

**PROGRAM AND ABSTRACTS**

**Wichita State University**

15th Annual

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



**APRIL 7, 2015**

**HUGHES METROPOLITAN COMPLEX**

# 2015 URCA FORUM

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**Wichita State University**  
15<sup>th</sup> 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

- Social Sciences and Humanities, *Hughes Metropolitan Complex, Rm 138*
- Natural Sciences and Engineering, *Hughes Metropolitan Complex, Rm 130*

**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*

**Social Sciences and Humanities Oral Presentations****Hughes Metropolitan Complex Room 138**

| <b>Presentation Time</b> | <b>Presenter's Name</b>  | <b>Presentation Title</b>   | <b>Abstract Page</b> |
|--------------------------|--------------------------|---|----------------------|
| 9:30                     | <b>Lindsey Stillwell</b> | A Lost History: An Ethnography of the Historic Dunbar Theatre   | 19                   |
| 9:45                     | <b>Lydia Ibarra</b>      | Shaping the Ideal Stepfamily: Myths and Stressors   | 12                   |
| 10:00                    | <b>Colyn Jones</b>       | Searching for Demoralization in the MCMII-III   | 12                   |
| 10:15                    | <b>Gage Webb</b>         | Manufacturing's Relationship to Economic Growth in Wichita  | 21                   |
| 10:30                    | <b>Joy Foster</b>        | Barriers to Healthy Eating and Physical Activity in African American Women at Risk for Peripheral Arterial      | 9                    |
| 10:45                    | <b>Hailey Lundin</b>     | Preliminary Validation of a Psuedo-Physiological Test Bench in Accelerated, Dynamic, Eletrochemical, Conditions | 14                   |
| 11:00                    | <b>Mary Maneth</b>       | Nosecone Flow Visualization   | 15                   |

**Natural Sciences and Engineering Oral Presentations****Hughes Metropolitan Complex, Room 130**

| <b>Presentation Time</b> | <b>Presenter's Name</b>    | <b>Presentation Title</b>  | <b>Abstract Page</b> |
|--------------------------|----------------------------|--|----------------------|
| 9:30                     | <b>Ryan Becker</b>         | Optimization of nanoparticle-embedded scaffolds to improve neural cell remyelination through Raman micro-spectroscopy      | 7                    |
| 9:45                     | <b>Colton Turner</b>       | Pedestrian Detection In A Night Time Driving and Texting Task  | 20                   |
| 10:00                    | <b>Rustin Clark</b>        | Examination of Hand Kinematics for the Development of Assisive Orthotics   | 9                    |
| 10:15                    | <b>Matthew Wong</b>        | Method for Culturing Bacterial Colonies on Agar Coated Microscope Slides Using the Strain: Bacillus Megaterium             | 23                   |
| 10:30                    | <b>Christopher Thacker</b> | Developing a Targeting System for Bacterial Membranes  | 19                   |
| 10:45                    | <b>Qi Heng Weng</b>        | Optimal Design of Gas Diffusion Layer of Polymer Electrolyte Membrane Fuel Cells using Biomedical Porosity and Wettability | 22                   |

**Social Sciences and Humanities (UPSSH) Poster Presentations**

**Hughes Metropolitan Complex Room 132**

| <b>Presentation</b> | <b>Presenter's Name</b>    | <b>Presentation Title</b>  | <b>Abstract Page</b> |
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| UPSSH1              | <b>Lindsey Regier</b>      | Mother-Infant Interaction: The Role of Speech Breathing  | 18                   |
| UPSSH2              | <b>Lauren Berry</b>        | Characteristics of Child Utterances During Teacher-Led Music Experiences in a Speech-Language Preschool                            | 7                    |
| UPSSH3              | <b>Maha Madi</b>           | Reducing Medication Administration Errors in Emergency Medical Services through the Implementation of a Verbal Verification Method | 14                   |
| UPSSH4              | <b>Ashton Pfannenstiel</b> | An Investigation of the Usability and Functionality of Fitness-Tracking Devices  | 17                   |
| UPSSH5              | <b>Riley Krehbiel</b>      | Born and Raised or Here to Stay?: Native and Transplant Constructions of Authenticity in New Orleans                               | 13                   |
| UPSSH6              | <b>Hannah Maine</b>        | University Students' Satisfaction With Independent and Group Projects  | 15                   |
| UPSSH7              | <b>Kelly Ha</b>            | Sports Playing to Improve Visual Functions   | 10                   |

**Natural Sciences and Engineering (UPNSE) Poster Presentations**

**Hughes Metropolitan Complex Room 132**

| <b>Presentation</b> | <b>Presenter's Name</b>          | <b>Presentation Title</b>   | <b>Abstract Page</b> |
|---------------------|----------------------------------|---|----------------------|
| UPNSE1              | <b>Tyler McGinnis-Extine</b>     | Effect of dwell time and dwell length on friction coefficient in machining under minimal-quantity lubrication       | 16                   |
| UPNSE2              | <b>Kaitlyn Howard</b>            | Fourier Transform Infrared Spectral Biomarkers of Muscle Degeneration   | 11                   |
| UPNSE3              | <b>Jennifer Smith</b>            | Effects of Fire on Forb Germination and Survival in a South-Central Kansas Tallgrass Prairie                        | 18                   |
| UPNSE4              | <b>Corissa Wright</b>            | Evaluating Reading Comprehension Skills in Users of AAC Device  | 24                   |
| UPNSE5              | <b>Yatharsana Manickavasagar</b> | Development of Thin Film Thermal Conductivity Measurement System  | 16                   |
| UPNSE6              | <b>Sandra Olekanma</b>           | Surface Modification of Titanium and Stainless Steel with Poly (Methyl Methacrylate) Based Polymer Brushes          | 17                   |
| UPNSE7              | <b>Jonathan Wilks</b>            | Culturing Staphylococcus aureus in the presence of several concentrations and types of honey to measure inhibition. | 23                   |
| UPNSE8              | <b>Hoa Truong</b>                | Trispyrazolylborate Ligands Reacted with Cobalt (II) Nitrate  | 20                   |
| UPNSE9              | <b>Michael Sullivan</b>          | Indium Complexes with Nitrogen and Sulfur Donor Ligands   | 19                   |
| UPNSE10             | <b>Linh Vu</b>                   | Variability in Torso Kinematics in Arm-Constrained Human Rolling  | 21                   |
| UPNSE11             | <b>Lindsey Carson</b>            | Muscle Damage in Hind Limb Ischemia Murine Model of PAD   | 8                    |
| UPNSE12             | <b>Craig Wilkinson</b>           | Smart Materials for Morphing Aircraft   | 23                   |
| UPNSE13             | <b>Charles Hayes</b>             | Assesment of Visual Discomfort of Steroscopic Displays in a Movie Theatre Environment                               | 11                   |
| UPNSE14             | <b>Adara Leonard</b>             | Using a Mouse Model of Infection by Staphylococcus aureus to Explore Anti-Infective Agents                          | 13                   |

**Ryan Becker**

Faculty Mentor: Kim Cluff

Co-Authors: Madhulika Srikanth, Ramazan Asmatulu, and Kim Cluff

College of Engineering

Natural Sciences and Engineering Oral Presentation

**OPTIMIZATION OF NANOPARTICLE-EMBEDDED SCAFFOLDS TO IMPROVE NEURAL CELL REMYELINATION THROUGH RAMAN MICRO-SPECTROSCOPY**

Nerve tissue damage produces a significant decrease in the quality of life and represents a considerable public health burden in the United States and in the world. Current treatment interventions are mostly preventative and symptomatic, and even with existing technologies progress is limited due to the properties of the neural tissue. Nerve tissue repair is complex and the solution must involve strategies to create environments that promote the regeneration of critical nerve components. Among these critical nerve components is the myelin sheath - a protective coating surrounding the nerve axon that improves signal conduction. The overall goal of this project was to contribute to nerve tissue repair through optimizing the environment to encourage re-myelination. The specific aim of this study was to create an environment (with nanoparticles and a scaffold polymer matrix) that induces myelin repair. Namely, cells that are critical to the repair of the myelin sheath (astrocytes) were cultured and grown on a nanoparticle embedded electrospun scaffold, then analyzed with Raman micro-spectroscopy in order to optimize the substrate matrix concentrations for optimal cell growth. Three types of scaffolds were prepared, one for each type of nanoparticle used in the study: carbon nanotubes, graphene, and fullerene. Spectra of the scaffolds were taken from control samples as well as astrocyte-cultured samples. These spectra captured chemical information capable of characterizing both the scaffolds and the degree of cell proliferation by providing key raman peaks and their corresponding intensities for each sample. It is expected that a significant difference will be observed in cell growth on these nanoparticle embedded scaffolds. Such results are expected to have an important positive impact, because the optimized nanoparticle matrix is highly likely to provide new strategies for preventative and therapeutic interventions in addition to fundamentally advancing neural damage treatment interventions.

**Lauren Berry**

Faculty Mentor: Elaine Bernstorf

Co-Authors: Elaine Bernstorf, and Douglas Parham

College of Health Professions

Social Sciences and Humanities Poster Presentation

**CHARACTERISTICS OF CHILD UTTERANCES DURING TEACHER-LED MUSIC EXPERIENCES IN A SPEECH-LANGUAGE PRESCHOOL**

The purpose of this research is to determine if music experience in a speech-language preschool helps increase children's utterances. Data was examined to discover the primary types of utterances made by children during teacher-lead songs, the percent of the song-time segments that include child utterances, and if there is a difference between segments recorded early and late in the semester by type (utterances and no utterances). Each of the five subjects wore a LENA recording device for one day early and late in the semester. From the LENA recordings, the song segments were extracted and divided into five-second

segments. Each segment was coded for primary type of utterance. Segments were analyzed to determine percentage of utterances produced by type. Based on aural observation of the recorded sessions, all sound segments were easily classified as no utterance, singing, talking, or other. Results were interpreted using a child-by-child approach given the small number of participants. Two of the children demonstrated changes in their behavior from early to late, and three of the children did not demonstrate change. The two children who showed change increased their utterances by 26% and 34% respectively. The three children who did not show change remained within 5% of their original percentages of utterances. Even though there was a short time of exposure to the program, two of the five demonstrated a large increase in utterances. Given the short amount of time between the two data sets, perhaps an extended amount of time would lead to similar changes. These children have continued to maintain the increases in their conversational output.

### **Lindsey Carson**

Faculty Mentor: Kim Cluff

Co-Author: Kaitlyn Howard, Ryan Becker, and Hootan Mehraein

College of Engineering

Natural Sciences and Engineering Poster Presentation

### **MUSCLE DAMAGE IN HIND LIMB ISCHEMIA MURINE MODEL OF PAD**

Peripheral Artery Disease (PAD), defined as atherosclerotic blockages of the arteries supplying blood to the lower extremities, becomes more common with age and produces a considerable public health burden. PAD produces a progressive accumulation of ischemic injury to the muscles cells, nerves, skin and subcutaneous tissues of the leg. At the level of the skeletal muscle cell, this injury includes altered metabolic processes, damaged organelles, and compromised bioenergetics. High variation in PAD patient clinical presentations complicate the study of skeletal muscle damage. PAD patients have high variation in their clinical presentation, disease severity, and differ greatly in comorbidities. This research studied the muscle pathology in the absence of this high variation of comorbidities by using a hind limb ischemia mouse model of PAD. The objective of this study was to identify novel Raman micro-spectral biomarkers which may characterize biochemical alterations in the diseased muscle and complement existing methods for diagnosis and monitoring of PAD patients. Eight mice had their left femoral artery ligated and a sham procedure on the right limb. The mice were allowed to live for 14-30 days before excision of the gastrocnemius muscle and euthanasia. The harvested muscle was analyzed using Raman micro-spectroscopy. Statistical analysis of the muscle tissue Raman spectra included a paired t-test, principal component analysis and discriminant analysis. Significant differences ( $p < 0.05$ ) in spectral peaks were found in the finger print region of the spectra using a paired t-test. Fishers Linear Discriminant analysis on the first principal component was able to correctly classify the ischemic and control muscle tissue with 100% accuracy. The Raman spectral profiles showed a consistent difference between the ischemic and non-ischemic muscle tissue. Raman micro-spectroscopy may provide a novel method of label-free tissue analysis and has the potential to aid in diagnosis and treatment monitoring of PAD patients.

**Rustin Clark**

Faculty Mentor: Nils Hakansson

Co-Author: Helen Bannon, and Nils Hakansson

College of Engineering

Natural Sciences and Engineering Oral Presentation

**EXAMINATION OF HAND KINEMATICS FOR THE DEVELOPMENT OF ASSISTIVE ORTHOTICS**

Reduced hand function is an impedance to activities of daily living, such as working on a computer. Therefore, assistive orthotic devices such as exoskeletons have the potential to improve the situation for people with limited hand function. However, there is no current exoskeleton that is widely used to improve hand function for activities of daily living.

The purpose of this study was to collect and analyze kinematic data of the hand while performing common tasks such as typing on a keyboard and manipulating a computer mouse. This data is meant to be used in further studies relating to the design of orthotic devices for the hand.

Hand kinematics data were collected as subjects typed a sentence on a keyboard and performed a simple copy-paste task using a mouse. The data collection was performed using a video motion capture system consisting of 5 high-resolution digital cameras that determined the x, y, and z coordinates of 21 retro-reflective markers taped to the bony landmarks of the fingers, thumb, and elbow of the dominant hand of each subject. The data collection software recorded the marker positions at 60 frames per second and was used to create 3D models of the hands, including the joint angles with respect to time.

At the end of this study, the identified range of motion of the hand during typing and use of a mouse can be used to provide preliminary parameters for future orthotic devices of the hand. Further studies will be performed in moving forward with the project, which are expected to provide a solution for those persons who have reduced hand function.

**Joy Foster**

Faculty Mentor: Michelle Redmond

Fairmount College of Liberal Arts & Sciences

Social Sciences and Humanities Oral Presentation

**BARRIERS TO HEALTHY EATING AND PHYSICAL ACTIVITY IN AFRICAN AMERICAN WOMEN AT RISK FOR PERIPHERAL ARTERIAL DISEASE**

This study seeks to gain a better understanding of barriers and mediators to physical exercise and healthy eating habits for African American women who present risk factors for Peripheral Arterial Disease (PAD). Female participants, specifically those aged 60 or older who had hypertension, diabetes, smoking, and/or hyperlipidemia, were recruited to participate in a qualitative study of their daily physical activity and healthy eating habits. Themes that emerged for barriers to healthful eating include the following: personal reasons, costs/access, and no barriers. Themes that emerged for barriers to physical activity include: physical pain/health, time, and no barriers. Information from this study helps us to understand barriers as perceived by African American women who possess risk factors for PAD and how to intervene on those barriers.

**Logan Gisick**

Faculty Mentor: Evan M. Palmer

Co-Authors: Evan Palmer

Fairmount College of Liberal Arts & Sciences

Social Sciences and Humanities Poster Presentation

**MEDICATION VIAL SEARCH: IDENTIFYING GUIDING ATTRIBUTES**

Because of the large variety of labeling methods, vials for injectible medications have become highly confusable. What visual features of a medication vial are most crucial for quick and accurate identification? We investigated text size, text orientation, and label color density of medication vials to evaluate their impact on search time and accuracy. **METHOD:** A sample of 30 participants completed a visual search task designed in MATLAB. Participants first saw a target medication vial and then an array of 12 vials, with six vials on the left and six on the right side of the screen. Participants indicated whether the target vial was on the left or right or was absent via keypress and response time (RT) and accuracy data were gathered for analysis. Medication vial stimuli were selected according to a 3 (Color Density – low, medium, high) X 2 (Text Size – small or large) X 2 (Text Orientation – horizontal or vertical) design. **RESULTS:** Data analyses detected main effects of color density and text orientation with high density color vials and vials with vertical text yielding the fastest and most accurate responses. Furthermore, text size interacted with text orientation such that vials with small, vertically-oriented text were faster and more accurately identified than other types of vials. Text size interacted with color density such that high color density and large text yielded faster and more accurate search. Finally, in terms of accuracy, there was a three-way interaction of text size, text orientation, and color density. **CONCLUSIONS:** Color density has a large effect on search, with higher density color labels being located most quickly and accurately. Surprisingly, medication vials with small text were located more quickly and accurately when the text was oriented vertically. This research has the potential to improve medication vial label design and hopefully limit medication dispensation errors.

**Kelly Ha**

Faculty Mentor: Rui Ni

Fairmount College of Liberal Arts & Sciences

Social Sciences and Humanities Poster Presentation

**SPORTS PLAYING TO IMPROVE VISUAL FUNCTIONS**

Visual and motor skills are essential for our daily tasks, including driving and playing sports. Previous research (e.g. Paul et al., 2011) has mainly focused on the relationship between visual functions and performance in sports. The current study aims to examine the effect of playing sports in improving eye-hand coordination (EHC) and visual functions by training participants with Ping-Pong playing.

In this study, 11 college students of ages 18-35 were recruited to go through multiple visual tests and training sessions over four nonconsecutive days. Performance on a series of visual tasks were compared between the first and last day, including processing speed, motion-in-depth perception, and divided attention, to examine the improvement as a result from playing Ping-Pong. At the beginning of the first training day and at the end of last training day, participants were also measured on their EHC performance. All participants went through multiple training sessions playing against a Ping-Pong robot.

A four-way repeated-measures ANOVA was conducted to evaluate the effect of training on EHC and visual functions. Although participants didn't improve on their Ping-Pong playing performance over just two days' training, the results showed a significant ( $P < 0.01$ ) improvement in their EHC function. More importantly and interestingly, significant improvements were found in visual processing speed and

divided attention, suggesting that sports playing can be a useful intervention to improve motor skills and visual functions.

**Charles Hayes**

Faculty Mentor: Rui Ni

Co-Authors: Rui Ni

Fairmount College of Liberal Arts & Sciences

Natural Sciences and Engineering Oral Presentation

**ASSESSMENT OF VISUAL DISCOMFORT OF STEROSCOPIC DISPLAYS IN A MOVIE THEATER ENVIRONMENT**

3D cinema is in a position to increase its portion of cinema revenue. Although the 3D movie market posits itself to be the future of cinema, it does have limitations, including visual discomfort and visual fatigue as experienced by the viewer. Surprisingly, few studies have replicated the movie theater experience and even fewer have assessed visual discomfort associated with watching feature length stereoscopic movies. The current study aims to develop a method of continuously assessing visual discomfort associated with viewing stereoscopic cinema. 17 undergraduate students participated in the study, who watched a 90-min segment of stereoscopic film wearing a pair of active 3D shutter glasses. Visual discomfort levels were measured before and after watching the film. As hypothesized, there was a significant change in self-reported visual discomfort level after watching the 3D movie. Limitations of the current study and directions for future research on stereoscopic film viewing experience are discussed.

**Kaitlyn Howard**

Faculty Mentor: Kim Cluff

Co-Author: Hootan Mehraein, Ryan Becker, and Kim Cluff

College of Engineering

Natural Sciences and Engineering Poster Presentation

**FOURIER TRANSFORM INFRARED SPECTRAL BIOMAKERS OF MUSCLE DEGENERATION**

Peripheral artery disease (PAD), characterized by blockages of the arteries to the legs, affects approximately 8 million lives in the United States. This injury includes altered metabolic processes, damaged organelles, and compromised bioenergetics in the affected muscle. In this study, we evaluated the hypothesis that Fourier Transform Infrared (FTIR) spectroscopy of human biopsy samples (gastrocnemius muscle) can be used to identify biochemical alterations in PAD muscle and characterize severity of muscle damage. When comparing spectral peaks between controls and patients with PAD, significant differences were found in the fingerprint region. FTIR spectroscopy was able to characterize the secondary effect of PAD on the gastrocnemius by identifying unique biochemical signatures of diseased PAD skeletal muscle.

**Lydia Ibarra**

Faculty Mentor: Jodie Hertzog  
Fairmount College of Liberal Arts & Sciences  
Social Sciences and Humanities Oral Presentation

**SHAPING THE IDEAL STEPFAMILY: MYTHS AND STRESSORS**

The purpose of the study was to investigate the myths that shape college student perceptions about the ideal stepfamily. Drawing on previous literature, the relationship between the myths that cause unrealistic expectations and the stressors that shape stepfamily dynamics were explored. It is these two factors that create many challenges faced by the stepfamily, specifically the challenge of staying together. The study identified past predictions that fail to support the functioning of the stepfamily and identified roles of expected norms of the traditional family, fairytales past and present, and media contribution to the stigmatization of the stepfamily. Based on these findings, the stepfamily myth questionnaire of 19 questions was developed and administered online using Google Docs to 100 Wichita State Psychology and Sociology college students. The findings indicate members of the traditional nuclear family perceive stepfamily myths to hold more truth than those members of the stepfamily.

Keywords: stepfamily, myths, challenges, misconceptions, dynamics

**Colyn Jones**

Faculty Mentor: Dorwin Dorr  
Co-Authors: Lindsey Bupp, and Yvonne Chaw  
Fairmount College of Liberal Arts & Sciences  
Social Sciences and Humanities Oral Presentation

**SEARCHING FOR DEMORALIZATION IN THE MCMI-III**

In 2003 the Restructured Clinical demoralization or RCd scale of the MMPI-2 was developed to independently measure the MMPI “first factor,” a technical issue found to be synonymous with demoralization which contributed to an overall degree of diminished discriminant validity criticized in the measure’s first edition. This scale was subsequently included in the publication of the RC scales of the MMPI-2 for the purpose of measuring demoralization in clients being assessed for individual psychopathology (Tellegen et al., 2003). Although still psychometrically new, demoralization has been long thought to be a valid psychological construct separate from depression and anxiety. Additionally, demoralization has been hypothesized to play a significant role within a client’s assessment picture, thus affecting both diagnosis and treatment planning (Frank, 1974). The present study sought to investigate this hypothesis by examining the relationship between two indicators of demoralization found in the first two editions of the MMPI and another empirically-validated measure of personality and psychopathology, the Millon Multiaxial Clinical Inventory (MCMI-III) within a sample of psychiatric inpatients. The two markers of demoralization selected for this study were the RCd scale and an empirically-derived, unpublished scale referred to as JBW72, which is composed of original MMPI items gleaned from the overlapping first factors reported in Johnson, Butcher, Null, and Johnson (1984) and Waller (1999). Correlational and factor analytic methods were utilized in order to determine the extent to which demoralization may be present within the personality pathology and clinical syndrome scales of the MCMI-III. The summation of analyses appear to indicate the empirical presence of theoretical dimensions thought to be characteristic of demoralization, including negative affect, significant maladjustment, subjective distress, helplessness, and self-efficacy issues. These findings serve to empirically reinforce the construct’s validity with respect to clinical populations.

**Riley Krehbiel**

Faculty Mentor: Angela Demovic

Co-Authors: Angela Demovic

Fairmount College of Liberal Arts &amp; Sciences

Social Sciences and Humanities Poster Presentation

**BORN AND RAISED OR HERE TO STAY?: NATIVE AND TRANSPLANT CONSTRUCTIONS OF AUTHENTICITY IN NEW ORLEANS**

Despite frequent discussions of authenticity in anthropology, little research has been done to explore the possible ideological differences between the demographically small, but culturally significant population of transplants and their native counterparts in New Orleans—a city dominated by strong native pride. The following study examines and compares transplants, native New Orleanians, their opinions regarding the city, their reasons for living there, and their ideas about authenticity. It was originally thought that transplant and native individuals would have inherently different opinions about authenticity in New Orleans, providing evidence for a perspective of authenticity that recognizes simultaneously co-existing constructions of authenticity. Analysis of interviews with New Orleans residents and pile-sorting of photos taken by those residents indicate that differences in opinions about authenticity may not be influenced most by residential history. Rather, other aspects of identity, such as socio-economic status, have a greater influence on the experiences and perspectives of individuals living in New Orleans. Although the results of the study differ from the initial expectations, the overall conclusion about the nature of authenticity is consistent with the original perspective that denies the idea of the Authentic-versus-inauthentic.

**Adara Leonard**

Faculty Mentor: David McDonald

Co-Authors: David McDonald

Fairmount College of Liberal Arts &amp; Sciences

Natural Sciences and Engineering Poster Presentation

**USING A MOUSE MODEL OF INFECTION BY STAPHYLOCOCCUS AUREUS TO EXPLORE ANTI-INFECTIVE AGENTS**

Because of continual development of antibiotic resistance in clinically important bacteria, many antibiotics have lost the effectiveness they once had. Further, new antibiotics are not being produced to replace the antibiotics that have lost their usefulness. Another class of anti-microbial substances, called “anti-infectives”, may provide a viable alternative to unsuccessful antibiotics. Medical-grade honey and the molecule allicin from garlic will both be investigated. We propose to use an in vivo model, the epicutaneous mouse model, to measure the effectiveness of these substances against *Staphylococcus aureus* infection. Honey and allicin each boast a number of anti-infective benefits. An experimental procedure was developed, along with positive and negative control groups, which utilizes the tools of PCR and histology to further explore their anti-infective properties. The goal of this experiment is to find clinically useful alternatives or adjuncts to antibiotics.

**Hailey Lundin**

Faculty Mentor: Anil Mahapatro  
Fairmount College of Liberal Arts & Sciences  
Natural Sciences and Engineering Oral Presentation

**P PRELIMINARY VALIDATION OF A PSEUDO-PHYSIOLOGICAL TEST BENCH IN ACCELERATED, DYNAMIC, ELECTROCHEMICAL, CONDITIONS**

Biodegradable materials including biodegradable metals are continuously being investigated for the development of next generation cardiovascular stents. Accurate, predictive in vitro tests are needed that could evaluate potential stent materials while simulating in vivo conditions. Purpose: To fabricate and validate a pseudo-physiological test bench in dynamic electrochemical conditions for evaluating the biodegradation behavior of potential cardiovascular stent materials. The preliminary validation was conducted using 316L stainless steel (SS). The experimental test chamber was designed in Catia and 3-D printed from ABS plastic. The overall test bench assembly consisted of the test chamber, a Heidolph 5006 peristaltic pump, a Gamry Reference 600 potentiostat, 2.5 wt tygon tubing and a fluid reservoir filled with 500 ml of PBS. 316L SS was used as the testing material due to its relatively inert biodegradation behavior, thus allowing the comparison of corrosion rates with a standard corrosion cell. For static testing the pump was turned on to fill the chamber with PBS solution, and then stopped before conducting electrochemical analysis. Similarly, the Gamry cell was filled with PBS fluid prior to analysis, and the results compared to validate the stability of the system. Dynamic tests were also performed at 100, 200, 300, and 400 RPMs to prove the validity of the system at varying speeds. Tafel plots were generated and corrosion rates subsequently determined. Corrosion rates determined under static conditions using the standard corrosion test bench was found to  $.035 \pm 0.003$  mm/yr while using under the developed test bench was found to be  $.069 \pm 0.009$  mm/yr. Conclusion: corrosion evaluation in the developed cell was found to be relatively stable with the corrosion rate deviating marginally from the expected corrosion rate obtained via standard corrosion cell thus validating the usability of the developed test bench.

**Maha Madi**

Faculty Mentor: Joseph Keebler  
Co-Authors: Paul Misasi, Joseph Keebler, and Brady Patzer  
Fairmount College of Liberal Arts & Sciences  
Social Sciences and Humanities Poster Presentation

**REDUCING MEDICATION ADMINISTRATION ERRORS IN EMERGENCY MEDICAL SERVICES THROUGH THE IMPLEMENTATION OF A VERBAL VERIFICATION METHOD**

Healthcare reform is a reoccurring issue that is common to legislatures across the country. Policy changes to healthcare affect everyone and in order to better provide for the citizens of the State agreements must be made on the type of reform that is needed. Reforming healthcare in the United States includes improving the access and quality of care provided to citizens. In order to improve the quality of care, medication errors need to be minimized in the healthcare field. Emergency Medical Services (EMS) professionals evaluate over 36 million people a year with over 16 million of these people transported to hospitals for additional care. Thousands of these people are prone to preventable medication administration errors made by providers. One of the many causes of these errors is in the way EMS professionals verify the drugs they are administering. The current verification method in place, is known as the 5 Rights method, has been questioned since no empirical data exists to support it. The 5 Rights method is a mental verification susceptible to fallibility of human processing. Currently we are studying the effects of a new Medication Administration Cross-Check (MACC) on the frequency of medication administration errors. We hypothesize that the introduction of the MACC will significantly reduce medication administration errors compared to prior MACC implementation. By implementing MACC, the quality of the administration of healthcare in Kansas can be greatly improved.

**Hannah Maine**

Faculty Mentor: Barbara Chaparro  
Fairmount College of Liberal Arts & Sciences  
Social Sciences and Humanities Poster Presentation

**UNIVERSITY STUDENTS' SATISFACTION WITH INDEPENDENT AND GROUP PROJECTS**

The purpose of this study is to discover students' preferences between group and independent projects. Many previous studies consider problems with group projects such as fairness of grading and unequal contributions of members (Aggarwal & O'Brien, 2008). However, few studies can be found dealing directly with student satisfaction regarding independent projects, and students' satisfaction working independently versus collaboratively. Furthermore, a 19-item survey was administered to thirty-nine participants via Google Doc Forms. The survey included basic user demographic questions, items about involvement in each project type, and preference between the two types. Participants were also asked how much time they usually spend working on each project type. This survey was adapted from So and Brush's (2008) CLSS questionnaire. To interpret results, a dependent-samples t test was conducted. The results indicate that satisfaction with group projects ( $M = 4.27$ ,  $SD = 1.09$ ) was significantly lower than the satisfaction with independent projects ( $M = 5.92$ ,  $SD = 0.82$ ),  $t(35) = -7.99$ ,  $p < .05$ . Moreover, this study shows that students have higher satisfaction levels with their work on independent projects than in group projects. Reasons for this, based on previous studies, may include the perception of grading unfairness and unequal contributions of other group members. Other reasons that may contribute to this could be the number of each project type that students have participated in or the amount of learning students feel take place in each project type. To further this research, experimenters could look at different school settings, project work in business settings, or affects of gender on project involvement. Teachers may also make changes to their grading structure, such as requiring students to give an report of individual and peer contributions, for group projects. Satisfaction levels may be higher if grading is perceived to be more fair.

**Mary Maneth**

Faculty Mentor: Linda Kliment  
College of Engineering  
Natural Sciences and Engineering Oral Presentation

**NOSECONE FLOW VISUALIZATION**

The nosecone shape is an important consideration when designing a rocket. Aerodynamic literature is full of tables and charts stating which nosecone design and contour performs best at which speeds. However, no literature could be found explaining the reason for the rankings of these designs. As a result, this project attempts to find this explanation by investigating the flow characteristics over various nosecone shapes as well as establishing a method for constructing custom nosecones. Seven contours were chosen to be built and tested: conic, blunted conic, bi-conic, tangent ogive, secant ogive, and elliptic. A non-traditional lathe was built as the basis for creating the custom contours and the nosecones were constructed out of foam insulation. A Dremel was then used as the main tool to remove excess material and create the required shape while the insulation was rotated. A final surface finish was achieved with sanding and resin. All nosecones had the same base diameter and length, giving them the same fineness ratio, which is the ratio of length to base diameter. Flow visualization was then acquired by placing each nosecone in the Wichita State 2'x3' Water Tunnel. An external dye system was used to place dye on the center of the nose tip for each instance studied. Each nosecone went through a 40 degree pitch-sweep at two different speeds where various visual phenomenon were then recorded and photographed, the main concern being flow separation. Correlations between instances of flow separation and contour shape, flow velocity, and pitch angle were investigated, and the results will be presented.

**Yatharsana Manickavasagar**

Faculty Mentor: Gisuk Hwang

College of Engineering

Natural Sciences and Engineering Poster Presentation

**DEVELOPMENT OF THIN FILM THERMAL CONDUCTIVITY MEASUREMENT SYSTEM**

Optimal thermal managements are crucial for enhanced performance and minimal degradation in many applications. One key parameter is thermal conductivity, and its accurate measurement is important to analyze and design optimal thermal management systems. Thin film samples becomes popular components to the thermal management systems as the micro-/nano-technologies have been common in modern industries. However, existing thermal conductivity measurement systems are too expensive, sensitive to sample types, and challenging to accurately measure thin samples. In this study, we develop an inexpensive yet accurately measure various sample thermal conductivities including thin samples. The principle of the thermal conductivity measurement is to examine the ratio between heat flux and temperature gradient, under steady-state and 1-D temperature gradient across the sample by the sandwiched copper disks. Four thermocouples are installed to measure sample surface temperatures as well as heat flux across the sample. This developed system also allows for measuring temperature-dependent thermal conductivity. From this experiment, when successfully executed, could be inferred that the proposed method of thermal conductivity measurement system could prove to be much more efficient than the currently available thermal conductivity measurement systems in energy, automotive and aerospace industries.

**Tyler McGinnis-Extine**

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Natural Sciences and Engineering Poster Presentation

**EFFECT OF DWELL TIME AND DWELL LENGTH ON FRICTION COEFFICIENT IN MACHINING UNDER MINIMAL-QUANTITY LUBRICATION**

Studies have shown that U.S. expenditures in machining represent between 3 and 10 % of the gross domestic product (GDP); i.e., between \$503 to \$1,676 billion dollars for 2013 (H. Soons and S. Yaniv, "Precision in Machining: Research Challenges," National Institute of Standards and Technology, NISTIR 5628, Gaithersburg, MD.). In 1998, Merchant estimated that 15% of the value of all mechanical components manufactured worldwide is derived from machining operations (E. Merchant, in Proceedings of the CIRP International Workshop on Modeling of Machining Operations, Atlanta, GA, 1998). Machining is also a process that involves extreme physical and chemical interactions between the cutting tools and the work materials. The extreme conditions inherent to the process produce high tool wear, intensive energy expenditure and need for utilization of polluting lubricants/coolants. These consequences translate into high operational costs and environmental impacts. Thus, it would be desirable to formulate machining methods that significantly reduce the extreme physical and chemical interactions, without having to employ toxic fluids. As a step towards this goal, the project described herein was conducted to gain fundamental understanding of friction phenomena arising from the work material-tool interactions in machining. The specific objectives were: i) measure the work material-tool dwell time below which machining lubricants, applied in small quantities, are effective at reducing the friction coefficient at the tool rake face, and ii) measure the work material-tool dwell length below which machining lubricants, applied in small quantities, are effective at reducing the friction coefficient at the tool rake face.

**Sandra Olekanna**

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Natural Sciences and Engineering Poster Presentation

**SURFACE MODIFICATION OF TITANIUM AND STAINLESS STEEL WITH POLY (METHYL METHACRYLATE) BASED POLYMER BRUSHES.**

Orthopedic implants and surgeries are continually being practiced in hopes of improving lifestyles and reducing pain associated with various injuries to the bone or genetic diseases. However, many implanted materials are prone to infections and poor bone integration. Due to these problems, multiple surgeries have to be performed on patients who may be experiencing post-surgical infections. These procedures are costly and inconvenient to the patients involved. To tackle this problem, various biocompatible coatings have been developed that can either prevent infection or improve bone integration. However, no coatings that can both prevent infection and improve bone integration are not available.

Poly (Methyl Methacrylate) is an acrylic plastic that enhances bone integration and fixing (Erben 1997). If used as a coating, the polymer can prevent infections, and enhance bone integration. Hence, the objective of this experiment is the grafting of polymer; Poly (methyl methacrylate) (PMMA) based polymer brushes, on the surface of titanium and 316L stainless steel using surface-initiated atom transfer radical polymerization (SI-ATRP). The modified samples were characterized using a Scanning Electron Microscope (SEM) and Fourier Transform Infrared (FTIR) on a Thermo Nicolet Avatar. The resulting spectra's from the FTIR were collected and compared with standard methyl Methacrylate peaks. In addition, a corrosion testing was conducted on blank and modified samples using the Gamry corrosion test. Results for the SEM, showed no notable changes in the modified samples related to the blank. However, the Gamry test showed an increase in corrosion resistance for the modified Titanium sample.

In conclusion, tests and characterization techniques conducted in this study, are insufficient to make a claim on the growth of PMMA polymer brushes. Further research would need to be conducted in terms of: how to increase polymer brush thickness, other characterization techniques, and use of other Methyl Methacrylate's to compare growth changes

**Ashton Pfannenstiel**

Faculty Mentor: Barbara Chaparro

Fairmount College of Liberal Arts &amp; Sciences

Social Sciences and Humanities Poster Presentation

**AN INVESTIGATION OF THE USABILITY AND FUNCTIONALITY OF FITNESS-TRACKING DEVICES**

**Purpose.** Two studies were conducted to investigate the usability and functionality of 6 different fitness-tracking wristbands suggested to improve and encourage healthy behaviors. While many studies assess the accuracy and behavioral effects of fitness-tracking devices, limited research has been done to examine usability and desirability. **Method.** The devices used in each study were the Garmin Vivofit, Jawbone Up24, Fitbit One, Basis B1 Band, Misfit Shine, and Tom Tom Multisport. In Study 1, 18 participants were asked to rate their first impressions of each device and its packaging. After completing a series of simple tasks, they rated the 6 devices again in terms of overall preference and likelihood to purchase and/or use. In Study 2, 6 new participants used each device for 2 weeks and provided feedback on their experience. Participants were asked to complete daily logs, a survey after 1 week, a survey and interview after 2 weeks, and a final interview where they rated and compared all 6 devices. **Results.** Study 1 indicated that participants are more likely to favor small, lightweight devices that have a visual display. These devices were considered more inconspicuous and less likely to interrupt their daily lives. Study 2 indicated that overall preference was influenced by each individual's daily routine and exercise habits.

Participants favored devices that were more customizable in terms of what information was tracked and goals that could be set. Participant impressions on the importance of certain features changed as they used the devices over the two weeks. Conclusion. By gathering first impressions of these devices as well as analyzing participants' experiences with the technology, results from this research provide insight about what factors influence initial desirability and long term usage. The studies suggest that a "one-size-fits-all approach" to designing fitness tracking devices may not be the most effective method.

**Lindsey Reiger**

Faculty Mentor: Douglas Parham

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College of Health Professions

Social Sciences and Humanities Poster Presentation

**MOTHER-INFANT INTERACTION: THE ROLE OF SPEECH BREATHING**

This pilot study explored the interaction of an infant and his mother by comparing their utterances and respiratory behaviors during communicative turn-taking. Little is known about how infants develop the speech capacity to respond to—and to influence—familiar communicative partners. Much less is known about breath support for speech production during turn-taking. We measured the speech output and respiratory movements of the infant and his mother during face-to-face interaction and free play dialogue. We predicted that for this mother-infant pair, utterances and the breathing behaviors that supported them would be similar during turn-taking events, and more variable during non-turn-taking events. We speculated that the mother would adjust her respiratory timing to match the breathing behaviors of her infant. Some evidence of this matching was observed, but much more research is needed to understand the impact of turn-taking on the breathing behaviors of mother-infant dyads. A better understanding of the actions and reactions of healthy infants might lead to insights related to early identification of infants at risk for communicative impairments.

**Jennifer Smith**

Faculty Mentor: Gregory Houseman

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Natural Sciences and Engineering Poster Presentation

**EFFECTS OF FIRE ON FORB GERMINATION AND SURVIVAL IN A SOUTH-CENTRAL KANSAS TALLGRASS PRAIRIE**

Prescribed burning is an important tool for the conservation, restoration, and management of prairies, but, how fire impacts seeds in the year of the fire is poorly understood. For example, prairie burns can result in litter removal and increased nutrient availability, however it is unclear whether fire causes high seed mortality, or if such losses are offset by increased germination or establishment. In this study, we examined whether prescribed burning has facilitative or suppressive effects on the germination and survivorship of forbs in a south-central Kansas tallgrass prairie. Seven experimental treatments, which manipulated litter removal, burning of the seeds (lab and field), and burning of the prairie, were applied to 0.5 x 0.5-m plots to examine the effects on 15 species of common Kansas forbs. After one growing season, cumulative germination and end-of-season survivorship strongly increased in plots that were burned or had litter removed, though the effects were lower when seeds were sown prior to the burn. These results suggest that in similar tallgrass prairies, prescribed burns have a net positive effect on forb colonization and that sowing native forbs following a prescribed burn may be an effective restoration technique.

**Lindsey Stillwell**

Faculty Mentor: Natalie Grant  
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Social Sciences and Humanities Oral Presentation

**A LOST HISTORY: AN ETHNOGRAPHY OF THE HISTORIC DUNBAR THEATRE**

This research explored sense of place and generational values of an African American cohort from Wichita, Kansas, that experienced the Historic Dunbar Theatre during the 22-years following its opening in 1941. Utilizing narrative inquiry and semi-structured interviews, the cohort described their individual lived experiences and memories in the community. Results show a strong sense of place among the cohort reinforced by a sense of belongingness and a generational value that emphasizes the importance of community and human relationships. Issues of social justice and further research are also presented.

**Michael Sullivan**

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Natural Sciences and Engineering Poster Presentation

**INDIUM COMPLEXES WITH NITROGEN AND SULFUR DONOR LIGANDS**

Diagnostic imaging in radiopharmaceuticals has become a significant area of interest for indium research due to indium's labeling ability in the body. However, indium compounds are typically unstable in the body, reacting with sulfur-containing proteins, which causes a buildup in the liver. Ligands containing nitrogen and sulfur donor atoms have been shown to aid in the stability of indium complexes due to their strong bonding abilities. Previous research in our lab has involved the use of 2,2'-dithiodibenzaldehyde (DTDB) in combination with ethylenediamine (en) to form the ligand N,N'-ethylenbis(thiosalicylideneimine) (tsalen). Tsalen has successfully been used to synthesize complexes with nickel, iron, and copper centers. In this paper, we report the synthesis of a stable indium compound, In(tsalen)(OAc), by the reaction of DTDB and ethylenediamine with indium(III) acetate, and the spectroscopic and crystallographic characterization of this complex. A side product of this synthesis, In(en)<sub>2</sub>(OAc)<sub>2</sub>, has also been crystallographically characterized. The indium complexes created may aid in the future development of radiopharmaceuticals.

**Christopher Thacker**

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Natural Sciences and Engineering Oral Presentation

**DEVELOPING A TARGETING SYSTEM FOR BACTERIAL MEMBRANES**

An ammonium picket porphyrin that targets bacterial membranes has been prepared and shown to bind to phosphatidylglycerol (PG), a bacterial lipid, when the lipid was in solution, contained within synthetic membrane vesicles, or when in Gram-negative and Gram-positive bacterial membranes. The multifunctional receptor was designed to interact with both the phosphate anion portion and neutral glycerol portion of the lipid headgroup. The receptor's affinity and selectivity for binding to surfactant vesicles or lipid vesicles that contain PG within their membranes was directly measured using fluorescence correlation spectroscopy (FCS). FCS demonstrated that the picket porphyrin's binding

pocket was complementary for the lipid headgroup, since simple Coulombic interactions alone did not induce binding. The lipid-receptor binding motif in solution was shown to mirror the binding motif of membrane-bound PG and receptor. Cell lysis assays with *E. coli* (Gram-negative) and *Bacillus thuringiensis* (Gram-positive) probed with UV/Visible spectrophotometry indicated that the receptor was able to penetrate either bacterial cell wall and to bind to the bacterial inner membrane. Interestingly, the receptor itself inhibits gram-negative bacterial growth in low concentrations while not being degraded or metabolized.

### **Hoa Truong**

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Natural Sciences and Engineering Poster Presentation

### **TRISPYRAZOLYLBORATE LIGANDS REACTED WITH COBALT(II) NITRATE**

Trispyrazolylborate (Tp) ligands, also called scorpionates, have been one of the most popular ligands in inorganic chemistry since its discovery. The metal complexes isolated using these ligands have a wide range of application in catalysis, as well as in bioinorganic chemistry as models for metalloenzymes. In our lab we work with scorpionate ligands with a CN substituent in the 4-position of the pyrazole ring. The cyano substituent, due to its strong electron withdrawing character, not only alters the electronic properties of Tp ligands, but also facilitates metal binding through the cyano nitrogen. Binding metal ions at both pyrazole nitrogen atoms and cyano nitrogen atoms may also facilitate the formation of coordination polymers. In this study we reacted a Tp ligand with cobalt(II) nitrate in hopes of forming a stable complex.

### **Colton Turner**

Faculty Mentor: Alex Chaparro

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Natural Sciences and Engineering Oral Presentation

### **PEDESTRIAN DETECTION IN A NIGHT TIME DRIVING AND TEXTING TASK**

The dangers of texting and driving have become the focal point of driving research in recent years. Most of this research has been directed at examining the dangers distracted drivers present to other motorists. However, roadside pedestrians are also endangered by distracted drivers. According to the National Highway Traffic Safety Administration nearly 76,000 pedestrians were injured in traffic accidents in 2012. An additional 5,000 accidents resulted in pedestrian deaths.

Current research tends to focus on daytime driving despite the fact that distracted night time driving is far more dangerous for motorists and pedestrians alike. Nearly 70% of all pedestrian/automobile fatalities in 2012 occurred at night. These numbers are projected to continue over the coming years. Despite this projection surprisingly little research has been done on preventing pedestrian/vehicle collisions. Even less research has been done on night time prevention.

The goal of this research study was to examine the effects texting while driving at night has on a driver's ability to detect roadside pedestrians as well as examining the effects the pedestrian's clothing has on their visibility. To do this participants were driven through a closed road course at night and given a texting task to complete when prompted. The participants were also asked to report anytime they saw a roadside pedestrian. The pedestrians were wearing one of three possible clothing options.

The results of this study indicate that the presence of texting is not the determining factor of if a pedestrian will be detected, but instead it is the pedestrians clothing choice that determines detection and the distance of detection.

**Linh Vu**

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Natural Sciences and Engineering Poster Presentation

**VARIABILITY IN TORSO KINEMATICS IN ARM-CONSTRAINED HUMAN ROLLING**

Human rolling, most commonly executed as turning in bed, is a fundamental activity of daily living. Rolling reduces the risk of decubitus ulcers, which are injuries to the skin and underlying tissue. Previous research on human rolling has been dependent on observing the rolling motion with constraints to decrease the variable nature human rolling. Therefore, the objective of this study was to determine whether constraining the upper extremities would alter shoulder and pelvis kinematics when rolling from the supine to sidelying position.

A video motion capture system recorded the positions of retro-reflective markers adhered to the shoulders and the torso of twelve individual healthy subjects as they rolled from the supine to sidelying position. Subjects performed two types of rolling movements five times each: i) arms crossed over the chest and ii) arms uncrossed and free to move naturally. Shoulder and pelvis velocities were examined through numerical differentiation of the shoulder and pelvis angles formed from the position of the respective markers. The results indicated that there was no significant change in whether the shoulder or pelvis initiated or concluded the roll when rolling with the arms crossed and uncrossed. The time to complete the roll and the peak shoulder and pelvis angular velocities differed with rolling condition, but the timing in the roll at which these peaks occurred did not vary.

This study found that having subjects roll with their arms crossed increased the speed of rolling, yet produced no identifiable difference in the fundamental rolling movement. This finding is useful because it shows the integrity of the rolling motion can be maintained when the arms are crossed. Additionally, it supports future studies that use the arms crossed constraint to study rolling by including populations who may not have use of their arms to assist in the roll.

**Gage Webb**

Faculty Mentor: Jen-Chi Cheng

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Social Sciences and Humanities Oral Presentation

**MANUFACTURING'S RELATIONSHIP TO ECONOMIC GROWTH IN WICHITA**

When the Great Recession hit Wichita, KS it hit hard. Jobs disappeared overnight, unemployment rates rose, and things changed in a bad way for the average Wichita citizen. Since then, however, the city has seen a resurgence of growth that has helped get things back on track. My question when analyzing this situation is simple: What caused this new growth? Was it manufacturing and aerospace coming back in force, or something else entirely?

To answer these questions I researched the economic trends of Wichita over the last 25 years (in particular the local unemployment rates) and compared these trends closely with those found in the Wichita manufacturing sector specifically. Compiling, graphing, and analyzing this data allowed for several realizations. Firstly, it became clear that, since at least 1990, the local Wichita economy has been heavily influenced by the manufacturing industry. This concept is reflected clearly during the most recent financial crisis when manufacturing jobs in the city dropped by nearly 20,000 and unemployment, as a result, rose by about 6%. These two forces remained closely intertwined until around 2010 when things began to unravel.

In 2010, local unemployment rates and manufacturing job creation separated. The overall health of the Wichita economy improved steadily while the number of manufacturing jobs remained stagnant. This new found trend continues to this day, and it is hard to see it as anything other than a blessing. In the last five years Wichita has successfully begun the diversification of its economy. Local technology, education, health, and business service industries have demonstrated measurable economic growth that has “filled in” for some of the stagnancy in the manufacturing industry. This diversification has lowered the risk levels of the overall Wichita economy and improved the local economy’s ability to resist recession and other forms of economic downturn.

### **Qi Heng Weng**

Faculty Mentor: Gisuk Hwang

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Natural Sciences and Engineering Oral Presentation

### **OPTIMAL DESIGN OF GAS DIFFUSION LAYER OF POLYMER ELECTROLYTE MEMBRANE FUEL CELLS USING BIMODAL POROSITY AND WETTABILITY**

A Polymer Electrolyte Membrane Fuel cell (PEMFC) is the one of the promising alternative energy sources for a renewable energy and environmental future. However, its performance is limited by poor reactant and product transport at the cathode side, especially at low temperature operations and high current density. The limited reactant transport is caused by excessive amount of produced water, which in turn results in filling the pores of Gas Diffusion Layer (GDL) to hinder the reactant transport to active catalyst sites. In this work, the GDL is optimally designed using bimodal porosity and water wettability for optimal water management and improved gaseous fuel transport for enhanced performance. A key idea is to build efficient pathways to maximize the water removal and reactant supply in the GDL by optimally designing local fiber density and wettability. In bimodal porosity, the liquid water preferentially flows through large local porosity (low capillary pressure), whereas the gaseous reactant flows through small local porosity. In bimodal wettability, the liquid water favorably flows through the hydrophilic area, while the gaseous reactant flows through the hydrophobic regions. In the bimodal porous GDL (commercially available product), the favorable water transport through the large local porosity is successfully visualized using ex-situ X-ray microtomography imaging technique. In bimodal wettability, GDL is fabricated using patterned, chemical surface treatments for the desired phase separation between the gaseous reactant and water. The enhanced gaseous reactant transport is measured using various ex-situ experiments and predicted using the commercially-available COMSOL Multiphysics software.

**Craig Wilkinson**

Faculty Mentor: Animesh Chakravarthy  
College of Engineering  
Natural Sciences and Engineering Poster Presentation

**SMART MATERIALS FOR MORPHING AIRCRAFT**

In the fall of 2014, a literature review was performed in order to consider the viability of using piezoelectric actuators or shape memory alloys (SMA) for drag reduction on an unmanned aerial vehicle (UAV). An overall focus was primarily placed on macro fiber composite (MFC) actuators, shape memory alloys, and some form of conformal –or shapeable- material. Multiple MFC actuators were then purchased and, at the time of this abstract, are being tested and modeled in order to create an airfoil to reduce drag and –potentially- also control the aircraft. A working model will be presented in order to display the ongoing progress of this project.

**Jonathan Wilks**

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Natural Sciences and Engineering Poster Presentation

**CULTURING STAPHYLOCOCCUS AUREUS IN THE PRESCENCE OF SEVERAL CONCENTRATIONS AND TYPES OF HONEY TO MEASURE INHIBITION**

Abstract: In this experiment, Staphylococcus aureus was cultured in the prescence of several concentrations and types of honey to measure inhibition. Manuka honey and MEDIHONEY have been shown to have growth inhibitory effects for bacteria (1). Therefore, we exposed bacteria in culture to different dilutions of these honey preparations. The honey was diluted to four different concentrations: 10%, 25%, 50%, and 75%. Dilutions were made based on a weight to volume ratio. The S. aureus was grown up from pure culture. From this, 8 plates of Brain Heart Infusion agar were lawn inoculated using cotton swaps. Sterile discs were dipped into each of the four honey concentrations. Half of the plates contained discs dipped in manuka honey while the other half contained discs dipped in MEDIHONEY. There were no zones of complete inhibition, however, there were zones of reduced bacterial growth surrounding all discs except for the 10% disc.

**Matthew Wong**

Faculty Mentor: Marlon Thomas  
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Natural Sciences and Engineering Oral Presentation

**METHOD FOR CULTURING BACTERIAL COLONIES ON AGAR COATED MICROSCOPE SLIDES USING THE STRAIN: BACILLUS MEGATERIUM**

The detection and enumeration of bacterial colonies is essential for the development of medicine and research of bacterial species. To do this, basic bacterial culture techniques are used before the tests are conducted. These techniques include using a petri dish that is filled with agar, liquid culture, or stab culture. The drawback with these methods of bacterial culture are that they use large amounts of materials and time which in turn increase the amount of money spent to conduct these experiments. The work presented in this paper uses Bacillus Megaterium as the bacterial specimen and provides a reproducible,

quick, and cost effective method for culturing bacterial colonies which can house as a construct for different bacterial assays. Various concentrations of nutrient-rich agar were made to find the optimal growth medium for bacteria. Microscope slides were cleaned and the agar was deposited onto the surface using a spin-coating technique. Microliters of bacteria was then arranged in a 4x4 matrix on the agar coated microscope slides that viability assays were conducted on. The bacteria were monitored over time using fluorescence microscopy to measure cell density and kinetics on the slides. Results showed that an agar concentration lower than 8% did not provide enough viscosity to stay on the slides while spin coated. Any concentrations that are higher than 16% were too opaque for quality images. Agar concentrations of 8% and 16% were optimal for spin coating onto the microscope slides as well as culturing bacteria on. Observations over a 24hr period showed bacterial colonies that a viability assay could be conducted on.

**Corissa Wright**

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College of Health Professions

Natural Sciences and Engineering Poster Presentation

**EVALUATING READING COMPREHENSION SKILLS IN USERS OF AAC DEVICE**

Objective statement: This study assessed the effectiveness of using reading supports for adults with severe physical impairments who use AAC (augmentative and alternative communication) devices for speaking and learning.

Background: Adults who use AAC devices are often below grade level expectations in literacy skills, including reading comprehension. Technology has been developed to make printed text more accessible to these adults, but little is known about the effectiveness of the technology with adults who are past school age.

Methodology: Three adults were tested using the Qualitative Reading Inventory (QRI) to determine their silent reading comprehension levels with no supports. Reading materials two grade levels above their independent reading level were presented to each reader under three conditions: no supports (i.e., the adult read the passage silently to themselves); an individual reading the passage and related questions aloud to the adult; and a software package, Read and Write Gold, which read the passage and the questions to the adult. Each adult heard one narrative and one expository passage under each condition. Reading comprehension levels were again assessed using the QRI at the completion of the trials. Participants were also asked to rate their preference for the three types of support.

Expected Outcome: We expected to see an increase in reading comprehension scores in the two conditions where supports were provided. We also expected that the computer-generated support would show higher scores than the natural read-aloud support.

Outcome: Each of the participants showed improvement in reading comprehension with the use of reading supports. Scores in the two supported conditions were not different from each other. However, all participants indicated a preference for the computer software support.