some deliberately made use of female characters that obviously broke from the traditional standards of the feminine ideal. These characters were instrumental in assessing and critiquing the social psyche and institutions that contributed to the marginalization of women. These Gothic female characters have been dismissed as cautionary examples meant to frighten women into fulfilling their "natural" role, but such characterizations neglect the significant contributions of authors like Anne Radcliffe, Matthew Gregory Lewis, and Charlotte Dacre. In A Sicilian Romance, Radcliffe aligns the story of Maria, the "evil" stepmother, with the Roman myth of Lucretia,

thereby suggesting that Maria played an indispensable role in overthrowing the Marquis's patriarchal control. In The Monk, Lewis confronts the practice of gendering education in order to subject women to a secondary role in society. In Zofloya, Dacre concerns herself with destroying representations of traditional male authority and female virtues through Victoria, a sexual and hateful woman whose gender becomes ambiguous by the end of the novel. This presentation will argue that traditional interpretations of characters such as Maria, Matilda, and Victoria as archetypes of female evil neglect the critical function that they serve within the narrative. These authors deliberately used these women to highlight, question, and restructure the social laws governing women's identity.

Jaclin Paul - Imagining and Digital Arts (Artist Talk)
First Contact

First Contact is a series of twelve digitally altered images that use American Girl Dolls to explore themes of cultural and phenotypic identity in Colonial America. Alice Wexler, Maurice Berger, Malek Alloula and Lisa Nakamura each write about issues surrounding biological identification, the colonial gaze, and methods of cultural assimilation. First Contact extrapolates from these scholar's texts by using the animals, clothing, housing and accessories commoditized by American Girl Company and sold along with American Girl Doll, Kaya (a fictitious member of the Nimi'ipuu tribe). In 1764, Kaya lived nomadically in the Pacific Northwest. Fictitious American Girl Dolls Addy (African, escaped slave), Caroline (Caucasian, post-colonial), and Josefina (Chicano, lives in NM under Mexican rule) are relative contemporaries of Kaya. In this project, Addy, Caroline and Josefina are photographed wearing Kaya's clothes and are superimposed into dioramas of plants and topographic features native to Oregon, Idaho and Washington. Each of the three dolls is featured in four separate simulated images that correspond to the four seasons of the Pacific Northwest. In First Contact, I combine three concepts: cultural assimilation by use of clothing and accessories, objectification of the Other, and reproduction of one's self image. In doing so, I attempt to create a dialogue among viewers around these themes.

Meghan Marx - Imagining and Digital Arts (Artist Talk)
Vulnerability and the Potential of Breath in a Time of Hoarding

Tiny particles hover in the air, inhabiting our spaces, acting as contaminants leaving their imprints upon us as we leave ours upon our environment; these are traces of our collective presence. These particles have the ability to permeate our bodies by ways of absorption, ingestion, and inhalation. They transgress the otherwise safely hidden haven of the internal organs of our bodies, becoming a part of us. My current work consists of interactive pneumatic sculpture, video projection, and traditional sculpture aiming to encapsulate the breath, suspending and pausing the act of breathing to become aware of the universe of man-made particulates that surround and trespass us; rethinking the breath as an uncertain act which has a power to change our body that is out of our control. My concern is with our place, our time, and our borderless airscape. I am particularly interested in the air that we breathe and looking at the relationship between the body and our awareness and unawareness of the indirect, incidental, and unintentional hoarding of our environment. I am currently working with a group of UMBC's Mechanical Engineering Capstone students for the interactive sculpture, and Ruben Delgado of the Atmospheric Physics Group for pollution data provided by his light detection technology to detect particulate matter in the atmosphere.

-Poster Presentations-

University Center 312

Lipi Mukherjee - Atmospheric Physics
Inherent Optical Properties of Cyanobacteria Particles

Cyanobacteria (also known as blue-green algae) are considered to be among the oldest organisms in the evolutionary cycle. They belong to a rare group of organisms that perform oxygenic photosynthesis and respiration simultaneously in the same compartment. Cyanobacteria have both beneficial and harmful impacts to mankind. It produces cyanotoxins, which can be harmful to aquatic and terrestrial organisms including humans. There is no information on when or why these toxins are produced in water. This makes the scientific community inquisitive to

know more about its activities and study its interactions with the ocean ecosystems. Satellite remote sensing is an indispensable tool to monitor the global amount and distribution of the cyanobacteria and other algae. More than 25 satellite missions, including both past and current missions, have been launched to study the global ocean ecosystem. To correctly interpret the satellite data, we need to understand the optical properties of the particles in the atmosphere and ocean systems. We are particularly interested in the inherent optical properties, which do no depend on the light field and are only dependent on the particle morphology. In this study we will use the numerical methods to study the inherent optical properties of the cyanobacteria particles. The sensitivity of the inherent optical properties of the cyanobacteria structures will be shown. The Discrete Dipole Approximation method will be used for this study because it is efficient for soft particles, i.e., particles with index of refraction close to 1, which is exactly the case for cyanobacteria.

Noah Robinson - Chemistry
Developing Nano Vesicle-Vesicle Fusion Systems for Single Molecule Studies

Vesicles are nano-scale fluid filled sacs composed of a spherical lipid membrane separating the outside from the in. Designing vesicle pairs that fuse, mixing content stored inside may allow for controlled small volume mixing experiments. Such a nano-scale reaction chamber would be useful for studies of short-lived protein interactions at the single molecule level. Designing these vesicles to fuse and mix content involves two mixing systems. In the first system, vesicles are made charged by incorporating charged lipids in the membrane. Creating negatively charged vesicles and positively charged vesicles yields a pair that will spontaneously fuse when placed together. When the two different vesicles are fused, the content inside the vesicle will interact. Because no more than one single protein will be encapsulated inside each vesicle, mixing the vesicles will allow the interaction of a single pair of proteins to be observed. This vesicle mixing system shows promise with indirect data from bulk fluoresce measurements as well as from particle size measurements using digital light scattering. Many biological processes employ a set of multiple proteins. To investigate the interactions between multiple proteins, we will utilize a second method for combining vesicles using the vesicle fusion protein machinery found in nature. Combining these two methods could allow for studying interactions between multiple different proteins at the single molecular level, that is to say interactions between a single molecule of protein A with a single molecule of protein B using the first system and adding a single molecule of protein C using the second system. Interactions of the targets confined in these nano-scale vesicle chambers can then be studied using fluorescence microscopy, via FRET pairs or other single molecule techniques. Current work focuses on developing these systems.

Therese Ku - Chemistry
Examining the Effect of Structural Diversity in Nucleoside Drug Design

There exists an abundance of Food and Drug Administration (FDA) approved drugs that effectively target viral diseases, however, they are increasingly plagued with the rapid loss of efficacy due to the pathogens' ability to adapt and mutate. Thus, the use of FDA approved combination therapies against viruses is now the preferred mode of treatment, since the rate of resistance has decreased significantly in the presence of multiple types of drugs. A key component in antiviral cocktails is a nucleoside/tide inhibitor, such as Tenofovir (HIV) or Sofosbuvir (HCV). This class of inhibitors comprises of modifications on the nucleoside/tide's sugar, base and/or phosphate moieties, and different modifications show different medicinal activities. They owe their success as treatments to their characteristic similarity to endogenous DNA and RNA, thereby disrupting viral replication by mimicking the native nucleosides/tides. Unfortunately, despite efforts to the contrary, antiviral resistance has not been completely halted. Consequently, the development of novel drugs that work through alternative modes of action are needed. Our lab is focused on utilizing organic chemistry to synthesize nucleoside/tide analogues that include all the aforementioned modifications, but in addition endow the nucleoside/tide base with additional aromatic or flexible characteristics that may circumvent antiviral resistance. The objective of my project is to synthesize a series of nucleoside analogues with these modified bases and couple them to 2'-modified sugars as seen in Sofosbuvir, where a methyl and fluorine group are substituted.

Rowena Bastero - Statistics
Alternative Approach to Average Treatment Effect Estimation

In causal inference, the potential outcome framework posits that every unit has a pair of potential outcomes; one under the control setting and the other under the treatment setting. However, in observational studies, having both outcomes at once is impossible and one is always missing. Such types of data also have systematic differences in the covariates between the two groups, unlike randomized clinical trial data. These issues pose a problem in the estimation of the average treatment effect, which is the target estimand for inference. While propensity scores technique addresses this issue, assessment on the matches made based on propensity score continue to reflect imbalance with respect to the covariates of matched pairs (in direct matching) or matched groups (in stratification matching). With this, a modified method is proposed that guarantees a more balanced group with respect to the covariates. The proposed matching and estimation method infuses classical model-building and swapping techniques into the meta-analyses framework. The swapping procedure imputes the missing potential outcome using classical regression and the use of meta-analyses framework provides a pooled estimate for the average treatment effect. Analysis on a data with continuous response variable suggests that minimal difference in estimates is realized between the proposed method and propensity score technique. However, relatively more efficient estimates are generated using the former as reflected by the smaller variance of the estimated average treatment effect.

Bryan Wilkinson - Computer Science
A Resource for Evaluating Adjective Scales

Sets of adjectives like [big, little, small, large, tiny, giant] and [beautiful, ugly, pretty, gorgeous, hideous] are known as scalar adjectives, because they can be ordered among some attribute by intensity. While the exact relations between these words have not been resolved in the linguistic community, there has been work to learn these orderings computationally. Work by Sheinman, et al. and De Melo and Bansal uses pattern based techniques while work by Kim and De Mareneffe uses vector based techniques to achieve this. It is difficult to assess these methods without an empirically derived gold standard. The work of Ruppenhofer, et al. begins work towards an empirically derived gold standard, but the words on the scale are not empirically determined, only their order. This absence of a gold standard not only affects the evaluation of computational methods, but linguistic inquiries as well. We have found no concrete examples of these scales in the linguist literature studying the phenomenon either. Using methods from linguistic field work, we present a new resource of scalar adjectives, created using Mechanical Turk. We first elicit the groups of words that should be on a scale together and then elicit the ordering of these words.

Neil Agarwal - Chemical and Biochemical Engineering
Numerical Techniques in Determining and Modeling Beta Amyloid's Role in Alzheimer's Disease

Alzheimer's disease (AD) is a progressive neurodegenerative disorder that primarily affects the elderly population. The amyloid hypothesis proposes that the beta-amyloid peptide (Aβ) in its aggregated form contributes to neurodegeneration in this disease. Many have shown a link between Aβ and toxicity, but the mechanistic connection between Aβ and signaling pathways related to loss of learning and memory has been harder to elucidate using in vitro studies. One hypothesis concerning the link between Aβ deposition and loss of learning and memory in AD involves Aβ induced activation of a Src family tyrosine kinase, Fyn, which modulates the expression and activity of glutamate receptors. Fyn is also thought to phosphorylate tau, also implicated in AD. Despite the growing evidence of a role for Src activation in Aβ induced changes in cellular function and pathology, the mechanism of Aβ induced Src activation that leads to these pathological changes is still unclear. Multiple signaling pathways converge onto Fyn, thus any mechanism relating Aβ and Fyn to pathology must address signal integration and the inherent non-linear behavior of this complex signaling network. In this work, we examined the time-dependent effects of fibril Aβ-42 on tyrosine kinase and Src family kinase (which includes Fyn) activation through the use of several theoretical techniques such as the postulation of a time-dependent mathematical model and stability analysis to determine the points of interest of when A interacts with Src, other transmembrane receptors, Integrins and Ligands.

Caroline Galbraith - Human Centered Computing
SentenceShaper: Enabling Social Communication and Complex Expression for Individuals with Aphasia

The social implications of losing the ability to speak in fluent or complex sentences and understand complex language due to aphasia can be very severe. It can easily lead to social isolation, false assumption about remaining

intelligence by others, and a lack of expression and confidence in oneself. Aphasia is a language impairment affecting the production and understanding of language as a result of a stroke or traumatic brain injury. This research explores software called SentenceShaper that can be used as a platform to create fluent speech and narratives and to improve speech abilities of aphasiacs through utilizing the individuals own voice through recording, rather than an alternative voice that the user has no relation to. This research involves testing of a new feature in SentenceShaper that enables the user to email their recorded speech to someone, and increase the user's social interaction and ability to express complex thoughts. This research involves two participants working one-on-one with the researcher for two hours each week, for 9 weeks. The goal of this research is to evaluate how the members interact with the software, how the software could be improved to be more accessible, identify any program bugs, and identify alternative ways in which the software could be beneficial to the users. The research led to several alterations to the program concerning the usability of the user interface, and resulted in several findings concerning the social interaction impact that such software can have on people with Aphasia.

Adam Price - Computer Science
Big Data Analytics for Expanding Alice Analysis for the United States

In 2009, the United Way of New Jersey conducted a study of every county in the state to determine if families were falling out of the middle class but staying above the poverty line. This group and new income level was termed ALICE or Asset Limited, Income Constrained, Employed. This work was highly influential, inspired additional research and was later discussed in an article in the Washington Post. However the article implied that the plight of New Jersey was representative of the rest of the United States. This particular article also did not bother to offer any additional evidence or original research beyond what was discussed for the state of New Jersey. To improve upon the work reported in the Washington Post, we collected and put together data from various U.S. data repositories. With this data we created our own ALICE data for the most populous counties within the contiguous United States for the near decadal period from 2005 to 2013. In addition, we developed a dynamic interactive web based tool to display ALICE data for any user specified geographic region in the U.S. By placing the raw data on the web it is possible for anyone to read, analyze and validate the inferences from this Big Data repository.

Seyed Ehsan Jamali Mahabadi and Yue Hu - Electrical Engineering
Gain Recovery in Quantum Cascade Lasers

Quantum cascade lasers are semiconductor lasers that operate at infrared wavelengths (300GHz-430 THz). Semiconductor lasers are small, chip-scale lasers that are used in compact disk players, computer displays, and numerous other electronic devices. Standard semiconductor lasers operate by using a voltage source to create pairs of positively charged holes (e+) and negatively charged electrons (e-) that release light when they combine. This mechanism no longer works at mid (37-100 THz)- and far(0.3-20 THz)-infrared wavelengths, and, until recently, there have not been good compact sources of radiation at these wavelengths. This wavelength range is critical for environmental and medical sensing. The invention of quantum cascade lasers, which only use electrons and not holes, addressed the need for sources in this wavelength range. When the laser light is created in a quantum cascade laser, the electrons, which have gotten energy from a voltage source, give up that energy to the light, and it takes some time for the electrons to regain the energy that is needed to produce the light. This process is called gain recovery. We are modeling the transport of electrons through a quantum cascade laser and the processes by which they gain energy from the voltage source and lose that energy to light or to collisions with the semiconductor lattice that produce vibrations and ultimately heat. There is a component of the gain recovery that occurs quickly and another component that occurs slowly. Our principal new finding is an elucidation of the processes that lead to the slow gain recovery.

Brian Stevens - Computer Engineering
Characterization of Glucose Responsive Phenylboronic Acid-Based Hydrogel Using Optical Coherence Tomography

With the increasing prevalence of diabetes in the population and the rising costs of healthcare, there has been a continuously increasing effort towards glucose sensing research alternatives for the treatment of diabetes. In this work, we investigate the use of optical coherence tomography (OCT) in characterizing a glucose responsive

hydrogel based sensor that employs a synthetic receptor system, phenylboronic acids (PBA) as opposed to naturally occurring receptors, such as glucose oxidase. An OCT based material deflection technique, based on Hertz contact theory, measures the degree of deflection in a material in response to the expansion and contraction of the hydrogel to calculate glucose concentrations. The glucose responsive hydrogel sensor was fabricated using soft lithography which incorporated a polydimethylsiloxane (PDMS) flexible reservoir with a 10 nm thick layer of gold on the interior surface of the reservoir. The reservoir was fabricated to contain the hydrogel synthesized from an acrylamide hydrogel that was co-polymerized with 3-acrylamideophenylboronic acid. The glucose responsiveness of the hydrogel within the sensor system is measured by analyzing the change in axial depth of the flexible PDMS and were found to correlate linearly with the volumetric changes in response to glucose. The OCT optical system along with the glucose responsive hydrogel sensor enables real-time non-invasive 3-D image acquisition of the glucose responsive hydrogel and provides accuracy and referable reference points for calibration over simple tissue scanning techniques.

Ahmad Alaiad - Information Systems
An Empirical Investigation of Preferences toward Using WSN based Smart Home Healthcare Systems: Patient's Perspectives

Advances in Wireless Sensor Network (WSN) have opened up new opportunities for healthcare systems. WSN based smart home healthcare systems (WSN-SHHS) represent innovations in the area of sensor technology that have promised to improve healthcare quality and to stem rising healthcare costs by facilitating effective patient-medical professional collaboration and smart information sharing, and increasing patients' health observability and remote monitoring. Most previous research on WSN-SHHS has focused on algorithm development and technical improvement. However, limited research has explored the factors influencing patients' adoption of WSN-SHHS, which are of equal importance for successful implementation of WSN-SHHS. To fill the knowledge gap, we contextualized UTAUT model (unified theory of acceptance and use of the technology) to the domain of WSN-SHHS. The model was tested using survey questionnaire. The empirical results confirm that performance expectancy, social influence, life quality expectancy, and cost expectancy have direct effects and effort expectancy has indirect effects on patients' behavioral intention to use WSN-SHHS. Several practical and theoretical implications of the research findings are discussed. In particular, the research has implications for smart home healthcare service providers, manufacturers, and designers.

Reception and Research Information Fair
3:15pm-5:00pm
Flat Tuesdays

The reception serves as a space for graduate students, faculty, and staff to connect, identify potential collaborators, and reflect on the day. The Research Information Fair will simultaneously provide information about resources available to graduate researchers at UMBC.

Thank you for making GRC a success!