

PROGRAM AND ABSTRACTS

Wichita State University

14th Annual

**UNDERGRADUATE RESEARCH AND
CREATIVE ACTIVITY FORUM—URCAF**



APRIL 8, 2014

HUGHES METROPOLITAN COMPLEX

2014 URCA FORUM

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Wichita State University
14th Annual Forum
Undergraduate Research and Creative Activity Forum—URCAF

SCHEDULE

9:00 am – 9:30 am: Registration, *Hughes Metropolitan Complex, Rm 132*

9:30 am – 12:00 pm: Oral Presentations

- Creative Activity and Performance, *Hughes Metropolitan Complex, Rm 138*
- Social Sciences and Humanities, *Hughes Metropolitan Complex, Rm 138*
- Natural Sciences and Engineering, *Hughes Metropolitan Complex, Rm 137*

10:00 am – 12:00 pm: Poster Presentations, *Hughes Metropolitan Complex, Rm 132*

1:30 – 2:00 pm: Awards Ceremony, *Hughes Metropolitan Complex, Rm 138*

Creative Activity and Performances

Hughes Metropolitan Complex, Room 138

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9:30	Nelson Spaulding	“I Know Who Holds Tomorrow”: Choral Arrangement for SATB Choir	18

Social Sciences and Humanities Oral Presentations

Hughes Metropolitan Complex Room 138

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10:15	Andrew Longhofer	They Come Not Single Spies but in Battalions	15
10:30	Thoi McNair	Gun Violence Epidemic: Midwestern College Students Sound Off	16
10:45	Tracy Anne Travis	The Presence of Donizetti's Operas in Stephen Foster's The Social Orchestra	20

Natural Sciences and Engineering Oral Presentations

Hughes Metropolitan Complex, Room 137

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10:15	David Jorgensen	Accelerometer Balance Study	14
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UPSSH3	Khondoker Usama	Color, Relevance and Eccentricity Influence Detection Performance of Changes in Driving Scenes	20

Natural Sciences and Engineering (UPNSE) Poster Presentations

Room 132

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UPNSE2	Jon Brooks	Small Scale Medical Waste Incinerator for On Site Waste Disposal	8
UPNSE3	Justin Brull	Genus-Wide Microsatellite Primers for the Goldenrods	8
UPNSE4	Lindsey Carson	A Comparison of Estimated Heart Rate and Peak Heart Rate in Firefighters and Non Firefighters	9
UPNSE5	Marina Coberly & Riley Hammond	The Secret Language of Twins: A Preliminary Study	10
UPNSE6	Justen Crane	Niobium Thin Films on Magnesium Alloy	10
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UPNSE14	Thanh Nga Van	Defining The Natural Ligand For The Anthrax Toxin Receptor	19

Afiqah Ayauf

Faculty Mentor: Katie Mitchell-Koch
Fairmount College of Liberal Arts & Sciences
Co-Authors: Rajni Verma, Katie Mitchell-Koch
Natural Sciences and Engineering Poster Presentation

MOLECULAR DYNAMICS SIMULATIONS OF ORGANIC COMPOUNDS AS PURE SOLVENTS AND IN AQUEOUS SOLUTION

Alcohol dehydrogenase enzymes are of interest for their role in biological systems and in industrial catalysis for biofuel production. An NADPH and Zn dependent alcohol dehydrogenase, YqhD, is being studied to understand its activity and specificity. In order to study enzyme-substrate interactions with molecular dynamics, first the substrates must be characterized and their force fields verified. The work presented studies several organic compounds: acetaldehyde, propionaldehyde, isobutyraldehyde, ethanol, propanol and isobutanol. Electronic structure methods with Gaussian09 have been used to compute preliminary parameters and optimize the structures of the solvent molecules. Molecular dynamics simulations using GROMACS have been carried out to calculate the density and diffusion coefficients of these substrates, and are compared with available experimental values as a preliminary step toward understanding substrate specificity and efficiency of the YqhD enzyme.

Derek Blair

Faculty Mentor: Dinorah Azpuru
Fairmount College of Liberal Arts & Sciences
Social Sciences and Humanities Oral Presentation

HIGH TIMES IN THE USA: A LOOK AT SOCIODEMOGRAPHIC FACTORS CONNECTED TO LEGALIZING MARIJUANA

Marijuana has long been considered a fringe policy issue, with most individuals historically being against any sort of legalization. Recent pushes for legalization in states such as Colorado and Washington merit wondering if changes in public opinion on a national scale are taking place. In addition to determining the extent of support for the legalization of marijuana for medical use in 2013, my research seeks to understand why some Americans are in favor of legalization while others are not. An extensive literature review showed that scant research has been done on this issue.

Using the most recent raw data available from a Gallup survey in 2013, I found that 52% of Americans support the legalization of marijuana for medical use. I ran a multiple regression test to determine which sociodemographic variables are correlated to the support for legalization. Those variables are age, gender, religiosity, education, and political ideology.

My results showed that variables such as gender and education are not correlated with favoring legalization, but that ideology, church attendance (religiosity), and age show that Americans with more liberal views, who are younger and less religious are more likely to have a favorable opinion about the legalization of marijuana.

My research concluded that there seems to be an important national shift on the issue of legalization and that sociodemographic variables play a key role in this change

Jon Brooks

Faculty Mentor: Ward Jewell

Co-Author: William Thorne

College of Engineering

Natural Sciences and Engineering Poster Presentation

SMALL SCALE MEDICAL WASTE INCINERATOR FOR ON SITE WASTE DISPOSAL

How to handle medical waste is a growing international concern. In higher economic status nations, such as the United States, medical facilities generate an average of 0.50 kg of medical waste per bed per day. Using a hypothetical 1000 bed facility, as an example, it would generate 182 metric tons of waste per year. When considering the medical infrastructure of the United States this is literally a mountain of potentially lethal material. Disposal of biological hazards are costly and the dangers to the public are great. The need of a better, faster, disposal method is necessary to adapt to present and future demands of our medical systems.

Our engineering team has purposed a small and efficient on site incinerator that will decrease the amount of time between generation and destruction of biological hazards. It will allow for safe disposal and a reduction in the amount of waste after treatment. The incinerator utilizes fluidized bed technologies primarily used by large industry. We chose this type of system due to its efficiency of combustion, making it ideally suited for this application.

We are assembling a prototype device as proof of this concept. We will show that this device presents a possible solution to handling medical waste, resolving a portion of this far-reaching health and environmental concern.

Justin Brull

Faculty Mentor: James Beck

College of Education

Co-Author: James Beck

Natural Sciences and Engineering Poster Presentation

GENUS-WIDE MICROSATELLITE PRIMERS FOR THE GOLDENRODS

Biological species are commonly established based on their morphology, which can be problematic if traits overlap or do not diverge dramatically enough to allow for discrimination. Genetic techniques, such as simple sequence repeat (SSR) genotyping can help with species delimitation in these difficult situations. The ca. 120 species of goldenrod (*Solidago*; Asteraceae) are recognized for their taxonomic complexity, a problem stemming from species richness, low overall levels of genetic differentiation, interspecific hybridization, and frequent polyploidy. The goals of this study were to develop a set of common SSR loci that could be used for species delimitation across this large, difficult group. Specifically- can SSR loci developed for one *Solidago* species be amplified across the genus?

Lindsey Carson

Faculty Mentor: Nils Hakansson

College of Engineering

Co-Authors: Lisa Donner, Ryan Amick, Ruth Ann Miller

Natural Sciences and Engineering Poster Presentation

A COMPARISON OF ESTIMATED HEART RATE AND PEAK HEART RATE IN FIREFIGHTERS AND NON FIREFIGHTERS

Firefighters have a mentally demanding job, which requires preparedness to perform important and difficult tasks instantly once called upon, causing sudden peaks in heart rate. **PURPOSE:** To determine whether Firefighters and non Firefighters are mentally synced with their heart rate during strenuous activities. **METHODS:** Six male professional Firefighters (aged 26.83 ± 6.08 years) and five male non professional Firefighters (aged 25 ± 4.64 years) participated in this pilot study. Each Firefighter and non Firefighter performed three and two progressive incline treadmill stress tests, respectively, using a further Modified Balke protocol. One test was performed while wearing regular exercise clothing only. During the second test, a vest weighted to 35.5 lbs was worn. The final test, performed by Firefighters only, was done while wearing fire gear, including boots, bunker pants, coat and helmet. For each test, heart rate was monitored via a Polar heart rate monitor, and rated perceived exertion (RPE) was collected as the subject reached a peak heart rate (PHR). RPE was used to determine the subject's estimated heart rate (EHR). **RESULTS:** Mean EHR and PHR for Firefighters was 141.67 ± 34.17 and 165.94 ± 5.50 bpm. Mean EHR and PHR for non Firefighters was 164.44 ± 21.86 and 166 ± 3.43 bpm. Paired sample t-tests show that there is not a significance difference between EHR and PHR for non Firefighters ($p=0.828$), whereas there is a significant difference between the two for Firefighters ($p=0.005$). **CONCLUSION:** As determined by this pilot study, non Firefighters are mentally synced with their heart rate, whereas Firefighters are not in regards to RPE during physical activity.

Melissa Chinn

Faculty Mentor: Joseph Keebler

Fairmount College of Liberal Arts & Sciences

Co-Authors: Dustin Smith, Brady Patzer

Social Sciences and Humanities Poster Presentation

INVESTIGATING TRAINING MODALITIES FOR COMBAT IDENTIFICATION

Combat identification (CID) training is of growing concern for the military, and aims to aid in the reduction of friendly fire incidents. Specifically, the cognitive aspects of training need to be better examined. One way to understand the cognitive and human factors underlying CID is through examining the success of different training modalities. Through this we can design training modalities and discern which training methods are more effective than others. Currently we are studying three different training modalities: 1) Traditional graphic training information cards containing line drawings, 2) Die cast miniature scale models, and 3) 3-D virtual augmented reality simulation. This research plans to assess the differences between modalities through training participants and then having them make CID decisions of images of real world vehicles. We are hypothesizing that the die cast miniature scale models will provide substantial training benefits over the other two conditions. We collected 30 participants, 10 for each training modality. Participants underwent a demographic form, a mental rotation exercise, and three cognitive tests that tested their ability to remember blocked patterns and to memorize associations between words, numbers and names. They were trained on the modality they were randomly assigned by having them interact with each of the 7 vehicles and the participants learned the critical cues for each vehicle. They then underwent a computerized test, which asked them if they recognized the tank, if the tank was an ally or a foe, and the name of the tank. Results of this research indicate that the participants trained using the die cast models scored significantly higher on identification tasks than participants trained using either the traditional graphic training information cards or the 3-D virtual augmented reality simulation. These findings suggest that there is a benefit to using physical scale models of tanks for combat identification training.

Marina Coberly & Riley Hammond

Faculty Mentor: Kathy Strattman

College of Health Professions

Co-Author: Kathy Strattman

Natural Sciences and Engineering Poster Presentation

THE SECRET LANGUAGE OF TWINS: A PRELIMINARY STUDY

Purpose: To gain a better understanding about speech and language development and its relationships to early use of twin talk in fraternal and identical twins.

Method: An online survey consisting of 23 questions was completed by 10 fraternal (FT) and 11 identical (IT) twins' ages 21 months to 63 years (Means 17 and 27, median 21 and 21 respectively) or parents of the twins. Questions included information on motor and language development, use of twin language, and sibling comparative data.

Findings and interpretations: Motor development was determined by walking age. Results showed 60% of FT and 82% of IT walking at 1 year or before. Typical language development was measured by use of short sentences at 18 months with 90% of FT and 82% of IT using short sentences by 18 months. Twin talk used by 60% in FT and 73% in IT. Twin talk was used more prevalently in same gendered pairs (75%) than combined gender pairs (40%). FT stopped using twin talk before at about four years of age whereas IT continued using twin talk into early elementary school. Participants reported that most of the siblings had no delays or problems with reading, writing, spelling or hearing.

Conclusion: While this is a preliminary study and further research with larger sample sizes and a wider demographic is under way, initial findings suggest that more twins used their own language than was expected especially same gender pairs. The data shows a trend that twin talk favors same gendered pairs over combined gender pairs. Additional data are needed to determine more explicitly whether twins have specific speech-sound or language development patterns as they begin to use more words and longer utterances.

Justen Crane

Faculty Mentor: Anil Mahapatro

College of Engineering

Co-Author: Hakim Jehanzeb

Natural Sciences and Engineering Poster Presentation

NIOBIUM THIN FILMS ON MAGNESIUM ALLOY

Internal fracture fixation devices continue to be used, necessitating development of biodegradable materials to eliminate the need for a resurgery to remove these devices. Magnesium (Mg) based materials are being explored as a potential biodegradable metal for these applications, however prolonged degradation of Mg is needed. The primary purpose of this study was to electroplate a Niobium coating over Magnesium to control its biodegradation. Mg is a naturally occurring trace element and is able to be reabsorbed by the body, and Nb is osteoconductive with a highly protective oxide layer which gives protection until the bone may support itself. The difficulties in electroplating the two alloys lie in developing an electrolyte which can sufficiently dissolve the niobium salt and simultaneously conduct a current. Process parameters such as time of deposition, electrolyte pH, and composition were investigated. Electrodeposited samples were characterized using optical and scanning electron microscope (SEM) for topographic feature. SED-EDS analysis were conducted to determine elemental composition of Nb deposited. SEM-EDS results indicated an percent atomic deposition of up to 35.5% Nb. This plating provided enhanced corrosion protection to Mg however SEM images suggested further optimization is required to obtain a pore free coating. Recommendation for further studies include investigation into more stable salts, a stronger solvent, and an electrolyte which is able to conduct a current with little impedance.

Joseph Dakora

Faculty Mentor: Ngoyi Bukonda

College of Health Professions

Co-Author: Ngoyi Bukonda

Natural Sciences and Engineering Oral Presentation

COMPLEMENTARY AND ALTERNATIVE MEDICINE AND HEALTH CARE ACCESSIBILITY IN GHANA

Introduced in Africa by colonialism between 1880 and 1960s, Western conventional medicine (WCM) has failed to provide universal access to health care and has left many Africans without access to quality health care. Contributing to this situation are factors such as inadequate number and insufficiently equipped health facilities, limited availability of trained personnel and medical supplies, and reliance of WCM on approaches that are sometimes insensitive to the cultural values of the African populations. To remedy this state of affairs, suggestions have been made to promote complementary and alternative medicine (CAM) which not only covers a heterogeneous spectrum of ancient to new age approaches used to prevent or treat disease but also has more desirable features in terms of physical accessibility, financial affordability and cultural fitness. This promotion is not an easy task given that CAM has been also challenged for its general lack of documented proof of effectiveness and safety and that African governments simultaneously face many other competing issues. It is unclear whether or not African countries such as Ghana have indeed designed and implemented effective policies aimed at promoting CAM. In order to shed some light on this issue, we have researched studies and official reports on CAM in Ghana and we have conducted a critical review of any available documents. This critical documentary review reveals that Ghana has initiated a process of CAM promotion, including but not limited to formulation of a vision and creation of CAM research structures. However, these efforts have been hampered by various difficulties at the conceptual and implementation stages. Additional efforts are needed to really make CAM in Ghana to emerge as a strong element for increased accessibility to health care for the Ghanaian populations.

Lisa Donner

Faculty Mentor: Nils Hakansson

College of Engineering

Co-Authors: Lindsey Carson, Ryan Amick, Ruth Ann Miller

Natural Sciences and Engineering Poster Presentation

TIME TO TARGET HEART RATE IN PROFESSIONAL FIREFIGHTERS WEARING A WEIGHTED VEST VERSUS FIREFIGHTER GEAR

Firefighters must have the ability to perform difficult tasks while carrying the weight of their fire gear. The Candidate Physical Ability Test (CPAT) is a physical exam that tests a candidate's ability to perform firefighting tasks while wearing a 50-lb weighted vest to simulate the weight of a firefighter's gear. **PURPOSE:** To determine whether a weighted vest accurately simulates gear in regard to heart rate (HR) activity of professional Firefighters during physical activity. **METHODS:** Six male professional Firefighters (26.83 ± 6.08 years) participated. Each subject performed two progressive incline treadmill stress tests using the Modified Balke protocol, which was further modified to reduce test time. One test was performed while wearing a weight-vest of 35.5 lb simulating fire gear without the self-contained breathing apparatus (SCBA). The second test was performed while wearing fire gear, including boots, pants, coat and helmet. Tests were randomized and performed with a six-day break between tests. Target heart rate (THR) was calculated for each subject using the equation $(220 - \text{Age}) \times 0.85$. For each test, HR was measured with a heart rate monitor and time to THR was recorded. **RESULTS:** Mean time to THR was 570.5 (± 91.55) seconds and 511 (± 92.79) seconds with vest and gear, respectively. A paired sample t-test indicates there is a significant difference between time to THR while wearing fire gear and a weight-vest ($p=0.026$). **CONCLUSION:** As determined by this study, a weight-vest does not accurately simulate fire gear with regard to time to THR of professional Firefighters during physical activity.

George Elkouri

Faculty Mentor: Moriah Beck

Fairmount College of Liberal Arts & Sciences

Co-Authors: Yan Hong, Chamitha Weeraman, Fariba Behbod, Moriah Beck

Natural Sciences and Engineering Poster Presentation

TRANSLATIONAL STUDIES OF THE ROLE OF PALLADIN IN BREAST CANCER INVASION

Palladin is an actin binding protein that is overexpressed in cancer cells. Actin is responsible for cytoskeletal structure and cell motility. Studies have shown that when palladin expression is knocked down in cancer cell lines, it also reduces cell motility. One aspect that has not been determined is whether the overexpression of palladin is the sole trigger of increased cell motility. This is because previous studies have involved isolated human breast cancer cell lines, which are a poor model of the complex cancer cell environment for examining the effect of palladin overexpression. Dr. Fariba Behbod has developed a new model, which involves delivery of human breast cancer cells into mouse mammary ducts. Through a collaboration between the Behbod and Beck labs, this model was used to better determine whether palladin is able to solely affect cancer cell motility. Since this model imitates the whole process of cancer cell progression, the role of specific genes in regulating cancer progression and metastasis can be assessed. One goal of this research was to create both a palladin overexpression construct and knockdown construct. Creating the overexpression construct involved the PCR amplification of palladin followed by two recombination reactions, whereas the knockdown construct involved subcloning a shRNA sequence. The constructs were then transfected into both cancer cell lines and the mouse to determine how palladin expression influences cancer progression directly. Migration and invasion assays showed that cells with the palladin knockdown construct had reduced motility and cells with the palladin overexpression construct had increased motility. This is an ongoing study that will ultimately include xenograft data from the mouse. The results so far show a clear correlation between palladin expression and invasive motility. This research suggests that palladin plays an important role in cancer cell motility.

Sharon Glaser

Faculty Mentor: Kathy Stratman

College of Health Professions

Social Sciences and Humanities Oral Presentation

PHONOLOGICAL AWARENESS AND EARLY INTERVENTION

Studies have shown that the explicit instruction of phonological awareness (PA), an individual's ability to attend to and manipulate the sound structure of a spoken word, significantly influences later literacy. Current research being conducted is looking at the duration and intensity of PA instruction. The purpose of this study was to examine the effect of low-intensity, short duration PA intervention upon preschool-aged children with the following questions:

Is there a difference in the pre-and post-test phonological awareness scores of children in PA intervention? Is there a gain difference made in phonological awareness task scores between typically developing children and children with identified speech and/or language (SL) impairment in PA intervention? Forty children (21 males, 19 females) aged 2:5-5:10 (12 SL impaired) participated in a weekly literacy development class with caregivers, containing fifteen minutes of PA instruction. Paired sample t-tests of pre- and post-scores evidenced significant improvement. Independent sample t-test showed no significant difference between "groups" in gain scores. This suggests that explicit PA instruction, even of short duration and low intensity, yielded positive results, for both typically developing children and children with SL impairments.

Ariel Fluharty

Faculty Mentor: William Hendry
Fairmount College of Liberal Arts & Sciences
Natural Sciences and Engineering Oral Presentation

ASSESSMENT OF THE HAMSTER CHEEK POUCH FOR XENOTRANSPLANTATION STUDIES OF HUMAN OVARIAN TUMOR TISSUES

According to the American Cancer Society and other independent sources, ovarian cancer is most lethal gynecological cancer in America. The disease is difficult to diagnose, treatment options are limited, and resistance to them almost always develops. We are conducting a pilot translational research project to evaluate the hamster cheek pouch for xenotransplantation studies designed to potentially improve the diagnosis, prognosis, and personalized treatment of ovarian cancer. The rationale is that the hamster cheek pouch is an immunologically privileged and particularly convenient site able to accept both homo- and xeno-transplanted cells, tissues, and organs. Other advantages of the cheek pouch system are that: 1) The surgical procedures are very simple and require no special equipment or animal maintenance facilities; 2) The transplant grows in a structurally compliant and physiologically normal environment; 3) The transplant can be evaluated repeatedly (measured, photographed, etc.) by simple eversion of the pouch from an anaesthetized animal; and 4) The transplant will respond to systemically delivered agents. Indeed, we did observe: 1) rapid and robust neovascularization to human ovarian tumor tissue fragments introduced into host cheek pouch sites and 2) maintenance of viable xenotransplant masses there for at least four weeks. Next, we conducted immunohistochemistry on formalin-fixed and paraffin-embedded tissue samples to analyze the expression of specific proteins at the cellular level both in the donor human tumor tissues and in the viable transplant masses generated from those tumor tissues. Our preliminary results include protein-staining patterns that were well-correlated between the pre- and post-transplanted tissues. Some examples are: 1) cytoplasmic localization of the BRCA1 tumor-suppressor protein and 2) nuclear localization of the Sp1 transcription factor protein. These results do provide Proof-of-Principle that the hamster cheek pouch transplantation system is amenable to the development and assessment of new diagnostic, prognostic, and therapeutic strategies that target human ovarian cancer.

Anosh Gomes

Faculty Mentor: Marlon Thomas
College of Engineering
Natural Sciences and Engineering Poster Presentation

PRODUCTION OF THE RED PIGMENT PRODIGIOSIN IN SERRATIA MARCESCENS USING FED-BATCH BIOREACTORS

Prodigiosin is a red, linear tripyrrole compound that is produced as a secondary metabolite by several families of bacterial species including some strains of *Serratia marcescens* (*S. Marcescens*). Prodigiosin was first isolated as a pure form in 1929 and has since been shown to have strong immunosuppressive, antibacterial, antimycotic, anticancer, and antimalarial activity. For this reason, prodigiosin has received much attention from researchers in the recent years. Numerous studies have shown to prove the above stated functions of prodigiosin. Although prodigiosin has numerous attractive qualities there is minimal knowledge in the extraction process of prodigiosin from bacterium. This research project aims to design and develop a bioprocess whereby prodigiosin could be produced and extracted in a fed-batch bioreactor. In this project, *Serratia Marcescens* is cultured on semi-solid media using standardized cell culture techniques and used to inoculate the bioreactor for production and extraction of prodigiosin. A fed-batch reactor was proposed for this due to past report on prodigiosin production and due to its overall simplicity. This reactor system allows optimum production using a simplistic design that could be produced easily at minimal cost and allows careful monitoring of the culture media. The results of this project will enhance our knowledge of prodigiosin production and may facilitate commercial scale production in the future.

Kayla Jensen

Faculty Mentor: Anil Mahapatro

College of Engineering

Co-Authors: Anil Mahapatro, Zheng Song, Shang-You Yang

Natural Sciences and Engineering Oral Presentation

EFFECT OF PCL AND PDDL POLYMER COATINGS ON THE DEGRADATION RATE AND BIOCOMPATIBILITY OF MAGNESIUM

The permanence of cardiovascular stents and internal orthopedic fixation devices often causes problems; thus, it would be advantageous to make these devices biodegradable to prevent or minimize the issues caused by their long-term use. Magnesium is a biodegradable and biocompatible metal that is currently being investigated for its potential use in these implants, but its rapid degradation in vivo poses issues about its use. In order to slow down the rate at which magnesium corrodes, polymer coatings have been explored, because they have the potential to be loaded with drugs to help prevent adverse tissue reactions caused by the implant. However, limited knowledge exists on the effect of polymer characteristics on the degradation and biocompatibility behavior of magnesium alloy. In this study, the effects of polymer structure [polycaprolactone (PCL) and poly-ε-pentadecalactone (PPDL)], molecular weight and coating thickness on the degradation and biocompatibility behavior of magnesium were investigated. Results showed that PCL coatings, with varying molecular weights (45,000 vs. 70,000-90,000) but similar thickness did not significantly change the corrosion rate. On the other hand, the magnesium samples (similar molecular weights) with the thicker PCL coatings (930 μm) were more corrosion resistant than those with the thinner coatings (160 μm). The effects of the PCL and PDDL coatings on the biocompatibility of magnesium were also investigated with elution cell studies. Polymer coatings did not significantly affect the normal cell growth but they markedly enhanced the biocompatibility of bare magnesium alloy samples, which showed systemic toxicity due to their rapid corrosion.

David Jorgensen

Faculty Mentor: Nils Hakansson

College of Engineering

Natural Sciences and Engineering Oral Presentation

ACCELEROMETER BALANCE STUDY

A recent application has been developed to use the tri-axial accelerometers to determine a person's balance. The application measures the person's accelerations at the chest level. Alternatively, some research literature proposes that the best location to assess accelerations for balance is at a person's center of mass – estimated to be the lumbar-3 vertebrae (L3). It is unclear whether there exists a better location (ie., chest or L3) to assess balance. Purpose: To compare variances of accelerometers located at the chest and L3. Methodology: 26 college-aged subjects (14 male, 12 female) participated in the study. Zephyr's Bioharness™ 3 (BH3) were used to record tri-axial accelerations. BH3 accelerometers were placed on the subjects' mid-sternum and L3. BH3 placements were based on anthropometric measures. The subjects were instructed to stand on their non-dominant leg with their eyes open. Data was recorded for 10 seconds while the subjects tried to maintain their balance. Results: The mean variance of the accelerations in the frontal (X) and sagittal (Y) planes for the Chest accelerometer were 0.0755 (± 0.252) and 0.0202 (± 0.0492) respectively, and for L3 accelerometer were 0.0176 (± 0.0411) and 0.0361 (± 0.0765) respectively. Paired samples t-tests revealed no significant difference between the Chest X and L3 X (p = 0.174) or between the Chest Y and L3 Y (p = 0.285). A very high correlation was found between the Chest X and L3 X (r = 0.984, p = 0.000), however, a correlation between the chest Y and L3 Y was not observed (r = 0.365, p = 0.067). Conclusion: There is a correlation and no significant difference between the Chest and L3 frontal plane acceleration variances. Additionally, there is no correlation or significant difference between the Chest and L3 sagittal plane acceleration variances.

Emily Lancaster

Faculty Mentor: David Eichhorn

Fairmount College of Liberal Arts & Sciences

Co-Author: David Eichhorn

Natural Sciences and Engineering Poster Presentation

SYNTHESIS OF IRON (III) NNS COORDINATION COMPLEXES

Synthesizing complexes to model the active sites of enzymes can be useful for researching functionality of biological processes. These complexes, if proven to have catalytic activity, can also be used in industrial settings to increase efficiency, or potentially in drug design. Modeling of organometallic enzyme active sites can be achieved using metal coordination compounds with ligands similar to the amino acid residues in the protein. Ligands containing imino nitrogen and thiolate sulfur are typically not air stable, and therefore difficult to use to model enzymes. Dr. Eichhorn's lab has shown that 2,2'-dithiodibenzaldehyde (DTDB) is an air-stable compound that can be used to form stable mixed N/S coordination complexes with a series of metals. DTDB has been combined with *N,N'*-dimethylethylenediamine (dmen) and Ni salts to produce models for superoxide dismutase. Similar coordination complexes with iron, which is also prevalent in biological systems, could have catalytic properties. We report studies investigating whether an Fe(NNS)₂ complex with catalytic properties can be produced by reacting DTDB, dmen, and iron (III) salts. These were combined, changing the order of addition, length of reaction time, solvents, counterions, and other experimental variables. Mass spectrometry shows a peak consistent with the desired NNS ligand, but no Fe(NNS)₂ complex has yet been isolated or crystallized. However, byproducts of the reaction have been successfully characterized, including one new compound, the crystal structure of which will be presented.

Andrew Longhofer

Faculty Mentor: Carolyn Shaw

Fairmount College of Liberal Arts & Sciences

Social Sciences and Humanities Oral Presentation

THEY COME NOT SINGLE SPIES BUT IN BATTALIONS

The April 1982 invasion of the Falkland Islands by Argentine forces and the two-month military response by the United Kingdom produced surprise and chagrin through the international system. This paper examines the historical, economic, political, and personal factors that should have predicted this interstate territorial dispute and rendered the international system ill-equipped to respond to the conflict and explores their effects on the prospect for peace thirty years hence. This research applies the concepts of the realist and liberal theories of international relations to the specific conflict through a case study methodology reviewing the responses of international organizations, period news media accounts, and contemporary interviews with political and military leaders as well as studies analyzing a particular element of the conflict from the international, domestic, and personal levels of analysis. Further, it generalizes these concepts to the potential future causes of global conflict by examining the three decades of peace in spite of demonstrably larger incentives for dispute that have emerged since the ceasefire agreement. While Argentina and the United Kingdom have maintained their mutually exclusive positions regarding their claims to the Falkland Islands, and while a robust economy has emerged in the Falkland Islands in part due to fruitful petroleum exploration in surrounding maritime territory, it appears unlikely that this dispute will erupt into another full-scale military conflict in the immediate future in light of economic pressures, shifts in international norms and conflict resolution methods, democratic peace, and war-weariness.

Thoi McNair

Faculty Mentor: Rhonda Lewis

Fairmount College of Liberal Arts & Sciences

Co-Authors: Rhonda Lewis, Jamie LoCurto, Kyrrah Brown, David Stowell

Social Sciences and Humanities Oral Presentation

GUN VIOLENCE EPIDEMIC: MIDWESTERN COLLEGE STUDENTS SOUND OFF

America's gun violence epidemic has captured the attention of mainstream media and catapulted this issue into a societal frenzy demanding immediate action. This research will examine how the different media outlets influence college students' perceptions surrounding gun violence and what they perceive are the core issues.

A total of 419 Wichita State University college students (Mage=28 years) participated in an on-line survey. Participants completed a 52-item questionnaire about consumption of media, mental health issues, perceived causes of gun violence and gun ownership.

Preliminary results indicate that participants used traditional media sources ($M=3.70$, $SD=.78$) more often than social media sites ($M= 1.92$, $SD=.65$). Moreover, there was no relationship between the frequency in which participants logged into preferred social media sites and how often participants researched the details of the gun control laws in the last 12 months ($r= -.13$, $p<.001$). The relationship between the frequency in which participants watched or read traditional media sources (e.g., TV news, newspaper) and how often participants researched the details of the gun control laws was weak but it was statistically significant ($r= .25$, $p<.001$). Finally, the top three factors participants believed to be the cause of gun violence were 1) bullying, 2) poor identification and treatment of people with mental illness and 3) a decline in parenting and family values.

Overall, the results indicate that college students tend to rely on traditional media sources more than social media to stay current on news. In addition, it appears that students, who use traditional media sources more often, may also tend to be more likely to do their own research regarding the topic of gun control. It also appears that students perceive the causes of gun violence to be social and environmental in nature. Limitations and implications for future research will be discussed.

Jacob Newkirk

Faculty Mentor: Nils Hakansson

College of Engineering

Natural Sciences and Engineering Poster Presentation

VALIDATION OF ACCELEROMETER DATA FOR JOINT REACTION FORCE CALCULATIONS

The purpose of this study was to examine the validity of ground reaction and joint reaction force data gathered by an accelerometer mounted on the medial malleolus. Eight adult participants (four male, four female) completed a variety of movement tasks, with an emphasis on lateral "cutting" movements. Each participant was equipped with two Biometrics accelerometers and 38 spherical markers used to collect 3D motion data. Movements were designed such that one foot would strike a force plate in the center of the capture volume. Data was then processed using Motion Analysis Cortex and OpenSim. Preliminary analysis shows a strong correlation between forces calculated using the force-plate and the accelerometers. Further analysis is in progress with the objective of determining the specific nature of this correlation.

Chelsea Nemeth

Faculty Mentor: Antje Mefferd
College of Health Professions
Social Sciences and Humanities Poster Presentation

**TONGUE MOTION DURING SPEECH IN PERSONS WITH PARKINSON'S DISEASE:
EFFECTS OF SPEECH MODIFICATIONS**

Purpose: Parkinson's disease (PD) affects the ability to produce intelligible speech. Although speech characteristics of persons with PD are well-described in the literature (i.e., a soft-spoken voice, reduced speech precision) and speech deterioration is known to have profound effects on the person's communicative abilities, the specific articulatory deficits that underlie these speech problems and how they can be improved in therapy remains relatively unclear. This study sought to 1) identify disease-related articulatory deficits and 2) determine if speech behavioral modifications (i.e., loud and clear speech) improves articulatory performance in persons with PD.

Method: Six persons with PD and six controls repeated a sentence as they normally would speak, after which they were instructed to speak as clearly as possible, and to speak louder than their typical speech. The electromagnetic articulograph was used to measure the range of motion of the tongue during these sentence productions.

Results: Data analysis is currently underway. Range of tongue motion will be compared across speech conditions as well as between groups. Results will be discussed with regards to their implications for speech treatment.

Joshua Palacios

Faculty Mentor: Anil Mahapatro
College of Engineering
Natural Sciences and Engineering Poster Presentation

**COMPUTATIONAL SIMULATION OF DRUG ELUTION FROM POLYMERIC
MICROSPHERES**

When developing drug delivery systems researchers are concerned with optimizing the initial quantity of drug to be loaded in the delivery system to obtain the desired drug concentration in the body. Current methods of optimizing drug delivery systems are based on experimental trials and could be time consuming and very expensive. In order to arrive to improved drug delivery systems, faster and cheaper, the use of mathematical modeling and computational simulation for optimization of drug delivery systems can be utilized. The focus of this research was to create computational simulations to model the diffusion of drugs thorough polymeric microspheres and provide insight on the variables that affect the rate of drug diffusion. Fundamental mathematical equations between the drug delivery system and body were utilized to model the diffusion of insulin from poly methyl methacrylate (PMMA) microspheres. Fick's 2nd law of diffusion was chosen as the model system however the same principles could be applied to optimize the drug delivery for any desired drug / delivery system. COMSOL Multiphysics software was used to set up and solve our computer models. Once our computer models were designed and ready, different simulations were run changing specific variables such as microsphere size, shell thickness, and initial drug concentration. To test out the model, different known diffusion properties of insulin and PMMA were used. Currently work is being done to develop a module that will be able to interpret the data given from the different simulations and acquire the parameters needed to optimize the given drug delivery system. Ongoing research is being conducted to obtain an optimal polymer shell thickness, initial drug concentration, and microsphere diameter for a chosen drug / polymer system. Thus these models show promise in optimizing drug delivery systems for any given drug / polymer combination.

Nelson Spaulding

Faculty Mentor: Tom Wine

College of Fine Arts

Creative Activity and Performances Oral Presentation

“I KNOW WHO HOLDS TOMORROW”: CHORAL ARRANGEMENT FOR SATB CHOIR

The purpose of this activity, is to rearrange a previously written song in a twenty-first century style for an SATB (soprano, alto, tenor, bass) choir. This song was originally written by Christian composer Ira Stanphil, and has been performed by other artists in the sixties and seventies. I wanted to take this happy, gospel sounding song and add more emotion and movement to it than what was originally conveyed. By adding sad sounds into a song that was originally full of only happy sounds, I attempted to portray the path one's life can sometimes take, from the good times to the bad, but always arriving at a happy place. I started out by first changing the harmonic structure of the song, which was the chords in the accompaniment. By changing a few of these happy chords into sad chords, or unresolved chords, I gave emotional momentum to the harmony that complimented the emotional momentum of the melody. After that, I added three-part harmony to the melody line, which resulted in a four-part vocal score. The vocal score occasionally breaks up into more parts as the song progresses, adding further depth to the text or lyrics. After that, I added a piano accompaniment line. The result is a choral arrangement of the piece with a piano accompaniment in the style of a twenty-first century composition. The song has undergone multiple revisions and is still being revised, but it is almost complete. I will be revising this song continually until I feel that the vocal parts are both beautiful, meaningful and performable, and until I feel that the accompaniment line is beautiful, augments the choral and is performable.

Nathan Templon

Faculty Mentor: Atri Dutta

College of Engineering

Natural Sciences and Engineering Oral Presentation

GRAVITY ASSIST TRAJECTORY OPTIMIZATION

Space is the final frontier, and exploring its vast reaches is one of the greatest challenges mankind has undertaken. However, moving around in space is expensive. Exploring the cosmos requires large amounts velocity change (ΔV). Changing velocity requires fuel, which is expensive. Because of these costs, it is advantageous to explore more efficient methods of moving around the Solar System.

In this project, one such method of maneuvering in space will be explored – gravity assist. Specifically, a trajectory from the Earth to a highly inclined heliocentric orbit using gravity assist from Jupiter to increase inclination will be considered. This orbit was selected because few spacecraft have explored the polar regions of the Sun, and a spacecraft in this orbit would be capable of studying the solar magnetic fields and wind there. By calculating the ΔV for a traditional Hohmann-like transfer and plane change maneuver trajectory and by comparing it to the ΔV required for a gravity assist trajectory, the practicality of gravity assists will be demonstrated. To determine the trajectory for this case, software will be developed, incorporating a solver of Lambert's Problem. The spacecraft is assumed to use a chemical engine, so its maneuvers can be treated as impulsive. In between maneuvers, the spacecraft follows the natural conic section trajectory around the central body (planet or sun). The spacecraft's overall trajectory can be formed by patching together conical orbits from different phases of the transfer.

Chelsea Thomas

Faculty Mentor: Douglas Parham

College of Health Professions

Co-Author: Douglas Parham

Natural Sciences and Engineering Poster Presentation

SPEECH BREATHING DURING TURN-TAKING IN MOTHER-INFANT INTERACTIONS

In the first years of life, infants develop the ability to interact with others (Oller et al., 2001; Papaeliou et al., 2002). As the complexity of an infant's vocalizations changes over time, the infant becomes more effective as a social communicator (Oller, 2000; Stark, et al., 1993). We do not know how infants alter vocalization and respiration when communicating with a partner. Specifically, the mother-infant interaction literature has not explored speech breathing during turn-taking (Jaffe et al., 2001; Papoušek & Papoušek, 1989). The adult speaker can control the speech breathing mechanism during conversational turn-taking. What is not known, however, is how infant speech-related breathing influences adults (Boliak et al., 1996; Parham et al., 2011). This pilot study is part of a larger study exploring speech breathing during turn-taking in a mother-infant pair during communicative interaction. Speech output and respiratory movements were collected on a 15-month infant and his mother during vocal interaction. We used the audio and breathing signals to identify utterances during turn-taking events and the breath cycles associated with them. Our pilot data show that for this mother-infant pair, speech breathing during turn-taking events was not only measureable, but also suggested that the mother altered her breathing in anticipation of the turn-taking event. In our future recordings, we predict that for both mothers and infants, utterances and the breathing behaviors that support them will be less variable during turn-taking events than during non-turn-taking events. Speech breathing is foundational to speech production, but we know little in terms of speech breathing development in infants (Parham, 2013). Understanding typical speech-related breathing might lead to early identification of infants at risk for communicative impairments.

Thanh Nga Van

Faculty Mentor: James Bann

Fairmount College of Liberal Arts & Sciences

Natural Sciences and Engineering Poster Presentation

DEFINING THE NATURAL LIGAND FOR THE ANTHRAX TOXIN RECEPTOR

Capillary Morphogenesis Protein 2 (CMG2) is a host cell receptor that is responsible for movement of the heptamer of the anthrax protective antigen (PA) into host cells via endocytosis. CMG2 was identified as an upregulated gene during endothelial cell (EC) morphogenesis, and was found to be most prominently expressed in human placenta. Further, CMG2 was found to be localized to the endoplasmic reticulum, and was found to bind collagen type IV and laminin. The enhanced expression of CMG2 on endothelial cells during EC morphogenesis suggests that this protein may play an important role in assembling basement membrane matrix. CMG2 contains a von Willebrand factor A (VWA)-integrin like domain that is responsible for binding to PA, and may be the same site that binds collagen type IV. However, recent crystallographic studies by Brondijk and coworkers suggest that the interface for collagen type III is distinct from the metal ion dependent adhesion site (MIDAS) observed in the integrin $\alpha 2 \beta 1$ -collagen structure, and between PA and the VWA domain of CMG2. To investigate the interactions between collagen, PA and CMG2, we applied a pulse proteolysis assay in which various complexes were mixed and then treated with the protease thermolysin. Our studies indicate that collagen type IV competes with PA for the same binding site on CMG2, but not type I. These results have implications for the interaction between collagen type IV and CMG2, and for the pathogenesis of anthrax.

Tracy Anne Travis

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College of Fine Arts

Social Sciences and Humanities Oral Presentation

THE PRESENCE OF DONIZETTI'S OPERAS IN STEPHEN FOSTER'S THE SOCIAL ORCHESTRA

In 1854, American songwriter Stephen Foster published a collection of popular tunes arranged primarily for flute and violin. The collection, entitled *The Social Orchestra*, included some of his own compositions, but the main body of the work came from Italian operas, including those of Gaetano Donizetti. Foster's New York publishers marketed the work as a conveniently-bound resource for amateur musicians in social settings. The tunes were at once 'popular' as well as 'tasteful.' Foster received a mere \$50 for the work upon which he had spent months working, but *The Social Orchestra* enjoyed a large sale and was reprinted for several decades. Scholars have argued that *The Social Orchestra* was published as a response to a perceived need for 'tasteful' instrumental music arranged in parts. Opera was viewed by many as higher-class, but it was a lucrative style for music publishers. While scholars have noted this overlap in *The Social Orchestra*, the discussion has not focused on how music publishers were offering opera excerpts specifically to instrumentalists or how Foster arranged the melodies. In this paper, I compare Foster's collection to similar instrumental volumes published around 1854 and also examine how Foster treats the music of Donizetti. The work of Foster's publishers to expand the presence of opera within the instrumental repertoire was more than the fulfillment of some philosophical duty to elevate the taste of the music-loving public. With the narrative stripped, did the melodies become more abstract, musical arrangements, or mere beat-keeping ditties for the dance floor? I found that while the collection does display some creativity on Foster's part which makes the arrangements unique among the repertoire available at the time, the work is intended for parlor dance parties, meaning versatility and clarity of form trump more abstract goals of instrumental music valued by Foster's critics.

Khondoker Usama

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College of Engineering

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Social Sciences and Humanities Poster Presentation

COLOR, RELEVANCE AND ECCENTRICITY INFLUENCE DETECTION PERFORMANCE OF CHANGES IN DRIVING SCENES

Background: The ability to detect sudden onset of events while driving is critical for driving safety. This study explored how factors such as color, relevance to driving and eccentricity of changes influence the detection performance of driving scenes. Method: A change detection paradigm using real-world driving scenes was used (McCarley, et al, 2004). Participants detected the only change in a pair of driving images. The changes varied in color (green, red or other colors), eccentricity (peripheral versus central), and relevance for driving (related versus unrelated). An eye-tracker monitored participants' eye scanning patterns. Results: Behavioral and eye movement data suggested that color, relevance to driving and eccentricity all influence change detection performance of driving scenes. Changes in red were detected quicker and with fewer fixations than changes in green or other colors; Changes relevant to driving (such as appearance of a stop sign or a car) was detected significantly quicker and with fewer fixations than changes not relevant to driving (such as grass color change or onset of an advertisement post); Participants detected changes appearing in the center quicker than changes appearing in the peripheral location of the scenes. The saccadic amplitude was smaller for changes in the center than changes in the peripheral location. In summary, change detection performance is better for red, relevant and central changes (McCarley et al., 2004; Zwahlen & Schnell, 1997). Applications: This study can potentially be used to guide the design of the road and advertisement.