UNDERGRAD
research & artistry day

Tuesday, April 24, 2013
Holmes Student Center
Duke Ellington Ballroom
Welcome to the 4th annual Undergraduate Research and Artistry Day! From research that searches for the cure to cancer to artistry projects that analyze how Irish music is taught, NIU students have the ability to engage in hands-on meaningful activities that bring to life the world around them.

We believe NIU’s undergraduate research programs like Huskie Research Rookies, USOAR, URA, URAP, EURA, UARAP, SROP, the Undergraduate Travel Scholarship, and Undergraduate Research & Artistry Day will challenge students to define their passions, academic and professional goals, and ultimately your contributions to society.

Moreover, participating in the breadth of undergraduate research opportunities at NIU can have a profound impact on a student’s academic journey. It is our hope that students will explore these exciting programs and begin to realize their full potential while they move toward their degree at Northern Illinois University.

Our goal through this event is to provide students with a venue to showcase their academic work. We know you will be as impressed with the caliber of NIU’s undergraduate students as we are!

Julia Spears, Ph.D.  Rachel Tripodi
Director   Assistant Director
Letter From the Executive Vice President & Provost

Greetings,

At Northern Illinois University, we place a premium on providing students with opportunities for learning that extend far beyond the classroom. Nothing better illustrates the success of those efforts than the dramatic growth of Undergraduate Research and Artistry Day.

Launched just two years ago, with 108 participants, this year’s edition features more than 260 students, drawn from all six of the undergraduate colleges on campus. Every piece of work on display represents not only knowledge acquired by our students, but also new knowledge and new artistry created. Their work not only enriches their time on campus, but also prepares them for greater success in the years ahead.

Please join us in celebrating the success of the top projects at today’s award ceremony at 2:30 p.m. Awards will be presented for the first-, second- and third-place projects, as well as for honorable mention. Additionally, a “People’s Choice” Award will be given to the audience’s favorite project. One research adviser also will be honored with the Faculty Mentor of the Year Award.

We are extremely proud of our students’ accomplishments and invite you to get to know them at this event. Thank you for your support of undergraduate research at NIU.

Raymond W. Alden III
Executive Vice President and Provost, Northern Illinois University

Letter From the President

Greetings,

Thank you for joining us at Undergraduate Research and Artistry Day, a celebration of the hard work and dedication put forth by some of our most outstanding students.

The individuals participating in this event comprise the next generation of scientists, engineers, artists, inventors and discoverers. Working under the mentorship of some of our top faculty and researchers, they are participating in the highest forms of learning – not just memorizing or synthesizing information from lectures and textbooks, but contributing new ideas and new works of art to the existing body of knowledge and culture.

The value of such learning experiences cannot be overstated. That is why the Vision 2020 Initiative we launched last year includes a goal of ensuring that, by 2020, every student enrolled at NIU will partake in at least one form of experiential learning. That includes Research Rookies, Study Abroad, URAP, etc. – before they graduate.

Events such as Undergraduate Research and Artistry Day bring into focus the value of these activities. So please explore, ask questions and, most importantly, join us in working to make such opportunities part of the experience of every NIU student.

John G. Peters
President, Northern Illinois University
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**Research Categories**

The following two research categories will be judged:

- STEM: Science, Technology, Engineering, Math
- SSHA: Social Science, Health, Humanities, Arts

**Awards**

The following awards will be given to the winning project in each category:

- First - $200
- Second - $150
- Third - $100
- Honorable Mention - $50
- People’s Choice - $50

The audience will have the opportunity to select their favorite poster in each category.

**Schedule of Events**

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<td>Viewing of Projects</td>
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<td>Awards Ceremony</td>
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Judges

Adler, Marc - STEM
Department of Chemistry & Biochemistry

Alcantara, Marina - SSHA
School of Allied Health & Communicated Disorders

Anderson, Eden - SSHA
Department of Psychology

Barbe, Katharina - SSHA
Department of Foreign Languages & Literatures

Barber, Larissa - SSHA
Department of Psychology

Barber, Nick - STEM
Department of Biological Sciences

Britt, Anne - SSHA
Department of Psychology

Buford, Andrea - SSHA
School of Nursing & Health Studies

Carnahan, Jon - STEM
Department of Chemistry & Biochemistry

Chakraborty, Dhiman - STEM
Department of Physics

Demir, Veysel - STEM
Department of Electrical Engineering

Elsawa, Sherine - STEM
Department of Biological Sciences

Farrell, Sean - SSHA
Department of History

Macdonald, Doris - SSHA
Department of English

Maher, Colette - SSHA
Academic Advising Center

Matuszewich, Leslie - SSHA
Department of Psychology

Miller, Debra - SSHA
Office of Student Academic Success

Mirman, Cliff - STEM
Department of Technology

Moran, Rachel - STEM
Department of Biological Sciences

Moremen, Robin - SSHA
Department of Sociology

Muthuswamy, Shanthi - STEM
Department of Technology

Napientek, Randi - SSHA
Office of Student Academic Success

Olson, Peter - SSHA
School of Art

Parker, Christopher - SSHA
Department of Psychology

Pitney, William - SSHA
Department of Kinesiology & Physical Education

Pohlman, Nicholas - STEM
Department of Mechanical Engineering

*Retiree and/or Alumni
**Judges**

**Reynolds, Jeff** - STEM  
*Office of the Provost*

**Rigg, Lesley** - STEM  
*College of Liberal Arts & Sciences*

**Rodgers, Diane** - SSHA  
*Department of Sociology*

**Schatteman, Alicia** - SSHA  
*Department of Public Administration*

**Schwartz, Howard** - SSHA  
*School of Allied Health & Communicative Disorders*

**Shokrani, Masih** - STEM  
*School of Allied Health & Communicative Disorders*

**Streb, Matt** - SSHA  
*Department of Political Science*

**Wallace, Douglas** - SSHA  
*Department of Psychology*

**Wallace, Patricia** - SSHA  
*Department of Psychology*

**Wescott, Mandy** - SSHA  
*Office of Student Academic Success*

**Wiemer, Katja** - SSHA  
*Department of Psychology*

**Wolter, James** - SSHA*  
*Department of Leadership, Educational Psychology & Foundations*

**Wolter, Moke Chee** - SSHA*  
*School of Art*

**Yore, Adam** - SSHA  
*Department of Finance*

**Zinger, Don** - STEM  
*Department of Electrical Engineering*
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ABSTRACTS

POSTERS

PLEASE NOTE: CONTENTS OF THE ABSTRACTS WERE PRINTED AS SUBMITTED BY THE PROJECT PARTICIPANTS AND ARE REPRESENTED IN THE COLLEGE OF THE STUDENTS MAJOR.
1  GLYNNIS WHITE

*TEACHING TRADITIONALLY: IRISH MUSIC IN AN IRISH SETTING*

Authors: Glynnis White  
Department: Music  
Faculty Mentor: Janet Hathaway  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 12:45-2:00 PM

The goal of my research is to gain an understanding of how teaching traditional Irish music in Ireland differs from teaching Irish music in the United States. I gathered the majority of my research by attending the All-Ireland Fleadh (Fleadh Cheoil na hÉireann), an international Irish music festival that is centered on an international Irish music competition held in Cavan, Ireland, from August 10th-20th 2012. While at the Fleadh, I interviewed respected Irish music teachers about their teaching style and pedagogy. The information I have gathered falls into three categories: music, culture and session. In regard to music, I learned that rhythm is the most important aspect in Irish music, and the best way to teach rhythm is by ear, without musical notation. When Irish musicians use musical notation, they use it as a memory aid to help teach, while in the U.S. students might use notation as a primary tool to learn the tune. One cultural aspect of playing traditional Irish music is the Irish language. English is the most common language but Irish is still spoken and promoted during events like the Fleadh. The most important cultural setting for participating in Irish music is the session, which is a group of Irish musicians meeting informally in public to play sets of tunes together. Although the session is primarily for socializing, Irish musicians learn most of their tunes at sessions. There are a few sessions in the Chicago area but in Ireland they are abundant.

2  JENNIFER WEGMANN-GABB

*RETHINKING THE NARRATIVE OF THE CHARLEMAGNE WINDOW AT CHARTRES CATHEDRAL*

Authors: Jennifer Wegmann-Gabb  
Department: Art History  
Faculty Mentor: Ann Van Dijk & Valerie Garver  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 11:30 AM-12:45 PM

The Charlemagne window at Chartres Cathedral is unique in its presence as the only window dedicated solely to a historical rather than religious individual. Scholars have yet to agree upon the windows meaning and purpose. This paper examines the current leading theories on the purpose and meaning of the Charlemagne window, and proposes a middle ground between them. Elizabeth Paston argues that the Charlemagne window’s narrative focuses on his relationship with relics and then attempts to link Charlemagne (or the memory of) to the relics of Chartres. Paston also argues against the popular belief that panels 16 and 21 were switched during an early 20th century cleaning. Mary Jane Schenck, alternatively argues that the window has little to do with the relics of Chartres and instead exemplifies Charlemagne as a great Christian king for France. Schenck further argues that figures in the window previously believed to be Roland, nephew to Charlemagne, instead are Charlemagne himself. If the switching of panels 16 and 21, and the idea that certain scenes portray Charlemagne and not Roland are accepted, then I argue that the narrative in the window serves the dual purpose of invoking Charlemagne’s memory in regards to the relics of Chartres and elevating the kingship of Charlemagne as the beginning point of the Christian kingdom of France in the 12th century.
**MARIA STAPLETON**

*DIVINE MAIZE: THE CRUCIFIX OF TLANALAPA AND RELIGIOUS SCULPTURES OF SPAIN*

Authors: Maria Stapleton & Charles Stapleton  
Department: Art History  
Faculty Mentor: Jeff Kowalski  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 12:45-2:00 PM

In Early Colonial Mexico, some religious sculptures were made from maize or corn-based material carrying a pre-Hispanic tradition forward in time, but the forms of these sculptures were based on Spanish models. These Early Colonial maize sculptures are unique because of their use of divine and sacred materials and the specialized technology used for their manufacture. The ancient crucifix of Tlanalapa is a magnificent example of this syncretism or hybridization between indigenous Mexican and European traditions intrinsic to Mexican colonial art. The crucifix’s history, dating, materials, and sculptural school have been investigated through a comprehensive program of research.

**MADELAINE DICKINSON**

*INVESTIGATING BARRIERS TO CELIAC DISEASE DIAGNOSIS AND PATIENT WELLBEING IN THE U.S.: A COMPARATIVE STUDY OF THE UNITED STATES AND ITALY*

Authors: Madelaine Dickinson  
Department: Public Health  
Faculty Mentor: Nailya Almagambetova  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 10:15-11:30AM

This study compared awareness of and attitudes toward celiac disease (CD) among American and Italian medical professionals, patients, and the general public in order to better understand and identify barriers to celiac disease diagnosis and patient wellbeing in the United States. Although the U.S. prevalence of the disease is somewhat higher than in Italy, the rate of diagnosis in the United States is significantly lower. One of the biggest differences between the two countries is awareness level (Guandalini, 2012 & Fasano, 2001). Factors that impact awareness are an important topic for study because of the strong relationship between awareness level and successful celiac disease diagnosis. Untreated celiac disease is associated with reduced quality of life and increased healthcare costs (Biagi, 2010 & Hershcovici, 2010). In addition, screening for celiac disease is inexpensive and reliable treatment is readily available (Reddick, 2008). The main issue in the United States in underdiagnosing celiac disease is awareness of medical professionals and the public.

The topic of how awareness level as well as social and medical support systems affect celiac disease diagnosis and wellbeing of patients with celiac disease in the United States and Italy was investigated by interviewing patients and celiac disease professionals from the two countries and comparing their perspectives. Data were also collected through social observation, visiting stores and restaurants that provided gluten-free products, and comparing information provided by awareness organizations from each country. Lack of awareness among both patients and medical professionals and the social environment surrounding celiac disease all proved to be significant barriers to patients with celiac disease in the United States.
I investigated child sexual abusers, who are adolescent boys. I focused on three interventions that limited abuse. To identify interventions that worked, I compared strategies that were designed to limit abuse. My goal was to compare successful interventions representing 1) therapy, 2) education, and 3) targeted primary prevention. I learned which interventions best limited abuse and ultimately prevented adolescent boys from becoming child sexual abusers. The problem I investigated involved both primary and secondary prevention strategies; these are public health concerns. I carried out the investigation using a comparative method in which efficacy of each prevention strategy was determined. I learned more about specific examples of interventions that impacted the complex topic of child sexual abuse perpetrated by adolescent boys. I also learned which level of prevention is most effective in limiting and preventing abuse and will apply this learning to my own career goals.

Introduction: Pediatric patients in the hospital setting often experience pain. The management of acute and chronic pain is a high priority for nursing care. The aim of this literature review is to determine if humor is an effective pain management tool, if it has a unique ability to control pain, and to provide recommendations for the future use of humor and laughter by registered nurses to manage pain of pediatric patients. Methods: A literature search was performed on the NIU library catalog and databases. Search criteria included the following words and/or phrases: pediatric, children, humor, humour, laughter, and pain. Results: Overall, the current literature supports humor and laughter as an effective tool to increase pain thresholds, decrease pain perception and provide distraction from painful stimuli. Research supports that humor is beneficial as a pain management tool in the clinical setting. Both nurses and patients report satisfaction when using humor and laughter to manage pain and build rapport. Conclusion: More quantitative research is needed in the area of humor and pediatric pain management. It is recommended that education regarding the safe and effective use of humor should be provided to nursing students and professionals. Opinions vary as to whether humor has a unique ability to control pain beyond being a distraction and promoting relaxation. However, research does support patient preference for humor therapy and the many other benefits of humor and laughter in the clinical setting. Overall, it is a worthwhile tool to use in conjunction with other medical interventions to treat and manage pain in pediatric patients.
IMPROVING ATTITUDES TOWARD BREASTFEEDING OF MOMS WITH AND WITHOUT BIRTH EXPERIENCE

Authors: Lexie Williams & Isabel Contreras
Department: Nursing
Faculty Mentor: Donna Plonczynski
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30 AM

The purpose of this project is to improve the attitudes toward breastfeeding of moms with and without birth experience in the Sherman Health Systems. This is imperative, because many people are uninformed about the benefits and ease of breastfeeding. Exclusive breastfeeding is recommended until at least 6 months of age in order to decrease obesity, diabetes, and asthma, and increase maternal bonding and other physical, psychological, and psychosocial effects. We will be using a cross-sectional design to evaluate the attitudes of pregnant moms in the outpatient clinic of Sherman Health Systems. The 12-question survey instrument, produced from the literature, assesses plans to bottle feed, breastfeed or both; as well as length of time expected to breastfeed (if applicable). There are also questions about Peer Counselor perceptions and previous contact with a Peer Counselor. I will specifically be analyzing the questions that ask about previous children and whether or not they were breastfed. After IRB approval, the questionnaires will be distributed to 200+ English-speaking new moms in post-partum for 2 weeks in March 2013 before initiation of a peer counseling intervention to foster breastfeeding in the community. The expected outcomes are a poster representation for the Undergraduate Research and Artistry Day and dissemination of our findings at conferences (NCUR in LaCrosse) and to Sherman Hospital nursing staff.

IMPROVING THE ATTITUDES OF BREASTFEEDING THROUGH A BREASTFEEDING PEER COUNSELING PROGRAM IN LATINA WOMEN

Authors: Isabel Contreras & Lexie Williams
Department: Nursing
Faculty Mentor: Donna Plonczynski
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15 AM

There is an issue with low-income groups, specifically in the Latina population, in breastfeeding initiation and duration rates. Breastfeeding initiation rates and duration are lower in low-income women, such as Latinas. This is important because many Latinas may not be educated about the benefits and how important it is to maintain breastfeeding for at least one year. The purpose of this project is to measure attitudes before and after breastfeeding through a question-naire, and examine the Latina population who may be exposed to Peer Counselors in the hospital and change their attitudes on breastfeeding. English speaking Latina adults will be the participants of this project from Greater Elgin, Illinois. A questionnaire will be used to measure the attitudes of Latina mothers. The questionnaire will be given by the nurses at Sherman Hospital, who will distribute them to the appropriate participants. Our expected outcome is after being educated from the breastfeeding peer counselors, the attitudes will improve on breastfeeding thus increasing the duration of breastfeeding.
The Positive Impact of Physical Therapy on a Patient with a Neurodegenerative Disorder

Authors: Elaine Rodriguez  
Department: Pre-Physical Therapy  
Faculty Mentor: Mary Jo Blaschak  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 12:45-2:00 PM

The objective of the research project is to observe and identify the balance and motion characteristics involved with a patient with a neurodegenerative disease. This disease affects her nervous system and muscles. There are many symptoms including the degeneration of motor skills, speech, and voluntary movements. Physical therapy for patients with neurodegenerative diseases can minimize disability and pain help maintain functioning in activities of daily living. This research is based on observations that will take place for about of 3 months. Once balance and motion characteristics are identified, the investigator will compare the patient’s characteristics with those of an average healthy person. It is anticipated that the patient’s balance and movement activity will improve as they continue to perform prescribed exercise and stretching at home and in the clinic. During this project, the investigator will gain insight into the field of physical therapy, which will help her prepare for her future career.

Case Study: Physical Therapy on a Patient with Friedreich’s Ataxia

Authors: Lauren Nale  
Department: Pre-Physical Therapy  
Faculty Mentor: Mary Jo Blaschak  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 9:00-10:15 AM

Ataxia is a loss of muscle control and coordination– Friedreich’s Ataxia, also called FA, is a type of ataxia that primarily results in loss of coordination in gait and the extremities. Since there is no cure for Friedreich’s Ataxia, the most prevalent way to manage this disease is by the use of physical therapy (PT) and occupational therapy (OT). PT and OT can help patients with FA improve: muscle strength, flexibility, posture, and their ability to complete activities of daily living (ADLs) independently. The purpose of this study is to observe and collect data about a patient with Friedreich’s Ataxia during physical therapy sessions to see what PT interventions are utilized and to see how the disorder is affecting the patient’s activities of daily living. The objective of PT and OT is to try and delay the symptoms of FA and to help the patient adapt to and manage their symptoms. Since this type of disorder is not well studied, and is not well understood by PTs and OTs it is important to be able to identify exercises and strategies that are helpful during and outside of the patient’s physical therapy sessions. If effective strategies are identified for patients with Friedreich’s Ataxia, PTs and OTs would be able to more effectively work with these kinds of patients, and patients would have a more successful outcome.

Shareny Mota

Authors: Shareny Mota  
Faculty Mentor: Gregory Long  
Department: Allied Health & Communicative Disorders  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 11:30 AM-12:45 PM
Energy is used to heat and cool our homes in modern heating and cooling systems. Instead of getting our power from a windmill or solar farm and transmitting it down a power line to heat and cool our homes. We have wind and solar energy right outside our windows that can be used to make our rooms more comfortable, drawing less power from the power company in the process. In addition to the monetary savings, it is also nice to get fresh air. Unlike an air exchanger system that looks like a window air conditioning unit, you can see through a window and feel more in touch with the world around. Opening a window when the weather is nice has been around since windows you could open. People are busy and may not want to spend their time opening and closing windows. Also we cannot live all of our lives in front of the window. Additionally, in our homes we probably have more than one window as well. Adjusting a house full of windows would be quite a laborious task. An automatic system to control when your window opens and closes could accomplish this for the user. This automatic system can be set to the settings that make one comfortable. It has sensors to detect rain, interior temperature, outside temperature, intruders, wind, window open, and window closed. With this added peace of mind, users of the Smart Window would free up time to enjoy other aspects of life.

12 Jenna Krumpos

Pregnancy and Body Image

Authors: Jenna Krumpos
Department: Allied Health & Communicative Disorders
Faculty Mentor: Kristen Myers
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30 AM

Women must negotiate several interrelated social pressures: gender roles, social norms about beauty and success, body image and personal health, for example. Pregnancy affects and is affected by all of these gendered factors. For many women, pregnancy is the embodiment of womanhood. And yet the changes to women’s bodies caused by pregnancy confront assumptions about body image and beauty norms. This study aims to assess how gender roles, social norms, body image, and personal health can affect pregnancy and how pregnancy affects those issues for women who are, have been, or are considering becoming pregnant. My project builds on the scholarly research. Data sources include social media communities and an online survey. The survey captures self-reported experiences during pregnancy or anticipating becoming pregnant in the near future, body image, and feelings about being pregnant. The subjects (N=50) in this study range in age from 18 to 50. This broad sample allows for different generation’s perceptions regarding body image, social norms, and personal health in relation to pregnancy. This pilot study on pregnancy and body image—a topic that has not been sufficiently researched in the United States—will be used to further research in this area.

13 Rachel Harris

Comparing the Length of Maternal Verbal Initiations with the Length of Maternal Verbal Responses

Authors: Rachel Harris
Department: Communicative Disorders
Faculty Mentor: Janet Olson
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15 AM

The current study examined if the length of maternal verbal initiations and maternal verbal responses were different. Thirty-one 13-month-old infants interacted with their mothers for six minutes while experimenters observed and videotaped from an adjacent room. Mothers were given a standard toy set and asked to play as they typically would.
Videos of the mother-infant dyads were transcribed in SALT and mothers’ verbal initiations and verbal responses during the play session were identified. Maternal verbal responses were further categorized as responses to infant vocalizations, responses to infant verbalizations, maternal imitative responses, and maternal non-imitative responses. The MLU of the mothers’ utterances in each category and their frequency was calculated in SALT. Mothers’ verbal initiations were significantly longer than mothers’ verbal responses to infant vocal/verbal behavior. Maternal responses to infant vocalizations were found to be significantly longer than maternal responses to infant verbalizations. In response to infant verbalizations, mothers responded more frequently with imitative responses than nonimitative responses. These conclusions demonstrate that as infants begin using more words to communicate during the second year of life, mothers may adjust the length of their utterances in response to their child taking a more verbal role in the conversation.

14 CARLY SEIBEL

MOTHERS’ RESPONSES TO INFANT GESTURE AT 17 MONTHS

Authors: Carly Seibel
Department: Communicative Disorders
Faculty Mentor: Janet Olson
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30 AM

Mothers’ responses to infants’ gestures have been proposed as a mechanism for vocabulary acquisition. It is known that at 13 months mothers give more object labels to pointing than object extensions, which is beneficial because this is a time when the infant would be learning object labels. However, it is not known how mothers respond to infants’ gestures at 17 months when their vocabularies are expanding to include a greater variety of word types. Therefore, the current study examined mothers’ responses to three types of infant gestures: points, open-hand reaches, and object extensions at 17 months to determine if there were differences in maternal provision of object labels, action labels, internal state labels and nonlabels. These interactions were observed in three communicative contexts designed to elicit proto-declarative, ambiguous, and proto-imperative communicative bids. It was found that infant pointing dominated in the proto-declarative context and object extensions were most prevalent in the proto-imperative context. More points than reaches were seen in the ambiguous context. Mothers provided mostly object labels after points and action labels after object extensions. Internal state labels were displayed at similar rates across gesture type. These findings could begin to explain why infants’ gestures are related to their vocabulary sizes. Their gestures elicit verbal responses from mothers that mirror infants’ communicative intents.

15 ELIZABETH DI ZENZO

MODIFIED MELODIC INTONATION THERAPY FOR APHASIA

Authors: Elizabeth Di Zenzo
Department: Communicative Disorders
Faculty Mentor: Jamie Mayer
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30 AM -12:45 PM

Aphasia is the impairment in the ability to express or comprehend language resulting from brain injury. Some patients with aphasia may benefit from intonation-based therapy because it has been observed that these patients often generate well-articulated words while singing, rather than while speaking. Melodic intonation therapy (MIT) is a treatment that emphasizes melodic aspects of speech in a hierarchy of progressively difficult tasks. The purpose of this study was to determine whether a modified version of MIT that trained frequent and highly visual verbs and nouns in structured phrases would be more effective in improving propositional speech in an individual with severe aphasia than would a more traditional MIT design that used functional, less visual, and more variable phrases. The modified MIT program
consisted of eight sessions over a two-week period, and trained three sets of stimuli that included 15 items for each set (15 nouns, 15 verbs, and 15 noun-verb phrases). Results reflected a general trend of improvement in the individual's responses, suggesting the possibility that the use of visual cues and highly imageable phrases can be an effective modification in MIT for improving speech in individuals with severe aphasia.

16  **RUTH FREIDEL**

*MOTHERS PRESENT WORDS DIFFERENTLY WHEN PAIRED WITH REPRESENTATIONAL GESTURES*

Authors: Ruth Friedel  
Department: Communicative Disorders  
Faculty Mentor: Janet Olson  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 10:15-11:30 AM

Twenty-four mothers and their 13 month-old infants were studied during book sharing tasks to determine if there were differences in how mothers present words with and without representational gestures (i.e., Baby Sign ®). This is important to consider because using Baby Sign ® is advocated for use with infants without understanding its impact on mothers’ linguistic input. Mothers and their infants were asked to look at a book as they would at home or instructed to use 4 signs while sharing the book. The book was designed to elicit 8 target signs: ball, throw, bear, dance, car, go, duck, and open. Mothers’ speech changed in a number of ways when they used representational gestures. Mother’s utterances were significantly shorter and there was a trend towards more one-word utterances when the mothers used representational gestures. However, mothers presented target words and placed them in utterance final position with the same frequency regardless of gesture use. Importantly, mothers and their infants spent more time engaged in book sharing when the mothers used representational gestures. These findings could be important because increasing the amount of time infants spend in joint attention with caregivers and presenting words in short sentence frames have been shown to facilitate vocabulary size. Results could begin to explain why Baby Sign ® might be helpful for early language development.

17  **CAROLINA GUSCIARA**

*COMPARATIVE ANALYSIS OF HIV-2 DIAGNOSTIC METHODS*

Authors: Carolina Gusciara  
Department: Clinical Laboratory Sciences  
Faculty Mentor: Masih Shokrani  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 11:30 AM-12:45 PM

The human immunodeficiency virus (HIV) is a widespread virus that causes acquired immunodeficiency syndrome (AIDS), to which there is still no cure. Two strains of HIV have been identified, HIV-1 and HIV-2. It is estimated that just by the end of 2009, approximately 33.3 million individuals have been infected by HIV-1 alone. In addition, health care costs associated with HIV/AIDS are enormous. HIV-2 is the less virulent form of HIV that is endemic in the regions from of West Africa from where it originated. Over time, HIV-2 has progressively spread from West Africa into other parts of the world, including the United States, due to travel and immigration. This project was focused on the comparative analysis of HIV-2 diagnostics with the goal of determining which testing method would be the most practical for implementation in high-HIV-2 frequency regions that often times are impoverished areas. Important factors that were analyzed included the efficiency, cost, sensitivity and specificity of the testing options. The diagnostic tests that were evaluated included both screening tests and confirmatory tests. The available methods of detection for HIV have also increased due to the recent discovery and implementation of rapid tests. Conclusively, the most practical testing methods for these regions would be a combination of two rapid tests. Proper and early diagnosis of HIV will help the infected patients control the spread of this deadly condition.
MICHELLE CAMPBELL

**HEMOGLOBIN A1C MONITORING AND THE NEED FOR THE STANDARDIZATION OF MEASUREMENT METHODOLOGY**

Authors: Michelle Campbell  
Department: Clinical Laboratory Sciences  
Faculty Mentor: Masih Shokrani  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 9:00-10:15 AM

The increasing prevalence of diabetes, particularly type 2 diabetes mellitus, has been recognized as a public health concern. The cost of diabetes is rising, with healthcare expenses in the United States estimated to be as high as $192 billion by the year 2020. HbA1c measurements are crucial for monitoring the health of diabetics and serves as a principle consideration when tailoring medication and treatment plans. The purpose of this study was to examine the use of hemoglobin A1c (HbA1c) in the monitoring of blood glucose management in patients with diabetes mellitus (DM) and to analyze discrepancies among the various methodologies employed for measurement of HbA1c in clinical laboratories. The management of DM focuses on controlling blood glucose levels. Consistent maintenance of blood glucose concentration to levels at or near the nondiabetic range and the avoidance of significant blood glucose fluctuations is imperative in maintaining the health of DM patients. HbA1c serves as a longitudinal measurement for comparison of DM control over the previous 2 to 3 months. Several genetic factors and hemoglobin variants were found to interfere with automation commonly used in HbA1c determination. Furthermore, point-of-care instrumentation studies were analyzed to reveal several inconsistencies in the reporting of results. The use of other glycated protein testing as an alternative to HbA1c was also investigated. The analysis of numerous testing methods utilized to monitor glycemic control in DM patients culminated in an understanding of the distinguishing capabilities and shortcomings involved in HbA1c and additional methodologies employed in the clinical laboratory.

BETHANY ROHL

**KINESIOTAPE® APPLICATION DOES NOT AFFECT FUNCTIONAL PERFORMANCE IN SUBJECTS WITH FUNCTIONAL ANKLE INSTABILITY**

Authors: Bethany Rohl & William Pitney  
Department: Athletic Training  
Faculty Mentor: William Pitney  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 12:45pm-2:00pm

Objective: Examine the effects of KinesioTape® on functional performance on subjects with Functional Ankle Instability (FAI). Design: Crossover design. Setting: Kinesiology Laboratory. Participants: 13 participants (9 female, 4 male), mean age: 22.5±4.3. Intervention: The independent variable was KinesioTape® application to the ankle; the dependent variables were the Star Excursion Balance Test (SEBT), Figure-8 Hop Test (F8HT), and Side-Hop Test (SHT). During the intervention, subjects performed the SEBT, F8HT and SHT Pre-tests and post-tests. After the pre-tests, KinesioTape® was applied to the affected leg followed by post-testing using the same procedures. During the control session, subjects performed the same actions as during the intervention session, except tape application was replaced with rest. Main outcome measures: Separate paired sample T tests with the a priori α level of P <= 0.05 was used to compare the control and intervention session for each variable. Results: For the SEBT, there was no difference between groups (T12= -.26, P=.8); the mean difference scores between pre-post control and pre-post intervention were 2.71±4.68 and 3.12±4.72, respectively. For the F8HT, there was no difference between the control and intervention (T12=1.46, P=.17); the mean difference scores between the pre-post control and pre-post intervention were -.27±.85 and -.64±.72, respectively. For the SHT, there was no difference between the control and intervention (T12=.9, P=.39); the mean difference scores between pre-post control and pre-post intervention were -.68±1.09 and -1.15±1.31,
respectively. Conclusions: The use of KinesioTape® did not affect balance or agility performance of participants. Further research should examine the use of different application parameters.

20  **CHRIS BURKETT**

*THE BENEFITS OF YOGA IN AUTISTIC CHILDREN WITH MILD TO SEVERE INTELLECTUAL DISABILITIES*

Authors: Chris Burkett  
Department: Special Education  
Faculty Mentor: Toni Van Laarhoven & Jeffrey Chan  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 10:15-11:30AM

Yoga has been beneficial for cardiovascular, mental, and physical health in students with learning disabilities such as Aspergers Syndrome and Attention Deficit Hyperactivity Disorder (ADHD). However, the benefits of yoga should be explored further in adolescents with autism and/or intellectual disabilities for the benefits in an academic setting. The purpose of this research is to investigate the predicted benefits of yoga on disruptive behavior (e.g., loud vocalizations) and on-task or off-task behaviors (e.g., concentrating on task at hand or staring off into space, respectively) in adolescent students with autism and/or developmental disabilities in a classroom setting. This study utilized an ABAB withdrawal methodology in which there was collection of data for five days for baseline information (no yoga) followed by collection of data for five days with implementation (yoga). The process was repeated to see if information was reliable. Partial interval recording and momentary time sampling, were used to measure disruptive and on task behaviors in each participant. A round robin data collection method was used where each student is observed for 24-seconds in two-minute intervals of the 20-minute instructional period. To verify the accuracy of data, at least 25% of sessions will have a secondary observer. The observers must score at least 85% on inter-observer agreement indices for data to be considered reliable. It is predicted that participation in yoga will lead to an increase in observed on-task and a decrease in observed disruptive behaviors for students.

21  **COLLIN THOMPSON**

Authors: Collin Thompson  
Faculty Mentor: Brad Cripe  
Department: Accountancy  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 9:00-10:15 AM

*Abstract not submitted.*

22  **BAILEY RHOADS**

*TOLL-LIKE RECEPTOR-MEDIATED REGULATION OF GLI PROTEINS*

Authors: Bailey Rhoads  
Department: Biological Sciences  
Faculty Mentor: Sherine Elsawa  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30 AM

The goal of my research project is to better understand the role of GLI proteins in regulating proinflammatory
Cytokine production. To study this, I have used previous research that has shown GLI transcription factors can act in a hedgehog-independent pathway, where they regulate IL-6 in the tumor microenvironment. Research from our laboratory has shown that GLI2 modulates the proinflammatory cytokine IL-6 in the tumor microenvironment, suggesting its potential role in regulating inflammatory cytokines. To address this, we used lipopolysaccharide (LPS) infection of monocytes as a model to mimic bacterial infections. LPS induce an inflammatory response by infected cells. In our cells, we found an increase in GLI3 expression in response to LPS stimulation. There was no difference in GLI1 or GLI2. As a control, we found an increase in IL-6 expression. LPS is a ligand that binds to the toll-like receptor 4 (TLR4). Whether an increase in GLI3 in response to LPS is unique to TLR4 signaling or a general response to TLR-mediated signaling is unknown. Therefore, future experiments will focus on stimulating other TLRs, specifically TLR3 and TLR9 and investigate the downstream effects on GLI1, GLI2, and GLI3 expression. Additionally, we will determine the signaling pathway stimulated by TLR4 that regulates GLI3 expression.

23 AMBER STEDMAN

**Using Environmental DNA to Detect the Presence of Blanding’s Turtle (Emydoidea blandingii)**

Authors: Amber Stedman, Collin Jaegar & Richard King  
Department: Biological Sciences  
Faculty Mentor: Richard King  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 9:00-10:15 AM

Blanding’s Turtle (*Emydoidea blandingii*) has been designated as threatened or endangered throughout a large portion of its range largely due to destruction and degradation of wetland and terrestrial habitat. More precise knowledge of locations where Blanding’s Turtles are found would greatly aid efforts to protect this species. Unfortunately, Blanding’s Turtles can be difficult to observe or trap, making detection difficult. Instead, environmental DNA (eDNA) collected from an aquatic habitat may be utilized as a cost- and time-effective alternative to determine whether Blanding’s Turtles have recently occupied a given locale. For this study, we designed species-specific primers to amplify a short segment of the cytochrome b gene. Following eDNA isolation and PCR amplification using these primers, the presence or absence of Blanding’s Turtles may be inferred from presence or absence of a 219-bp band on a 1% agarose gel.

24 BRIAN KEEFE

**Microalgae Grown in Wastewater Effluent as a Feedstock for Biodiesel**

Authors: Brian Keefe & Zach Davidson  
Department: Biological Sciences  
Faculty Mentor: Gabriel Holbrook  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00 PM

We examined the conditions optimizing growth and lipid yields from *Monoraphidium* spp., a unicellular microalga that occurs naturally in Illinois waters. This algal species has the potential to grow in natural midwest conditions within wastewater treatment facilities. This approach allows both the removal of nitrate and phosphate from effluent and the collection of algal biomass as a feedstock for biodiesel production. *Monoraphidium* can be grown to high densities at relatively low light levels and at cooler temperatures that prevail in the Northern US in Spring and Fall. We are investigating the effect of carbon sources such as gaseous CO2 or bicarbonate on cell growth and lipid production, as well as the effect of nitrate depletion as a “lipid trigger” in these cells. Initial population density data for algae in culture suggests that lower concentrations of cells grow to higher numbers of cells/ml for final harvest of
the algae. The results will be evaluated for a potential scale-up of cell cultures in larger volumes to produce lipids for transesterification to biodiesel.

25   **Evan Wittke, Afreen Papa & Jessica Tarragano**

**Expression, Regulation and Association of ASCT2 and LAT1 in Epithelial and Mesenchymal Human Hepatocellular Carcinoma Cells**

Authors: Evan Wittke, Afreen Papa & Jessica Tarragano  
Department: Biological Sciences  
Faculty Mentor: Barrie Bode  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30AM-12:45PM

ASCT2 and LAT1 are amino acid transporters that are coordinately enhanced in human cancers where they regulate cell growth. ASCT2 transports glutamine into the cell to support metabolic needs and LAT1 transports essential amino acids that drive growth through the amino acid-regulated mammalian target-of-rapamycin kinase (mTOR). Here, we tested the hypotheses that ASCT2 and LAT1 are more highly expressed in aggressive hepatocellular carcinoma cells (HCC), that they physically associate in the plasma membrane, and that their protein expression levels are coordinately regulated. To test these hypotheses, the level of ASCT2 and LAT1 protein expressed in a broad panel of seven epithelial (Group 1) and seven mesenchymal (Group 2) human HCC cells modeling primary and metastatic cancer, respectively, was determined via western blot analysis. Both transporters were found to be expressed at variable levels in both groups of HCC in a pattern that correlated with their cognate activities. Through chemical cross-linking studies and immunoprecipitation, ASCT2 and LAT1 were found to physically associate in the plasma membrane of HCC cells. Finally, ASCT2 targeted silencing led to corresponding declines in LAT1 expression, while forced over-expression of LAT1 failed to elicit enhanced ASCT2 expression. The results suggest that ASCT2 and LAT1 function as a complex in HCC cells and that their relative expression levels are not elevated in mesenchymal vs. epithelial HCC, but are coordinated to a threshold value within individual cancer cells. This data will be used as context when designing therapies targeting ASCT2 and LAT1 in primary and metastatic HCC.

26   **Taylor Nicholas**

**Evolution of Cereals to Predict Responses to Climate Change**

Authors: Taylor Nicholas  
Department: Biological Sciences  
Faculty Mentor: Melvin Duvall  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30 AM

Global warming and the increased concentration of atmospheric carbon dioxide (CO2) are becoming a pressing source of concern to the world’s population. The grass family, containing important agricultural crops, account for approximately half of the caloric consumption by humans. Many cultivated crops are an efficient type of plant called “C4”, while many weeds that grow are typical “C3” plants. In high concentrations of CO2, the C3 plants require less energy to survive and may outcompete cultivated crops, creating a supply deficiency. However, C4 plants have an advantage in high temperatures. Understanding the evolution of C4 from C3 plants will be vital in predicting the future of C4 grasses, the ecosystems they inhabit, and the impact on the agricultural industry as the climate continues to change. According to Hattersley and Watson (1992), these evolutionary ties are found by comparing nuclear and chloroplast genes. Chloroplast genes are inherited maternally, highly conserved, and widely used. However, nuclear genes are inherited biparentally, found in multiple locations of the genome, and are more variable. My project involves
sequencing nuclear genes to generate a more reliable evolutionary tree than that of the already existing chloroplast trees. The nuclear evolutionary tree I have generated for the gene PHYB shows congruency to the chloroplast tree of Burke, et al. (2012). More nuclear genes are currently being sequenced for better resolution. Dates of origin of C4 lineages and their relationship to paleoclimates can then be determined, allowing the fate of these grasses to be assessed.

27  IMMANUEL JACKSON & MIKE NUNEZ

HMGB1: DANGER SIGNALING TOWARDS CELL DEATH PATHWAYS

Authors:  Immanuel Jackson, Miranda Foster, Mike Nunez & Linda Yasui  
Faculty Mentor:  Linda Yasui  
Department:  Biological Sciences  
Research Category:  Science, Technology, Engineering, Math  
Judging Time:  12:45-2:00PM

HMGB1 is a protein that can mediate different modes of cell death. It accomplishes this task by being able to translocate due to differences in its structure which are caused by redox environments and other mechanisms of regulation. This feature allows it to have different roles in different cell compartments. Furthermore, understanding HMGB1’s pathways can be helpful in designing therapeutic approaches in treatment of deadly human brain cancer, glioblastoma multiforme (GBM). GBM U251 cells were collected by trypsinization and then irradiated with 10 Gy • rays at room temperature in medium. Irradiated cells were then re-plated and replaced back into the 37oC tissue culture incubator. On day 0, day 3 and day 7 after irradiation, cells were collected, washed and solubilized using 2X solubilization buffer (40 mM HEPES, 1 M NaCl, 2% Triton X) containing protease inhibitors and phosphatase inhibitors. The cell samples in solubilization buffer were assayed for protein content using a Lowry assay. Equal amounts of protein per lane were loaded onto a SDS PAGE gel. Western blotting was performed for each cell treatment. The compiled data shows that HMGB1 protein concentration inside the cell decreases with 10 Gy •• irradiation over time and protein concentration is constant in unirradiated cells with time. This trend is also confirmed by imaging cytometry data. These results reconfirm HMGB1’s status as a marker for cell death and are relevant in understanding HMGB1’s pathways which can help pave the way for future treatment of GBM cancer. Funded by DOD grant W81XH-10-1-017.

28  SCOTT SMITH

TETRACOCCUS BENTLEYI GEN. NOV., SP. NOV., A NOVEL BACTERIUM HARBORING A PLASMID ENCODING CAROTENOID PIGMENT

Authors:  Scott Smith & Kirthi Kutumbaka  
Department:  Biological Sciences  
Faculty Mentor:  Rangaswamy Meganathan  
Research Category:  Science, Technology, Engineering, Math  
Judging Time:  12:45-2:00 PM

The isolate (AM-6) was found to be Gram positive, yellow-pigmented, cocci (circular) occurring in tetrads. Transmission electron micrographic studies confirmed the tetrad nature of the bacterium. The nutritional properties of the organism were analyzed by using BiOLOG analysis. It was found that the organism grows well on complex media and is also capable of utilizing a number of sugars and amino acids as carbon sources in a minimal salts medium. For the determination of the optimum growth temperature, the bacterium was incubated at 28 C, 30 C, 37 C and 42 C. Surprisingly, at 42 C a number of white colonies appeared. Microscopic examination revealed that the colonies were identical in morphology to the yellow wild type. Hence, the possibility of a plasmid loss from the parent strain due to growth at higher temperature contributing to the yellow color was investigated. The wild type strain was
subjected to different plasmid isolation procedures and it was found that a large plasmid was responsible for the pigmentation. Phylogenetic analysis was performed by obtaining the complete nucleotide sequence of 16S rDNA for the bacterium. The phylogenetic relationships of the strain were analyzed and it showed that AM-6 occupies a branch that is distinct from, although very close to the family Micrococcaceae in the suborder Micrococcineae. Based on phenotypic characteristics, phylogenetic position, and 16S rDNA signature nucleotide data, it is concluded that the isolate represents a novel member of the suborder Micrococcineae, for which the name Tetracoccus bentleyi gen. nov., sp. nov. is proposed.

29 ASIM MUHAMMAD

**CHALCONE’S METAL DETECTING PROPERTIES**

Authors: Asim Muhammad  
Department: Biological Sciences  
Faculty Mentor: Marc Adler  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00PM

As the population of the world continues to increase so does the need for an accurate and cost effective way of testing potentially contaminated water. Toxins such as lead, mercury and chromium are carcinogens (cancer causing substances) and are often found in unclean water. These toxins are dangerous even in small amounts, and are often difficult to selectively detect. In this project we aim to study how the UV/Visible absorbance of the organic molecule chalcone changes based on the presence of different metals. We will study this by mixing chalcone with a solution of a metal of interest at various pHs and then evaluating the resulting spectra. This may result in a new method to detect trace amounts of various important metal species.

30 WHITNEY MITER

**THE EFFECTS OF NECROSTATIN ON HUMAN BRAIN CANCER CELLS**

Authors: Whitney Miter & Miranda Foster  
Department: Biological Sciences  
Faculty Mentor: Linda Yasui  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30AM

Glioblastoma multiforme, GBM, is a deadly brain cancer. Current radiation therapy for GMB induces radiation gliosis an inflammation response leading to necrosis, which results in a poorer prognosis for the patient. By imaging cells with transmission electron microscopy, the process of necrosis can be quantitated in a population when using our criteria for necrosis (a whole cell is view able and membrane integrity is lost and contents of the cell are spilling out). In this project, we investigated the ability of a rationally designed drug against necrosis, necrostatin, to prevent necrosis. GBM cells were treated with necrostatin (5 μM) for 1 hour and at the end of the hour treatment, cells were irradiated with 10 Gy • rays, then cells were replaced back into the incubator for several days to allow time for the expression of necrosis. At least 30 different cells for each population were scored for necrosis. The results (proportion of necrotic cells +/- confidence interval) for samples imaged 3 days after treatments follow: Control cells-0.03±0.05, Necrostatin alone-0.04±0.04, Radiation alone- 0.26±14, and Radiation with necrostatin: 0.04±0.0. Preliminary results suggest that with necrostatin treatment necrosis is reduced and that GBM cells are undergoing a programmed necrosis. Future experiments include imaging cells 7 days after treatment and including fast neutron irradiation trials.
**Preventing Aflatoxin Production by Chemical Interference**

Authors: Justin Durancik  
Department: Biological Sciences  
Faculty Mentor: Ana Calvo  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00PM

Aspergillus nidulans is a filamentous fungus and model organism for other Aspergillus species, such as A. flavus. A. flavus and some other Aspergillus species produce a toxin known as aflatoxin. Aflatoxin is a carcinogenic secondary metabolite produced by the fungi. A. nidulans is often used to study this pathway because it used the same pathway to produce the mycotoxin sterigmatocystin (ST). For my project, I have screened for chemicals that disrupt the biosynthetic pathway responsible for producing aflatoxin. Specifically, I screened for chemicals that inhibit the VeA-LaeA protein-protein interaction. This protein interaction has been previously shown to affect production of secondary metabolites, including aflatoxin, in Aspergillus species. The experiment was done by performing a yeast 2 hybrid strain, so that growth of the yeast is dependent upon the interaction of these two proteins. After performing the high throughput screening, I found one chemical of interest. We are currently investigating in our lab whether this chemical affects vegetative growth, morphogenesis, and mycotoxin production.

**Effects of Arbuscular Mycorrhizal Fungi and Induced Defenses on Insect Herbivore Growth**

Authors: Lindsey Gordon  
Department: Biological Sciences  
Faculty Mentor: Nick Barber  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30 AM-12:45 PM

Introduction  Arbuscular mycorrhizal fungi (AMF) have a symbiotic relationship with plants that they colonize, exchanging nutrients it acquires from soil for plant carbohydrates. This direct interaction has been researched extensively and generally benefits both the plant and fungal partners. New evidence suggests that mycorrhizae benefit plants in other ways, such as through its defensive mechanisms. This experiment tests the hypothesis that mycorrhizal fungi living symbiotically on plant roots assist the plant’s induced defensive mechanism. We used a factorial experimental design by inoculating 16 Solanum ptycanthum plants with AMF and 16 with sterilized inoculum and applying jasmonic acid, a plant hormone that triggers induced defenses, to half of each AMF group. We fed leaves from each plant to Manduca sexta caterpillars and recorded their growth as a bioassay of plant defense. The results from this experiment will help in understanding how a belowground symbiont affects plant interactions with an aboveground enemy. This could benefit restoration ecology or agriculture where reducing herbivory could help plant establishment and growth.

**The Importance of MHC Haplotypes and Alloantigen Systems Identification in Commercial Poultry**

Authors: Sarah Carter  
Department: Biological Sciences  
Faculty Mentor: Nick Barber  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30 AM-12:45 PM

The importance of MHC haplotypes and alloantigen systems identification in commercial poultry is crucial for understanding the genetic diversity and immune response within poultry populations. By identifying these markers, researchers can better understand the potential for disease resistance and the development of vaccines. This information is vital for improving poultry health and productivity.
Through selective breeding of individuals with the most advantageous major histocompatibility complex (MHC) haplotypes and other genetic markers, poultry companies produce elite lines which are crossed to form commercial “super” layers. Chicken MHC is commonly defined by the serological reactions between erythrocytes and antibodies specific to the MHC Class I (BF) antigen and the highly polymorphic MHC Class IV (BG). Particular MHC haplotypes are associated with disease resistance to Marek’s Disease (malignant lymphoma), Rous Sarcoma Virus, and Coccidiosis. Several non-MHC alloantigen systems have been demonstrated to have an effect on increased weight and quality of eggs, greater livability, and other highly desirable traits. Genotyping of two distinct, pure commercial lines was performed using immunogenetic and molecular techniques. Seven alloantigen systems were identified in the two lines with hemagglutination assays using polyclonal antisera specific for the A, C, D, I, L, P, and M systems. The identification of MHC alleles was performed serologically and with DNA-based typing utilizing a microsatellite known to be located between the B-G (MHC IV) and B-F (MHC I) regions. PCR-SSCP (single-stranded conformational polymorphism) was performed in one line to examine differences between B-F, B-L and B-G genes among similar MHC alleles. The identification of MHC and non-MHC alloantigen genes within the parent and grandparent elite stock assists in selection of the best birds with the most desirable traits to produce a superior commercial cross.

34 MATT MARCEC

CASE OF THE MISSING SEEDS: A RELATIONSHIP BETWEEN HIGHLY CONSERVED DRG PROTEINS AND SLH HELICASES.

DRG’s are an ancient and highly conserved family of GTP binding protein genes. DRG1 and DRG2 orthologs have been found to exist in all eukaryotic organisms tested. Recently in yeast it has been found that DRG proteins interact physically and genetically with a DEAD-box helicase named SLH1. In particular, DRG and SLH1 proteins together may have a role in polyribosomal production. Due to the high conservation of both the SLH and DRG proteins it is expected they serve a similar function in other eukaryotes as well. I am studying Arabidopsis thaliana homologs of SLH1 helicases called SLHA and SLHD. It is expected that SLHA is the same as SLH1 in yeast and serves the same function, whereas closely related SLHD is being used as a negative control. Triple knock out mutants of the DRG1, DRG2 and SLHD genes could be obtained, suggesting no association between the two groups. However, a triple knock out for DRG 1, DRG2 and SLHA has never been observed, possibly because this allele combination is lethal to the plant. When a double mutation of one of the DRG genes and the SLHA is obtained a phenotype called the “missing seeds” occurs if the plant is also heterozygous for the other DRG gene. By observing the siliques of Arabidopsis these mutants show that one third to a half of their seeds never develop at all supporting the idea that DRG1, DRG2 proteins and SLHA have some relationship that is necessary for development. To explore this possibility, double mutants of every combination of DRG1, DRG2 and their regulatory proteins the DFRP1, DFRP2 along with SLHA are currently being constructed. Thus far no particular genotype has been found that produces the missing seed phenotype, yet many of the double mutants and even heterozygotes show the missing seed phenotype, whereas wild type does not. Although much research remains to be done, these results may be attributed to a gametophytic event in which the pollen and/or embryo sacs may never develop in the absence of the DRG and SLH genes. Whatever the case may be it appears there is some association between the DRG and SLH proteins in Arabidopsis.
THE EFFECTS OF HOST AGE AND SIZE ON THE PARASITOID WASP SPALANGIA ENDIUS

MEGAN SIEG & SCOTT BROSKI

Authors: Megan Sieg & Scott Broski
Department: Biological Sciences
Faculty Mentor: Bethia King
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00 PM

A well-documented strategy observed in plants and insects to deter herbivores and predators is the hardening of outer tissue layers. The hardness of a tissue is often a component of size and age; older, larger individuals have tougher tissue than their counterparts. We examined this method of resistance in a host-parasitoid interaction using Spalangia endius, a parasitoid wasp, and its natural host, the pupal stage of Musca domestica. We investigated whether utilizing larger and older hosts imparted fitness costs to the parasitoid in terms of mechanical wear to ovipositors and mandibles and in terms of long term production of offspring. We found that parasitoids produced significantly more offspring in smaller and younger hosts compared to larger and older hosts. Preliminary results also suggest shorter drill durations. Additionally, the puparia of smaller and younger hosts were significantly thinner; and preliminary results indicate less force is required to penetrate them compared to larger and older hosts. However, no wear was detected on the ovipositors of female wasps or on the mandibles of wasps, even with large old hosts. This work is evidence that host age and size influence the reproductive capacity of this parasitoid wasp. This influence may be through effects of host age and size on tissue hardness, but is apparently not through wear effects on the parasitoid.

P62 AND ITS CENTRAL ROLE IN CELLULAR “GARBAGE” COLLECTION AND DISPOSAL

ANDREW SCHUCK & KELSIE ALLEN

Authors: Andrew Schuck, Kelsie Allen, Ana Recendiz & Linda Yasui
Department: Biological Sciences
Faculty Mentor: Linda Yasui
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30 AM

The intracellular multi-domain protein p62 (SQSTM1) is involved in the aggregation and sequestration of targeted cellular components. Acting as a cargo receptor, specific domains in p62 bind various proteins. One protein binding partner, LC3 II, targets p62 to the forming autophagosome membrane. Thus, p62 is responsible for the collection of cellular “garbage” or “junk” and is a main player in the process of autophagy, which is necessary for cellular survival. Our results show for the first time that the autophagic flux is perturbed by exposure of ionizing radiation to U87 and U251 malignant human glioblastoma multiforme cells. Imaging cytometry of acridine orange stained autophagosomes illuminated an altered flux and a gross accumulation of unique cellular “garbage” within the autophagosomes, as shown by TEM. Western blot data indicated different levels of p62 which did not conform to control levels, confirming our suspicions of an altered autophagic flux induced by ionizing radiation. Therefore, we conclude that with time after irradiation, intracellular p62 levels increase because of radiation-induced modulation of autophagy. This is due to a continual accumulation of p62 bodies within pre-autophagosomes without normal degradation.

METABOLIC STRESS INDUCED BY HBSS IN Glio BLASTOMA MULTIFORME CELLS

HANNAH SAVAGE
Glioblastoma multiforme (GBM) is the most commonly diagnosed and most aggressive form of malignant brain tumor in humans. Patient prognosis with treatment is only about a year so a need exists for therapies to enhance longevity or even better, provide a cure. The role of metabolic stress in the radiation response of GBM (U87 and U251) cells was investigated because the combination of metabolic stress and radiation was previously shown to enhance radiation response. An extreme method of inducing metabolic stress is by replacement of the cell medium with Hank’s balanced salt solution (HBSS) for short periods of time. A short HBSS treatment of 30 minutes did not result in any decline in clonogenic ability for either U87 or U251 cells so a 30 minute HBSS treatment was used for these initial experiments. The induction and progression of autophagy by HBSS treatment was investigated using acridine orange (AO) staining of cells and confocal laser scanning microscopy to image the number and size of autophagosomes. AO stained cells were analyzed using imaging cytometry to estimate brightness or luminosity of autophagosomes in cells. Future experiments will include combining radiation with the HBSS treatments and to investigate if metabolic stress leads to autophagy-dependent senescence and the contribution of this cellular death pathway in GBM. Funded by DOD grant W81XH-10-1-017.

38  ANNA ROMAN-PLESCHKO

STUDY OF THE MTF A GENE IN THE FUNGUS ASPER GILLUS FLAVUS

Authors:  Anna Roman-Pleschko, Sourabh Dhingra & Jessica Lohmar
Department: Biological Sciences
Faculty Mentor: Ana Calvo
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30AM

In the model fungus Aspergillus nidulans the mtfA gene has been shown to be important in the regulation of morphogenesis and of production of secondary metabolites, including the mycotoxin sterigmatocystin. Currently I am studying the ortholog of mtfA in the fungus Aspergillus flavus, a producer of the carcinogenic mycotoxin aflatoxin. This fungus contaminates our food supplies worldwide. In order to study this gene, a deletion mutant has been generated. To verify that the observed phenotype is only due to the deletion of this gene I am creating a complementation strain for mtfA in A. flavus. It is predicted that the complementation strain of the gene will recover wild type phenotype. The complementation is being created using the pPM1 plasmid, containing the ptrA (pyrithiamine resistant) gene as selection marker. I am performing a series of steps including PCR amplification, endonuclease digestions, DNA dephosphorylation, and DNA ligations in order to successfully create a plasmid containing a wild-type copy of the mtfA gene. Once I successfully obtain the final recombinant plasmid pPM1+ptrA+mtfA I will be performing a bacterial transformation and bacterial culture in order to generate abundant copies of this plasmid. Then I will transform the A. flavus mtfA deletion mutant with this final plasmid (transformation vector) and select for pyrithiamine resistant fungal colonies. Our studies of the regulatory genes controlling mycotoxin production and fungal mechanisms of survival or dissemination could set the bases for the developing of a strategy to control the detrimental impact of fungi such as A. flavus.

39  AMIR TOGHRAEE

LIPID RICH MONORAPHIDIUM ALGAE CULTIVATION AS A SOURCE OF BIODIESEL FUEL
The ability of microalgae to grow in wastewater coupled with their low environmental impact makes them an attractive, sustainable source of biodiesel fuel. To be economically viable, algae require an environment for optimal growth and an energy efficient means of lipid extraction. This research entails growing Monoraphidium algae, a naturally occurring species in the Northern Illinois area. Monoraphidium was grown in 1 liter cultures in the laboratory and in a controlled environment growth chamber. Daily measurements of algal growth, pH, conductivity, total dissolved solids, salt content, temperature, ammonium ions, and nitrate ions were taken to better characterize the algae’s growth. Lipid content of the algae was visible using a Nile red fluorescence staining technique, and viewed under a confocal microscope. Further analysis is required to determine optimal conditions for commercial scale growth and the best time to harvest algae with maximum oil yields.

40 LARISSA ROOT

PHOTOSYSTEM REDOX STATE OF INDIVIDUAL SYMBIODINIUM SYMBIONTS DURING CORAL BLEACHING

Authors: Larissa Root
Department: Biological Sciences
Faculty Mentor: Neil Blackstone
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM

Coral reefs are productive and highly diverse ecosystems. Nevertheless, these reefs are threatened by, “coral bleaching,” in which the photosynthetic dinoflagellate symbionts (Symbiodinium sp.) of corals are perturbed by environmental stress. Plausibly, perturbation begins with damage to the biochemical mechanisms of photosynthesis. Considerable debate focuses on whether the damage occurs at the initial step, where the D1 protein extracts electrons from water, or at the terminal step, where the RuBisCO protein fixes carbon dioxide. Methodological limitations of field studies of corals have thwarted resolution of this debate. Employing fluorescence microscopy of corals in the laboratory, for the first time chlorophyll fluorescence of individual symbiont cells has been quantified. Using two excitation (510-560 and 535-580 nm) and emission (>700 and 610-680 nm) wavelengths, essentially identical results have been obtained, suggesting the Photosystem II dominates fluorescent emissions. The redox state of Photosystem II can thus be determined. Comparison of bleaching and control colonies can distinguish the differential predictions: if the D1 protein is damaged, Photosystem II should be oxidized, while if the RuBisCO protein is damaged, Photosystem II should be reduced. Preliminary data suggest initial reduction followed by subsequent oxidation. Thus damage may initiate with RuBisCO and proceed to D1. This information may lead to a better understanding of coral bleaching which is currently devastating coral reefs worldwide.

41 KATARZYNA BUJARSKA & ARIEL FINNEY

LONG TERM EFFECTS OF METHYLPHENIDATE ON SPATIAL LEARNING AND MEMORY IN JUVENILE RATS

Authors: Katarzyna Bujarska & Ariel Finney
Department: Chemistry and Biochemistry
Faculty Mentor: Leslie Matuszewich
Research Category: Science, Technology, Engineering, Math
Judging Time: 11:30 AM-12:45 PM
The use of psychotropic stimulants in children with attention deficit disorder has steadily increased over the years. Current literature investigating the effects of methylphenidate (Ritalin©) in children primarily focuses on the short-term cognitive changes and the potential for long-term increased risk of drug abuse. However, the long-lasting cognitive effects of stimulant exposure during the juvenile period of development are not well known. Therefore, the purpose of this study was to ascertain whether any enduring changes in spatial memory following methylphenidate exposure during the juvenile period are present in adulthood. Young male and female rats (PND 21-35) were administered 2 mg/kg of methylphenidate daily (through intraperitoneal injection or on a cookie) and then tested as adults, after 30 days without drug exposure. All rats were tested in the water maze, which is commonly used to assess spatial learning and memory in rodents. There was a significant improvement in locating a submerged platform over 5 days of training across all groups. Male rats tended to perform better than female as indicated by shorter latencies and distances swam to reach the platform, although females swam faster. There was no significant difference between juvenile exposure conditions when compared to control rats for either male or female rats. These results indicate that juvenile exposure to methylphenidate produces no lasting changes to performance on a spatial memory task. Although this study concludes no negative effects on spatial cognition, there may be lasting effects from early exposure of this drug on other types of learning behaviors critical for success later in life.

42 HECTOR ALVARADO

SYNTHESIS OF IMINO SUGARS FOR THE USE OF BORON NEUTRON CAPTURE THERAPY (BNCT)

Authors: Hector Alvarado & Amartya Chakrabarti
Department: Chemistry and Biochemistry
Faculty Mentor: Narayan Hosmane
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15 AM

Research is being conducted regarding the idea of Boron Neutron Capture Therapy (BNCT) to help combat cancer in humans. BNCT is a fairly new concept for cancer treatment and the possibilities are infinite. Unfortunately boron-based molecules are not water-soluble. It is important for boron-based molecules to be water-soluble so that they can be introduced to cancer cells. To solve this, imino sugars are seen to be good carrier molecules for boron-based molecules in BNCT therapy allowing them to be more water-soluble. Imino sugars are based on the structure of a regular sugar, except for the oxygen is replaced with the nitrogen. Nitrogen is used in the imino sugar because it can easily be protonated to create a positive charge. This allows the boron molecules to be up taken by the cell.

43 ASHLEY HALL

DESIGN AND SYNTHESIS OF PYRIMIDINE BASED ISP F INHIBITORS WITH IMPROVED SOLUBILITY

Authors: Ashley Hall, Derek Burnet & Timothy Hagen
Faculty Mentor: Timothy Hagen
Department: Chemistry and Biochemistry
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM

In the ever-expanding medical research field, keeping up with an infectious disease’s ability to mutate and become resistant to current treatment is a difficult task. This is especially true with malaria. Many infectious disease causing organisms utilize the methyl-erythritol isoprenoid (MEP) pathway. This metabolic pathway produces isoprenoids, which are essential building blocks. The MEP pathway is an excellent drug target for infectious disease because humans do not use this pathway. The overall objective of this project is to target a specific enzyme (IspF) in the
MEP pathway. The Hagen group identified a pyrimidine derivative, HGN-028, as an inhibitor of the IspF enzyme and a potent anti-bacterial agent. This pyrimidine analog contains a 4-chlorophenyl substituent. In order to design more potent analogs that have improved physiochemical properties the chlorophenyl ring was replaced by various heterocyclic rings. The identity and purity of the newly synthesized compounds was determined by NMR, HPLC, MS and elemental analysis. The compounds were submitted to collaborators at the University of North Carolina and Walter Reed Army Institute for Research for anti-bacterial and anti-malarial testing.

44 ADAM AHERN

DESIGN AND SYNTHESIS OF IMIDAZOLE ISP F INHIBITORS

Authors: Adam Ahern, Zheng Zhang, Gashaw Goshu, Sriram Rao; Richard Sciotti, Patty Lee, James Horn, Darren Begley, & Timothy J. Hagen
Department: Chemistry and Biochemistry
Faculty Mentor: Timothy Hagen
Research Category: Science, Technology, Engineering, Math
Judging Time: 11:30 AM-12:45 PM

The enzyme, 2C-methyl-D-erythritol 2,4-cyclodiphosphate synthase (IspF), is highly conserved in the methyl erythritol isoprenoid (MEP) pathway common to bacterial and other infectious organisms such as the malarial parasite. Fragment based screening determined that FOL955 bound to IspF from Burkholderia pseudomallei and that it would be a starting point for developing new antibacterial and antimalarial agents.

Analogs of FOL955 were prepared using a [3+2]-dipolar cycloaddition reaction. These analogs have been screened for their ability to inhibit IspF, using surface plasmon resonance (SPR) to determine their respective KD values. Antibacterial and antimalarial data for the compounds have also been evaluated.

45 JOSHUA DEMUTH

SYNTHESIS AND CHARACTERIZATION OF HEXAGONAL BORON NITRIDE NANOSHEETS

Authors: Joshua DeMuth
Department: Chemistry and Biochemistry
Faculty Mentor: Narayan Hosmane
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30 AM

Few layered hexagonal boron nitride (h-BN) nanosheets was synthesized using a newly developed catalyst-free method. The synthesis was performed under several variant conditions in which the temperature and reaction time acted as parameters. The products from each reaction, run at a specified condition, were characterized using a combination of Fourier transform infrared spectroscopy (FT-IR), powder X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), high resolution transmission electron microscopy (HRTEM) and electron energy loss spectroscopy (EELS). The different reaction conditions were compared and optimized to develop h-BN nanosheets.

46 BIANCA WHITAKER

SYNTHESIS OF ZINC SULFIDE NANOMATERIALS USING ORGANIC SURFACTANTS
Zinc sulfide (ZnS) is a semi-conductor with a band-gap of 3.6 eV. Potential application of ZnS nanomaterials includes a variety of electronic devices, such as electroluminescence devices and photoluminescence devices. We have developed a methodology to prepare ZnS nanomaterials by varying percentages of organic surfactants to investigate the morphologies of the nanomaterials formed. The nanomaterials were synthesized by reaction of thiourea and Zn(NO3)2 in the presence of different surfactants. Purified ZnS nanomaterials were characterized by attenuated total reflectance Fourier transform infrared spectroscopy (ATR-FTIR), X-ray powder diffraction (XRD), transmission electron microscopy (TEM), scanning electron microscopy (SEM) and energy dispersive X-ray spectroscopy (EDX). Transmission electron microscopy revealed the morphology of the materials to be in the form of nanorods and nanosheets.

47 GEORGE KHOSHABA

**MEP PATHWAY AND ISP F INHIBITORS**

Methyl erythritol isoprenoid (MEP) pathway, a non-mevalonate isoprenoid biosynthetic pathway, is essential for certain bacteria and other infectious disease organisms. One highly conserved enzyme in the MEP pathway is 2C-methyl-D-erythritol 2,4-cyclodiphosphate synthase (IspF). Inhibitors of IspF enzyme may result in potential anti-malarial activity with minimal host toxicity. Fragment based screening of IspF from Burkholderia pseudomallei yielded a co-crystal structure of FOL955, an imidazole analog. The first design and synthesis cycle of analogs of FOL955 resulted in HGN-099, as a potent inhibitor of the IspF enzyme and a potent anti-malarial agent. This imidazole analog contains a 2,4-dichlorophenyl substituent. In order to design more potent analogs that have improved physiochemical properties the dichlorophenyl ring was replaced by various heterocyclic rings. The identity and purity of the newly synthesized compounds was determined by NMR, HPLC, MS and elemental analysis. The compounds were submitted to collaborators at the University of North Carolina and Walter Reed Army Institute for Research for anti-bacterial and anti-malarial testing.

48 MELISSA TAM

**OPTICALLY TRANSPARENT AND UV/IR CUT NANOCOATINGS AND APPLICATIONS**

Glass is used everywhere; in architectural design and in automobiles. Generally, glass permits the entire light spectrum to be transmitted. Certain wavelengths, such as ultraviolet (UV) radiation can cause detrimental damage to humans and materials. UV light is responsible for the decomposition and degradation of organic compounds. In materials such
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as paints and polymers, it deteriorates pigmentation, and in rubbers, elasticity. NIR light is responsible for needless heating.

In order to prevent this, UV and NIR protection afforded by UV and NIR absorbing nanoparticles in environmentally friendly water based resins or acrylate topcoat was investigated. Many inorganic UV absorbing metal oxide nanoparticles systems, like ZnO and TiO2 have been developed based on particle or thin film coating. Near infrared absorbing nanoparticles like Indium tin oxides (ITO) and lanthanum boride (LaB6) have been well known for many years and are continuously investigated. In our proposed work, we are researching the incorporation of UV and NIR absorbing nanoparticles to water based topcoat by dispersion method. Nanoparticles of different concentrations were dispersed to see the most effective concentration in cutting UV and NIR light while preserving the visible light spectrum. ZnO nanoparticles were chosen for UV light cut while for the NIR spectrum, inorganic nanoparticles ITO and Cs0.35WO3 and organic dyes IR806, IR165, and NIR911A were investigated. Many of the formulations were single material formulations to see the effectiveness of absorbing the UV/IR spectrum. Coating formulations were applied on glass panels for investigation and they were analyzed using an UV-VIS-IR spectrophotometer and compared to an uncoated glass panel. From the data collected, effective UV cut was confirmed by using ZnO nanoparticles while maintaining more than 80% transmittance of visible light. ITO nanoparticles also obtain satisfactory IR radiation absorption around 1500nm but absorption around 800nm is required for effective prevention of overheating. NIR light absorbing organic dyes, in addition to their narrow absorption, proved unstable when mixed with inorganic nanoparticles in the coating formulation. Recently, CsxWO3 nanoparticles were reported as an excellent NIR absorber and we are investigating the possibilities by synthesizing CsxWO3 nanoparticles and incorporating them into our formulations.

49  STEPHEN HINCK

ATTACHMENT OF ARPE-19 CELLS TO NITRATED FIBRONECTIN

Authors: Stephen Hinck, James Dillon, Mai Thao & Elizabeth Gaillard  
Department: Chemistry and Biochemistry  
Faculty Mentor: Elizabeth Gaillard  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30AM-12:45PM

Age-related macular degeneration (AMD) is the leading cause of irreversible blindness in people over the age of 50. The exact etiology of AMD is still unknown, however, inflammation has been strongly linked to AMD pathogenesis. In this experiment, fibronectin is modified via non-enzymatic nitration to model inflammation, and the effects on ARPE-19 cells are determined. ARPE-19 cells are cultured and seeded on 96 well plates coated without fibronectin, with fibronectin, and nitrated fibronectin. A MTT assay is preformed on each of these wells and an absorbance is taken at 570nm to evaluate ARPE-19 cells population that have attached. The wells that are coated with nitrated fibronectin have a lower absorbance compared to the non-nitrated fibronectin. This indicates that once the fibronectin is nitrated, less ARPE-19 cells are able to attach.

50  AUDRINA PRYER

GRAPHENE NANOSHEET SYNTHESIS, PURIFICATION, AND CHARACTERIZATION

Authors: Audrina Pryer & Glen Svenningsen  
Department: Chemistry and Biochemistry  
Faculty Mentor: Narayan Hosmane  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30AM

Graphene is a 2-dimensional planar allotrope of carbon with sp2 bonding. This material is a flat monolayer of carbon
atoms tightly packed into honeycomb lattice, and is the basic building block for graphitic materials. Our project focuses on examining the production of graphene nanosheets through the green synthesis method of combusting magnesium turnings, powder, or ribbon within the presence of carbon dioxide in the form of dry ice. Investigation of surfactant treatments via ultrasonication, centrifuging, and filtering were performed to isolate purified colloidal dispersions of graphene nanosheets. Three surfactants were chosen for experimentation: sodium dodecyl sulfate, sodium dodecyl sulfonate, and sodium cholate. Concentrations of graphene suspension were determined by ultraviolet spectroscopy. New procedural investigations of this reaction are explored using arc welding as the ignition source. Arc welding allows for industry processing of this synthetic method and has the potential for a more controlled reaction. All characterizations are preformed through TEM, SEM, EDX, and XRD to determine quality of the graphene nanosheets.

51  RICK JESWEIN

ISPF INHIBITORS AND ANTI-MALARIAL ACTIVITY

Authors: Rick Jeswein  
Department: Chemistry and Biochemistry  
Faculty Mentor: Timothy Hagen  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00 PM

Methyl erythritol isoprenoid (MEP) pathway, a non-mevalonate isoprenoid biosynthetic pathway, is essential for certain bacteria and other infectious disease organisms. One highly conserved enzyme in the MEP pathway is 2C-methyl-D-erythritol 2,4-cyclodiphosphate synthase (IspF). Structure Bases Drug Discovery (SBDD) combined with organic synthesis imidazole compounds have anti-malarial activity by inhibiting the IspF enzyme of the MEP pathway. The first design cycle resulted in compounds with heterocyclic rings including dichloro and difluoro heterocyclic rings. The structures were confirmed by proton and carbon NMR. The purity was determined by HPLC and elemental analysis. The compounds were submitted to collaborators at the Walter Reed Army Institute for Research for anti-malarial testing. This poster will describe our latest efforts in the synthesis of new imidazole based IspF inhibitors.

52  KATHERINE POWERS

SYNTHESIS OF NOVEL ANODE CATALYSTS FOR THE INCREASED PERFORMANCE OF LITHIUM ION BATTERIES

Authors: Alexander Kincaid & Heather Barkholtz  
Department: Chemistry and Biochemistry  
Faculty Mentor: Tao Xu  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30 AM

Lithium ion batteries (LIB) are prevalent throughout today’s modern technological world. LIBs are a key component to cell phones, tablets and all types of small digital devices. These devices that run our world would not be possible without the lithium ion battery. LIBs can be significantly sized down and still provide enough power to give these small devices a long battery life. In addition to providing very small devices with power, a goal of LIB research is to create a battery that can successfully power a car. LIBs are currently not advanced to the point of safely providing a high enough energy density to allow for long distance driving without recharging. Dr. Tao Xu’s research group is currently examining a method to raise the power and energy density in a LIB through the support of copper tin nanoalloy on the graphite anode of the LIB. It is the hope that this method will increase power and energy density, the specific capacity to higher than that of graphite (the current “standard”), and cycling performance. High power density
would allow LIB cars to accelerate and maintain high speeds and high energy density would allow for long distance
driving. In addition to improving the performance of the battery the presence of the nanoalloy is also hoped to lower
the production cost of the battery as well as improve the safety.

53  **SEAN HAYES**

**Biophysical Characterization of an Anti-Methotrexate Single Domain VHH Antibody Engineered to Possess a pH-Dependent Binding Profile**

Authors: Sean Hayes  
Department: Chemistry and Biochemistry  
Faculty Mentor: James Horn  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30AM-12:45PM

Antibodies play important physiological roles in biology, as well as applications including medical diagnostics,
therapeutics, and chromatography. Here, the structurally unique, heavy chain-only antibodies found in the Camelidae
family were used as a model antibody system to explore protein engineering efforts aimed at producing pH-dependent
binding events. Specifically, an anti-methotrexate single domain VHH antibody was engineered to exhibit pH-
dependent methotrexate binding. Two pH-dependent variants were produced; both involved incorporating a histidine
residue in the methotrexate binding pocket (tyrosine-79 or tryptophan-34). Isothermal titration calorimetry (ITC) was
used to determine the binding thermodynamics over a range of pH values to determine the extent of pH dependence.
The origins of the pH-dependent binding, including the linked protonation events, will be discussed.

54  **DAN JEFFRIES**

**Novel Agents for Use in Boron Neutron Capture Therapy**

Authors: Dan Jeffries  
Department: Chemistry and Biochemistry  
Faculty Mentor: Narayan Hosmane  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00 PM

It is the focus of this research to synthesize a complex compound from the amino acid cysteine. This complex
compound will be developed through the use of various organic chemistry techniques and will be modified for use in
Boron Neutron Capture Therapy. This therapy, informally known as BNCT, is considered a revolutionary treatment
for a wide variety of cancer patients. It works by introducing the element boron into cells and then inducing the boron
to decompose and destroy said cell. BNCT still has many problems to overcome before it can be formally introduced
into the market. One such problem is how to selectively transport boron to tumor cells only. The compound to be
synthesized through this research offers means of selective transport. Once the compound has been synthesized,
further tests will be run using cell cultures to examine cellular uptake levels. If results come back positive, then this
particular compound will be tested further for use in BNCT.

55  **KYLE MONDRON**

**Preparation of Boron-Doped Hydrophylc Magnetic Nanoparticles**
The intention of the proposed research is to prepare boron doped hydrophilic magnetic nanoparticles. Forming a durable and thorough aqueous suspension of nanoparticles is a primary focus of this research. Once the particles are successfully synthesized, determination of surface characteristics, magnetic properties, size of the nanoparticles and boron loading will be performed. Each synthetic step will be examined through Fourier transform infrared spectroscopy.

56  STEFANIE DeVLIEGER

SMALL MOLECULE PROBES OF SILICON LEWIS ACIDITY

Authors:  Stefanie DeVlieger, Vlad Skrypai & John Price
Department:  Chemistry and Biochemistry
Faculty Mentor:  Marc Adler
Research Category:  Science, Technology, Engineering, Math
Judging Time:  11:30 AM -12:45 PM

Tetravalent silicon has been demonstrated to be weakly Lewis acidic. We have synthesized a number of ortho-silyloxy carbonylbenzenes to study the donor-acceptor relationship between the carbonyl oxygen and the silicon. A number of such molecules have been synthesized and spectroscopically evaluated, and the results are presented.

57  TAM LE

DOPAMINE DERIVED DRUGS FOR THE APPLICATION OF BNCT

Authors:  Tam Le & Hiren Patel
Department:  Chemistry and Biochemistry
Faculty Mentor:  Narayan Hosmane
Research Category:  Science, Technology, Engineering, Math
Judging Time:  10:15-11:30 AM

Dopamine is a naturally occurring biological molecule. Dopamine can be classified as a substituted phenethylamine. Because it is water soluble, it can travel to different organs in the blood, including crossing through the blood-brain barrier to reach the central nervous system. These features make dopamine an attractive carrier for boron. Dopamine was modified in order to incorporate single boron atom in the form of boronic acid. Minimal change in dopomine structure will allow it to retain its biological activities, and water solubility.

58  DANIELLE LAMBERT

COMPARATIVE ANALYSIS OF VARIOUS SULFUR OXIDES USING THERMODYNAMIC AND SPECTROSCOPIC METHODS
Sulfur oxides are major anthropogenic additions to the atmosphere, where it is important as a source of acid rain and as a nucleation site for water droplets. Sulfur oxides and their ions are also abundant on Jupiter’s inner moon, Io and its atmosphere. Various computational methods such as B3LYP, MP2, PMP2, ROMP2, MP4, ROMP4, CCSD, CCSD(T), G4, CBS-QB3, W1RO, and W1BD have been used to calculate thermodynamic and spectroscopic (bond length and frequency) values for SxOx and SxOy+. The B3LYP and MP2 methods were used to calculate geometries and vibrations. All other computational methods except CCSD use either the MP2 or the B3LYP geometries and frequencies. The computational data has been analyzed and compared with experimental values to assess the accuracy of various determinations. The most stable geometries were often very dependent on which computational method was used. The MP2 frequencies are occasionally in substantial error (about 100%) because of wavefunction instabilities. The W1RO, W1BD, CBS-QB3, and CCSD(T) calculations typically take longer but are more accurate.

59  MATTHEW WOZNICKI

SYNTHESIS OF IMINO SUGARS FOR BORON COMPOUNDS IN THE USE OF BORON NEUTRON CAPTURE THERAPY

Authors: Matthew Woznicki, Chanisse Abraham, Hiren Patel & Narayan S. Hosmane
Department: Chemistry and Biochemistry
Faculty Mentor: Narayan Hosmane
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30 AM

Imino sugars have potential to be used for boron neutron capture therapy (BNCT) by acting as a carrier molecule of boron compounds into cancerous cells. Since boron compounds are not water soluble, a way to overcome this needs to be addressed. With imino sugars, boron compounds can be made more soluble to be up taken into cells. The key feature that can allow this is the nitrogen replacing the oxygen in the sugar. This nitrogen can be protonated to carry a positive charge, making the overall compound more water soluble. By using these imino sugars, the goal is to attach boron compounds of varying composition such as o-methylbromo-1,2-dicarba-closo-dodecaborane, benzyl bromic acid and p-methylbenzyl bromic acid to the sugar to study the overall effect of cellular uptake.

60  JAMES O’SULLIVAN

QUANTUM AND KINETIC EFFECTS RELEVANT TO LASER INDUCED BREAKDOWN SPECTROSCOPY

Authors: James O’Sullivan
Department: Chemistry and Biochemistry
Faculty Mentor: Chhiu-Tsu Lin
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00 PM

Laser induced breakdown spectroscopy (LIBS) is an analytical method that is used in current research and industry because of its easy sample preparation. LIBS technique is a form of atomic spectroscopy where the sample is partially evaporated via laser pulse, and the resulting emission spectrum is collected. The spectra from LIBS contain the characteristics of elements and ions, which allow the sample to be determined qualitatively and quantitatively. However, physical phenomena under the laser induced breakdown has various complication based on the sample type,
atmospheric composition and laser energy because each phenomena is generally transient and instantaneous. We have studied characteristics of laser induced plasma by measuring plasma temperature. An Nd:YAG laser with a 10 nsec pulse width was used for plasma generation. The pure metal samples of copper, zinc and silver are used under the specified gas environment and laser power. The spectra are collected by an array-detector integrated spectrometer. The obtained temperatures of the plasma were in 8000 K - 18000K depending on the breakdown condition. The copper sample shows about 12000K but varies by gas environment. Temperatures of silver plasma were more sensitive than other metal by the environment gas, especially helium gas cools down the plasma rapidly. The transitions between quantum mechanical energy levels in the atom and ion are discussed based on the Boltzman distribution energy density.

61 AKHIL PILLAI

SYNTHESIS OF CATECHIN BASED CHIRAL AUXILIARIES FOR USE IN ASYMMETRIC DIELS-ALDER REACTIONS

Authors: Akhil Pillai
Faculty Mentor: Timothy Hagen
Department: Chemistry and Biochemistry
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30 AM

For the better part of the century, the Diels-Alder reaction has been used to synthesize substituted cyclohexene rings. The reaction occurs between a substituted alkene and a diene. As the reaction proceeds, there are multiple possible enantiomeric products arising from the orientation of the reactants with respect to one another. Since different enantiomers could potentially have different biological activity, it is absolutely imperative to produce a single enantiomerically pure product. A chiral auxiliary can be employed to influence the directionality to produce the desired compounds during this process. Here we have esterified the C-3 secondary alcohol of catechin using cinnamoyl chloride. Catechin is a favorable candidate as a chiral auxiliary scaffolding due to its abundance in natural products from which it can be easily extracted, as opposed to its production synthetically. In addition, the catechin scaffolding can be left on the Diels-Alder product and certain medicinal properties can be further explored.

62 JARED TROUT

CHARACTERIZATION AND INHIBITION OF PLASMODIUM FALCIPARUM METHIONINE AMINOPEPTIDASE 2

Authors: Jared Trout
Department: Chemistry and Biochemistry
Faculty Mentor: James Horn
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00 PM

Plasmodium falciparum is a plasmodium parasite, which when transferred by a mosquito of the genus Anopheles, is known to cause malaria in humans. The type malaria caused by this species is known as malignant malaria and is one of the most dangerous types of malaria. In fact more than 80% of all malarial related fatalities which occur in sub-Saharan Africa are caused by P. falciparum. The number of infected mosquitos is directly related to the number of infected humans in the area. Therefore, in order to prevent the transmission of this parasite it is important to reduce the number of infected hosts. To prevent P. falciparum growth methionine aminopeptidase 2 (Met-AP2) was targeted with various inhibitors. PFMet-AP2 was first cloned into the BL21-DE3 E. coli strain where the enzyme was first determined to be in its natural active conformation and then was expressed and purified in considerate yields. Following the purification of PFMet-AP2 its enzymatic characteristics were analyzed in the presence of different co-
Students in the NIU Department of Chemistry and Biochemistry experience a wide range of research opportunities – from working with a single faculty advisor in the traditional areas of chemistry, through highly interdisciplinary and collaborative projects.

The research interests of our faculty not only span across the traditional areas of chemistry, but also across other sciences, including biology, physics, and environmental sciences. In fact, many of our faculty are actively involved with collaborative research centers, such as the Center for Biochemical and Biophysical Studies (CBBS), and the Institute for Nano Science, Engineering, and Technology (InSET).

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factors and the lead inhibitor which act against it was determined through the use of enzyme activity assays. It was found that different metals at various concentrations affect the activity of PFMet-AP2. Up to date, eight inhibitory compounds were tested and Nitroxoline displayed the greatest antimalarial properties; it exhibited the lowest IC50, between 3.0 and 3.8 μM, dependent on the PFMet-AP2 strain. This compound will be used as a lead to further develop a new set of novels against PFMet-AP2.

63  **SABA HAMID**

*A COMPARATIVE ANALYSIS OF THE NON-ENZYMATIC GLYCATION TO THE BOVINE LENS: A MODEL TO PROBE THE STRUCTURAL ALTERATIONS OF THE DIABETIC LENS*

Authors: Saba Hamid, Danesha Lewis, Dionne Griffin, Elizabeth Gaillard & James Dillion  
Department: Chemistry and Biochemistry  
Faculty Mentor: Elizabeth Gaillard & Dionne Griffin  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30 AM-12:45 PM

The primary function of the eye lens is to focus light on to the retina. With age the lens becomes modified by several non-enzymatic processes: glycation, nitration and oxidation, which leads to structural alterations and decreased lens transparency. These alterations are accelerated within the diabetic lens and retina. Accumulation of advanced glycation endproducts (AGEs) within the lens by non-enzymatic glycation occurs at similar rates within the retina. A causative component of Diabetic Retinopathy is the overproduction of AGEs within the retina. Two major glycation agents within the body are glyoxal and methylglyoxal. The objective of this project was to conduct a comparative analysis on the formation of AGEs with in the bovine lens by glyoxal and methylglyoxal. We hypothesize the rate of modification is selective for each glycation agent. Using ultraviolet absorbance(UV), fluorescence and circular dichroism (CD) spectroscopy we will investigate the formation and structural alterations of bovine lens protein. Preliminary UV and fluorescence studies indicate formation of AGEs by the non-enzymatic glycation with glyoxal is maximum by 72hrs. We are currently probing for possible alterations to the native β-sheet structure by Far-UV CD. Ultimately this research will be compared with studies obtained from diabetic lens.

64  **MICHAEL VEGA**

*EFFECT OF AGE AND DIABETIC RELATED MODIFICATIONS TO HEAT SHOCK PROTEINS ON EYE AND NEURODEGENERATIVE DISORDERS*

Authors: Michael Vega & Devi Kalyan Karumanchi  
Department: Chemistry and Biochemistry  
Faculty Mentor: Elizabeth Gaillard  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00 PM

Purpose: To investigate the glycolytic modifications of heat shock proteins using alpha crystallin as the model. This study will help us to understand the relation between the pathology of protein aggregation and a hyperglycemic environment. Methods: Alpha crystallin was incubated with open chain sugars and dicarbonyl reactive intermediates at 25 degrees Celcius for 0.5-72 hrs. UV-Vis, fluorescence, circular dichroism, light scattering and microscopy imaging techniques were performed to study the changes that occur in the structure of the protein as well as the whole lens. Results: The hydrodynamic diameter of α-crystallin (~18 nm) was found to increase rapidly on reaction with glycatig agents. Non-tryptophan fluorescence (emission at 400-500 nm) intensity was found to increase while the surface hydrophobicity decreased over the time period. Circular dichroism data shows a significant loss of β-sheets to form random coils. SDS-PAGE and microscopic techniques confirm the formation of protein cross-links. Overall, methyl glyoxal and glycoaldehyde showed faster reaction kinetics compared to glucose and sucrose. Conclusion: The model system can be used to explain the effect of the Maillard reaction on the heat shock proteins in aging and diabetic
These modifications in vivo lead to amyloid fibril like protein deposits. The reaction kinetics involved in the glycation of heat shock proteins helps to explain the mechanism of damage in conditions like cataracts, diabetic retinopathy and protein aggregation neurodegenerative diseases.

**65 DANESHA LEWIS**

**NON-ENZYMATIC GLYCATION OF BOVINE LENS: A MODEL SYSTEM FOR THE DIABETIC LENS**

Authors: Danesha Lewis  
Department: Chemistry and Biochemistry  
Faculty Mentor: Elizabeth Gaillard  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30 AM-12:45 PM

Diabetic Retinopathy (DR) is the leading cause of irreversible blindness worldwide. The detection of this detrimental disease is rare during the first 5-10 years of diabetes diagnosis. During the progression of diabetes, the lens and retina accumulates increased amounts of advance glycation end products (AGEs). AGEs have been implicated in mediating diabetic complications such as Diabetic Retinopathy. Studies have shown that AGEs autofluorescence within the lens is due to glycation of the lens protein. The objective of this work is to spectroscopically characterize the formation of AGEs within the bovine lens as a model system for the diabetic lens. We are currently using UV and fluorescence spectroscopy to evaluate the formation of AGEs. In addition, Far-UV CD will be used to monitor alterations in protein secondary structure with glycation. Selective identification of these modifications will later be compared with donor diabetic lens. This information may aid in the development of early noninvasive diagnostic fluorescence imaging techniques.

**66 DANIEL PEREZ**

**MEASURING OXYGEN CONCENTRATIONS IN THE ANTERIOR CHAMBER OF RABBITS**

Authors: Daniel Perez & Mai Thao  
Department: Chemistry and Biochemistry  
Faculty Mentor: Elizabeth Gaillard  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00 PM

Most people over the age of 50 will develop a nuclear cataract after a vitrectomy, an ocular surgery to remove the vitreous body. This side effect will require yet another surgery. Previous evidence has indicated that the oxygen tension increases after the ocular surgery, which may be the reason for nuclear cataract development. Therefore, the purpose of this project is to develop a non-invasive technique to measure oxygen concentrations in the anterior segment of the eye. This technique utilizes the probe molecule, palladium porphyrin I (PdUro I) as the reporter molecule. PdUro I phosphoresces at room temperature and oxygen quenches the phosphorescence in a way that is linear with oxygen concentration. The phosphorescence is detected with a modified Fluorotron. This system was used to make a Stern-Volmer plot of the phosphorescence lifetime of aqueous solutions of PdUro I at various known oxygen concentrations. The PdUroI was then injected into the vitreous fluid of a rabbit eye, and the intensity emitted from the PdUroI was measured. The oxygen concentration was then calculated using the Stern-Volmer equation. Post injection, PdUroI was observed as it traveled from the vitreous body into the lens of the eye. The oxygen tension varied throughout the vitreous body, with an average of 14±8.4mm Hg. Once in the lens, the oxygen tension decreased to 9 mm Hg. Conclusion: Oxygen tensions within the different compartments of the eye can be measured by using the phosphorescent PdUro I and Fluorotron detection along with the Stern-Volmer calibration plot without invasive procedures to the eye.
The AND-1B core was recovered from beneath the Ross Ice Shelf, near Ross Island, Antarctica through the efforts of the ANtarctic geological DRILLing (ANDRILL) program. The upper ~450 meters beneath the surface (mbsf) of the core consists of Pleistocene and Pliocene sediments, representing the last 5 million years (m.y.), which are characterized by 40,000 year obliquity-driven climate cycles. These sediments consist of intervals of glacially mixed sediment (diamict) and diatomite deposited under open ocean conditions, along with various intermediate transitional facies. Fossil diatoms can be used to determine environmental changes/events and chronology by the assemblages observed at different intervals. Since most diatoms are sensitive to minor changes in their environment, there are certain assemblages that can be tied to distinct conditions such as nutrient availability, sea-ice extent and ocean temperature. We targeted sediments deposited ~3 m.y. ago by taking 60 samples, at 10 cm sampling interval between 169 - 175 mbsf and were processed/analyzed for diatoms in the light microscope. This interval consists primarily of mud and siltly clay with some diatomite. Since diamict is not present, diatom analysis is the preferred method for determining the extent of the ice sheet’s retreat. Additionally, this study will further refine the age of the sediment, allowing for a more accurate chronology. The assemblages of diatoms observed, in association with previous work, are expected to show a minor glacial maximum followed by warmer water temperatures, representing a retreat of the West Antarctic Ice Sheet prior to Pleistocene global cooling and ice sheet advance.
are discharging animal waste products into local water resources through soil runoff and lagoon breeches (Jackson, 1998) however no records of exactly what is being discharged exist nor do we know what impact waste lagoons are having on local water systems. The new data collection procedures developed in this report will make it easier to get the information that will strengthen our understanding of CAFO waste management practices that will lead to future legislation regarding the operation and mitigation of CAFOs.

70 Nicholas Gray

The Lightning Distribution Around Wind Turbines in Northwest Iowa

Authors: Nicholas Gray  
Department: Meteorology  
Faculty Mentor: Mace Bentley  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30 AM - 12:45 PM

As wind farms become an ever increasing sight across American landscapes it is important to look at the impacts they can have on the environment around them. Particularly, how can they affect meteorological conditions near their locations? This study examines wind farms and lightning activity in thunderstorms. By using geographic information systems (GIS), lightning data from five different mesoscale convective systems (MCS’s) were mapped in relation to a group of wind turbines in Northwest Iowa. The wind turbines chosen have a north to south orientation and the storms chosen passed the turbines in a general west to east path. The lightning associated within the specific cell that passed over the turbines was then singled out from the rest of the lightning in the MCS. Lightning flash densities and other lightning characteristics were then examined.

71 John Barmann & Doug Dziubla

Driving Blind: Vehicular Crashes Due to Weather-Related Visibility Impairment

Authors: John Barmann & Doug Dziubla  
Department: Meteorology  
Faculty Mentor: Ashley Walker  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00PM

Widespread or locally dense fog, smoke, and dust events are not typically thought of as dramatic meteorology hazards, but their impairment of vehicular driver visibility can lead to reduced roadway speeds, higher speed variability, and increased crash risk. These atmospheric conditions, and affiliated driver visibility reductions, may play a role in singular, multiple, and chain-reaction vehicular crashes that can produce casualties. Despite the substantial threat to the safety of drivers on the nation’s highways, no effort has been made in the research community to catalog these events and quantify their effects at the national scale. This research presents a national analysis of fog-, smoke-, and dust storm-related vehicular fatalities in the U.S. from 1994-2011. Thereafter, we focus on the state of Illinois, comparing and contrasting sources of fatal crash information for the state while generating a more focused analysis of the fatal events that have occurred on the state’s roadways from 2005-2011. Temporal trends, spatial patterns, and roadway characteristics for visibility related fatal crash events are revealed. The overarching goal of the research is to generate a basic understanding of the geography of these fatal hazard events that can be used to inform future mitigation activities focused on reducing visibility related hazard impacts.
ENHANCING THE POWER TRANSMISSION EFFICIENCY OF A SUPERCONDUCTOR THROUGH NANOENGINEERING

Authors: Gabriela Arriaga
Department: Physics
Faculty Mentor: Zhili Xiao
Research Category: Science, Technology, Engineering, Math
Judging Time: 11:30 AM-12:45 PM

Theoretically, superconductors are materials that exhibit zero electrical resistance and can transmit electrical energy without any loss, in contrast to the normal power cables that can dissipate up to 10% of the energy due to Joule heating (Tinkham 1996). When a current of high density flows in a superconductor, however, electrical resistance can appear due to current-induced magnetic fields. A frontier in superconductor research is to find ways to enhance the current carrying capability of a superconductor with minimal energy loss. The main focus of this project is to develop a better understanding of effects of artificial defects on the loss-free current transmission capability of a superconductor by patterning superconducting films to introduce desirable defect arrays. I hope to learn or better understand the properties of superconducting films, the patterning process, and develop more ideas on how to improve the power transmission efficiency of superconductors.

PERMEATION OF INORGANIC MATERIALS IN LIPID BILAYERS

Authors: Aaron Epps, Dan Boyden & Shane Sullivan
Department: Physics
Faculty Mentor: Yasuo Ito
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30 AM

Lipids are a class of naturally occurring organic molecules that include fats, waxes, and most cell walls. Natural lipids have a hydrophilic head and hydrophobic tails. Because of this, they form into sheets with the head facing out and the tail facing in. Lipid bilayers consist of many of these sheets interspaced by water channels. The reason for our interest is that inorganic molecules can be used to increase the stability of these lipid bilayers making them more suitable for solar cells and other engineering applications. In our case, the original lipids are 4nm in thickness while the water channels are 2nm in thickness. Using chemical vapor deposition techniques, tetramethylorthosilicate was imposed on the bilayers. Using STM microscopy it was found that this resulted in an increase of the interbilayer spacing to 7nm. This indicates that silicon dioxide may have been formed in the interbilayer spacing. It was also observed that there was marked disordering in the tails of the lipids. This could lead to silicon dioxide forming inside the lipid layers as well. We are currently analyzing both higher resolution spectra and transmission electron microscopy images to determine if the silicon dioxide is formed only in the bilayer spacing or inside the lipid bilayer as well. We are also interested in whether the disordering of the lipid tails is a result of the deposition or if it is naturally occurring.

A DETECTOR FOR PROTON COMPUTED TOMOGRAPHY

Authors: Steven Boi
Department: Physics
Faculty Mentor: David Hedin
Proton computed tomography (pCT) is in many ways similar to the conventional X-ray CT. However, there are two major advantages of pCT over X-ray CT: lower dosage administered to the patient, on the order of five to 10 times less, as well as the higher precision in image reconstruction. Because the imaging quality will be significantly improved, this means better discrimination of normal tissue from a mass of uncontrolled, proliferating cells. In an attempt to realize this superior medical imaging technique, a prototype pCT scanner is under development through collaboration between the Fermi National Accelerator Laboratory and the Northern Illinois Center for Accelerator and Detector Development (NICADD). This next generation device requires several major components: four tracker detectors and a range stack calorimeter. The tracker detectors will be placed before and after the target to be scanned and are used to determine the initial path and deflection of the protons before and after passing through the target. When the protons pass through the target, they lose a certain amount of energy. This energy loss can be determined from difference between the initial beam energy and the energy deposited into the calorimeter. Using the difference in energy, the density of the material can be determined, which, when combined with the path of the protons took, it is possible to reconstruct the internal structure of the target. Through this reconstruction it will be possible to visually see and pinpoint, with reasonable accuracy, neoplastic areas within the target.

75  JOSHUA STEVENS

MORPHOLOGY OF INDU M NITRIDE NANO-CRYSTALS GROWN ON GALLIUM NITRIDE SURFACES

Authors: Joshua Stevens
Department: Physics
Faculty Mentor: Carol Thompson
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30 AM

The growth of Indium nitride (InN) and its alloys with gallium (InGaN) is a technologically interesting problem, because advances in energy efficient lighting are based on the attractive properties of these materials. But the creation of these deposits, and controlling the nano-structural arrangement of the layers is difficult because InN and InGaN are metastable materials. This makes them an ideal system for fundamental studies in materials physics to study the competition between kinetics and equilibrium processes during growth. In collaboration with scientists at Argonne National Laboratory, we are studying InN nanocrystals that were grown by metal organic vapor phase epitaxy. I have studied and determined which crystal facets remained on InN nano-crystallites grown under controlled temperature, pressure, and environment on two different faces of GaN bulk single crystals. The nanocrystals are imaged using atomic force microscopy (AFM) and scanning electron microscopy (SEM). The AFM and the SEM are complementary instruments for this research. The AFM images allow for a quantitative measurement of angles between neighboring crystal facets, but is insensitive to overhangs. The SEM images are able to show the more complete three-dimensional structure of a crystallite, including looking under any overhangs. The absence or presence of particular facet families may help elucidate those processes which dominated the growth of InN under the growth conditions explored. In summary, we are interested in gaining insight into the thermodynamical and kinetic mechanisms that must be controlled and balanced to create and synthesize new metastable materials with interesting physical properties that are not available in normal materials.

76  DANIEL BOYD EN, SHANE SULLIVAN & AARON EPPS

INVESTIGATION OF FE-DOPED SrRuO3 THIN FILM

Authors: Daniel Boyden, Aaron Epps & Shane Sullivan
Department: Physics
Chemical substitution of transition metal elements in perovskite oxides is a proven method of manipulating the physical and structural properties of a material and can even result in new properties. In particular, our group looked at iron doped strontium ruthenium oxide (SRO) with the hope that the doping would modify the magnetic properties of the sample. The sample was prepared by periodically spacing iron ions in an oxide form within a strontium ruthenium oxide sample by a pulsed laser ablation deposition system. It was hypothesized that this method would periodically space the iron oxide nanoparticles throughout the sample. We investigated the iron composition within the sample by transmission electron microscopy in conjunction with x-ray spectrometry. Transmission electron microscopy allowed us to observe the sample at the atomic level while x-ray spectrometry with a focused electron beam allowed us to investigate the location of elements within the material in nanometer scale. We found that 1) the film was grown epitaxially with structural distortion at the film/substrate interface, and 2) iron ions were possibly evenly distributed within the sample rather than in iron oxide nanoparticle forms. However, we were limited by the spatial resolution of the x-ray spectroscopy and it is possible that the spacing is in fact atomic scale. It is highly likely these local changes in structure may have caused the observed change of its magnetic properties. Further analysis will be needed with improved analytical resolution or larger spacing of the iron ions.

77 GARRETT WISE

FABRICATION AND ANALYSIS OF FREE-STANDING ULTRA-THIN ALUMINA-BASED FILMS USING ELECTRON MICROSCOPY

Authors: Garrett Wise
Department: Physics
Faculty Mentor: Yasuo Ito & Xiao Zhili
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30 AM

This alumina based film has various application potentials which range from TEM supporting films to computer hardware such as random access memory (RAM). A reaction between porous alumina and sodium hydroxide resulted in an electron transparent thin continuous alumina-based film. The thickness achieved was as thin as about 20nm. The process of fabricating the thin film was quick and simple, which may make it well suited for mass-production. The goal of this project is to analyze the synthesized film to determine chemical composition and structure on the nanometer scale by transmission electron microscopy and its related spectroscopic techniques, and to understand the formation mechanisms and conditions, which may lead to find a reliable way of manufacturing the film.

78 MASON HAYWARD

CONSTRUCTION OF A COSMIC RAY STAND FOR TESTING STRAW TUBES FOR THE “G-2” EXPERIMENT AT FERMILAB

Authors: Mason Hayward, Mary Shenk & Dr. Michael Eads
Department: Physics
Faculty Mentor: David Hedin
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15AM

This research will be conducted at NIU and will focus on testing a cosmic ray detector. The goal of this project is to assemble a cosmic ray test stand which will then be used to test other detectors. As part of this, the electronics must also be tested and will be adjusted to insure optimal performance. Once the electronics and phototubes are tested
and adjusted for maximum potential, the test stand will be designed and constructed for the cosmic ray detector. The cosmic ray muons that are selected will then be used to efficiently test straw tubes for the g-2 experiment that will be done at Fermilab. During this time, straw tubes will be assembled at Fermilab. Each straw tube is made of an aluminum straw approximately 9 inches long with a gold wire run through the center of it. These tubes will be filled with a gas, which when struck by an electron from the decayed muon will cause the gas to ionize and indicate the position of the electron at the point of contact. By doing this project, I hope to familiarize myself with the process of research and development in the experimental physics field. I also hope to prepare myself for future research within the field of physics and contribute to Northern Illinois University’s effort on the g-2 experiment.

79 SURINA CARDENAS, KELSEY SONDGEROTH & MICAH IOFFE

QUALITATIVE EXPLORATION OF GRANDCHILDREN’S PERCEPTIONS OF LIVING WITH GRANDPARENTS

Authors: Surina Cardenas, Kelsey Sondgeroth & Micah Ioffe
Department: Psychology
Faculty Mentor: Laura Pittman
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30 AM

An increasing number of multigenerational households, where grandparents live with their grandchildren, have formed in the past decade (Livingston & Parker, 2010). These living arrangements can provide grandchildren with a sense of safety and stability in the household (Backhouse & Graham, 2012) and can enhance cooperation and mutual support of family members in the home (Postigo & Honrubia, 2010). However, when a grandparent is physically or mentally ill, grandchildren may experience the burden of care-taking (Postigo & Honrubia, 2010). Due to the variability in these living arrangements, a better understanding of how co-residing grandparents may influence their grandchildren is needed.

In the present study, 84 qualitative interviews were conducted with college students who had ever lived with one or more grandparents for at least one month. Questions were asked to gain insight into the reasons for cohabitation as well as the positive and negative aspects of living with grandparents. Interviews were coded by multiple people to identify emerging themes. Reasons identified for multigenerational household formation included financial instability, educational purposes, or young adolescent parents. Positive aspects of living with grandparents include having an additional caregiver, being taught specific skills, and learning responsibility. Negative aspects, which were less common, included not feeling comfortable in one’s own home and feeling the burden of taking care of the grandparent. An exploratory qualitative analysis will be conducted in an attempt to examine the various reasons for cohabitation and links to grandchildren’s positive and negative perceptions of living with grandparents.

80 LAUREN E. BODDY & JENNIFER T. MORGAN

RELATIONAL AGGRESSION IN FIFTH GRADE: ASSOCIATIONS WITH ACADEMIC SKILLS

Authors: Lauren Boddy, Jennifer T. Morgan, Jewel M. Robinson, Nelly V. Bonilla & Falak Ishaque
Department: Psychology
Faculty Mentor: Amy Luckner
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30 AM-12:45 PM

In the field of aggression, the term relational aggression describes a form of aggressive behavior in which relationships or social status are damaged or threatened (Crick et al., 1999). Relational aggression is associated with negative
social outcomes for children (e.g., peer rejection; Crick et al., 1999); however, less is known regarding the impact of engaging in relational aggression on children’s academic success. The purpose of this study is to examine the relations between relational aggression and academic enabling behaviors (e.g., engagement, motivation, and study skills) in a sample of elementary school children. Previous research shows connections between physical aggression and decreases in academic achievement and engagement (e.g., Stipek & Miles, 2008). It is anticipated that students reporting higher levels of engagement in relationally aggressive behaviors will also report lower levels of academic enablers. Data were collected in 10 fifth-grade classrooms from three Midwestern elementary schools (N = 189). To assess engagement in relational aggression, the fifth graders completed a subscale of the Children’s Social Behavior Scale (CSBS; Crick & Grotpe, 1995). The Academic Competence Evaluation Scale (ACES; DiPerna & Elliot, 2000) was also administered to assess academic enabling behaviors (engagement, motivation, study skills). Hierarchical multiple regression analyses will be conducted to analyze the associations between relational aggression and student academic enabling behaviors. Gender differences will also be examined.

81 ASHLEY CLEMONS & CARA ALLEN

AT MATTERS TO ME: A COMPARISON OF SOCIOMETRIC STATUS, PREFERRED ACTIVITY, AND PEER VERSUS ACADEMIC PREFERENCES

Authors: Ashley Clemons & Cara Allen
Department: Psychology
Faculty Mentor: Nina Mounts
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15 AM

Previous research has linked sociometric ratings (i.e., how much children are liked by their peers) to later behavioral, social, and academic adjustment (Ollendick et al., 1992). The purpose of this project is to investigate peer liking, child peer versus academic priorities, and children’s after school activities. The research questions are: 1) Are there gender differences in peer liking, peer versus academic priorities, or after school activities? 2) Are there age differences in peer liking, peer versus academic priorities, or after school activities? 3) Is peer liking related to peer versus academic priorities? 4) Is peer liking related to after school activities? 5) Is peer versus academic priorities related to after school activities? Participants included 225 3rd-, 4th-, and 5th-graders. Sociometric ratings were obtained by asking participants to rate each of their classmates on the basis of how much they liked to play with each person. Peer versus academic priorities was assessed with a question that asked children to rank a list of items in terms of what is most important to them. After school activity was assessed with a question about who the children usually spend time with after school. All data analyses will be conducted with SPSS. Research questions 1 and 2 will be analyzed using ANOVA and independent samples T-tests. Research questions 3, 4, and 5 will be analyzed using a Pearson product moment correlation coefficient.

82 ASHLEY DOTSON

SOCIAL ISOLATION, STRESS, AND DEPRESSION: INSIGHTS FROM AN ANIMAL MODEL

Authors: Ashley Dotson, Neal McNeal, Joshua Wardwell, Melissa L. Scotti, Rachel Schultz & Angela J. Grippi
Faculty Mentor: Angela Grippi
Department: Psychology
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30 AM-12:45 PM

Depression is common in humans, and is among the leading causes of quality-of-life problems worldwide. The development of depression may be influenced by exposure to and inability to cope with stressors. Long-term social
stressors, such as isolation or feelings of loneliness, may lead to depression in humans and depressive behaviors in animal models, as well as physiological health problems. Prairie voles are a useful animal model for investigating interactions between social and environmental stressors, because their social bonds are similar to those of humans. In this study, we hypothesized that isolation would induce depressive signs, and exposure to additional environmental stressors would exacerbate these depressive behaviors. Adult female prairie voles were either paired with a female sibling or isolated from the sibling for 4 weeks. Following this period, half of the paired and isolated animals were exposed to 7 days of chronic unpredictable mild stressors while the other half remained undisturbed. Following the 7 days of stressors, both paired and isolated animals were exposed to the forced swim test (FST), which measures depressive behaviors in rodents. Isolated animals showed significantly more depressive behaviors during the FST and when exposed to chronic mild stressors than those that were paired with a female sibling. These findings suggest that social isolation produces depressive behaviors, and additional stress from the environment can exacerbate these behaviors in socially isolated animals. Future analyses will investigate more specifically the neurobiological mechanisms through which social experiences and environmental stress interact to influence health.

83  KRISTEN HAWKINSON, MATTHEW GREEN & LINDSAY MILLER

THE EFFECTS OF SHYNESS MINDSET AND SOCIAL ANXIETY ON SELF-ESTEEM AND NEGATIVE MOOD

Authors: Kristen Hawkinson & Matthew Green
Department: Psychology
Faculty Mentor: David Valentiner
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00 PM

The purpose of the present study is to examine the effect of a shyness mindset intervention on self-esteem and negative mood. Entity theorists believe that their traits, such as shyness, are fixed, while incremental theorists believe that their traits are malleable. Beliefs in the fixed versus malleable nature of anxiety can be changed. The main hypotheses of this study are that at higher levels of social anxiety and fixed shyness mindset, the shyness mindset intervention will increase state self-esteem and lower negative mood. Undergraduate psychology student participants completed baseline measures of Shyness Mindset, Victimization, Depression, and Social Anxiety. Participants were then randomly assigned to a shyness mindset intervention condition or a control condition (watching a movie). The intervention condition included a presentation about shyness malleability neuroscientific evidence of brain plasticity, and inspirational videos about incremental self-theories. Belief change was facilitated using the “saying is believing” paradigm by having participants write a letter summarizing the information. Following participation in the intervention or the control condition, participants read a book in front of an audience of two confederates. Participants completed the same measures after the read aloud task and approximately one week later. Data collection for the study is in progress.

84  JENNIFER MORGAN, LAUREN E. BODDY, JEWEL M. ROBINSON, FALAK ISHAQUE, NELLY V. BONILLA & KATHLEEN COOK

PLAYFUL AND AGGRESSIVE RELATIONAL BEHAVIORS IN FIFTH GRADE: ASSOCIATIONS WITH SOCIAL OUTCOMES

Authors: Jennifer Morgan, Lauren E. Boddy, Jewel M. Robinson, Falak Ishaque, Nelly V. Bonilla & Kathleen Cook
Department: Psychology
Faculty Mentor: Amy Luckner
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30AM
The purpose of this study is to investigate differences in children’s engagement in aggressive and playful relational behaviors. Research investigating both aggressive and playful relational behaviors has previously focused on late adolescents. The current study builds on previous work by investigating these behaviors in middle childhood. Specifically, this study examined associations between aggressive playful relational behaviors and social skills in fifth-grade. We anticipated that children who display higher levels of playful relational behaviors will have higher ratings of social skills functioning, whereas those who engage in higher levels of relational aggression will report lower levels of social competence. Participants include 189 fifth-grade students from 10 suburban Midwestern elementary classrooms. Children’s perceptions of their social behavior, including relational aggression and playful relational behaviors, were reported using the Children’s Social Behavior Scale- Self-Report. Fifth-grade students’ social skill functioning was measured using teacher- and self-report forms from the Social Skills Intervention System. Multiple separate hierarchical regression analyses will be conducted to understand the association between students’ playful and aggressive relational behaviors and their social skills. Preliminary analyses indicate that student engagement in relational aggression and playful relational behaviors are differentially associated with social skills, although results vary depending on the source of report.

85 POONAM DHILLON

BUILDING A SERIOUS GAME FOR CRITICAL THINKING

Authors: Poonam Dhillon
Department: Psychology
Faculty Mentor: Keith Millis & Patricia Wallace
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15 AM

People make important decisions everyday regarding their jobs or school activities, family, and personal lives. In many cases, people ignore, fail to evaluate, or seek out alternative viewpoints, arguments and data when making decisions. The goal of my poster is to describe a serious game that teaches critical thinking and to present to data regarding the importance that NIU professors place on various critical thinking skills. The described game has not been built, but has been proposal to the National Science Foundation. The serious game is called “A Justified Life” and its primary target audience will be undergraduate students taking critical thinking courses. The game will teach how to evaluate arguments, the credibility of a source, and the value of seeking out evidence along with other critical thinking skills commonly addressed by critical thinking texts. Animated pedagogical agents posing as friends, a teacher, and a significant other will be available for consultation and for brief tutorial dialogues. The player will also have a searchable career data-base and the WWW as resources. The player will make a choice based on the presented information, and will justify it to their significant other agent. In preparation of the NSF proposal, we surveyed NIU professors in different fields on the importance that they placed on critical thinking skills. Although all fields emphasized critical thinking skills, we found that professors in STEM areas placed less emphasis on argumentation and decision making skills than non-STEM fields. This finding might indicate that STEM areas place higher importance on other constructs which were not measured in our survey, such as math skills.

86 ZACHARY GETTE, AUDREY FRANCES, AUBREE ROGERS & SONIA CERVANTES

EMOTIONAL EFFECTS OF MEDIA ON BODY IMAGE

Authors: Zachary Gette, Audrey Willson, Aubree Rogers & Sonia Cervantes
Department: Psychology
Faculty Mentor: Tamzin Batteson
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30 AM-12:45 PM
A plethora of research has been conducted on how the media may influence young women in their self-concept and body image. However, there appears to be less research examining media influence on men. Using Social Comparison Theory and Farquhar and Wasyliw’s (2007) idea of body-as-process vs. body-as-object we aim to explore the different influences that media plays as to male and females’ view of their self-image after being exposed to matched and un-matched media images. Body-as-process is viewing the body with instrumental value (strength, traditionally male advertising) as being greater than beauty where body-as-object (traditionally female advertising) is valuing the body for its looks and appeal rather than its functionality. This could account for the differential findings; however, male advertising campaigns are changing. Approximately 50 participants, both males and female undergraduates will be assessed using the Body Shape Questionnaire (BSQ) as a baseline, followed by media images to prompt social comparison. The images will reflect both body-as-process and body-as-objects. Participants will then be re-given the BSQ to measure whether their self image has changed. We predict that males and females will show a decline in their satisfaction with their body shape for the matched (social comparison, body-as-object) images. Unlike previous research we intend to compare the different outcome in men and women. Findings have suggested that different types of media tend to bring different amounts of pressure to males than to females. (Calado et. al 2011.). However, changes in advertising may bring male body image in line with females.

87  ELLIOTT IHM

REVERSING THE EFFECTS OF SOCIAL STRESS THROUGH ENVIRONMENTAL ENRICHMENT AND EXERCISE: AN ANIMAL MODEL

Authors: Elliott Ihm, Ashley Dotson, Nalini Jadia, Neal McNeal, Rachel Murphy, Rachel Schultz, Joshua Wardwell, Andrew Wegner & Angela J. Grippo
Department: Psychology
Faculty Mentor: Angela Grippo
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15AM

Social bonds are important for human well-being, and their disruption has adverse effects on mental and physical health. The social behavior of prairie voles closely resembles that of humans, making them a useful animal model for studying the relationship between human social behavior and pathophysiology. The disruption of social bonds in prairie voles contributes to anxiety- and depression-like behaviors, but an enriched environment (including an exercise wheel, hiding places, and small objects) might prevent these effects. The current study examines whether environmental enrichment can reverse the negative effects of social isolation after they occur and whether this effect is due to exercise alone or to other aspects of an enriched environment. Adult female prairie voles were isolated from a sibling for four weeks, followed by an additional four weeks of isolation in enriched cages, cages with only a running wheel, or standard cages. Afterwards, all animals were exposed to several behavioral tasks used to quantify anxiety- and depression-like behaviors. Animals who remained in standard cages exhibited more anxiety- and depression-like behaviors than those who were given an enriched environment or a running wheel, demonstrating that environmental enrichment and exercise can reverse the negative behavioral effects of social isolation. These results demonstrate the efficacy of non-drug treatment strategies for analogs of human mood disorders related to sociality. Future studies should investigate differences in the neurobiological mechanisms underlying the effects of environmental enrichment and exercise on behaviors related to anxiety and depression.

88  SHAAKIRA HAYWOOD

CHANGE IN ACHIEVEMENT GOAL ADOPTION DURING DIFFERENT PHASES OF AN ACHIEVEMENT ACTIVITY
Research Rookies are...

- Interested in research and inquiry
- Committed to participate for two semesters
- Strongly committed to an intended major
- Self-directed learners

"After my experience as a Research Rookie, I feel a lot more confident conducting research, reading articles, and writing journal articles as well. I feel more prepared for my future in my undergrad, master’s, and overall career."

-2011-2012 Research Rookie

Research Rookies will...

- Learn what research looks like in their major
- Learn how to write a formal research proposal
- Gain experience working alongside talented faculty
- Attend professional and academic enrichment activities
- Present their work at the annual Undergraduate Research & Artistry Day

Application online at [www.niu.edu/ugresearch](http://www.niu.edu/ugresearch)

Office of Student Engagement & Experiential Learning
[www.niu.edu/ugresearch](http://www.niu.edu/ugresearch) • 815-753-8154 • ugresearch@niu.edu
The present research examined motivation in achievement situations, by testing the conditions under which individuals adopt particular types of achievement goals. Specifically, we tested whether people would adopt different achievement goals depending on the phase of an activity (e.g., beginning, middle, or end). The goals that were examined were those focused on outperforming or avoiding being outperformed by others as well as those focused on personal improvement. Participants looked at a cartoon vignette of people running a foot race. The target person was slightly behind the rest of the runners in all conditions, but the manipulation varied whether the beginning, middle, or end of the race was depicted. Participants were asked to rank achievement goals that would be most relevant in the situation as well as rate each goal on a Likert scale. Preliminary results indicate that, at the middle of the race, participants focused more on avoiding doing worse than other runners than at the beginning or end of the race. In contrast, at the beginning and end of the race, participants focused more on improving their running time from the previous race and doing better than the other runners. Fear of failure and need for achievement will also be examined.

ALLISON HANSEN & ANTONIA SELIGOWSKI

THE ROLE OF PERITRAUMATIC DISSOCIATION IN THE RELATIONSHIP BETWEEN PTSD SYMPTOMS AND ALCOHOL USE IN A SAMPLE OF TRAUMA EXPOSED WOMEN

Background: Posttraumatic Stress Disorder (PTSD) is a reaction that some individuals experience following a traumatic event. Symptoms of PTSD may include intrusive memories, flashbacks, avoidance of reminders of the trauma, feeling disconnected from loved ones, and hyperarousal. In addition, some individuals experience dissociation immediately after a traumatic event (called, peritraumatic dissociation), which may precede other symptoms. Dissociation involves an altered perception of time, place, and/or person. In a study of 77 trauma exposed women, Najavits and Walsh (2011) found that those with higher levels of dissociation tended to have worse PTSD symptoms and greater substance dependence than those with lower levels of dissociation. In a similar vein, we sought to examine the relationships among PTSD symptoms, peritraumatic dissociation, and alcohol use. Specifically, we hypothesized that peritraumatic dissociation would have an indirect effect on the relationship between PTSD symptoms and alcohol use. Method: Participants were 595 trauma exposed women (Mage = 20.05, SD = 2.12). Measures included the Distressing Events Questionnaire (DEQ), Peritraumatic Dissociation Questionnaire (PDEQ), and the Young Adults Alcohol Problems Screening Test (YAAPST). Using a mediation model, we examined the indirect effects of peritraumatic dissociation on the relationship between PTSD symptoms and alcohol use. Results: PTSD symptoms (DEQ) had a significant effect on alcohol use (YAAPST; B = .08, p = .019). However, when peritraumatic dissociation (PDEQ) was entered into the model, PTSD symptoms no longer had an effect on alcohol use (B = .00, p = .99), indicating that peritraumatic dissociation fully mediated the effect of PTSD symptoms on alcohol use. Conclusions: These results suggest that peritraumatic dissociation may be a better predictor of alcohol use following a trauma than PTSD symptoms alone. A limitation to our study is that we were only able to examine this relationship in women. It is recommended that future studies examine the effect of peritraumatic dissociation on alcohol use in both men and women.
Many academic tasks require that students engage in acts of argumentation and inquiry from multiple sources. Research shows that students struggle with such asks. Many students who have not been taught argumentation often only address one side of a topic. Considering that arguments often contain controversial assertions in which there are multiple perspectives, a complete argument should consist of addressing the multiple perspectives. Prior research has shown that even students who have been taught argumentation do not include multiple sides unless prompted to do so. One possible reason for these exhibited difficulties is a lack of clear and appropriate goals that would influence task performance. The purpose of this experiment was to assess how students use their goals to influence the structuring of their arguments. To examine whether students have appropriate goals, undergraduate participants were given a pre-task goal inventory to assess their goals when engaging an argumentative essay writing task. Participants were then given 16 documents and asked to select up to 8 to read with intent of writing an essay about mankind’s responsibility in global warming. Half of the documents supported the influence of mankind and half supported nature. After selection, participants then read and took notes from only the smaller set of documents. When finished reading, participants wrote their essay. After the essay writing phase, participants completed a post-task goal assessment. The results suggest that students may be aware that complete arguments require the consideration of multiple perspectives; many fail to address those perspectives and often only present information pertaining to one side of the issue.

Learning from history requires students to compare different sources that may have conflicting explanations of events; however, students have difficulty doing so spontaneously (Britt, & Aglinskas, 2002; Rouet, Britt, Mason, & Perfetti, 1996; Wineburg, 1991). Historical inquiry tasks must be constructed carefully because they will guide relevancy decisions, which in turn will decide what information will be deeply processed and integrated (Rouet & Britt, 2011). De La Paz and Felton (2010) have used take-a-side prompts to increase engagement in writing in history. One potential drawback to using a take-a-side task is that it could lead to selective learning from the documents (Nickerson 1998). The current study examined the effects of different reading tasks and essay prompts on students’ learning from multiple documents about a historical controversy. Participants were 144 7th grade students that read nine documents about the Panamanian Revolution of 1903. Students read to either take-a-side on Theodore Roosevelt’s responsibility for the revolution or to explain-the-perspectives of the different groups involved. Students also received a reading task to either identify important factors that caused the revolution, or to closely read the documents (underline, highlight, and summarize). After completing the essay, participants rated their interest and effort for the task, a cued recall of the motives and actions of the different groups, an inference verification task of between-text inferences (IVT), and a timeline task. The results showed that students who closely read in order to take-a-side showed better performance on the cued recall, IVT, and timeline task compared to students who closely read to explain-the-perspectives. These results suggest that tasks that have students annotate and summarize before taking a side on a historical controversy are the most beneficial for learning.
The present study examined associations between two forms of parental involvement in adolescent peer relationships (consulting, including advice-giving and problem solving regarding peers, and guiding, a directive type of involvement aimed at influencing peer relationships) and adolescents’ self-perceptions regarding beliefs about several domains of functioning (e.g., social, close friendship, appearance). Questionnaire data collected as part of a larger investigation on parenting and adolescent social and emotional well-being was utilized. Subjects were 28 mother-adolescent pairs (54% girls). Mean adolescent age was 12.18 years. Adolescents were 68% Caucasian, 21% African-American, 11%, Hispanic, and 25% multi-racial. Adolescent and parent reports of parenting via the Parenting and Peer Relationships Inventory (Mounts, 2004) and adolescent-reported self-perceptions via the Self-Perception Profile for Adolescents (Harter, 1988) were used. Mean subscale scores of adolescent-reported parental consulting (M=2.94, SD=.60), guiding (M=2.67, SD =.38) and adolescent self-perceptions (e.g., social M=2.84, SD=.63) were used in analyses. Parent reports of consulting (M=3.28, SD=.31) and guiding (M=2.58, SD=.19) were also measured. Bivariate correlations tested associations between adolescent and parent reports of consulting and guiding, and between each type of parenting and adolescent self-perceptions. Adolescent and parent reports of consulting and guiding were not significantly related. Adolescent-reported parental consulting was positively related to beliefs about athletic competence (r=.42, p < .05). Adolescent-reported parental guiding was negatively related with behavioral competence beliefs (r=-.39, p<.05). Several significant relations emerged between self-perceptions, supporting past research (Harter, 1988). Exploratory hierarchical regressions will test relations between adolescent reports of consulting and guiding with adolescent perceptions, controlling for demographic variables.

The study developed and tested the effectiveness of the intervention for individuals with shyness mindset. Twenty-six individuals with high levels of shyness mindset and high levels of social performance anxiety were randomly assigned to a Shyness Mindset Intervention or a control condition. During the intervention, targeted motivation and psycho-education components promoted the view that shyness is malleable. Participants in Shyness Mindset Intervention condition showed a significant drop in shyness mindset compared to those in the control condition. The effects appear to partially fade during the subsequent one-week follow-up period.
GUADALUPE LOPEZ

SHAPING ONE’S LIFE BASED ON IMMIGRATION STATUS: THE DIFFICULTIES OF BEING A LATINO UNDOCUMENTED SUBURBAN COLLEGE STUDENT

Authors: Guadalupe Lopez
Department: Psychology
Faculty Mentor: Amy Luckner & Katherine Brosier
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30 AM-12:45 PM

About 11.9 million undocumented Latino immigrants live in fear of deportation, experiencing a lifestyle that lacks stability, protection, and many useful resources (Passel & Cohn, 2009). Approximately 65,000 undocumented Latino immigrants graduate from a U.S high school each year (UCLA Center for Labor Research and Education, 2007), but only about 15% of these attend college (Gonzales, 2009). While economic and legal constraints are the most commonly discussed outcomes of undocumented immigration status, these experiences also likely negatively influence their mental health. Little research has been conducted, however on how their immigration status affects them psychologically. As a result, I conducted a research study that investigated Latino undocumented suburban college student’s psychological well being. This study focused on understanding how Latino undocumented suburban college students’ lives are shaped by their undocumented immigration status. Thus, I conducted a qualitative research study where I interviewed eight undocumented students. With the assistance of community gatekeepers, I found three female participants and five male participants who grew up in a suburban area. The students were asked about their late adolescence and how their transition to adulthood was affected by their undocumented immigration status. In addition, participants answered specific questions regarding how their undocumented status affected them psychologically. Results of this study will indicate whether there is a relationship between Latino undocumented suburban college student’s mental health and undocumented immigration status. The findings of this study will help mental health professionals understand the vulnerability this population encounters.

KARINA PEREZ

EFFECT OF CONCLUSION-EVIDENCE AGREEMENT ON MEMORY

Authors: Karina Perez & Brent Steffens
Department: Psychology
Faculty Mentor: Anne Britt
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15 AM

Reading articles on the Web requires the ability to differentiate sources of information based on their reliability and expertise. Source evaluation can occur when pieces of information are conflicting or inconsistent (Braasch, Rouet, Vibert, & Britt, 2012). Readers may evaluate the source’s credibility as a way to resolve the inconsistent information. The goal of the current study was to investigate how readers resolve within-text inconsistencies between claim and evidence information. We operationalize an inconsistency as the author either overstating (i.e., causal claims using correlational data as support) or understating (i.e., correlational claims using experimental evidence as support) their findings and consistency as the author appropriately interpreting their findings (i.e., causal claims using experimental evidence; correlational claims using correlational data). Participants were 134 NIU undergraduates that read about health articles based on actual news stories found on the Web. Within each article, we manipulated the claim strength (strong vs. weak) and evidence type (experimental vs. correlational). The source information was controlled so that all sources were reliable and described their own research. After reading, we tested participants’ memory for source information and claim-evidence information. When the claim-evidence information was consistent, participants recalled 37% of the sources on average, whereas inconsistent claim-evidence information led to only 19% recall of source information. Similarly, consistent arguments led to a better recall of claim-evidence pairs (31%) than did inconsistent arguments (18%). The results suggest that claim-evidence consistency does have an impact when
reading from texts, although inconsistencies leading to lower memory for source and claim-evidence information was
counter to our expectations. We are currently running a second experiment to replicate and clarify the findings from
Experiment 1. We are using the Read&Answer research tool to collect reading behaviors.

96  JENNY NEGELE

CAN METHAMPHETAMINE ACT AS A “SMART DRUG” FOR RATS?

Authors: Jenny Negele, Katarzyna Bujarska & Eden Anderson
Department: Psychology
Faculty Mentor: Leslie Matuszewich
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30AM-12:45PM

College students can go to extreme measures to get good grades, including using “smart drugs” or Nootropic
substance, such as caffeine, Vitamin B, or amphetamine. We have found that juvenile rats exposed to low doses of
methamphetamine (MA) performed better as adults in a spatial learning test, the water maze (Moenk and Matuszewich
2012). Thus, the purpose of this study was to test whether a single injection of methamphetamine improved spatial
memory in adult rats following early treatment with MA. Juvenile rats (PD21-35) were injected with either saline
or MA (2mg/kg) and then left undisturbed. In adulthood, spatial learning and memory rats was tested in the water
maze. For five days, all rats were trained to swim to a platform that was “hidden”, beneath the water. After the 5th day
of training, the rats were injected with either SAL or MA (2 mg/kg). The next day, the rats were placed into the pool
with no platform present to test spatial memory. There was a significant interaction between sex and drug exposure
on the reference memory test (p<.05). Female, but not male, rats showed better memory for the hidden platform if
the challenge injection matched the juvenile injection. As seen previously, male rats swam shorter swim paths and
latencies during the 5 days of training than females (p=.053) and the injection also marginal affected training (p=.08).
These data suggest that females may be more influenced by stimulant treatment than males on spatial memory tests.

97  CURTIS KRUEGER & LOWELL THOMPSON

DEMOGRAPHIC CORRELATES OF NIU STUDENTS’ INTEREST IN MATH

Authors: Curtis Krueger, Lowell Thompson, Megan Michalak, Jacob Hough, Michael Rydell &
Amanda Durik
Department: Psychology
Faculty Mentor: Amanda Durik
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00 PM

The purpose of this study was to determine how demographic variables relate to interest in math. This correlational
study examined self-reported levels of interest in math among Northern Illinois University (NIU) students. Interest
is defined as a relation between individuals and a content domain, characterized by positive feelings and personal
valuation (Hidi, Renninger, & Krapp, 1992). The sample consisted of 822 students from Introduction to Psychology.
We found that reported gender was somewhat related to interest, such that men reported a higher interest in math
than did women. However, women’s interest in math was reported to be at the neutral point of the scale rather than
reflecting a negative view toward math. This suggests that women were not disinterested in math but were only less
interested in it than were men. We also found that age was positively correlated with interest in math, such that the
older a person was, the more interested they were in math. In other words, math is viewed as more interesting among
non-traditional college students. It is unclear why this effect emerged, but this could be examined in future research.
In contrast, there was not a significant relationship between race/ethnicity and interest in math. Finally, several
additional variables were examined (e.g., sexual orientation, number of semesters at NIU) that were unrelated to
interest in math. Overall, these results suggest that a person’s age and gender are related to interest in math, whereas many other demographic factors are not related.

98 **LORENA ROSILES**

*CAN A SHYNESS MINDSET INTERVENTION IMPROVE SOCIAL PERFORMANCE?*

Authors: Lorena Rosiles, L. Miller, M. Baker, K. Hawkinson, J. Lambert, C. McCurry, B. Perkins, N. Skradski & D. Valentiner  
Department: Psychology  
Faculty Mentor: David Valentiner  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 11:30AM-12:45PM

The purpose of this study is to evaluate a shyness mindset intervention for adolescents making the transition to college. The goal of the intervention is to reduce a fixed shyness mindset, and thereby increase adolescents’ social engagement and improve their social performance. Individuals with a fixed shyness mindset believe that their feelings of shyness cannot change; those with a growth shyness mindset believe that their shyness can change. Prior non-experimental research has shown that a fixed shyness mindset is associated with poorer social performance, but a causal relationship has not yet been established. Participants are undergraduate students enrolled in introductory psychology courses. Each participant will complete baseline questionnaires and then be randomly assigned to either a shyness mindset intervention condition or a control condition. The intervention consists of a 90-minute tutorial on the malleability of shyness and includes exercises to facilitate belief change. The control condition consists of watching an entertainment video. After participants completed the intervention or control activity, they will complete questionnaires and participate in a social performance assessment. The social performance assessment involves reading aloud in front of a small audience. The intervention is predicted to lead to less anxiety, less self-focused attention, and better observer-rated performance. This study might clarify whether the shyness mindset intervention is likely to be useful for adolescents during the transition to college.

99 **ANNA SALEINGER & LAUREN ROSS**

*THE POWER OF NEGATIVE AGE METASTEREOTYPES AT WORK: CONFIRMATION VS. REACTANCE*

Authors: Anna Saelinger, Lauren Ross & Elora Voyles  
Department: Psychology  
Faculty Mentor: Lisa Finkelstein & Elora Voyles  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 9:00-10:15AM

Metastereotypes are what we think other members of a group think about our group (Finkelstein, Ryan, & King, 2012). This study examines the influence of personality traits in reactions to negative age metastereotypes in the workplace. More specifically, we examined whether individuals would confirm a negative metastereotype or react against it. We posit that personality traits such as self-esteem, self-efficacy, locus of control, and neuroticism will influence how participants respond to negative metastereotypes. To test our hypotheses, participants were asked to make a decision in a given hypothetical workplace situation. According to Finkelstein et al. (2012), younger workers are aware of existing stereotypes held by workers in other age groups. This study examined the stereotypes and metastereotypes that younger workers are less likely to arrive to work early and tend to be less responsible than members of other age groups. Using these known metastereotypes, participants were randomly assigned to one of two workplace scenarios. Each scenario featured a choice that would either demonstrate a participant’s tendency to confirm or react
against a negative metastereotype. Within each scenario, participants were randomly assigned to either a negative metastereotype condition, a neutral condition, or a control condition. Currently, data have been collected from 71 participants that fit in the younger worker age group (age < 30), with mean age of 19.6 (sd=2.87). At the time of presentation, more data will have been collected and analyzed for hypothesis testing.

100 LISA WIERSEMA

SYMPTOMS OF OBSESSIVE-COMPULSIVE DISORDER AND BELIEFS ABOUT PERCEIVED RESPONSIBILITY: THEIR RELATIONS WITH MEMORY AND MEMORY CONFIDENCE

Authors: Lisa Wiersema
Department: Psychology
Faculty Mentor: Kevin Wu
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30 AM

Obsessive-compulsive disorder (OCD) is an anxiety disorder characterized by obsessions (persistent intrusive thoughts that are anxiety-provoking), compulsions (repetitive behaviors aimed at reducing the anxiety associated with an obsession), or by a combination of both obsessions and compulsions (American Psychiatric Association, 2000). One OCD model posits that symptoms arise only when people feel personally responsible for avoidable negative outcomes. Interestingly, individuals with inflated perceived responsibility (as well as individuals with OCD in general) have been shown to be especially likely to display symptoms of decreased memory confidence (Tolin et al., 2001). The current study is a partial replication of Tolin et al. (2001) and assesses for potential relations among OCD symptoms (particularly checking), obsessive beliefs (particularly inflated responsibility), and memory/memory confidence for both threat-relevant and threat-irrelevant information. Participants completed baseline measures (including demographics, OC beliefs, OC symptoms, state anxiety) and then participated in a brief memory task. Specific hypotheses for this study are: (1a/b) OCD symptoms will be significantly positively correlated with inflated personal responsibility, both before and after controlling for state anxiety; (2a/b) OCD symptoms will correlate negatively with memory confidence, but not after controlling for state anxiety; (3a/b) inflated personal responsibility will correlate negatively with memory confidence, but not after controlling for state anxiety. Other associations will be explored.

101 LAUREN ROSS, ANNE SAELINGER & KATHRYN CZAJA

METAPERCEPTIONS OF EMPLOYEES TAKING LEAVE

Authors: Lauren Ross, Anna Saelinger, Kathryn Czaja, Camille Heneghan & Chris Budnick
Department: Psychology
Faculty Mentor: Alecia Santuzzi
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30 AM-12:45 PM

This study examined how potentially negative workplace behaviors such as missing or leaving work affect how individuals executing those behaviors think their co-workers evaluate them. A metaperception is an anticipated evaluation in which an individual rates themselves from another’s perspective. This study examined the metaperceptions of an individual leaving the workplace for either a personal reason or an ability-based reason. We also manipulated whether the employee left voluntarily or involuntarily. We predicted that participants would anticipate being viewed more negatively when their reason for leaving is personal rather than ability-based. Additionally, participants should anticipate being viewed more negatively when they leave voluntarily rather than involuntarily. Finally, we predicted that an Ability X Choice interaction would qualify those effects; participants should anticipate being viewed more negatively in the personal/voluntary condition than in all other conditions. Participants (n = 151) recruited from Amazon’s Mechanical Turk website read one of four workplace scenarios before
completing an online survey. In the first scenario, the participant was told that he/she chose to remove himself/herself from a work project because he/she thought the project was too hard. In the second scenario, the participant was told that the supervisor removed him/her from the project because he/she thought the project was too hard. In the third scenario, the participant was told that he/she suffered from a migraine and he/she decided to remove himself/herself from the project. Finally, the fourth scenario told the participants that the supervisor removed him/her from the project because he/she was suffering from a migraine. The survey assessed metaperceptions of self-discipline, conscientiousness, trustworthiness, and likability. Results from a 2x2 factorial ANOVA showed significant main effects of ability on all dependent measures, such that participants believed they would be judged more negatively if leaving for personal compared to ability reasons. This pattern did not emerge for choice conditions, with the exception of self-discipline. The predicted interaction was non-significant. Research limitations, implications, and future directions are discussed.

102  REBECCA MAYLE

DODGERS AND ROBBERS: EFFECTS OF AMPHETAMINE ON FOOD PROTECTIVE BEHAVIOR IN ADULTHOOD WITH ADOLESCENT METHAMPHETAMINE EXPOSURE

Authors:  Rebecca Mayle  
Department:  Psychology  
Faculty Mentor:  Leslie Matuszewich  
Research Category:  Arts, Education, Health, Humanities, and Social Science  
Judging Time:  12:45-2:00 PM

Historians who have researched why men enlisted in the U. S. Army during the Civil War have bypassed the northern Illinois region in favor of the eastern states. By examining primary sources exclusively from this region, the research will address the motivations behind men’s decisions and place them in the context of the overall analysis of men from the Union side. The study was conducted by examining primary source collections at ten archival repositories, and analyzing over twenty additional primary sources along with seventeen secondary sources. The results validate general themes of motivation across the northern states for volunteering during the first two years of the war including: preservation of the union, patriotism, liberty for the slaves, and the ability to prove one’s self a man. The research is also supplemented by more personal motivators. Money, prestige, personal affections, and social advancement are also discovered in the sources. The Civil War era in Illinois has been dominated by Lincoln, Grant, and the city of Chicago, now the face of the common man has a chance to emerge.

103  KATHRYN RUPP

EFFECTS OF CAUSAL CHAINS ON MEMORY FOR EXPOSITORY TEXTS

Authors:  Kathryn Rupp  
Department:  Psychology  
Faculty Mentor:  Anne Britt & Patty Wallace  
Research Category:  Arts, Education, Health, Humanities, and Social Science  
Judging Time:  11:30 AM-12:45 PM

Prior research has investigated the effects of causal connectors on readers’ memory for causal explanations within expository texts such as how we interpret pain signals or how stalagmites are formed (Millis, Graesser, & Haberlandt, 1993; Millis, Morgan, & Graesser, 1990). It was found that even short expository texts are challenging and connectors did not significantly increase memory. This lack of effect suggests that students need training to improve their sensitivity to connectors in causal explanations. The current research tests whether a short tutorial will improve students’ memory for explanations of a scientific phenomenon. University students were randomly assigned to either an experimental group (given the tutor before reading the documents) or a control group (given the tutor after
completing all measures). The tutorial taught students to carefully attend to language indicating on the key causal elements and how they are related. In addition to instruction, the tutorial also provided practice with feedback. The memory task required participants to read four short expository texts. Each text was a paragraph that described a natural process or mechanism (e.g., supernova, water purification process). After reading all texts, participants were given the titles and asked to list the causal information from each text. We found that the experimental group had significantly better surprise recall for the explanations than the control group, confirming that the tutorial was effective in helping students represent explanatory texts. We are now expanding the tutorial to help students understand explanations across multiple documents and testing the effectiveness of this expanded tutorial with an essay task rather than a memory task.

104 JUSTIN SBEIH

SELF-REPORT VERSUS CLINICIAN-ADMINISTERED ASSESSMENT IN DIAGNOSING PTSD

Authors: Justin Sbeih
Department: Psychology
Faculty Mentor: Holly Orcutt & Antonia Seligowski
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30 AM

Background: Previous studies have demonstrated the reliability of self-report measures of psychopathology, but few have examined the reliability of self-report measures compared to clinician-administered assessments (Foa, Cashman, Jaycox, & Perry, 1997; Mueser et al., 2001). It is important to determine the reliability of self-report measures of psychopathology because they are frequently used in research and clinical settings to determine whether or not an individual meets criteria for psychological diagnoses. The current study examined the reliability of a self-report measure of Posttraumatic Stress Disorder (PTSD) compared to a clinician-administered assessment. Methods: The data for this research project were previously gathered by the Faculty mentor, Dr. Holly Orcutt, during a study of adjustment following a mass shooting. Participants were 151 college-aged women. A chi-square analysis was used to determine the reliability of PTSD diagnosis by clinical interview versus self-report. The clinical interview used was the Structured Clinical Interview for DSM Disorders (SCID) and the self-report measure was the Distressing Events Questionnaire (DEQ). Results: The resulting chi-square value for the SCID and DEQ was 6.83 (p = .009). Sensitivity of the DEQ in correctly determining the presence of PTSD was .70, indicating that the DEQ will correctly identify those with PTSD 70% of the time. Specificity of the DEQ in correctly determining the absence of PTSD was .78, indicating that the DEQ will correctly identify those without PTSD 78% of the time. Conclusions: These results indicate that there is high reliability between the clinician administered assessment (SCID) and the self-report measure (DEQ). The DEQ demonstrated strong performance in correctly identifying those with and without PTSD. Therefore, it is a reliable measure of PTSD symptomatology.

105 JENELLE MCCALLA

AUTONOMY AS A MODERATOR OF THE RELATIONSHIP BETWEEN THE BIG FIVE PERSONALITY DIMENSIONS AND WORK-LIFE BALANCE

Authors: Jenelle McCalla
Department: Psychology
Faculty Mentor: Larissa Barber
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00 PM

This study investigates the relationship between Big Five personality traits and satisfaction with work-life balance, specifically examining the role of autonomy as a moderator between these two constructs. It is hypothesized that
conscientiousness (C), agreeableness (A), openness to experience (O), extraversion (X), and emotional stability (E) will be positively related to satisfaction with work-life balance (SWLB). Based on conservation of resources theory, it was predicted that autonomy would act as a moderator, strengthening the positive relationship between C, A, O, X, and E with SWLB. A sample of 515 participants recruited through an online open forum called Amazon’s Mechanical Turk, were used to test the hypotheses and moderated multiple regressions were used to analyze the data. The Work Autonomy Scale, HEXACO Personality Inventory and the Satisfaction with Work Life Balance Scale measures were used to assess this relationship. Autonomy was not found to be a moderating variable; however there were main effects which explained variance in the outcomes. In addition, E, X and O were also found to have main effects on SWLB.

106 BRYCE SOMMER

TYPES OF INFORMATION STUDENTS ATTEND TO WHEN WRITING SUMMARIES OF SCIENTIFIC RESEARCH ARTICLES

Authors: Bryce Sommer
Department: Psychology
Faculty Mentor: Anne Britt & Patty Wallace
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15 AM

One of the hallmark tasks of a science education is being able to summarize research articles. In this pilot study, we examine the types of information that students include in article summaries to provide a baseline level of performance (control condition). We also tested whether an expanded definition would improve performance (experimental condition). The single page expanded definition explained including information about the hypothesis of a study and how the results relate to this hypothesis. Twenty-three third and fourth year psychology students enrolled in two sections of an upper level psychology lab were given three psychology research articles and asked to provide typed summaries for each. Students read the articles prior to the study and had the research articles available during summary writing. One lab section was randomly assigned to the experimental group (expanded definition) and the other section was assigned to the control condition (no expanded definition). The summaries were assessed for presence of key elements (e.g., hypothesis, reasoning). The results show that students accurately summarize the key elements of the methods and results but often leave out the hypotheses and the reasoning connecting the results/design to the hypotheses. Furthermore, a simple definition to include information about the hypotheses and reasoning did not help. We are currently analyzing a questionnaire that participants completed to better understand what information they thought should be included in a summary. It could be that they knew it was important to include but could not summarize this information correctly. Our next step will be to develop interventions for teaching students how to write effective summaries.

107 NICHOLAS SKRADSKI

ANALYSIS OF INTERNALIZING AND EXTERNALIZING SYMPTOMS IN MINDSET CONSTRUCTS

Authors: Nicholas Skradski, David Valentiner & Lindsay Miller
Department: Psychology
Faculty Mentor: David Valentiner
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30AM-12:45PM

Previous research on mindset has included peer relationships, personality, and shyness. Research has been done to evaluate the relationship between mindset constructs and various variables, including internalizing symptoms (e.g., depression and self-esteem) and externalizing symptoms (e.g., aggression and hostility bias) following peer victimization. Measures of these mindset constructs have overlapping content. Little research has been done to
examine the relationships between these mindset constructs and to determine which mindset constructs are the most relevant to social and psychological outcomes. Specifically, three mindset measures (the Peer Relationship Mindset scale, Rudolph, 2009; the Personality Mindset Scale, Yeager et al., 2012; and the Shyness Mindset Scale, Beer, 2002) have all been shown to moderate the relationship between peer victimization and internalizing and/or externalizing symptoms. This study examines the relationships between measures of these mindset constructs and the incremental validity of these mindset scales in predicting victimization-related internalizing and externalizing symptoms. Based on observations about content, we anticipate that Peer Relationship Mindset and Personality Mindset are the same (or two highly related) constructs. We hypothesize that Shyness Mindset will account for unique variance in victimization-related depression and self esteem after controlling for other mindset constructs, and that Peer Relationship and Personality Mindset will account for unique variance in victimization-related aggression and hostility bias. We currently have data from 66 participants. We plan to collect data from 200 participants, as per recommendations from Loehlin (1987) for structural equation modeling. These results may inform the development of interventions by identifying which mindset constructs should be targeted.

108 Theresa Oostmeyer, Lauren Nelson, Laura Farrell, Jessica Ventrella, Guadalupe Trejo, Brumentha Bony, Kristi Kovacs & Leslie Simonovich

The Relations Among Victimization From Traditional Bullying and Cyber Bullying and Outcomes

Authors: Theresa Oostmeyer, Lauren Nelson, Laura Farrell, Jessica Ventrella, Guadalupe Trejo, Brumentha Bony, Kristi Kovacs & Leslie Simonovich

Department: Psychology
Faculty Mentor: Christine Malecki & Michelle Demaray
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00PM

Victimization from bullying, including cyber bullying experiences are a significant and growing problems in schools. Current estimates indicate that 20% to 35% of children and adolescents experience cyberbullying (Demaray & Brown, 2009). The current study expands on a recent study of gender differences in the relation between cyber victimization and negative outcomes (Brown & Demaray, 2012). The goals of the current study were to investigate: a) gender differences in victimization from face-to face bullying (i.e., traditional bulling) and cyber bullying, b) the relation between victimization from traditional bullying and cyber bullying for boys and girls, c) the relations among traditional and cyber victimization from bullying and four outcomes (emotional problems, conduct problems, peer problems, and prosocial behavior). Participants were 270 ninth graders from a suburban midwest high school. Students completed the Electronic Victimization Survey (EVS; Brown & Demaray, 2012), the Olweus Bully/Victim Questionnaire (OB/VQ; Olweus, 1996), and the Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997). Although no differences in overall levels of perceived victimization from traditional and cyber bullying were found, there were different relations among bullying experiences (both traditional and cyber) and outcomes for boys and girls.

109 Sarah Stuebing

Evaluating the Role of Frontal Cortical Structures in Self-Movement Cue Processing During Spontaneous Exploration

Authors: Sarah Stuebing, P. Blankenship, B. Kolb, I.Q. Whishaw, D.G. Wallace
Department: Psychology
Faculty Mentor: Douglas Wallace
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30 AM

Animals use environmental (visual, auditory, olfactory) and self-movement (vestibular, proprioception, optic flow) cues to maintain spatial orientation. Although disruptions in spatial orientation are frequently associated with acute and chronic neurological disorders, the nature of the processing deficit remains to be determined. The current study uses the organization of rat exploratory behavior under dark conditions to investigate the role of specific areas within the frontal cortex in self-movement cue processing. Control rats (n= 6) or rats with damage localized to either the medial frontal (n= 6) or orbital frontal (n= 6) cortex were placed in a small refuge that provided access to explore a large circular table. Each rat was free to explore the table under dark conditions for an hour. Subsequent to home base establishment, the first five exploratory trips were captured and digitized using the peak motion capture system. Groups did not differ in the amount of time spent in the home base quadrant or the distance traveled during the session; however, damage to the medial frontal cortex disrupted exploratory trip organization. These results will be discussed in the context of a system of structures that mediate self-movement cue processing and implications for understanding spatial disorientation associated with neurological disorders.

110 EMANUELA WITKOR & PHIL BLANKENSHIP

EVALUATING THE EFFECTS OF CORTICAL DEVASCULARIZATION ON THE ORGANIZATION OF FOOD PROTECTION BEHAVIOR.

Authors: Emanuela Witkor & Phil Blankenship
Department: Psychology
Faculty Mentor: Douglas Wallace
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15AM

Acute neurological disorders such as stroke frequently result in disruptions in spatial orientation. Rodent models provide a unique approach to understanding the nature of the spatial processing deficit associated with stroke related pathology. For example, several studies have shown that rats consuming a food item will use multisensory cues associated with an approaching rat to elicit lateral movement to protect the food item from being stolen. Previous work has shown that hemi-decortication disrupts the organization of food protection behavior. The current study examines the effects of more selective damage to cortical areas involved in responding to environmental cues by removing the vasculature overlying the AGm (n=4) or AGl (n=4) on the organization of food protection behavior. Rats were given two sessions a day for five days to consume/protect a hazel nut from a hungry conspecific. The number of thefts, type of food protection behavior elicited, and distance between noses was quantified for each session with a hazelnut. No disruption in food protection behavior was observed between groups. There are two possible accounts for these results. First, neither of these areas are involved in food protection behavior. Second, this lesion technique was not sufficient to disrupt cortical function. Future work will investigate the effects lesion techniques on food protection behaviors that more completely disrupt cortical function.

111 JARED TORRENCE

AGING AND ITS EFFECT ON SELF-MOVEMENT CUE PROCESSING

Authors: Jared Torrence, P. Blankenship, J. Köppen & D. Wallace
Department: Psychology
Faculty Mentor: Douglas Wallace
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30AM-12:45PM
The Summer Research Opportunities Program (SRP) was created to promote access to undergraduate research during the summer months for students at NIU. Participating in SROP allows students to connect with faculty mentors and build their resumes.

In SROP, students will:

- Learn what research looks like in their field of study
- Learn how to write a formal research proposal
- Gain experience working alongside talented faculty
- Attend professional and academic enrichment activities
- Receive housing, meals, and a generous stipend
Spatial orientation is dependent on processing multiple sources of information. Although the ability to maintain spatial orientation changes across the lifespan, relatively few studies have examined whether disruption in processing self-movement cues (vestibular, proprioceptive, optic flow) contributes to these changes in spatial orientation. Eight participants ranging from ages 21 to 86 were given twelve trials on a manipulatory scale dead reckoning task. During a trial a participant was blindfolded and instructed to search a tabletop using their pointer finger to find a piece of Velcro. Upon locating the Velcro participants were asked to return to the point on the table that they started. Motion capture software was used to characterize the topographic and kinematic aspects of their movements. The older group exhibited significantly larger errors in estimating the direction and the distance to the start location. This disruption in the performance may reflect impaired self-movement cue processing and may contribute to the change in spatial orientation observed across the lifespan. These observations establish a foundation for future work investigating lapses in spatial orientation observed during the progression of neurodegenerative disorders (Dementia of the Alzheimer’s Type).

112 KRISTEN STOICESCU

THE EFFECTS OF CHRONIC METHYLPHENIDATE EXPOSURE ON SPATIAL LEARNING IN JUVENILE RATS

Authors: Kristen Stoicescu & Eden Anderson
Department: Psychology
Faculty Mentor: Leslie Matuszewich
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15 AM

Methylphenidate (MPD), or Ritalin, is the most widely prescribed stimulant for the treatment of Attention Deficit Hyperactivity Disorder (ADHD). Despite the fact that MPD is taken orally by children to treat ADHD, most studies in rats administer MPD through injection, which is subjected to different metabolism processes in the body. The focus of this study was to determine whether MPD administered orally improved spatial memory in juvenile rats when compared to MPD administered through injection. Juvenile male and female rats were given MPD or water for 15 days and then tested in a T-maze. Either MPD or water was administered on a cookie or through IP injection. On the last treatment day (postnatal day 35), 1 hour after treatment, animals were placed into the T-Maze with one arm blocked for 15 minutes, removed from the maze for 5 minutes, and placed back into the maze complete access to all arms. Overall, rats spent more time in the novel arm compared to arm they had previously investigated. Longer exploration of the novel arm is thought to indicate retained memory for the habituated arm and increased attention to novel stimuli. While MPD did not significantly change any measure, the rats given MPH orally tended to show increased time in and greater preference for the novel arm compared to control rats. Our findings indicate that chronic exposure to MPD may improve spatial learning in juvenile rats when given orally; however, additional subjects are needed to determine if the observed differences reach statistical significance.

113 GIM REO

IS MINDFULNESS ASSOCIATED WITH DISTRESS TOLERANCE AND CHILD PHYSICAL ABUSE RISK IN A SAMPLE OF GENERAL POPULATION PARENTS?

Authors: Gim Reo & Regina Hiraoka
Faculty Mentor: Julie Crouch
Department: Psychology
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00 PM

Child physical abuse represents a public health concern of major scope, with far ranging consequences and significant
costs to individuals, families, and society. The present study was designed to advance our understanding of the underlying causes of parental aggression toward children. To advance our understanding in this area, we recruited a sample of general population parents and asked them to complete the Child Physical Abuse Potential Inventory (Milner, 1986), the Distress Tolerance Scale (Simons & Gaher, 2005), and the Freiberg Mindfulness Scale (Walach, Buchheld, Buttenmüller, Kleinke, & Schmidt, 2006). We hypothesized that lower levels of mindfulness would be associated with lower levels of distress tolerance and higher levels of child physical abuse risk. Moreover, we expected that the association between mindfulness and child physical abuse risk would be partially mediated through distress tolerance. That is, parents who were less mindful would report less ability to tolerate distress and would be at greater risk of behaving aggressively toward children. Support for these hypotheses would be consistent with the notion that mindfulness-based interventions may help at-risk parents increase their ability to tolerate distress and thus would reduce the likelihood of child physical abuse during stressful moments in parenting.

114 COURTNEY HALAS

**SEVERITY OF LIMB DIFFERENCE AND ITS RELATIONSHIP ON ADOLESCENT SOCIAL FUNCTIONING AND SELF ESTEEM**

Authors: Courtney Halas  
Faculty Mentor: Nina Mounts  
Department: Psychology  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 11:30AM-12:45PM

Existing research suggests that adolescents with limb differences are at a greater risk for depression, anxiety and loss of self-esteem (Varni, Rubenfeld, Talbot, & Setoguchi, 1989). There is limited information on the relation between severity of limb difference, as opposed to the presence or absence of a limb difference, and adolescents’ psychological functioning. Furthermore, very little information exists regarding adolescents’ social functioning, particularly their experiences with peer teasing, peer rejection, difficulties getting along with peers, and difficulty participating in activities with their peers. This investigation examined the relation between severity of adolescents’ limb differences and adolescents’ depression, negative self-esteem and the above described aspects of social functioning. It was hypothesized that more severe limb differences would be related to poorer social functioning, poorer self-esteem, and higher levels of depression. It was also hypothesized that the relation between severity of limb difference and depression would be mediated by poorer social functioning. Questionnaires were completed by 39 parent-child dyads in which the adolescent, ages 11-17, was receiving treatment for a limb difference at a local hospital. There were significant correlations between the severity of limb difference and the adolescents’ social adjustment, negative self-esteem, and depression, such that more severe limb differences were related to poorer social adjustment, higher feelings of negative self-esteem, and higher levels of depression. The relationship between severity of limb difference and negative self-esteem was mediated by social functioning. Similarly, the relationship between severity of limb difference and depression was fully mediated by social functioning.

115 AHLAM HAMDAOUI

**LOST IN SPACE: HISTORY OF BINGE DRINKING DISRUPTS SELF-MOVEMENT CUE PROCESSING IN A MANIPULATORY SCALE SPATIAL TASK**

Authors: Ahlam Hamdaoui, P. Blankenship & D. Wallace  
Department: Psychology  
Faculty Mentor: Douglas Wallace  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30AM-12:45PM
Recent studies demonstrate that a history of binge drinking (over five drinks in one setting) is associated with verbal cognitive impairments among college students. In contrast, relatively few studies have examined whether a recent history of binge drinking impacts spatial orientation. The current experiment examined the relationship between the history of binge drinking and performance on a manipulatory scale spatial orientation task that depends on processing of self-movement cues. Participants were undergraduates recruited from introductory psychology subject pool based on either a history (n=3) or no history (n=3) of binge drinking. In a closed room, a participant was seated in front of an empty rectangular table and a piece of Velcro was randomly placed on the table. Participants were blindfolded and instructed to use their finger to search for the piece of Velcro and upon locating the Velcro they were asked to return to the point on the table that they started. Participants were given twelve trials. Motion capture software was used to characterize the topographic and kinematic aspects of their movements. The group with history of binge drinking exhibited significantly larger direction and distance errors in returning to the start location, relative to the group without a history of binge drinking. This observation demonstrates that recent history of binge drinking impairs self-movement cue processing and may have broader implications for spatial orientation.

116 MATTHEW WOODBURY, ANDREW WAGNER & AMANDA VILLIE

IN THE HOT SEAT: AN ANALYSIS OF PERCEIVED DISTINCTIVENESS IN EVALUATIVE SITUATIONS

Authors: Matthew Woodbury, Andrew Wagner, Amanda Villie, Christopher Budnick & Camille Heneghan
Faculty Mentor: Alecia Santuzzi
Department: Psychology
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00 PM

Kramer’s (1998) Paranoid Social Cognition model posits that situations producing increased perceptions of evaluative scrutiny, uncertainty, or social distinctiveness should yield higher levels of self-conscious concern. Increased self-consciousness might increase paranoid cognitive processing resulting in increased hypervigilance and rumination. These paranoid cognitions should elicit more sinister attributions, conspiracy perceptions, and negative metaperceptions during social interactions. Research in social and organizational psychology suggests that White individuals might be more negatively affected by being a demographic minority than non-White individuals. This study focused on social distinctiveness in paranoid processing and whether White individuals would be more susceptible to such effects. To test this, undergraduates (n=93) participated in a simulated job interview. Each participant received information that they were 80%, 50%, or 20% similar in demographic and educational background to past successful applicants. Following the interview, participants completed measures assessing their affect, metaperceptions, and future interview expectations. Results will be analyzed with a 3 (condition; low, medium, or high distinctiveness) X 2 (race; White or non-White) analysis of variance (ANOVA). We predict main effects of condition and race qualified by a significant Condition x Race interaction. Based on past research, we expect that White participants will be more sensitive to being demographically distinct and experience more negative outcomes than non-White participants. Research limitations, implications, and future directions are discussed.

117 JESSLYN TRUESDALE

THE IMPACT OF ORGANIZATIONAL CHARACTERISTICS OF LAW ENFORCEMENT OFFICES ON DRUG ENFORCEMENT ACTIVITY

Authors: Jesslyn Truesdale
Faculty Mentor: Kirk Miller
The purpose of this research is to examine the relationship between the organizational structure of large law enforcement agencies (LEAs) and patterns of drug enforcement activity, especially as it relates to drug-related arrests and drug asset forfeiture activities. Existing research suggests that the organizational characteristics of LEAs may have a significant effect on police behavior in a number of arenas of police work (Reaves, 2007; Reiss and Bordua 1966; Bhagat and Sullivan 1992; Wilson, 1968). However, there is little research that examines how the organizational characteristics of LEAs affect officer discretion when it comes to drug enforcement search and seizure behavior. To date, few criminologist or public policy experts have examined how organizational factors of LEAs influence drug search and seizure activity. This research will begin to fill in this gap in the literature on police organization and drug enforcement activity. Using multiple sources of official including 2006 Uniform Crime Reports on drug and other serious crime and data about LEA characteristics from the 2007 Law Enforcement Management and Administrative Statistics dataset, we explore this question. Findings illustrate the strengths and limitations of the organizational approach to explaining police drug enforcement activity.

**118 CIERRIA MCPERRYMAN**

*RELATIONSHIP STABILITY AND MIDDLE CLASS VALUES IN A WHITE, NON-URBAN HOUSING PROJECT*

Authors: Cierria McPerryman  
Faculty Mentor: Kirk Miller  
Department: Sociology  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 12:45-2:00PM

Research on poverty in inner-city America is extensive (e.g., Venkatesh 2008; Massey and Denton 1993). Poverty in these studies is often used interchangeably with race. “Urban poor” becomes a synonym for black inner city life. There have been some studies of poor whites (Fine and Weis 1999), but these subjects are still “urban”. This project examines poverty and whiteness in a midsize, Midwestern city which would not qualify as urban when compared to existing studies. Poverty has also been shown to impact family and relationship structure. I focus specifically on the effects of poverty on the romantic relationships of women in this low income housing area. I compare the patterns from previous relationship studies of poor minorities to the patterns I have found in my research. I also compare the patterns of the white residents with the patterns of the minority residents in the same low income housing area. My results reveal many similarities between the white group and the minority group in both housing communities, including: difficulty finding suitable mates; the cost-benefit analysis of all romantic partners and relationships; expectations of what life should be before marriage; the amount of time the women’s children spend with their father; and quality of the relationship between the mother and the father. Poverty negatively impacts relationship stability. However, I also find— contrary to popular conceptions about poverty— that these white women express middle class values and aspire to middle class standards in their intimate relationships.

**119 AMANDA INSALACO**

*NGOS: RESPONSIVE TO AMERICA’S NEEDS? A 50 STATE ANALYSIS*

Authors: Amanda Insalaco  
Department: Community Leadership and Civic Engagement  
Faculty Mentor: Ben Bingle & Nancy Castle  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 11:30 AM-12:45 PM
To test the responsiveness of NGOs in the American states, various measures of societal need from the year 2000 are used to predict the number of NGOs operating in 2010. The results indicate that NGOs in the education and health sectors are unresponsive to multiple indicators of societal need. Environmental NGOs are unresponsive to per capita energy consumption, but highly responsive to carbon dioxide emissions. Emissions and state population are strongly associated, which suggests population rates may be what is ultimately influencing NGO responsiveness. This assumption is tested and in all three sectors, state population and per capita income are significant predictors of NGO sector size. These findings suggest that NGOs may gravitate more toward highly populated states and wealthier states as opposed to where services are needed most.

120  RICHARD BIRMANTAS & JULIE MOTEAU

GRAMMAR LEARNING AND TEACHING IN A FOREIGN LANGUAGE: A NECESSARY EVIL?

Authors: Richard Birmantas & Julie Moteau
Department: French
Faculty Mentor: Robert Reichle
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00 PM

This survey-based study investigated college and high school foreign language (L2) learners’ beliefs about L2 grammar instruction, as well as the beliefs of their teachers. French and Spanish students (n = 131) and teachers (n = 49) were asked whether they believed grammar instruction to be important and interesting. They were also asked how they felt about corrective feedback, grammatical accuracy, and diverse forms of grammar teaching and learning in the foreign language classroom, including whether they believed incorporating games in the classroom would make learning and teaching grammar in a foreign language classroom more interesting and more fun, and also whether they believed these games helped students learn the grammar. The majority of students and teachers indicated that grammar instruction in a foreign language is important, but a fairly large amount also agreed that it was not very interesting. Results also showed that females were more optimistic about learning grammar, and there were varying opinions amongst students who studied French or Spanish as a major in college compared to those studying different majors. The majority of students (95%) would like to see more games incorporated into the classroom, whereas teachers (78%) were less enthusiastic to incorporate games in the classroom, feeling as though they would be more of a “distraction”, if anything. Implications are discussed in view of the necessity to make grammar learning more interesting and more fun for students.

121  RONALD LEONHARDT


Authors: Ronald Leonhardt
Department: History
Faculty Mentor: J.D. Bowers
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 10:15-11:30 AM

Although there is a substantial body of literature analyzing the causes of the Cambodian genocide, the Cold War’s influence on the rise of the Khmer Rouge and the subsequent genocide is often overlooked. Once the Cold War settled into Southeast Asia, social unrest, economic decay, and political impotency began to pool in the fault lines of Cambodia’s domestic stability. A collapse of these institutions ultimately led to xenophobia, mass repression, and genocide under the Khmer Rouge. This connection, however, between the Cold War and the Cambodian genocide has been obscured in favor of intraregional issues. Although racial and ethnic tensions, struggles for control within the Pol
Pot regime, and socioeconomic changes in the rural and urban areas illuminate crucial components of the genocide, such components do not explain why such deep social and political fractures developed in the first place. Essentially, this project will explain what cannot be explained through regional analyses. Cambodia’s economic dependence on the United States, the ramifications of the Vietnam War, Democratic Kampuchea’s alignment with China, and the ideological radicalism of the Khmer Rouge all allude to the greater Cold War context of superpowers manipulating smaller nations in pursuit of selfish geopolitical goals. This transregional source of genocidal causality has always existed as an undertone in genocide studies; it was simply not organized into a macrocosmic Cold War framework. Thus, this project addresses this void in genocide studies and helps show the genocide for what it is—a product of the Cold War.

122 NATALIE CINCOTTA

HISTORY AND PHOTOGRAPHY: GERMAN PHOTOS FROM THE EUROPEAN EASTERN FRONT OF WORLD WAR II (1939-1945)

Authors: Natalie Cincotta
Department: History
Faculty Mentor: Heide Fehrenbach & Vera Lind
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 11:30AM-12:45PM

The research will examine how scholars of Nazi Germany from the 1980s to the present have utilized photography as historical evidence. The research provides a detailed review of both historical and photographic literature to examine how historians and scholars in related disciplines have used both official and amateur photographs as evidence of Nazi atrocities on the eastern front during the period 1939 to 1945. The project explains several key questions in this examination: What are the photographs a representation of, and how do scholars interpret this? What is the relationship between the image presented by the photographer and historical reality? How have scholars dealt with this relationship? Finally, what are the methodological challenges in using photos in historical work? Historical debates relating to the use of photos has arisen in my literature review. Some scholars use photos to visually illustrate what is being argued in the written text, and thus consider photos as windows to past realities. In contrast, other scholars argue that photos take on different meanings over time, and thus are not realistic representations of the past. Thus the latter group of scholars argue that photos should be treated as distinct pieces of evidence that need to be interpreted and explained. Hence, there is a lack of consensus on how photos, particularly of the Nazi era on the Eastern Front, should be used in history. The final part of the project interprets the diverse range of methodologies, including their strengths and weaknesses, to conclude a more critical, concise approach to utilizing photographs in history. Increasingly, historians are turning to photography as historical evidence, not just for illustration, so it is important to develop a careful, critical methodology to analyze photography.

123 JESSIE SHATTUCK

THE ROLES OF ANGLO-SAXON WOMEN IN SAXON MISSIONARY WORK

Authors: Jessie Shattuck
Department: History
Faculty Mentor: Valerie Garver
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00 PM

Many American students have read or at least heard of the epic Anglo-Saxon poem Beowulf, written in England in the early Middle Ages. Although women do not play a dominant role in the poem, examining the few women’s actions in this epic and a few other poems reveals their roles in Anglo-Saxon society. They are often viewed as “peace-
weavers,” a term that the Anglo-Saxons may not have used themselves, but that reflects their roles as keeping the peace among men through marriage, gift giving, and being virtuous and courteous women. In my research, I delve into the possibility that their roles in society passed into their missionary work in Saxony (today part of Germany). As abbesses, Anglo-Saxon women played a prominent role in assisting Bishop Boniface in converting and establishing German Christian communities according to Roman Catholic Doctrine. Instead of being “peace-weavers” between men, they became “peace-weavers” between people and Christ.

124 WAYNE DUERKES

"THERE’S NO VALLEY SO SWEET" THE MARKET DEVELOPMENT IN THE LOWER FOX VALLEY RIVER REGION: 1833 – 1852

Authors: Wayne Duerkes
Department: History
Faculty Mentor: Bradley Bond
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15AM

The research examines the development of the market economy in the region which encompasses southern DeKalb and northern LaSalle County from 1833 to 1852. The region’s history has been the domain of local history buffs’ tales, or it has been relegated to a sideshow of Chicago, or a mere footnote in the state history. In large part, the complexity of the region begins with its geographic location at the confluence of the Fox and Illinois rivers. The location’s market, originally thought to have preferential economic ties to St. Louis during the pre-railroad era, was actually an economic battleground for commercial trade between Chicago and St. Louis. The rivalry between these two markets was crucial to the growth and development of the communities located in north central Illinois. The study will also demonstrate how the region was not an amalgamation of new and various economic processes but rather more of a re-introduction of the economic situation many immigrants had left in their eastern origins. The lower Fox Valley River communities and the market developed there becomes an integral story in understanding the economic growth of the Midwest.

125 KIRANJIT GILL

SUPREME COURT LAW CLERKS; AN IN-DEPTH ANALYSIS

Authors: Kiranjit Gill
Department: Political Science
Faculty Mentor: Artemus Ward
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15AM

This particular research project concerns Supreme Court Law Clerks. Each year, about thirty-six law clerks are chosen to work for the nine Supreme Court Justices, and they serve for a term of one year. These law clerks are assigned to a justice and work with them on several tasks, which include drafting their opinions. The purpose of this project is to gain further knowledge about Supreme Court Law Clerks and their characteristics. Specifically, the 2000-2010 terms will be focused upon. A large part of this research is finding out the jobs that law clerks obtain after their clerkship at the Supreme Court. This is why terms after the 2010 term will remain out of the research for the time being. The clerks are analyzed using a standard series of questions. Depending on the results of the research, conclusions will be formulated once all the data is gathered. The final data will determine similarities and differences between the law clerks and each individual term. This information is expected to assist in further investigating the position that law clerks have in the Supreme Court, and the influence law clerks have on the justices they clerk for.
Scotland is presently experiencing one of its strongest efforts ever to gain independence from the United Kingdom. The Scottish Nationalist Party (SNP) has high hopes for the passage of its referendum issued tentatively scheduled for fall 2014, which would grant Scotland the independence the party so strongly desires. Should the referendum be successful, Scotland must plan for national departmental reconfgurations in areas such as defense, currency, and border control, not to mention readmission as an independent state into the European Union. In my research, I explore the possibilities behind the current push for independence and consider various theoretical explanations ranging from political gain and economic benefits to growing nationalism. International opinion, pro and anti-Scottish independence campaigns, and public opinion polls provide an insight into the likelihood of the success or failure of the referendum as the scenario unfolds. Only time will tell what’s in store for Scotland’s future, as well as the remainder of the United Kingdom.

The research tests the effect of alternative judicial selection methods on incarceration rates in the American states. State judicial selection methods are collapsed into a binary variable. Namely, states that use primarily elections and states that use primarily an appointment process. Theory suggests that elected judges, in order to appease the voting public, will be more punitive. Hence, the research hypothesizes that states which primarily use judicial elections will incarcerate a larger percentage of the state’s population. Results indicate that this is the case after controlling for both state conservatism and state prison expenditures.

The research tests for racial voting in US presidential elections by comparing Democratic vote totals for legislative and presidential candidates in 1992 and 2008. Specifically, we measure the percentage of people who vote for Democratic legislators, the percentage of people who vote for Democratic presidential candidates, and subtract the two. Our thesis
is that this gap will be wider in 2008 than it was in 1992 because of unwillingness on the part of some Democratic voters to back an African American presidential candidate. In the analysis we control for whether the legislator was an incumbent and also district level demographic considerations. Preliminary evidence suggests about a four percent increase in the voting gap in 2008. Put differently, Democratic legislators obtained about four percent more support in 2008 than in 1992 relative to presidential support.

129 JESSE RUTER

**BARRIERS TO ADOPTION: THE NEGATIVE CONSEQUENCES OF THE MILITARY ROBOTICS REVOLUTION**

Authors: Jesse Ruter  
Department: Political Science  
Faculty Mentor: Robert Brathwaite  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 9:00-10:15 AM

New military technologies change the way in which wars are fought. Desires for increasing military efficiency weighed against financial capacity can lead to the implementation of new technologies, resulting in revolutions that form the basis of military doctrine. The question my study addresses is why are certain major military innovations successful while others are not. The current robotics revolution, encompassing unmanned aerial vehicles (UAVs) and other developing machines, carries secondary consequences that will need to be considered. Specifically, potential negative consequences associated with the use of force, organizational structure, and international law are factors that need examination before the impact the robotics revolution has had on military operations can be clearly understood.

130 ANASTASIA KOCHER

**CENTRAL ASIAN REGIMES TRAMPLE WOMEN’S RIGHTS: THE EFFECTS OF POLITICAL TRANSITION ON THE STATUS OF WOMEN IN KAZAKHSTAN, UZBEKISTAN, KYRGYZSTAN, TAJIKISTAN, AND TURKMENISTAN**

Authors: Anastasia Kocher  
Department: Political Science  
Faculty Mentor: Christopher Jones  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 10:15-11:30 AM

The five Central Asian states have all had difficult economic and societal transitions following their political independence in 1992 and face uncertain futures. This reality is especially true in the case of women’s rights. Following the collapse of the Soviet Union, women began losing ground as traditional gender stereotypes returned to the newly independent countries of Central Asia. Without Soviet rule, women have found themselves increasingly unable to advocate for education, equitable working conditions, and political representation. Uzbekistan, Kazakhstan, Kyrgyzstan, Turkmenistan, and Tajikistan have faced their individual challenges since their independence. Yet, my research recognizes their commonalities, which I ascribe to similar types of political regimes. All five countries endured dictatorship after the collapse of the Soviet authoritarian state. The existing governmental leaders lack the ambition to enforce the gender related laws and policies aimed at improving the status of women. Since independence, each Central Asian country has tried to define its national identity. So far, this process has resulted in the deterioration of women’s rights based on redefined cultural norms that prioritize the women’s role as a housewife and mother. This tendency is reinforced by leaders in these countries, as well as a lack of a previously established socioeconomic system, including child care and elder care institutions. In order to achieve gender equality, where women enjoy equal opportunities as men and contribute to the social, economic, and political development of their countries, women
must be aware of their rights and encouraged to participate fully in political and economic decision-making. Some policy proposals are offered following the analysis of women’s conditions in three selected issue areas: employment, education, and women political representation.

131 MELANIE SULKIN

**COLLEGE STUDENTS’ PASSAGE RATES ON THE CIVICS PORTION OF THE CITIZENSHIP TEST**

Authors: Melanie Sulkin  
Department: Political Science  
Faculty Mentor: Matt Streb  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 9:00-10:15AM

College Students’ Passage Rates on the Civics Portion of the Citizenship Test  
This research examines Northern Illinois University students’ passage rates on the civics portion of the citizenship test. Students in three COMS 100 classrooms took mock citizenship tests. Factors expected to influence passing the mock test are whether the student took a previous political science classes, whether the student voted in the previous election, gender, and grade point average. The results will indicate whether Northern Illinois University students in general have sufficient knowledge of American government as well as whether certain groups of people are more likely to pass the exam.

132 SARAH STUEBING

**NEW FACES: THE DOCUMENTATION AND ANALYSIS OF FACIAL EXPRESSIONS IN BLACK HOWLER MONKEYS**

Authors: Sarah Stuebing  
Department: Anthropology  
Faculty Mentor: Leila Porter  
Research Category: Arts, Education, Health, Humanities, and Social Science  
Judging Time: 9:00-10:15AM

Documentation and analysis of the facial expressions of non-human primates can provide valuable insights into how communication systems evolved in non-human and human primates. For example, the relaxed open-mouth display of the chimpanzee and other primates has been proposed to be a precursor of human laughing (de Waal 2003). Recognizing similarities in non-verbal communication across species can further our understanding of their functions and evolutionary history. The Black Howler (Alouatta caraya) is a species of New World monkey whose facial expressions have not previously been documented. Fifteen Black Howler monkeys were videotaped while interacting over food during a five-week stay at the Proyecto Caraya in Argentina. These video data were analyzed to create photographic representations of the facial expressions observed, and the context in which each display occurred was noted. Data analysis revealed four distinct facial expressions of the Black Howlers, including a novel “howling pursed lips” expression, and a proposed function for each expression was determined. These findings provide the first facial display data of this New World species, and show similarities in facial expressions to other New World monkeys such as capuchins, and even a few similarities with the further-evolved Old World chimpanzee.

133 LINDSEY KOMES

**COMPARING ABOVE AND BELOW**


This project will build upon last year’s project, which focused on subsurface excavations, through categorization and analysis of surface collections from San Marcos Pueblo. Traditionally, surface collections are thought to be a viable substitute for subsurface excavations when there are time and/or financial constraints on a project. This year’s project will test that theory by examining how comparable the surface collections are to the subsurface collections.

134 MIGUELÀNGEL MARCHÀN

*Exploring Active Noise Cancellation and the Effects of Anti-Noise*

This project will deal with the idea of ANC (Active noise control). The purpose of this project is to simulate an active noise control system. To do this, anti-noise must be created to cancel out the sound waves created by snoring (in my case) and make silence. The goal of this project is to create a simulation of the noise cancellation by using MATLAB v7. This is a programming environment that helps with technical problems and real world problems. I have been provided with a snore sound file that I will use in my simulation. I will be displaying how the system cancels the noise over time and by using a simulation we will get a better idea of how effective anti-noise is created.

135 ROHAN ESCOBAR, RAY SPENCE & ANTHONY BOYD

*Smart White Cane*

With our Smart White Cane design, we intend to assist the visually impaired population of Northern Illinois University in navigating the campus most effectively. The two most prevalent means by which the visually impaired navigate are with the white cane and seeing-eye dog. The conventional white cane is a tool used for guidance; the user sways it as they walk to detect obstacles. To enhance the functions of the cane, an ultrasonic proximity sensor will be connected. The sensor is capable of detecting obstacles, laterally of 1.5 meters, and upwards of 3 meters in the direction of the cane while providing haptic feedback to the user. The haptic feedback (i.e. vibrations in the handle of the cane) will intensify as the cane nears an obstacle, or vice versa. We wish to increase the functionality of the conventional cane while maintaining relatively lost costs. There are variations of the Smart White Cane currently on the market; however, they are quite expensive. In addition to the proximity sensor, radio frequency (RF) technology will be utilized to further enhance the functionality of our design. We wish to make it easier for the user to traverse campus buildings. The user will carry a receiver that is triggered by a transmitter when it enters a predetermined radius. Transmitters will be pre-installed outside various campus buildings. The receiver will in turn trigger an audible response, notifying the user of their proximity to a given building.
Electronic Stabilization algorithms have become a standard in cars today but only adjust throttle or braking per wheel. This results in a vehicle that slides very predictably decreasing the skill and attention necessary to bring the car under control. Our end goal is to increase driver safety and prevent the vehicle from rolling. The system works by calculating a target angular velocity based off of the user’s steering and speed. A MEMS gyroscope then measures the actual angular velocity. The difference between measured and calculated angular velocity is brought to zero by a Proportional Derivative (PD) loop by adjusting the final output steering wheel angle and engine throttle. Our algorithms primarily focus on making corrections due to rear wheel slippage at moderate to high speeds. Since the Gyroscope is an inertial sensor it may be placed virtually anywhere in the vehicle. The only other sensor required is a wheel encoder, although speed may also be approximated with GPS or an optical flow camera.

MiLytez (“my lights”) are a pair of USB programmable LED gloves with wireless communication capabilities. MiLytez are used as a visual instrument—analagous to a musical instrument. The gloves have a controller worn on the wrist and an RGB LED on each finger which can be programmed for up to 64 different colors. The user can program the gloves with any Windows based PC via USB. The PC based graphical user interface allows users to program patterns in a step sequencer style. Each step contains 5 color blocks corresponding to the five fingers on each hand. The user can program up to 100 steps for each pattern. The speed at which the LEDs cycle through each step can also be set by the user. The Gloves can store up to 100 of these patterns. The gloves can be set into two modes: Pattern Mode and Dynamic Play Mode. In pattern mode the gloves “play” the currently selected pattern, indicated by a dual 7-segment display. The user can use pattern up/pattern down buttons on the controller to select which pattern to play. In the dynamic play mode, the user can program the gloves to do a variety of event/effect combinations. In this mode the wireless communications can be enabled to create an Event/Effect combo between the left and right glove.
Non-invasive ways to measure signals within the body are important. One method for obtaining the velocity of blood non-invasively is ultrasonic meters. These meters transmit a frequency and then receive the frequency after a Doppler shift has occurred. The frequency can be converted to velocity, and thus the velocity of the blood flow is obtained. The goal of the project is to build a safe, low-cost, and good-quality ultrasonic blood flow meter. Many ultrasonic blood flow meters in today’s market are rather expensive, which makes it difficult to obtain these devices for a small budget project. This project will build one of these meters at a reduced cost. The signal processing is the most important part of the project because this will reduce any noise and produce a quality signal that could be used in research. MATLAB will be used for the signal processing. Filters, Fourier transforms, and spectrograms will all be used to process the signal. Different experiments will be done to determine the level of processing and the overall quality of the final product. These tests will include experimenting with a simulated flow set-up and test done on human subjects. At the end of the processing and testing, the goal is to see an accurate velocity measurement.

139  **BRENDAN MERTENS & ALEC DUDGEON**

**ADAPTIVE MELANINOGENESIS DETECTION SYSTEM**

Authors: Brendan Mertens & Alec Dudgeon  
Department: Electrical Engineering  
Faculty Mentor: Martin Kocanda  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00 PM

Vitamin D3 is known to prevent disease and is also known for its significant health benefits to mammals. Synthesis of Vitamin D from cholesterol precursors occurs at the basal layer of the epidermis upon exposure to ultraviolet energy in the UVB sub-band. Unrelated to Vitamin D, the production of melanin (melanogenesis) also occurs in in the dermal layers as a protective pigment to mitigate the harmful effects of exposure to UVB energy. In this work a method is developed to quantify UVB exposure by measuring the changes in melanin production in the epidermis using a low-level UVB source, phototransistor and adaptive signal processing techniques.

140  **ANTHONY BOYD**

**ELECTRIC SIGN CONTROL: MAGNETIC OSCILLATION AMPLIFIER**

Authors: Anthony Boyd, Jose Hurtado, Nathaniel Thurman & Juan Rodriguez  
Department: Electrical Engineering  
Faculty Mentor: Donald Zinger & Vincent McGinn  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 9:00-10:15AM

Our goal is to manipulate the time delay between three incandescent light bulbs to mimic the appearance of oscillation (i.e. how frequent the bulbs dim). The primary task is to construct a circuit that consists of lighting controls by magnetic amplifiers which takes advantage of the time delay between the control voltage and the load current. The ability to control large currents with small control power make magnetic amplifiers useful for control of lighting circuits such as stage lighting and advertising signs. These magnetic oscillations resemble a transformer but the operating principle is a little different from a transformer; behavior is closely resembled to a saturable Reactor. Simply, a saturable Reactor remotely and proportionally controls the alternating AC current through a load such as an incandescent lamp. The circuit’s requirements involve the usage of six toroidal transformers along with passive elements, AC power, DC power, and a incandescent lamp. The project requires magnetic oscillation, which can be obtained by using the saturation of toroidal transformers. The saturation of the cores occurs with the AC current that’s passing through; the current that will be passing through the circuit lights up the lamps. In this experiment, when the group takes advantage of the time delay, it becomes possible to fade the circuits on and off in sequence.
The oscillations can be seen at each moment in time that the lighting dims. Basically, the fluctuations in DC and AC currents are what cause the circuit to give the appearance of oscillation.

141 **NOAH GORAJSKI & JAMES SEARING**

**SAE SUPERMILEAGE DATA ACQUISITION SYSTEM**

Authors: Noah Gorajski & James Searing  
Department: Electrical Engineering  
Faculty Mentor: David Schroeder  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30AM-12:45PM

The objective of designing and incorporating a digital speedometer, data acquisition system, and automated engine shut off will be impeccable compared to the current design of the SAE Supercar at NIU. When contrasted to the current technology of an off the shelf bicycle computer, the new system will be capable of much more than what is provided by the old system. The new system will provide an instantaneous digital speedometer, numerous timers monitoring events, data logging and an automated engine shut off to conserve fuel. Benefits of the system are to provide an accurate speedometer at any given speed that refreshes quickly, provide useable data to be stored to a storage device for analyzing, and remove human error when shutting off the engine at a predetermined maximum speed. This system will be completed well under budget compared to the price of similar, but yet less effective systems on the market today.

142 **ASHLEY PATTERSON, DONATO MIROBALLI, GUILERMO MEDINA & RYAN SWANSON**

**MINIMIZING LENGTH OF STAY IN THE EMERGENCY DEPARTMENT THROUGH COMPUTER SIMULATION AT CENTRAL DUPAGE HOSPITAL**

Authors: Ashley Patterson, Donato Miroballi, Guilermo Medina & Ryan Swanson  
Department: Industrial and Systems Engineering  
Faculty Mentor: Purushothaman Damodaran, Gary Chen & Reinaldo Moraga  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30 AM

Central DuPage Hospital (CDH) has recently merged with Delnor Hospital in Geneva and Delnor employees are currently trying to reduce the emergency department’s length of stay. The hospital currently has an average length of stay of 186 minutes for walk-in patients and an average length of stay of 223 minutes for ambulance arrival patients. With such a high length of stay, the hospital staff is concerned with the 0.9% number of patients that leave without being seen which relates to the number of lost revenue. Another concern of CDH is patient throughput and the fact that there has been a decrease in patient throughput, even though the number of beds has increased. As a result, they have challenged our team to reduce the length of stay through the use of simulation. By accurately modeling the flow of patients from arrival to discharge, our team will be to recommend where bottlenecks exist, where extra resources are needed, and where process should be combined or removed. Upon completion of this project we will implement improvements that will increase patient throughput and decrease patient length of stay.
143  **Haley Inboden**  

*Active Noise Control and Music Therapy Integration for Infant Incubators*

Authors: Haley Inboden  
Department: Electrical Engineering  
Faculty Mentor: Sen Kuo  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30AM-12:45PM

Current neonatal intensive care units do not fully protect premature infants from the effects of painfully loud noises from hospital equipment. This can lead to many long-term health consequences. My research illustrates the benefits of integrating active noise control and music therapy in incubators to combat this problem. I accomplished this by undergoing extensive literary research and a search of audio files fitting the parameters of music therapy as well as using a sound level meter to illustrate the volume ratio needed to cover the disjointed and disconcerting sounds of the NICU. This will reveal that combining these systems would create a drastic change in the auditory environment of the incubator and would lead to many health benefits for premature infants. This would help them not only have a shorter stay in the hospital, but also an improved life overall.

144  **Adrienne Decker & Benjamin Tregler**  

*Designing the New High Volume Stone Assembly Line at SPX Hydraulic Technologies*

Authors: Adrienne Decker & Benjamin Tregler  
Department: Industrial and Systems Engineering  
Faculty Mentor: Purushothaman Damodaran  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30 AM-12:45 PM

The Stone Line at SPX Hydraulic Technologies in Rockford assembles hydraulic pumps which are used in a variety of industries. Due to high variation in the build process, the assembly is not standardized. To compensate for this variation, the current layout of the Stone Line is made up of five individual U-shaped cells. As a result of the layout and the batch assembly of products, inconsistencies in cycle times and throughput have been observed. SPX has proposed converting the five work cells into two linear assembly lines. The two lines will be divided into a high volume line, consisting of 80% of demand, and a low volume line, consisting of 20% of demand and the more difficult builds. The objective of this project is to evaluate the feasibility of constructing a more efficient linear assembly line. Product families will be established by grouping together products that have similar components and build processes. Using lean techniques, the high volume line will be broken down into individual work stations in an effort to balance the work load of all stations. Each station will be equipped with only the tools and parts that are necessary for the specific work content to ensure operators do not waste time. Work instructions will be developed to standardize the operations performed at each station. Time studies will be conducted on a pilot line to establish line throughput and other performance metrics. Our efforts will help SPX determine whether or not to proceed with the linear assembly line.

145  **Charles Njaramba, Sean Nakanishi & Jeff Momani**  

*Improving Caterpillar Medium Wheel Loader Engine Dress Line*

Authors: Charles Njaramba, Sean Nakanishi & Jeff Momani  
Department: Industrial and Systems Engineering  
Faculty Mentor: Purushothaman Damodaran & Asoudegi Ehsan  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 9:00-10:15 AM
This project aims to eliminate/reduce any inefficiencies and safety hazards observed at the medium wheel loader engine assembly line at Caterpillar, Inc. The assembly line is broken into 8 zones, where specific tasks are accomplished by one or more operators. If the tasks assigned to an operator are inappropriately done, it can lead to safety hazards. For example, lifting a heavy assembly repeatedly over a period of time can lead to back/spine problems for the operator; oil leaking from the engines, if not properly cleaned at regular intervals, can lead to slippage. Initial observations are made for each operator in every zone and safety risks are analyzed to determine the severity of each risk. Based on the severity, appropriate solution approach is prescribed to minimize/reduce the safety hazard. The assembly line is expected to be balanced so each operator in the line has more or less similar work content to accomplish. However, due to variations in demand, the line is not perfectly balanced. So efforts are also made to improve the balance efficiency. The deliverable from this project are: a list of safety hazards and how to eliminate/reduce them, a balanced line for different demand scenarios, and implementation procedures for any process improvement opportunity observed during the course of this project.

146  **RAY NG, MATTHIAS MEHRPUYAN & HAMAD ALADWOD**

*CART UTILIZATION WITHIN MOTOROLA SOLUTIONS’ FACILITY*

**Authors:** Ray Ng, Matthias Mehrpuyan & Hamad Aladwod  
**Department:** Industrial and Systems Engineering  
**Faculty Mentor:** Purushothaman Damodaran  
**Research Category:** Science, Technology, Engineering, Math  
**Judging Time:** 11:30 AM-12:45 PM

This project aims at solving an inherent problem observed at Motorola Solutions in handling their materials from Warehouse to the production floor, and from production floor to the shipping docks. The materials are currently moved in carts from one location to another. However, there are many different types of carts with different dimensions and capacities. The parts that are moved also come in different dimensions and different production lines require different quantities of materials. In the current scenario, the operator responsible for moving the materials has difficulty in locating the right cart. Sometimes the carts are left in incorrect or inappropriate locations within the facility – leading to unnecessary searching and loss of production time. The objective of this project is to standardize the carts and to manage the cart/part handling more efficiently. Industrial and Systems Engineering tools such as clustering algorithm and operations research are used to prescribe the following: the number of cart types to use, the number of carts needed for each cart type, the location of the carts, a tracking system to minimize the loss/misplacement of carts. The solutions prescribed and implemented will reduce any inefficiency associated with part/cart handling in the facility.

147  **RYAN MIKA, JONATHAN ROSA & AMBER TULLY**

*COMPUTER SIMULATION MODELING AND ANALYSIS FOR THE MEDICAL CARE UNIT*

**Authors:** Ryan Mika, Jonathan Rosa & Amber Tully  
**Department:** Industrial and Systems Engineering  
**Faculty Mentor:** Purushothaman Damodaran, Shi-Jie (Gary) Chen & Reinaldo Moraga  
**Research Category:** Science, Technology, Engineering, Math  
**Judging Time:** 9:00-10:15 AM

This project involves creating a computer simulation of the operations of the Medical Care Unit at Central DuPage Hospital (CDH). The Medical Care Unit is an adult inpatient unit and oversees a variety of patient ailments, generally non-surgical such as oncology (cancer). Computer simulation software is widely used to predict and analyze changes to a system. The goal is to reduce the admission and discharge process times by recommending Kaizen events (small improvements) to CDH leadership. This has been done by creating a validated computer simulation of their current state processes in which brainstormed Kaizen events were implemented to determine their effects on the system. We find that certain events that were brainstormed have significant reductions on patients’ admit and discharge times when
executed in the computer simulation model. We believe these Kaizen events would benefit the Medical Care Center if they were implemented into their practice.

148 AUSTIN HALE

HYBRID AND ELECTRIC VEHICLE BATTERY DRIVE SYSTEM EVALUATION

Authors:  Autsin Hale  
Department: Mechanical Engineering  
Faculty Mentor: Pradip Majumdar  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30AM

The first phase of this research project, completed during the 2011-2012 academic year, encompassed mainly familiarization research into hybrid and electric motor vehicle battery and drive system layouts, and functions. This included battery types, and charge and discharge properties, as well as some other performance properties, such as how different environmental conditions affected performance and stability. Some testing was done at constant charge/discharge rates under different conditions, in order to evaluate the baseline performance of the batteries in a range of temperatures. The second phase of the project, during the 2012-2013 academic year, has expanded on this previous experience, by testing under a number of environmental conditions in between those previously tested, at different charge/discharge rates, as well as some investigation into incorporating actual sample vehicle load cycles from road tests, to get a better real-world simulation result. In addition to lab testing, more research was done into additional systems, such as on-board charging, regenerative braking, and benefits of different drivetrain layouts, for possible future testing.

149 JENNIFER CASE

FLUID DYNAMICS AT TRANSITION REGIONS OF ENHANCED HEAT TRANSFER CHANNELS

Authors:  Jennifer Case  
Department: Mechanical Engineering  
Faculty Mentor: Nicholas Pohlman  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00PM

Helical wire coil inserts are used to enhance heat transfer in high heat flux cooling channels. Past research using temperature probes has sufficiently proven that wire coils increase heat transfer through the disruption of the boundary layer in the channels. The coils are passive devices that are inexpensive to manufacture and easily integrate into existing heat exchangers given the limited pressure drop incurred. Most of the fluid mechanics research in flow over helical coils has focused on the dynamics and vortex structure in fully developed regions rather than the short transition region where the enhanced heat transfer is often expected. Understanding how the development of the flow occurs over the axial length of the cooling channel will determine minimum dimensions necessary for enhanced heat transfer. Results of particle-shadow velocimetry (PSV) measurements report on the flow velocities and turbulence that occurs in the transition regions at the beginning of wire coil inserts. The ability to relate parameters such as flow rate, wire diameter, coil pitch, and the total tube length will increase fundamental knowledge and will allow for more efficient heat exchanger designs.

150 SCOTT ANDERMANN

PD CONTROL LEARNING DEVICE
This project is an opportunity for students to demonstrate a broad knowledge of engineering. There are many different aspects of engineering that must be accounted for in order to build a successful and safe self balancing vehicle. This project will be approached theoretically to develop the control theory and overall design and experimentally to implement the design successfully. This project will also teach manufacturing skills. To build this vehicle it will be necessary to design with manufacturing in mind. Additionally, it will teach students how to work on a budget. It will be necessary to make engineering decisions in the sake of staying on budget. Overall, this project will be a successful senior design project.

151 BRIAN COSTELLO, JENNIFER CASE, JACOB BENHART, & ALEC FISHER

CAIDEN: A ROBOTIC MOBILE PLATFORM

Authors: Brian Costello, Jennifer Case, Jacob Benhart, & Alec Fisher
Faculty Mentor: Brianno Coller & Martin Kocanda
Department: Mechanical Engineering
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM

Everyday situations arise where human beings are sent into dangerous areas in order to investigate. Firemen get sent into burning buildings, and policemen are sent into similar dangerous places. It would be beneficial to have a robot that can patrol these areas to keep humans safe and out of harm’s way. A mobile robotic platform, code named CAIDEN, is being designed and constructed to move semi-autonomously through this type of unknown environment and relay its findings back to an operator. This project has been broken down into five major components: movement, obstacle avoidance, communication, platform type, and integration. Robotics itself is a new and growing field, so these types of robots are still in the prototyping stage. CAIDEN is designed to be a robotic platform which means it can have any number and kind of sensors attached to relay information. The CAIDEN platform that is currently being constructed will use gas sensors to determine whether or not the environment is safe. If times permits a CAIDEN with visual capabilities will also be constructed. The communication system will not only send and receive data from CAIDEN but will display this information on an easy to use GUI. CAIDEN can be controlled using this GUI, but can also roam on its own using a combination of ultrasonic and infrared sensors to detect obstacles, and a GPS sensor to provide location data. CAIDEN is being designed to be a versatile platform capable of many different configurations.

152 GNANA TEJA YALAMANCHILI & UDENNA OKAFOR

FLEXURE TESTS OF JUTE BIO-COMPOSITES

Authors: Gnana Teja Yalamanchili & Udenna Okafor
Department: Mechanical Engineering
Faculty Mentor: Abhijith Gupta
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15AM

This is a research project to conduct flexure test on natural fiber bio-composites. This test would help obtain the flexure strength of these natural fiber composites, which can serve as an alternative material for designing new products. It has a very good weight-to- strength ratio and it is a renewable natural composite. This research would advance the use of this material by determining its mechanical properties. An MTS 810 machine is used to aid the flexure test. This machine however is predominantly designed to conduct tensile tests. Special fixtures will be designed to hold the test specimen and perform the flexure test. The flexure test on the MTS 810 machine will provide the flexural modulus of elasticity and the strength of the natural fiber composites.
153 **ADAM LINDQUIST**

**SAFETY LASER SCANNER/Rc CAR INTEGRATION**

Authors: Adam Lindquist  
Department: Mechanical Engineering  
Faculty Mentor: Theodore Hogan  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00PM

The integration of the safety laser scanner and the Radio controlled car will show the students of Dr. Hogan’s class one of the many safety systems used to protect people from harm. The safety laser scanner is an optoelectronic device which uses diffused reflection of emitted light to determine if a person or object have entered a specified area where a machine is operating and turns of the machine. The configuration used is a typical configuration in service by automatic guided vehicles (AGV).

154 **PETIA GUERRERO**

**PERFORMANCE OF LITHIUM ION BATTERY FOR HIGH SPEED TRAIN APPLICATION**

Authors: Petia Guerrero & Arturo Sotomayor  
Department: Mechanical Engineering  
Faculty Mentor: Pradip Majumdar & David Schroeder  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 11:30AM-12:45PM

High speed trains are an energy efficient mode of transportation that could greatly benefit from the application of a regenerative braking system. Lithium iron phosphate (LiFePO4) batteries are a great choice for application of regenerative braking because of their high energy density and long cycle life. Before applying regenerative braking to high speed trains, experiments must be conducted to test the performance and surface temperature variations of battery cells to be able to design an efficient complete battery unit. To perform these tests, a LiFePO4 battery cell was placed in an environmental control chamber where it was charged and discharged using a battery testing system at different charge rates and temperatures. To monitor the surface temperature variation, seven thermocouples were placed on the battery cell while being tested in the chamber and another was placed in the chamber to measure the ambient temperature. The data from the battery testing system was then analyzed to determine the efficiency and capacity of the cell during each test. The results show that the LiFePO4 battery cell’s overall performance enhances as the charge rate decreases. The battery cell was tested at 10A (1.0C), 7.5A (0.75C), and 5A (0.5C) charge rates of which the 5A rate had the best overall performance. The temperatures in which the battery was tested include -10°C, 1°C, 20°C, 30°C, and 50°C. The battery performed the best in the range between 20°C and 50°C for all three of the charge rates. The thermocouple data showed that the surface temperature of the battery cell increased as you get closer to the terminals with the highest temperature being found in between the terminals. From these results we can conclude that in application to regenerative braking system, a battery operating at a lower charge rate is preferred and when designing a complete battery pack. A thermal management system should be taken into account for the increased temperature in the surface around the terminals when constructing a battery system.

155 **ZACHARY GRIFFITH & MATTHEW DURNING**

**NIU SAE SUPERMILEAGE CHASSIS DESIGN TEAM**

Authors: Zachary Griffith & Matthew Durning  
Department: Technology  
Faculty Mentor: David Schroeder  
Research Category: Science, Technology, Engineering, Math
The Department of Technology recognizes the following students for their research:

Jim Hotwagner, Nate Kinkley & Kevin Mei
*Dr. David Schroeder*

Matt Durning & Zach Griffith
*Dr. David Schroeder*

Jacob Jackson, Adam Lindquist, Simon Wu & Jeremy Kutz
*Dr. Ted Hogan*

Kyle Aragon, Todd Vongvanith, Matt Allen & Dan Yang
*Dr. Cliff Mirman*

Steve Vitkus & Chris Zimmerman
*Dr. Abul Azad*

Matt Schreiner & Zhenhui Lin
*Dr. Liping Guo*
The goal behind the NIU SAE Supermileage Chassis Design Team this year was to create a chassis that passes requirements set forth by the team. These requirements include passing technical inspection at competition, holding the driver safely and securely in place in the vehicle, turning within a specified turning radius, and reducing weight. The design process this year started with examining the current chassis. This included identifying the flaws of the current chassis such as weight, driver placement, and turning radius. The next step was designing the new chassis while addressing the issues of the current chassis that had been identified through examination, and conforming to competition requirements. After the chassis was designed it was tested using a computer finite element analysis for strength and rigidity based on competition technical inspection tests. Lightweight aluminum tubing was chosen for the frame, and the frame was professionally welded. The steering components and braking components and body mounting hardware were then attached to the frame. The chassis was tested using real world testing before being placed into competition to ensure final goals were met for turning radius and weight. The final product is a rolling chassis that conforms to both team and competition technical inspection requirements.

**156 ERIC CUEVAS**

**NANOPARTICLE EXPOSURE IN 3-D PRINTERS**

Authors: Eric Cuevas
Department: Technology
Faculty Mentor: Theodore Hogan
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30AM

The purpose of the project was to gain an understanding of the future of nanoparticles health risks by applying different research methods in gathering the data I needed. 3D printing is becoming more readily available in homes and offices, which increases the health concerns to the public welfare. As time continues, more innovations will have been done to make this more accessible and affordable to the public. Nanoparticles present different risks than larger-size particles. The smaller the particle is, the greater the surface area it contains for the same mass of material. More surface area allows for toxins to be exposed in greater quantities of surface to surface contact with the human body. Laser printers are a known source of nanoparticle exposures. The research question is: Does 3D printing present a similar risk of exposure? In my experiment, I further analyzed that concept by measuring: the nanoparticle surface area and respirable particles, aerosol contaminant (dust) mass and size of the particles, and the number of particles that are present. The valuable information obtained helped answer some questions about of potential health concerns related to 3-D printing.

**157 JAKE JACKSON, JEREMY KUTZ & SIMON WU**

**ADVANCED MACHINE GUARDING**

Authors: Jake Jackson, Jeremy Kutz, & Simon Wu
Department: Technology
Faculty Mentor: Theodore Hogan
Research Category: Science, Technology, Engineering, Math
Judging Time: 11:30-12:45PM

The idea was to introduce and reinforce that safety should be the number one priority in the machining industry to assure a better prepared workforce. For our project we will be implementing modern safeguard technologies to old technologies. The objectives of our project involve retrofitting, designing, machining, and installing state of the art safeguards onto a veteran lathe. The safeguards that were utilized in this project were provided by the OMRON Company and the fixtures were designed and machined. This goal of this project is to instruct future safety professionals graduating from NIU on the proper usage etiquette and provide hands on learning of these new safeguard technologies to reduce risk injury between operators and machines.
Our goal for this project is to automate the assembly of components onto the lid of an individually ventilated cage. The lid is composed of three pieces: the filter, the plastic cover, and the lid. In order to accomplish the goal we have broken the project down into three main objectives. The three objectives that we must accomplish are to separate the filters, separate the plastic pieces, and assemble the two components together onto the lid. This process will complete our main objective of assembling the lid with its components. Currently, the entire process is being done manually and it takes about four to five seconds for an entire lid to be assembled. We are looking to cut this time in half. Also, we are prohibited from using robots/robotic arms for the automated process. For the scope of this project and with the guidance of our project advisor we must develop and implement various methods of separating the pieces and installing them together. After the development of various methods, we will compare the results to determine the most feasible and efficient method to use. Upon completion of this project we will have a fully automated assembly process working at near 100% efficiency.

The purpose of this project is to collect data about the previous Supermileage® Shell and SAE bodywork design to improve the design for 2013 competition. The bodywork team is responsible for designing and manufacturing of the bodywork, which is the outer shell of the vehicle. The previous year’s bodyworks were lacking in serviceable design. They were constructed hastily and little thought was put into the time spent removing body panels as is common during competition. Our final product must meet several constraints such as; rigidity at speed, driver visibility, and serviceability. The driver must be able to see the road as well as other vehicles. The vehicle’s components, as well as the driver, must be able to function without interference from the bodywork. The bodywork must be able to be disassembled and reassembled quickly to service components during competition. To decrease service times, the hardware types and locations will be efficiently utilized. Our main goal is to increase the serviceability and reduce the weight of the bodywork by 15%. Data will be logged from testing on previous vehicle designs to justify making changes. These changes must yield a lower service time, rolling resistance, and increase rigidity while contributing to fuel efficiency. This senior design project will incorporate our efforts and those of the other sub-teams of the NIU Supermileage team.
This project focuses on Indexx Laboratory’s SNAP test device’s ability to detect antibiotics in water. SNAP test devices are manufactured to detect antibiotics in milk to a certain detection limit (parts per billion). This project uses SNAP test devices to test water with antibiotics and then determines if the readings can be used to reliably test antibiotics in water. To test with the SNAP devices, water is put into an incubator that is 45°F (+/-5°F) for a set amount of time between 2 to 6 minutes. The water is then put into the SNAP device and left to incubate for 5 to 7 minutes. This completes the incubation and the test can be read. For the reading, a SNAP device reader is used to show if the test was positive or negative and a value is given to show the degree. A stock was made for all antibiotics that were tested for and dilutions were made based on the SNAP test device’s detection limit for each antibiotic. Each dilution was tested twice and the average of the two results was used. These averages are used to show what the SNAP test device will read when a certain concentration of an antibiotic was detected. If the SNAP test devices can accurately detect antibiotics in water, then this process will be more time and money efficient than the current process for testing water for antibiotics.

A solar micro-inverter is a device that will convert solar energy from the sun into usable electrical power. The input of our project should be between 25 and 50 VDC with an output of 120 VAC at 60 Hz. While making sure that we have the desired output, we want our micro-inverter to have a greater than 94% efficiency and be as low cost as possible. Our design is made up of three main circuits that are all essential for achieving our target output and efficiency. The three circuits are: a Resonant converter, a full bridge diode rectifier, and an unfolder circuit. The resonant converter and unfolder circuit will be driven by the DRV8302 gate driver and will be controlled by a TI 28069 micro-controller. These two circuits will also have a full bridge MOSFET configuration in order to successfully complete their desired tasks. The resonant converter will convert the incoming low DC voltage from the solar panel, into a high frequency AC voltage to then be amplified by the transformer. After the transformer amplifies the voltage, it will then go through our rectifier to convert the AC wave into a rectified sine wave before the unfolder circuit converts it back to an AC voltage before being a usable source of electricity.
Abstracts - Exhibits

Please Note: Contents of the Abstracts were printed as submitted by the project participants and are represented in the college of the students major.
ALEXIS LAMB

DESCOBERTAS PELO PAU Y PEDRA: AN IN-DEPTH STUDY OF THE BRAZILIAN BERIMBAU, ITS TRADITIONAL APPLICATIONS, AND ITS FUTURE IN CONTEMPORARY MUSIC

Authors: Alexis Lamb
Department: Music
Faculty Mentor: Gregory Beyer
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00PM

My focus for this semester has been on the Brazilian berimbau and having a deeper understanding of structure of the instrument, the history of the instrument, and its applications in modern-day music. The berimbau is an instrument made of a staff, wire, and gourd, and played with a stick and stone, and is used mostly in a traditional Brazilian martial art called capoeira. Through my studies with Dr. Gregory Beyer, head of the NIU Percussion Studies, I have worked on understanding Pythagorean ratios and how those apply to the tuning of the instrument, listening to the berimbau in traditional capoeira music of Brazil, as well as new music pieces that Greg has commissioned for the berimbau or that have been written for the instrument, worked on website design on his own berimbau project, Arcomusical, to promote the use of the berimbau in contemporary music, and finally written a berimbau duet for the two of us as a way for me to apply my studies to a final product that reflects my knowledge of the instrument.

KASEY TWINE & SHERISE GARMON

THE ROLE OF HEARING HEALTH CARE EDUCATION ON THE PERCEPTIONS AND KNOWLEDGE ABOUT HEARING LOSS IN AFRICAN AMERICAN ADULTS

Authors: Kasey Twine & Sherise Garmon
Department: Communicative Disorders
Faculty Mentor: King Chung
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 9:00-10:15AM

Hearing loss negatively impacts a person’s quality of life. Only 20% of 46 million Americans with hearing loss seek amplification treatment. It is imperative to address the disparity within the general public between those who have hearing loss and those who seek treatment for hearing loss. The goal of this research project is to determine whether education, through in-person presentations, can be used to close the treatment gap. Data was collected from African Americans aged 50 and above. Participants were given a pre-presentation questionnaire that assessed their knowledge and perceptions about hearing loss: the types and causes of hearing loss, treatment for hearing loss, the medical/lifestyle effects of hearing loss, and when and where to seek help. Participants then filled in a post-presentation questionnaire and their outer, middle, and inner ear functions were tested. Data analysis will inform us if the in person presentations is a viable means for raising awareness and enhancing knowledge about hearing health care. It will also inform us whether the presentations have encouraged participants to seek hearing health care if a hearing loss is present. Participant response to the presentations was extremely positive, and indicated that further discussion about hearing health care is both wanted and needed.
E3 ANDREW SMITH

Knights in Battle: A Comparison of the Masculinity of French and English Knights from Late 11th - 12th Centuries

Authors: Andrew Smith
Department: History
Faculty Mentor: Valerie Garver
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00PM

My research compares and contrasts the ideological masculinity of knights in England and France as portrayed in epic poetry, historical texts, and art from late 11th – 12th centuries. To investigate French knights I studied two legendary epics the Chanson de Roland (written 1100), which describes the massacre of the French rear guard at the pass of Roncevaux, and Guillaume d’Orange (written 1200), which tells of the life of William of Orange who “heroically” fought against the Saracens and won lands for Charlemagne and Louis the Pious, for French knights. To study English knights, I studied the Bayeux Tapestry (made sometime between 1067 and 1082), which depicts the Norman invasion of England and The History of the Kings of England (written 1138) by Geoffrey of Monmouth, which is a “history” of England since Roman rule. Typical historical documents are lacking for the Middle Ages making purely historical research difficult; thus I take an interdisciplinary approach in my research. The History of the Kings of England is a historical type of source; the Bayeux Tapestry is a work of art; and the Chansons are literature. My methodology consists of studying the historiography of each primary source and the primary source itself to learn about the ideals of masculinity of knights. My research has shown some similarities between French and English knights and some of the differences between them.

E4 JACOB LAWRENCE

Examining the Social Networks of Israeli and Palestinian Nongovernmental Organizations

Authors: Jacob Lawrence
Department: History
Faculty Mentor: Jerome Bowers
Research Category: Arts, Education, Health, Humanities, and Social Science
Judging Time: 12:45-2:00PM

The focus of the product line at CST Storage in DeKalb, IL is: porcelain enameled tanks constructed from steel plates. These are enameled on the “glass line”, which consists of one major component “firing”, which bonds the porcelain glass to the steel. The furnace, which does the firing, limits the productivity of this process because it must be adjusted to accommodate for different thicknesses of the plates and their desired colors. While the furnace is heating or cooling or the line, that holds the plates is changing speeds the furnace must be empty, the time that the furnace is empty is called set up time. The objective is to reduce set up time. Reduction of set up time will be accomplished by creating part families, which can be run through the furnace under the same temperatures and line speeds. Families will be composed of sheets with similar firing parameters. Different combinations of line speeds, temperatures, and set up times will be tested to determine if certain types of plates can be combined into part families. This kind of testing is called a designed experiment and accounts for the effects of each variable and the effects caused by the interaction of these variables on the response. The response in this case is whether or not a good sheet is produced. The goal is to reach the minimal set up time without reducing the quality of the enameled steel plates. Designed experiments and other Industrial Engineering tools, such as time studies and simulation will be used to accomplish this goal without detriment to the efficiency of the rest of the process.
The definitions of masculinity in this country are very nebulous. There is the archetypal ideal male, but there are plenty of visions of masculinity such as the “rebel” and “outcast” which do not easily fit in that category. These archetypes appear in such iconic Hollywood actors as James Dean, Steve McQueen, and Dustin Hoffman. This project analyzes the “how” and “why” of American masculinity in midcentury cinema and how it reshapes to appear in postmillennial actors, specifically Ryan Gosling. Through the lens of psychoanalyst C.G. Jung’s work on archetypes, specifically those appearing within the male population of America, this study uses post-Jungian theories to look at the sociocultural connections between midcentury Hollywood film and current cinematic depictions of rebellious manhood.

The Computer Science Department at Northern Illinois University is known to be especially dedicated and effective at preparing students for mainframe development. This task can be very challenging for many reasons. The purpose of this project is to eliminate one of the non-programming issues that students face. Some of the challenges that students face are inherent to the principles and structure of mainframe programming. Students generally find the mainframe programming concepts to be more challenging and tedious compared to the higher-level languages most students are used to.

Additionally, most modern languages have very helpful and easy to use programming environments. These programming environments support all of the features that modern word processors do like copying and pasting but they also support functions that are specifically helpful to programmers. Currently, the environment used by NIU mainframe students is a challenge to learn and use in and of itself. The WebJCL project is designed to make a simple, easy to use and effective programming environment for working with mainframe programming. This will take one burden off of students while they learn the actual programming concepts in mainframe. WebJCL will speed up the time it takes to write code and retrieve work results. This increased efficiency will allow students to make fewer mistakes and to correct mistakes faster. Many people get scared off by mainframe just because it is new and challenging at first. WebJCL’s goal is to make learning and mastering beginner to intermediate mainframe topics much more simple for students.
Carbohydrate-active enzymes (CAZymes) are very important to the biotech industry, particularly the emerging biofuel industry. CAZymes are responsible for the synthesis, degradation, and modification of carbohydrates in all organisms. Specifically, plant biomass, the feedstock for producing biofuels, is mainly composed of cellulosics and hemicellulosics; both are non-food fiber carbohydrates. Generally, plants use CAZymes to build biomass while bacteria and fungi use other CAZymes to degrade biomass. We currently maintain a web resource, dbCAN, to provide automated CAZyme signature domain-based annotation for any submitted genomes and metagenomes to our website. This resource allows for biologists to determine what proteins in a given genome are involved in carbohydrate-related processes, and how they are involved. Based on dbCAN, we are further creating a new web resource, PlantCAZyme, a database specifically designed for CAZymes found in plant genomes. Our web-based Bioinformatics resources for CAZymes are of great interests of Bioenergy research.

Monoraphidium is a unicellular microalga, which occurs naturally in Illinois waters, and can be used to produce lipids as a feedstock for biodiesel. This alga is adapted to grow to high densities under cool conditions and low light levels prevailing in early Spring/late Fall in the Midwest. Monoraphidium can be cultured in effluent, obtained in abundance at any sewage treatment plant. Harvesting the algal suspensions requires flocculation and filtration. Addition of FeCl3 or KOH alters the media pH and exploits surface charge changes on the 20 um cells. This causes them to form “flocs” which can be caught on 45 um nylon mesh. The experiments optimized flocculation conditions for Monoraphidium algae, which have not yet been used extensively as biofuel feedstocks. The highest algae flocculation yield occurred at 5mM FeCl3 at a pH of 7.5. No flocculation was seen above 10mM FeCl3, suggesting that an optimum combination of (i) pH, (ii) formation of Fe(OH)3 complexes with cell surfaces, and (iii) a specific algal cell density (cells/ml) have to be satisfied for the best harvest of Monoraphidium. An alternative flocculation method showed 25mM KOH to be optimal as a flocculation agent at an alkaline pH of 13. Current experiments are focused on the KOH-based method, as it precipitates algal cells without the contaminating Fe(OH)3 present when the more widely employed FeCl3 flocculation process is used. This will produce a purer cell preparation for extraction of lipids for biodiesel production.
E9  **Jonathan McClure, Stephen Small, & Tim Macki**

**Intelligent Home Ventilation**

Authors: Jonathan McClure, Steve Small & Tim Macki  
Department: Electrical Engineering  
Faculty Mentor: Veysel Demir  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30AM

The intelligent home ventilation system aims at improving the overall level of comfort within a home by independently controlling the amount of airflow through the ventilation registers in multiple rooms. The goal is to maintain a balanced temperature throughout the home by preventing the overheating (or over-cooling) of any room. It is comprised of three fundamental components: a specialized smart thermostat, modified vent registers with fully-adjustable dampers, and remote room temperature sensors. The thermostat serves as the main controller by interpreting data received from the remote temperature sensors and issuing control commands to the individual vent registers. The vent registers will adjust their air damper positions based on the received control commands. All devices will be battery-powered and will utilize wireless communication. Considerations have been made to ensure that the system will be minimally invasive, such that it may be installed into existing home HVAC systems without any significant modifications necessary. This project is the focus of a senior design project for the Electrical Engineering department.

E10  **Sean O'Donnell, Kevin Silovich & Dennis Alferes**

**CNC Tube Bender**

Authors: Sean O’Donnell, Kevin Silovich & Dennis Alferes  
Department: Electrical Engineering  
Faculty Mentor: Martin Kocanda  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 12:45-2:00PM

Tube benders seem to range in price from a couple hundred to several thousand dollars. Yet no matter what make or model there is always one thing that is affected by price, that is the accuracy of the bend. In our senior design project we’re aiming to create a system that can be integrated into a hydraulic tube bender to get the best of both worlds; the accuracy of a high end CNC bender at the price of a manual bender. Through the use of microcontrollers, gyroscopes, and accelerometers, we are able to make an accurate bend with almost any hydraulic tube bender. With our system, the small race team or the at home “gear head” will be able to make a jump into the 21st century without the cost or space demands of a commercial CNC tube bender.

E11  **Ryan Ridel**

**Mechatronic Suppression of Parkinsonian Tremor**

Authors: Gloria Bingenheimer  
Department: Electrical Engineering  
Faculty Mentor: Abhijit Gupta  
Research Category: Science, Technology, Engineering, Math  
Judging Time: 10:15-11:30AM

The aim of my research is to develop a system that can be used by people who suffer from tremor to alleviate their symptoms. My system is composed of an exoskeleton that the patient wears, as well as electronics and custom-written software to let a medical professional easily devise a control algorithm that suits their symptoms.
E12  STEVE VITKUS & CHRIS ZIMMERMAN

MODEL SMART HOME

Authors: Steve Vitkus & Chris Zimmerman
Department: Electrical Engineering
Faculty Mentor: Adul Azad
Research Category: Science, Technology, Engineering, Math
Judging Time: 9:00-10:15AM

Smart home technology is a growing trend as a consumer product, and companies are actively addressing this need. Some of the reasons for this trend are convenience in managing home environment from remote locations, security, and increase in energy efficiency. With this scenario, the smart home project explores various technologies to integrate with a small scale model house (21 ¾” x 15 ¾” x 16”) so that it can control indoor temperature and lighting automatically. The user/house owner is able to monitor and adjust the temperature, light settings, open/close door, and view video feed from a remote location. The house is instrumented with a number of sensors, an actuator, and a camera that is connected with a computer via a suitable interfacing hardware and software. The computer uses software for controller designs as well as for developing a graphical user interface (GUI). The GUI has temperature and light level settings, view for the status of various sensors, and a few alarms. The GUI can be viewed directly from the host computer and can also be posted as a webpage for user interaction over the Internet. One of the major goals of the project is to study and incorporate different techniques, skills, and tools that were learned from the Electrical Engineering Technology program. This includes the study and selection of computer interfacing hardware and software, sensor and actuator selection, and required signal conditioning and amplification. The software tools that are used includes LabVIEW (controller and GUI designs), MultiSim and Ultiboard (PCB design).

E13  NICK GAJDORUS, DAVID TODD, ROBERT WALDEN & NICK WROBLESKI

Authors: Nick Gajdorus, David Todd, Robert Walden & Nick Wrobleski
Department: Electrical Engineering
Faculty Mentor: Donald Zinger
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30AM

Abstract not submitted.

E14  MATTHEW PHILLIPS, JAIME MARTINEZ & ERIC PIERCE

DAMAGE DETECTION IN BEAMS

Authors: Matthew Phillips, Jaime Martinez & Eric Pierce
Department: Mechanical Engineering
Faculty Mentor: Abhijit Gupta
Research Category: Science, Technology, Engineering, Math
Judging Time: 12:45-2:00PM

Crack propagation in a beam during a mechanical load may cause failure of the beam at a much lower stress than the one associated with the yield strength of the material of the beam. Early detection of cracks allows workers to fix damage in beams and prevent structures from fracture. This presentation is about the methods that may be used to detect damage in beams and the accuracy that follows. Among the methods presented, special attention is given to infrared thermography and ultrasonic testing. Infrared thermography consists of heating up a sample and using an infrared camera to detect different heat signatures in defected regions of the sample. Ultrasonic testing requires waves to travel through the sample, so that when a discontinuity is detected, the waves are reflected and detected by
a transducer. The transducer then transforms the wave signal into an electrical signal, and data can then be displayed graphically. Other methods reviewed include natural frequency analysis and small angle x-ray scattering.

E15 STEVEN FRENZER, RYAN ROUDEBUSH & WILL ENGLISH IV

RESPIRATION SENSOR

Authors: Steven Frenzer, Ryan Rodebush & Will English IV
Department: Electrical Engineering
Faculty Mentor: Michael Haji-sheikh
Research Category: Science, Technology, Engineering, Math
Judging Time: 10:15-11:30AM

Current technologies for measuring respiration are often bulky, not portable, invasive or expensive. We set forth to create a proof of concept that an inexpensive sensor and off the shelf components can measure breaths per minute or if a patient stops breathing. Using a thick film Wheatstone bridge style sensor, created at NIU’s MLDR directional air flow is sensed with the help of an integrated heater. After air is passed over one side of the sensor it is heated and passes over the other side, this creates a voltage differential that can be sensed. Processing of the signal is done after a series of amplifiers in a microcontroller. The microcontroller determines the period of a breath and outputs the “breaths per minute” to a high visibility display. This affordable technology could help professionals determine how well a patient is breathing.
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Dr. Arnold Hampel and Mrs. Denise Marie Kennedy for their continued support of undergraduate research at NIU.

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2013 GSRA student research conference

Saturday, April 27, 2013
Holmes Student Center
Northern Illinois University
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   Capitol Room, Main Level, Holmes Student Center

8:00 – 8:45 Continental Breakfast and Breakfast Chat
   Capitol Room, Main Level, Holmes Student Center

Co-sponsored by:  College of Visual & Performing Arts
                  College of Health & Human Sciences

**Conference Welcome and Introduction**

Robert Pulvermacher III, Psychology Department

**Dr. John Skowronski**

*Presidential Research Professor*
Department of Psychology
Northern Illinois University

9:00-11:45:  Research Poster Fair
Regency Room, Main Level, Holmes Student Center

Poster Fair & Artists’ Exhibits Co-sponsored by:
   Department of Biological Sciences
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   Department of English
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<td>Role of rfeA gene in regulating secondary metabolism in the model fungus Aspergillus nidulans</td>
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| 28  | Blankenship, Phillip  
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*Searching blindly: Evaluating aging effects on self-motion cue processing in humans using an analogue of the food-hoarding paradigm*  
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| 29  | Craig, Ashlee  
*The Application of Organic Residue Analysis to Archaeological Ceramics: A Case Study of Andean Vessels*  
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*Study of the MrF1 Transcription Factor in the Fungal Pathogen Aspergillus fumigatus*  
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*Optimizing Growth and Lipid Production of Monoraphidium sp. for Use in Biofuels*  
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<td><em>School Counselors’ Perceptions of Their Academic Preparation and Training Needs: A Kenyan Study</em></td>
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**Attendees:** Please complete the Poster Fair evaluation form and leave it in the box in the Regency Room. Thank you!
A.M. RESEARCH PAPER PRESENTATIONS

9:00-10:15: Research Paper Session 1: Research on Teaching and Learning

Lincoln Room, 2nd Floor, Holmes Student Center

Sponsored by: Department of Psychology

Esparza, Julie, Schmidt, Jennifer A., Shumow, Lee, & Durik, Amanda
Teaching Gifted and Talented Students about Growth Mindset
Department of Leadership, Educational Psychology & Foundations,
Department of Psychology

Kafkas, Stephen, Kackar-Cam, Hayal, & Lyles, Lara
Classroom interactions and utility value attributions in science classrooms
Department of Leadership, Educational Psychology & Foundations

Steffens, Brent, Britt, M. Anne, Wiley, Jennifer, Blaum, Dylan T., & Griffin, Thomas D.
Learning in History: Tasks that improve learning from multiple documents
Department of Psychology

Note: Each paper in this session is allotted 20 minutes. Paper presenters should ask an audience member to serve as time-keeper who will signal when time has expired for each presentation. Presenters should invite the audience to participate in discussion of the papers following presentation of all papers.

9:00-10:15: Paper Session 2: Research in Education

Illinois Room, 2nd Floor, Holmes Student Center

Sponsored by: Department of Leadership, Educational Psychology & Foundations

Abdi, Beheshda
Psychometric properties of Students’ Life Satisfaction Scale among Iranian high school students
Program in Educational Psychology

Awen, Dennis
Meditation, Buddhism, and human resource development
Department of Counseling, Adult & Higher Education

Moya, Jose
The Use of Facebook to Enhance Hispanic Parental Involvement in Schools
Department of Leadership, Educational Psychology & Foundations

Kraft, Carol
Development of a Land Ethic in Adolescents Disconnected from Nature
Department of Literacy Education

Note: Each paper in this session is allotted 15 minutes. Paper
presenters should ask an audience member to serve as time-keeper who will signal when time has expired for each presentation. Presenters should invite the audience to participate in discussion of the papers following presentation of all papers.

10:30-11:45: Paper Session 3: Research in Industrial & Systems Engineering  
Illinois Room, 2nd floor, Holmes Student Center

Sponsored by the College of Engineering & Engineering Technology

Roberts, Steven, & Chen, Shi-Jie (Gary)  
Lean Process Improvement for Medical/Surgical Unit in a Hospital  
Department of Industrial & Systems Engineering

Padilla, Marianella, Guo, Jingjing, & Zhang, Quan  
Evaluation of the relocation of a warehouse facility  
Department of Industrial & Systems Engineering

Manzoor, Fawwad  
Process and Productivity Improvement at SPX Hydraulics Technology  
Department of Industrial & Systems Engineering

Guo, Jingjing  
An Industrial Application of Simulation-Based Multi-Objective Scheduling  
Department of Industrial & Systems Engineering

Note: Each paper in this session is allotted 15 minutes. Paper presenters should ask an audience member to serve as time-keeper who will signal when time has expired for each presentation. Presenters should invite the audience to participate in discussion of the papers following presentation of all papers.

10:30-11:45: Paper Session 4: Research in the Arts and Humanities  
Lincoln Room, 2nd Floor, Holmes Student Center

Sponsored by: Department of English & Department of Foreign Language & Literatures

Goss, Samantha  
Defining Creativity: A Common Definition of Creativity in Learning, the Pros and Cons  
Program in Art Education, School of Art

Helton, Benjamin  
An Analysis of Beginning Band Pedagogy: The Lens of Neuroanatomy and Neuropereception  
Program in Music Education, School of Music

Jordan, Jesse  
Conception and Stereotypes of Middle Eastern Culture Heard at the Columbian Exposition  
School of Music
Note: Each paper in this session is allotted 15 minutes. Paper presenters should ask an audience member to serve as time-keeper who will signal when time has expired for each presentation. Presenters should invite the audience to participate in discussion of the papers following presentation of all papers.

Conference attendees and participants: Please fill out the Conference Evaluation Form and return it outside the:

Capitol Room
GSRA Check-in/Registration Table.

Your feedback will help GSRA plan for the 2014 Research Conference!

Conference Luncheon
Holmes Student Center
Duke Ellington Ballroom
11:45am-12:45pm

NOTICE: Lunch is free for first 100 Conference registrants.
(Must present a ticket for lunch.)

1:00-2:00: Conference Keynote Speaker
Capitol Room, Main Level
Holmes Student Center

Introduction: Ira Flatow
Host, Science Friday
“Science and Society”

GSRA gratefully acknowledges the support of Dr. Bradley Bond, Dean of the Graduate School, and the Graduate School Colloquium Committee for funding in support of the keynote speaker event.
P.M. RESEARCH PAPER PRESENTATIONS

2:15-3:15: Paper Session 5: Research in Biology and Physics

Illinois Room, 2nd Floor, Holmes Student Center

Sponsored by: Department of Biological Sciences

Karunaratne, Nuwan, Bera, S., Lurio, Larry, Thurston, G.M., Sutton, M., & Sandy, A.R.
X-ray Speckle Visibility Spectroscopy Measurements From The Diffusion Of Concentrated Alpha Crystallin Suspensions
Department of Physics

Kutumbaka, Kirthi
The RNA esre is not essential for the survival of Escherichia coli
Department of Biological Sciences

Neil, Matthew
GLI2 mediates CD40L expression in stromal cells
Department of Biological Sciences

Note: Each paper in this session is allotted 20 minutes. Paper presenters should ask an audience member to serve as time-keeper who will signal when time has expired for each presentation. Presenters should invite the audience to participate in discussion of the papers following presentation of all papers.

2:15-3:30: Paper Session 6: Cultural Perspectives

Lincoln Room, 2nd Floor, Holmes Student Center

Co-sponsored by: School of Music; School of Family, Consumer & Nutrition Sciences

Rodriguez, Aldo
Promoting Uruguayan ESL students’ self-regulation through online learning
Program in Educational Psychology

Odino, Christine
Latinas self perception of worth based on L2 Proficiency (English) and the correlation to career progression in Corporate America
Department of Literacy Education

AlShahrani, Fahad
The Role of Organizational Culture in Influencing Self-Efficacy toward Adoption of Online Education: A Case Study of the Royal Commission of Juabil
Program in Instructional Technology

Black-Chen, Marsha
The Academic and Lived Experience of Jamaican Nontraditional Female Students in Higher Education.
Program in Adult & Higher Education
Zack, Carrie  
*How an American Cultural Model of Shyness May Limit Our Interpretations of and Reactions to Shy Behavior and Contribute to Negative Outcomes for Shy Students*  
Program in Educational Psychology

Kutryb, Adam  
*Ancient trade and travel in northwest Pennsylvania: Exotic and local lithic distribution*  
Department of Anthropology

Note: Each paper in this session is allotted 10 minutes. Paper presenters should ask an audience member to serve as time-keeper who will signal when time has expired for each presentation. Presenters should invite the audience to participate in discussion of the papers following presentation of all papers.

**2:30 – 3:30  Center for the Interdisciplinary Study of Language & Literacy (CISLL) Poster Session**  
*Regency Room, Main Level, Holmes Student Center*

**Co-sponsored by the Department of Literacy Education**

Featuring faculty and graduate student research projects that focus on problems and issues in language development and learning, literacy education, and related topics.

CISLL is an interdisciplinary center for the study of lifespan language and literacy across diverse populations and contexts, both regionally and globally, with the commitment to:

- Engage in basic and applied research in language and literacy,
- Develop and apply innovative research and assessment methodologies to address complex issues,
- Identify and promote best practices in language and literacy, and
- Provide evidence-based outreach that generates results.

Light refreshments available.

Visit CISLL at [www.cisll.niu.edu](http://www.cisll.niu.edu)
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Maglino, Joseph P.  
Rapp, David N.  
A* are auditory imagery experiences spontaneously generated during reading?  
Department of Psychology |
| 2                   | Olson, Janet  
Masur, Elise Frank  
Mothers' labeling responses to infants' gestural but not nongestural communicative bids predict vocabulary size  
Program in Communicative Disorders & Department of Psychology |
| 3                   | Reichle, Robert  
Tremblay, Annie  
Coughlin, Caitlin  
Frenck-Mestre, Cheryl  
Working-memory and nativelikeness in the processing of non-adjacent subject-verb agreement:  
An ERP study  
Department of Foreign Languages & Literature |
| 4                   | Rupp, Kathryn  
Blaum, Dylan  
Higgs, Karyn  
Wallace, Patricia  
Britt, M. Anne  
Effects of Causal Chains on Memory for Expository Texts |
Ahmed, Syed Munawer
Real time implementation of duet algorithm
Department of Electrical Engineering

Gu, Hao, Gau, Jenn-Terng, Chen, Po-Han, & Rong, Shean Lee
The coupling influence of size effects and strain rates on the formability of austenitic stainless steel 304 foil
Department of Mechanical Engineering

Abdollahnejadbarough, Hossein, & Martin, Kevin B.
A Multiple Stage Optimization for Developing Hydrogen Refueling Infrastructures in the Northeastern United States
Department of Industrial & Systems Engineering

Note: Each paper in this session is allotted 19 minutes. Paper presenters should ask an audience member to serve as time-keeper who will signal when time has expired for each presentation. Presenters should invite the audience to participate in discussion of the papers following presentation of all papers.

WORKSHOP

3:30-4:30 Illinois Room, 2nd Floor, Holmes Student Center

Research and Good Causes: Getting Important Work Funded

Andrea Buford
Research Development Specialist
Office of Sponsored Projects
Northern Illinois University

This workshop offers a brief primer for graduate students about how to present your research ideas in a manner that can lead to funding that will support your work. Information on programs that fund research conducted by graduate students, helpful tips for writing a fund-able grant proposal, and how to put together a budget – all are addressed here. Come with questions!

INFORMATION FOR GSRA RESEARCH CONFERENCE PARTICIPANTS

Student Presenters!

Make your research presentation a part of the University’s permanent historical record!

You can submit your research paper or poster to be stored as part of a permanent electronic archive! To do so, send your file, in pdf format, to:
You MUST indicate in your email to Stacey Erdman (serdman@niu.edu) that you are granting permission for the University to include your paper or poster in the Huskie Commons digital archives.

Follow GSRA on Facebook, Twitter, and Blackboard

Get involved in GSRA!

2013-14 GSRA Executive Board elections held in April for all offices:
- President
- Vice-President
- Secretary
- Treasurer
- Webmaster
- Undergraduate Representative

Nominate yourself or another student by sending an email with your name and contact information to gsra@niu.edu.

Research Presentation Abstracts

**Abdi, Beheshda**
Psychometric properties of Students’ Life Satisfaction Scale among Iranian high school students
Program in Educational Psychology
Research advisor: Professor David Shernoff
Paper presentation

The Purpose of the present study was to examine the reliability and factorial validity of Persian adaptation of Students’ Life Satisfaction Scale (MSLSS; Heuebner, 1994). 716 Students (371 girls, 345 girls) in city of Tehran were randomly selected to participate in the study. Confirmatory factor analysis was used by means of LISREL statistical package to analyze validity of the data. The initial investigation of psychometric properties supported the validity and reliability of the MSLSS among Iranian high school students. Internal consistency reliability estimates (Cronbach’s alpha) were all above the conventional criterion of 0.70 for all factors indicating adequate reliability of the factors. Also, results of factor analysis revealed that the scale have an acceptable consistency. Also, the results of the confirmatory factor analysis revealed that the structure of the scale has an acceptable fit to the data. It seems this Persian adaptation of the MSLSS offers a reliable and valid means of assessing Iranian high school students’ life satisfaction.

**Abdi, Beheshda**
Shernoff, David
Understanding the role of student satisfaction in predicting engagement and academic achievement of university students: A mixed methods study
Program in Educational Psychology
Research advisor: Professor David Shernoff
Poster presentation
The present mixed-methods study will investigate the extent to which engagement and academic achievement can be predicted by student satisfaction. Undergraduate students (N = 200) from ten classes in several academic majors, including communication, psychology, economy, mechanical and industrial engineering, and physical education (two classes of each) will be randomly selected to respond to two surveys: The Noel-Levitz Student Satisfaction Inventory (SSI: Shreiner & Juillerat, 1994) and The First Year Experience Questionnaire (FYEQ: Krause & Coates, 2008). A focus group of NIU undergraduate full time students (n = 20; two students from each academic major) will also be invited to take part in semi-structural interviews in order to let new or unexpected issues to come out. Findings will interpreted in light of research and theory on student satisfaction, engagement, and academic achievement. Finally, implications and suggestions for future studies will be discussed.

Abdollahnejadbarough, Hossein
Martin, Kevin B.
A Multiple Stage Optimization for Developing Hydrogen Refueling Infrastructures in the Northeastern United States
Department of Industrial & Systems Engineering
Research advisor: Professor Sukgon Kim
Paper presentation

According to the U.S. Energy Information Administration, the United States consumed approximately 134 billion gallons of gasoline at a national average retail price of $3.52 per gallon for unleaded regular grade gasoline in 2011. A vast majority of this fuel was consumed by the 245 million U.S. registered automobiles and trucks that are included in the transportation sector which overall accounts for 27% of all U.S. greenhouse gas emissions. Hydrogen is a transformational energy carrier which can be domestically produced, lead to dramatic reductions in greenhouse gas emissions, and is approaching comparable prices with traditional fuels. However, the introduction of hydrogen as a vehicle fuel will require the design and development of a comprehensive refueling infrastructure network. An initial hydrogen vehicle supply network for the Northeastern U.S. is designed which includes the metropolitan areas of Boston, Philadelphia, Washington D.C. and New York City. A new formulation for modeling the congestion and capacity of the refueling stations along with strong heuristics and exact solution methods is presented. Stochastic demands are extracted from U.S. census tract data using predictive analytics and Geographical Information System (GIS) methodologies. A Discrete Event Simulation (DES) model is built to test the performance of the optimization model results within a year after construction of the stations and the refueling network in terms of utilization rate and the average number of waiting vehicles per day.

Abughayada, Castro
Dabrowski, Bogdan
Chmaissem, O.
Kolesnik, S.
Complex oxides for oxygen storage and electrolyte applications
Department of Physics
Research advisor: Professor Bogdan Dabrowski
Poster presentation

Complex oxides exhibiting superior reversible oxygen absorption/release capacities have gained increasing importance over the past years. A great deal of interest has been generated due to their critical role in the development of energy related technologies, such as oxy-fuel and chemical looping combustion. Based on
our previous studies of tolerance factor, we have successfully synthesized hexagonal (P63cm) RMnO3+δ manganites (R=Dy, Ho, Y) for which we discovered a large reversible oxygen storage/release capacities (within the range of oxygen content 3.0 - 3.4) at unusually low temperatures near 300°C which make them excellent candidates for air separation and production of high purity oxygen. Resistivity, structural, magnetic, and thermal expansion properties are correlated with the oxygen content 3+δ for these compounds. Work supported by NIU Great Journeys Assistantship.

Ahmed, Syed Munawer
Real time implementation of duet algorithm
Department of Electrical Engineering
Research Advisor: Mansour Tahernezhadi
Paper presentation

We present the Real Time Implementation of DUET algorithm for Blind Source Separation using Sub Band technique. Blind Source Separation is the method for extracting independent sources signals from the given mixtures generally referred as cocktail party problem. Degenerate Unmixing Estimation Technique (DUET) algorithm is used to separate any number of arbitrary sources by using only two mixtures. This method takes into consideration the time frequency representation of the signals and calculates the attenuation and delay pairs from their ratios. This method is valid on the assumption that the sources are orthogonally disjoint i.e. that the sources in the mixtures are disjoint. By using the maximum likelihood mixing parameter estimators, we use the concept of 2D-histogram plot constructed from the ratio of time frequency representation of the mixtures in order to account or the clustering of the sources, thus estimate the relative attenuation and delay mixing parameters. These parameters are thus used in the partition of the time frequency representation of the mixtures to recover the original sources. This method is well suited for speech mixtures as the time frequency representation of speech is sparse and this leads to W-disjoint orthogonality. For the Real-time implementation of DUET algorithm we use Sub-Band approach as it reduces the complexity of the observed mixture and is more suitable when compared to Full-Band estimation. In the Sub-Band approach the signals are segregated into various sub-bands and decimated to a factor using the analysis filter before performing DUET on them. To extract the high frequency components, band pass filters are used in order to divide the signal into bands. We recover the separated source signal at the end after performing DUET using a synthesis filter which is usually the sum of corresponding reconstructed sub-band signals. It is seen the sub-band implementation provides better estimation results when compared to full band implementation.

AlShahrani, Fahad
The Role of Organizational Culture in Influencing Self-Efficacy toward Adoption of Online Education: A Case Study of the Royal Commission of Juabil Program in Instructional Technology
Research advisor: Professor Lara Luetkehans
Paper presentation

This is a proposed research study that will be conducted for a doctoral dissertation. The Royal commission of Jubail and Yanbu higher education institutions, in Saudi Arabia, has been under much pressure to provide educational opportunities for both the community and the industry which has been a challenge because of lack in space, time and facilities. Distance education was suggested as a solution to this problem because of the ability to deliver learning objectives without the confinement of place and time. However, the literature indicated that for any online program to succeed, and analysis of the different stakeholders’ readiness must be conducted to ensure that the institution and all stakeholders involved are ready to venture into distance-learning environment. This study is aimed at analyzing the Royal Commission of Jubail higher
education institutions readiness to adapt online learning by analyzing the administration and instructors’ readiness for distance education. Moreover, this case study will attempt to understand the role of culture in influencing self-efficacy toward adoption of online education for administrators and instructors at the Royal Commission of Jubail. The study is guided by Bandura’s perceived Self-efficacy beliefs and Hofstede’s cultural dimensions. A three part survey will be created and distributed to both administrators and instructors. Part A will include demographic data (age, academic level, occupation, and computer knowledge). Part B of the survey will measure variables of Banduras’ perceived self-efficacy beliefs and Part C will measure Hofstede’s five cultural dimensions. Furthermore, interviews will be conducted with selected administrative staff. The findings of the study will allow the Royal Commission higher education institutions to create effective and productive online programs which might categorize it as a pioneer in online learning in the kingdom of Saudi Arabia.

Awen, Dennis
Meditation, Buddhism, and human resource development
Department of Counseling, Adult & Higher Education
Research advisor: Professor Eric Archer
Paper presentation

Mediation is a form of therapy that allows individuals to undergo self-reflection and personal understanding. The art of meditation has origins from East Asia. It is associated with religions and philosophies, such as Buddhism, and is studied and practiced in many nations such as China, Korea, and Japan. Meditation strives for an individual to purify his or her mind and find inner peace. Meditation has been used for training the minds of Japanese Samurai in preparation for battle, as a Japanese psychotherapy referred to as “Naikan,” and as a form of anger management for Cambodian refugees. The purpose of this paper is to learn about the basic fundamentals of meditation and Buddhism, understand how it can be used as a human resource development tool in relieving stress, anxiety, and anger from individuals in their professional and personal lives, and serve as a means for self-understanding and discovery. Keywords: Meditation, Buddhism, Hindrances of Buddhism, Deepening Levels of Meditation Practice, Wisdom, Concentration, Suffering, Compassion, Zen Buddhism, Naikan, Anger Management, Kolb’s Experiential Learning Cycle (Reflective Learning Theory), Mezirow’s Theory of Transformative Learning.

Battaglia, Steven
Cycling of Volatiles in Triton’s Icy Crust with Implications for Planetary Volcanism
Department of Geology & Environmental Geosciences
Research advisor: Professor Paul Stoddard
Poster presentation

Volatile ices including nitrogen, carbon monoxide, and methane cover Triton’s surface. Solid or liquid volatile compounds on the surface of a volcanically active planetary body suggest a magmatic-tectonic distillation process that concentrates the volatiles in surface reservoirs. On Earth, the hydro-tectonic cycle transfers water from the Earth’s interior to its oceans. Similarly, on Io, a theo-tectonic cycle transfers sulfurous compounds from Io’s interior to its surface. Volatiles that are solid or liquid in crustal reservoirs are transported into the subsurface as the crust recycles to the convecting mantle. As the slab penetrates the mantle, the interior thermal gradient melts the volatiles in the reservoir, distilling the compounds to shallow depths. The liquid or vaporous volatiles remain in the lithosphere until a rising plume assimilates them. Volatiles assimilated into a rising melt likely aid in the eruption of magma onto the surface. Therefore, other volcanically active bodies with solid or liquid volatiles on its surface should exhibit a similar self-sustaining process where cycling of volatiles in the lithosphere aids in planetary resurfacing and crustal recycling. Here,
I investigate this process by modeling the geothermal gradient of Triton’s crust using previously estimated ammonia concentrations for an outer solar system icy body and reported heat flux estimates of Triton’s surface in a true shell thickness model. The volatile ices on Triton’s surface melt at shallow depths in the water-ice lithosphere and likely aid in the eruption of cryomagmas, resulting in a “cryo-tectonic” cycling of its crust. Triton’s geologically young surface suggests this cycle has been occurring since its gravitational capture by Neptune, which implies Triton’s lithosphere may be differentiated. A similar process may be occurring on other bodies suspected of volcanic activity, such as Pluto.

Berchtold, Brian  
Sagarin, Brad  
Effects of Sex and Sexual Orientation on Definitions of Infidelity  
Department of Psychology  
Research advisor: Professor Brad Sagarin  
Poster presentation

Prior research examined sex and sexual orientation differences in definitions of infidelity by coding open-ended answers. The present study examined these differences among lesbians, gay men, and heterosexual women and men using closed-ended questions based on elements that emerged from the prior study. Sex difference predictions were derived from evolutionary psychology. Partner and orientation difference predictions were derived from sociocultural theories. Results found little support for sex or sexual orientation differences in definitions of infidelity. Findings also suggest that the sex of the partner significantly impacts definitions of infidelity.

Bewick, Lindsay  
Herrell, Kristine  
Rodriguez, Aldo  
Schwartz, John  
Smith, M Cecil  
Constituent Elements of Intimacy versus Isolation in Young Adulthood  
Program in Educational Psychology  
Research advisor: Professor M Cecil Smith  
Poster presentation

Building on the work of Erikson and his eight stage model of human development, we explore the idea that contemporary young adults lack understanding of social and sexual intimacy, and this contributes to problems in personal relationships for many individuals. Under-developed intimacy is a result of fear and ignorance, the impacts of popular culture and misinformation from peers, the complexity of family life, and over-reliance on social media. These factors contribute to young adults’ failure to fully resolve the intimacy vs. isolation stage of psychosocial development that Erikson (1950) described in his 8-stage model of lifespan development. We propose a model that describes various expressions of intimacy that develop in the psychosocial stages of development preceding intimacy and which, if fully realized, contribute to later stages. We explore these expressions of intimacy by drawing upon ideas from attachment theory (Ainsworth, 19xx; Bowlby, 19xx) and identity formation (Erikson, 1968), and through an examination of a variety of social-environmental factors, including the prevalence of technology and changing social views on traditional gender roles. Our work has important implications for understanding the complexity of how adults may ultimately achieve satisfactory intimacy relations in adulthood, and offers some insights into supporting adults in their quest for intimacy.

Black-Chen, Marsha
The Academic and Lived Experience of Jamaican Nontraditional Female Students in Higher Education.
Program in Adult & Higher Education
Research advisor: None indicated
Paper presentation

One of the most notable trends in the last two decades has been the dramatic increase in continuing education among non-traditional–aged females (Lewis, 1988). This study examined the academic and lived experience of women in Jamaica, specifically women who returned to college to further their education. Emphasis was placed on investigating reasons for returning, support receive from family, support service within the institution attended, successes, challenges, and strategies for successful academic and social integration into the institutional environment. This qualitative study was guided by 4 research questions, while using a narrative enquiry and a feminist approach to provide findings related to the study. Twenty females were interviewed and the study revealed concepts that are internal to the group, while investigating issues relating to them as a unique population. The literature shows that women dominating higher education in contemporary Jamaican society is intriguing, as the education system built on its Victorian Ideology saw it prudent for males to further their education, while not placing much emphasis on women. However, Senior (1991) posits that the 1960s and onwards has seen an increase in equality of education opportunities between sexes, and Caribbean girls have taken full advantage of this. Beckles, Perry and Whitley (2002), and Howe (2003) expressed that in the Caribbean, students over the age of 21 have created additional challenges for the university, which results in their academic experience being different from that of traditional-aged females. Jamaican scholars have not formally addressed these issues, and as such, there is no literature on non-traditional women, their academic experience, reasons for return and the support received from institutions as they pursue their studies. Findings indicate that majority of the students had a positive outlook, received support from family, but faced several challenges upon returning and integrating into the institutional environment. This research will provide information to the various institutions, policy makers and practitioners, but most importantly, it is an attempt to amplify their voices, while understanding the efficacy of this student population. The responses hold significant implications for future research involving female non-traditional students in higher education.

Blankenship, Philip
Musson, Tianna
Torrence, Jered
Koppen, Jenny
Wallace, Douglas
Searching blindly: Evaluating aging effects on self-movement cue processing in humans using an analogue of the food-hoarding paradigm
Department of Psychology
Research advisor: Professor Douglas Wallace
Poster presentation

Spatial orientation, or the ability to navigate through space, is dependent on multiple specialized neural processes. The ability to orient through space changes with age. The mechanism for this age-related change in spatial orientation ability continues to be debated. The food-hoarding paradigm is a behavioral task that has been developed to dissociate environmental and self-movement cue processing. Previous work has adapted components of the food-hoarding paradigm to the human ambulatory and manipulatory scales to investigate self-movement cue processing. Similar kinematic and topographic movement characteristics were observed in humans and rats across analogous tasks. The current study investigates the influence of age on self-movement cue processing in human participants (n=8) ranging in age from 21 to 86. Participants were blindfolded and instructed to search, with their fingertip, for a piece of Velcro placed at random positions.
on a table (searching segment). Upon finding the Velcro participants were instructed to return to the starting location (homeward segment). Both topographic and kinematic characteristics of the homeward segment were used to assess direction and distance estimation. Age of the participant was observed to significantly influence the homeward segment direction and distance estimation. This suggests that the ability to process self-movement cues varies across the lifespan; however, further work is needed to establish the nature of the processing deficit observed in the current study.

Blomberg, Ben
Channeling Radiation at HBESL and ASTA Facilities
Department of Physics
Research advisor: Professor Phillippe Piot
Poster presentation

When relativistic electrons pass through the axial or planar channels in a crystal lattice they can oscillate about the crystal plane making transitions between transverse quantum states, and thus emitting radiation. This radiation is known as channeling radiation and can be in the x-ray region if the electrons have enough energy. Using a state of the art field emitting cathode placed in a Radio Frequency (RF) gun we hope to produce high quality electron bunches focused to a small spot on a diamond target. This experiment will first be done as a proof of concept at the High Brightness Electron Source Laser (HBESL) with 4 MeV electrons then later at the Advanced Superconducting Test Accelerator (ASTA) with 40 MeV electrons. We hope to see channeling radiation with peaks well above that of the expected bremsstrahlung, and with high spectral brilliance and narrow spectral line. An X-ray source from channeling radiation would be more compact than that of a traditional synchrotron and could still generate the coherent x-rays needed to do biological imagining techniques such as phase contrast imaging.

Boi, Shannon
Toll-like receptor signaling regulates GLI3 in monocytes in the tumor microenvironment
Department of Biological Sciences
Research advisor: Professor Sherine Elsawa
Poster presentation

Chronic inflammation has been implicated in several diseases including cancer. The interplay between tumor cells and inflammatory cytokines in the tumor microenvironment (TME) has been shown to promote tumor cell growth and survival. Therefore, understanding the nature of this interaction holds great promise by introduction of new therapies to control cancer. The Hedgehog (HH) signaling pathway mediates growth and proliferation of cancer cells. In previous work, we have shown that GLI proteins can regulate IL-6 expression in the TME independent of HH signaling. The goal of this study is to determine the role of GLI proteins in mediating inflammation in the TME. We confirmed expression of TLRs on monocytes. Upon triggering of TLR4 via LPS stimulation, we found that expression of GLI3 and IL-6 are induced. We then determined expression of the HH signaling components and found that cells express the receptors patched (PTCH) and smoothened (SMO), and GLI1, GLI2 and GLI3. LPS stimulation in the presence of SMO inhibitor (Cyclopamine) did not affect GLI3 expression suggesting that TLR4 mediated regulation of GLI3 does not require an active HH pathway. In malignant B cells, we found that BCWM.1 and MWCL-1 cells express PTCH, SMO, GLI1, GLI2 and GLI3. Stimulation of malignant B cells with LPS increased GLI3 expression. Signaling through TLR3 using polyI:C and TLR9 using CpG in monocytes had no effect on GLI3 expression with TLR9 stimulation and very little GLI3 expression with TLR3, suggesting this mechanism is specific to TLR4 signaling. In summary, our studies identify a novel regulation of GLI3 by TLR4 signaling pathway and suggest a novel role for GLI3 in the innate immune response to bacterial
infections. Further studies will investigate the mechanisms by which TLR4 signaling regulates GLI3 and the biological effect this has in the TME and in response to pathogenic infections.

Bothwell, Paige
Disparities in Glutamine Transport in Rodent and Human Liver Cancer Cells: Investigations Using the “ASCT2-specific” Inhibitor Glutaminyl-para-nitroanilide (GPNA)
Department of Biological Sciences
Research advisor: Professor Barrie Bode
Poster presentation

The liver serves as a major center of metabolic regulation, and plays a central role in whole-body nitrogen metabolism and homeostasis largely through metabolism of the amino acid glutamine. Upon cancerous transformation, liver cells switch to enhanced glutamine consumption to support their metabolic requirements for growth. As much cancer research relies on animal models to recapitulate human disease, it is essential that cancer-induced physiological alterations be equivalent in both species. To address this question with respect to glutamine transport changes in hepatocellular carcinoma (HCC), glutamine transport was measured in a series of rat and mouse liver and HCC cells, and a large panel of human HCC cells. Human HCC displayed rates of glutamine transport that markedly exceeded those measured in rodent HCC. Amino acid inhibition analysis revealed a variable pattern of uptake in rodent cells involving System N, System ASC and System B0,+/y+ activities – depending on the differentiation state of the cell. In contrast, human HCC transported glutamine almost exclusively by System ASC activity – known to be mediated by the SLC1A5 gene product ASCT2. Remarkably, when the “ASCT2-specific” inhibitor GPNA was applied to both rodent and human HCC cells, it inhibited all glutamine transport in spite of the inter-species disparities in measured transporter activities. To determine whether ASCT2 indeed mediates almost all glutamine uptake in rodents and humans, or is instead not ASCT2-specific, a rat liver epithelial cell line (RLE) was transfected with expression plasmids encoding specific System N and System A glutamine transporters (SNAT2, SNAT3 and SNAT5). GPNA was assessed for its ability to inhibit these enhanced activities. The results will help us to assess mouse models of liver cancer and their physiological relevance to the human disease, and further reinforce the need to develop more specific transport inhibitors for cancer diagnosis and therapy.

Broski, Scott
The effects of host size and age on the fitness of Spalangia endius
Department of Biological Sciences
Research advisor: Professor Bethia H. King
Poster presentation

A well-documented strategy observed in plants and insects to deter herbivores and predators is the hardening of outer tissue layers. The hardness of a tissue is often a component of size and age; older, larger individuals have tougher tissue than their counterparts. We examined this method of resistance in a host-parasitoid interaction using Spalangia endius, a parasitoid wasp, and its natural host, the pupal stage of Musca domestica. We investigated whether utilizing larger and older hosts imparted fitness costs to the parasitoid in terms of mechanical wear to ovipositors and mandibles and in terms of long term production of offspring. We found that parasitoids produced significantly more offspring in smaller and younger hosts compared to larger and older hosts. Preliminary results also suggest shorter drill durations. Additionally, the puparia of smaller and younger hosts were significantly thinner; and preliminary results indicate less force is required to penetrate them compared to larger and older hosts. However, no wear was detected on the ovipositors of female wasps or on the mandibles of wasps, even with large old hosts. This work is evidence that host age...
and size influence the reproductive capacity of this parasitoid wasp. This influence may be through effects of host age and size on tissue hardness, but is apparently not through physical wear on the parasitoid.

Clinton, James
Kurby, Christopher, A.
Magliano, Joseph P.
Rapp, David N.

Are auditory imagery experiences spontaneously generated during reading?

Department of Psychology
Research advisor: Professor Joseph Magliano

Kurby, Magliano, and Rapp (2009) showed that readers tend to activate aspects of dialog during reading, associated with the phenomenological experience of ‘hearing’ voices that are being read. These auditory imagery experiences (AIEs) can encode a variety of types of information, such as rate of speech production (Alexander & Nygaard, 2008) or the activation of the voice of a character (Kurby et al., 2009). The current project sets out to determine whether prior exposure to characters’ voices is necessary to generate phonologically based AIEs. Our methodology closely followed the paradigm used by Kurby et al. (2009). Participants listened to or read scripts about a man and woman bickering. To assess the activation of AIEs, participants then read (or reread) scripts while occasionally judging whether a probe word had appeared in the prior line of dialog. The probe words were presented aurally, either in the voice of the character that had spoken the line of dialogue (match condition) or in the other character’s voice (mismatch condition). Response times and accuracy to probe words were recorded. We hypothesized that if AIEs were activated without initial auditory exposure (i.e., the read-first group), this would provide evidence of the spontaneous activation of AIEs based on features associated with gender. The findings from Experiment 1 suggest that prior exposure to the sound of a specific voice is indeed necessary to generate phonologically-based AIEs. Participants responded faster when the probe voice matched than mismatched the target character, but only if they were exposed to the voices earlier (i.e., the listen-first group). The findings from Experiment 2 further support this claim by showing that AIEs occur for specific voices. The match-mismatch effect from Experiment 1 disappeared when new probe voices were introduced. Therefore, it is likely that prior auditory exposure is necessary to ‘hear’ voices during reading.

Comber, Evelyn
Schoenfeld, Donna
Griffin, Merlynette
Springfellow, Shana
Raji, Fuad

Do you know your drink size? Estimating drink size project
Program in Health Enhancement and Department of Psychology
Research advisor:
Poster presentation

In 2011-2012, Health Enhancement developed a demonstration and message regarding standard drink sizes and conducted a convenience sample educational activity allowing student participants to exhibit the pouring of actual serving sizes. Participants completed a pre-test survey and were verbally asked what they drank over a two week period: hard liquor, wine, or beer. Then the participants poured into a red SOLO cup how much alcohol they had normally consumed, without adding their choice of mixer to the cup. Hard liquor was simulated with water, wine with cranberry juice, and beer with cream soda. The participants were then educated on what constitutes a standard drink serving size by reviewing available handouts and
information on a display board. The amount the participant poured in the red SOLO cup was then measured by a shot glass (hard liquor), wine glass (wine) or beer can (beer). A dialogue on the importance of knowing drink size and the administration of the post-test survey completed the assessment. The respondents reported knowledge acquisition regarding serving size as well as an increased awareness of protective and risk reduction behaviors associated with alcohol consumption. This initial study has been replicated and extended this year (the results are not yet analyzed or reported) to include two residential floors. One floor has received the same treatment and the other floor has received the same treatment plus alcohol educational posters.

Craig, Ashlee
The Application of Organic Residue Analysis to Archaeological Ceramics: A Case Study of Andean Vessels
Department of Anthropology
Research advisor: Professor Winifred Creamer
Poster presentation

This research focuses on organic residue analysis of Andean vessels in the South American collection at The Field Museum in Chicago. Thirteen vessels have been sampled by collecting organic residues from the interior of each vessel. Those residue samples have been analyzed using Elemental-Analysis Isotope Ratio-Mass Spectroscopy to measure their carbon content. Eleven of the vessels were excavated by George Amos Dorsey in the late 1800’s from burial contexts in Ancon, Peru. Two others were obtained by The Field Museum from private collectors, most likely from looted contexts. Stylistic features of all 13 vessels suggest an ancient Andean Chancay culture origin. This project was made possible by a federally funded grant received by The Field Museum from the Institute of Museum and Library Services. The purpose of the grant is desalinate South American ceramics. Desalination is a conservation technique used to remove harmful salt deposits in ceramics. Due to their porous nature, ceramics become easily impregnated with salt, especially ones, like the Chancay vessels, that originate in coastal regions. The goal of my residue analysis project is to test for residues before and after desalination to determine if the conservation technique impacts the available organic material in any way. My analysis will provide information about the impact of desalination on archaeological residues.

Davidson, Zach
Keefe, Brian
Optimizing Growth and Lipid Production of Monoraphidium sp. for Use in Biofuels
Department of Biological Sciences
Research advisor: Professor Gabriel Holbrook
Poster presentation

As petroleum fuel prices continue to rise and natural oil reserves run out, the importance of alternative fuels has risen dramatically. The search for feedstocks for these fuels has led to many possible candidates from corn to trap grease. One of these feedstocks that has immerged is algae. Algae is beneficial in that it is able to use wastewater (effluent) as its main source of nutrients and as a byproduct “clean up” the wastewater by removing most if not all of the major inorganic pollutants (NO3- and PO4-3) which are otherwise discharged into rivers. One challenge to using algae as a feedstock is creating a continuous supply year-round. This is not a problem in warmer states such as Florida or Arizona, but to make algal biodiesel a practical economical application in northern states such as Illinois it must be addressed. Species such as those of the Monoraphidium genus have been found growing naturally in the cold months in northern states and some are even found to have optimal growth around 10°C with light conditions around 40μmol. Also the addition of bicarbonate at key growth stages can increase the growth and lipid production of these organisms. Bulk
growth of this indigenous algal species in local wastewater shows the potential to simultaneously treat wastewater and create biofuel feedstocks containing 20% - 49% lipid content for biodiesel production.

**Esparza, Julie**  
**Schmidt, Jennifer A.**  
**Shumow, Lee**  
**Durik, Amanda**  
Teaching Gifted and Talented Students about Growth Mindset  
Program in Educational Psychology  
Research advisor: Professor Lee Shumow  
Paper presentation

This study investigated whether gifted and talented middle-school students benefitted from learning about the malleability of intelligence (Dweck, 2000). This is particularly important for gifted students because they are at risk for both under-achievement and perfectionism, which may hinder them from reaching their potential. Students with a growth mindset, who believe that intelligence is malleable, are less likely to manifest academic under-achievement or maladaptive perfectionism (Siegle & McCoach, 2005). Secondary analysis of IMuscle project data compared the 32 gifted and talented seventh grade science students who participated in a six-week computer-based intervention (BrainologyTM) with 48 gifted and talented students who served as controls. A mixed-between-within subjects ANOVA was conducted to assess the impact of the Brainology program on the students’ growth mindset across three time periods (preintervention, postintervention and three-month follow up). There was a significant interaction between time and Brainology, Wilk’s Lambda = .85, F (1, 78) = 6.5, p < .002), partial eta squared = .15 indicating a large effect size. This study showed that teaching gifted and talented students about the way that their brains work and techniques that will help them learn changed the way the students thought about their own intelligence. Gifted and talented students maintained gains in growth mindset to a greater extent than students in the general population. As well, unlike students in the general population, the strong teacher effects on growth mindset among students who participated in Brainology were not found among the gifted and talented students (who responded similarly in both teachers’ classrooms).

**Feng, Xuehuan**  
The putative polysaccharide synthase gene cpsA regulates mycotoxin production and morphogenesis in the fungus Aspergillus nidulans  
Department of Biological Sciences  
Research advisor: Professor Ana M. Calvo  
Poster presentation

The model filamentous fungus Aspergillus nidulans synthesizes a variety of secondary metabolites, such as the mycotoxin sterigmatocystin (ST). The production of this toxin is positively controlled by VeA, a global regulatory protein that also governs sexual and asexual development in A. nidulans. In the absence of VeA, the biosynthesis of ST is blocked. We performed random mutagenesis in a deletion veA strain and identified several revertant mutants that are able to synthesize ST, among them RM1. This mutant is also strongly defective in asexual and sexual morphogenesis. Complementation of RM1 with a genomic library revealed that the mutation occurred in the coding region of a gene that encodes a putative polysaccharide synthase designated as cpsA. In a veA wild-type background, deletion of cpsA delays production of ST, and shows a reduction in conidial production and defective sexual stage. These results indicate that cpsA is important for mycotoxin biosynthesis and it is involved in A. nidulans morphogenesis.
Gearhart, Andrew
Fiber Tracker Studies for Proton Computed Tomography
Department of Physics
Research advisor: Professor George Coutrakon
Poster presentation

Proton computed tomography (pCT) is a new medical imaging technique that offers many advantages over conventional X-ray CT, specifically for patients undergoing proton therapy treatment. The pCT scanner consists of two fiber trackers in front of the patient, two fiber trackers behind the patient, and a range detector behind the rear fiber trackers. The residual proton energy is measured in the range detector to determine the water equivalent path length traversed by the proton. This data can be used to construct a three-dimensional image of the patient. The fiber trackers consist of four layers of 0.5 mm diameter polystyrene scintillating fibers mounted on a carbon fiber frame with a Rohacell® substrate. Fibers are bundled in groups of three, and each bundle is connected to a silicon photomultiplier (SiPM). When the proton passes through a fiber bundle, photons will be generated within the fiber that produce an electronic signal in the SiPM. Two fiber layers of each tracker make up the X layer of the tracker, while the other two fiber layers make up the Y layer of the tracker. With this position information, the trajectory of the proton both before and after the patient can be used to determine the most likely path of the proton that is necessary for image reconstruction. Simulation of the fiber trackers for the pCT scanner will be discussed along with SiPM characterization, fiber tracker assembly, and SiPM analysis from a proton test beam.

Gerardy, Haeli
Luckner, Amy
Mounts, Nina
Parental Management of Peers and Support of Peer Activities: Are They Related to Adolescents’ Aggressive and Prosocial Behavior?
Department of Psychology
Research advisor: Professor Nina Mounts
Poster presentation

Parental management of adolescents’ peer relationships has increasingly been linked to social outcomes, although there is limited research on management and adolescents’ social skills. Management consists of consulting - helping with problem-solving regarding peers, and guiding - a regulatory and directive effort by parents to influence peer relationships. In general, research suggests that consulting is related to positive adjustment (e.g., positive friendship quality and lower delinquency). Research on guiding is mixed with higher levels being related to lower levels of cooperation, higher levels of drug use and more positive friendship quality. Parents might also support adolescents’ activities with peers, which might impact aggressive and prosocial behavior by providing greater opportunities for peer interactions. The current investigation expands prior research by exploring linkages between parental management of peers, parental support of peer activities, and adolescents’ aggressive and prosocial behaviors. The sample consisted of 98 adolescents (50 males), age 10-18 (M=15.46 years). Adolescents reported on parenting social behaviors. Hierarchical regression analyses were used to examine the relationships between adolescent-reported consulting, guiding, parental support of peer activities, aggression (i.e. relational and physical), and prosocial outcomes (i.e. caring behavior, peer acceptance, playful relational behavior, rough and tumble play). Regressions revealed that there were no main effects for age. Higher levels of consulting predicted lower levels of relational and physical aggression. Higher levels of guiding predicted higher levels of relational aggression. For the prosocial outcomes, higher levels of consulting were related to higher levels of prosocial behavior and peer acceptance and lower levels of playful relational behavior and rough and tumble play. Higher levels of guiding predicted higher levels of peer acceptance. Parental support of peer activities was related to higher levels of prosocial behavior, peer acceptance, and rough and tumble play.
Gerzel-Short, Lydia
Response to intervention, family involvement, and student achievement at Tier 2: A mixed methods study of K-1 students and their families
Program in Curriculum & Instruction
Research advisor: Professor Elizabeth Wilkins
Poster presentation

This dissertation examined the importance of family involvement in student learning and achievement within the Response to Intervention framework. This study built upon the premise that family involvement in a child’s education is paramount if educational gaps are to be closed. Families included in this study were randomly assigned into a control or intervention group. This study connected early literacy curriculum based measurement scores and family involvement data gathered from family sessions/interviews. Several research strategies were utilized: 1) quantitative analysis of family-school connections; 2) slope data derived from early literacy curriculum based measurements (CBM); and 3) qualitative analysis of family sessions. Data were collected from an inventory, CBM benchmarking and progress monitoring data, and extensive interviews, memos, field notes, and other artifacts. This dissertation challenged the current myopic view of family involvement in student learning and placing the value of families in schools as vital to student learning. Analysis of the family interviews revealed several themes that are relevant for all educators as they attempt to close learning gaps among students.

Goss, Samantha
Defining Creativity: A Common Definition of Creativity in Learning, the Pros and Cons
Program in Art Education
Research advisor: Paper presentation

Assessment in education requires a consensus about the meaning of terms used. Creativity continues to be difficult to assess for several reasons including its definition. What are the pros and cons of having a common definition of creativity in learning? The differences between understandings of creativity mean that a common definition could be limiting or incorrect, even though it could be beneficial for sharing and connecting research. First, the existing definitions of creativity must be examined. A document analysis of The International Handbook of Creativity provides insight into international perspectives on creativity, including definitions, leading to 29 samples that fit into three categories focusing on person, process, or product. The analysis clarifies and reinforces the benefits and negatives of having a common definition of creativity.

Gu, Hao
Gau, Jenn-Terng
Chen, Po-Han
Rong, Shean Lee
The coupling influence of size effects and strain rates on the formability of austenitic stainless steel 304 foil
Department of Mechanical Engineering
Research advisor: Professor Jenn-Terng Gau
Paper presentation

In order to understand the coupling influence of size effects and strain rates on the formability of the austenitic stainless steel 304 foils in micro scale, a series of micro scale limited dome height (LDH) tests were designed and conducted in three different speeds without lubricant on the annealed and as-
received austenitic stainless steel 304 foils. In this study, a technique was developed to coat a layer of pure chromium (≈0.3 um thick) on the foils and by using the etching process to make the micro square grids (50 um × 50 um) on the foils. Then, the foils were annealed at different temperatures for obtaining different microstructures. A set of the forming limit curves (FLC) of the foils were obtained and they can be used by industry right away for product design, process design and development, die design, and simulations, etc. Besides, the coupling influence of the size effects and the strain rates on the formability of the austenitic stainless steel 304 foils has been studied, observed and understood.

Guo, Jingjing  
An Industrial Application of Simulation-Based Multi-Objective Scheduling  
Department of Industrial & Systems Engineering  
Research advisor: Professor Reinaldo Moraga  
Paper presentation

This paper describes the application of a simulation-based multi-objective scheduling for a component facility of a well-known heavy equipment manufacturer. The operations within this facility can be identified as a flexible job-shop environment and the scheduling solution should provide them a way to organize their jobs while meeting their objectives defined. These objectives are to minimize the makespan, the total tardiness and the total earliness. A baseline model for a sample of jobs is created by replicating the current scheduling rules with a Matlab program. The scheduled orders are the input for a simulation model in Arena. By applying some changes to the current scheduling rules, improvements are observed when comparing the results to the baseline model. This paper presents the main approach, assumptions, results, improvements and lessons learned.

Helton, Benjamin  
An Analysis of Beginning Band Pedagogy: The Lens of Neuroanatomy and Neuroperception  
Program in Music Education  
Research advisor: Professor Mary Lynn Doherty  
Paper presentation

This study will analyze current beginning band methods through the lens of neuroanatomy and aural perception. There have been significant advances in research over the past twenty years that redefined the way we understand how our brains process information and learn new skills. However, some “tried and true” methods in novice instrumental books are still advocating archaic pedagogical techniques. There are two specific aspects of beginning instrumental teaching upon which this study will focus. The first will be the neuroanatomy of motor movement. Every young musician must have well tuned fine motor skills to perform. The bilateral activation of the parietal cortex is unique to instrumental training as well as the sophisticated procedural development of the somatosensory lobes. Knowledge of these processes is critical to the new motor development involved with beginning instrumental teaching. Exercises in motor movement that reflect these procedures have been proven effective versus other incremental pedagogical ideas. The second will be auditory perception. The brain processes sound information through a myriad of lobes. The cerebellum, auditory cortex, limbic system, and frontal lobes all react to the sound that enters the ear and they all process and react to it in different ways. In addition to the basic system functions, the lobes also create a set of anticipatory processes related to music. Our understanding of these processes has impact on the way we view pedagogy and the way we present aural (both pitch and rhythmic) information to young students. I hope that an analysis of of methods through motor movement and aural processing can have impact on the way that the music education community views beginning instrumental pedagogical techniques.
Higgs, Karyn  
Britt, M. Anne  
Wallace, Patricia  
Evaluating Student Produced Causal Explanations about Complex Scientific Phenomena  
Department of Psychology  
Research advisor: Professor M. Anne Britt  
Poster presentation

Reading comprehension research, for both single and multiple documents, often relies on written explanations to measure comprehension. Comprehension is often assessed by coding for the presence of important concepts. However, a student’s understanding of complex causal systems is difficult to capture using a system that only measures isolated concepts and not the relationships between them. This is especially true for assessing comprehension of multiple documents in science, where students are presented pieces of a complex system across documents and must make connections to form a coherent understanding. Concept coding alone may capture content that students extract from the texts and include in their written explanations, but which they have not connected with other concepts to form an integrated understanding. We address this by focusing on the relationships produced in conjunction with the concepts. This allows a better assessment of the students’ mental models of the system as opposed to their ability to identify key concepts. Our scoring system also measures evidence and source information. The use of evidence to support a claim suggests that students have a deeper understanding of the claim since they know which evidence can be used to support it. We used our system to score argumentative essays produced after students read a set of documents. Answering the essay prompt required integrating information from different documents. We first coded for important concepts and then assessed the extent to which students connected these concepts in causal chains. We found that students often produced concepts in their essays that were important to a causal explanation but frequently did not connect them, suggesting that they may not have formed an integrated understanding. Our scoring of connected causal explanations was strongly correlated with another measure of comprehension, the sentence judgment task.

Jordan, Jesse  
Conception and Stereotypes of Middle Eastern Culture Heard at the Columbian Exposition  
Program in Music  
Research advisor: Professor Brian Hart  
Paper presentation

The 101 wax cylinders made by Benjamin Ives Gilman at the World’s Columbian Exposition in 1893 are some of the earliest known examples of recorded non-Western musics. The cylinders preserve the music of Javanese, Turkic, Samoan, and Native American performers. Gilman never made an analysis of his recordings, and they remained unknown for almost a century. This study will examine the nine recordings that Gilman made at the Turkish Theatre on September 25th, 1893. The analysis of these recordings will provide information not only about what was considered “Turkish” music in 1893, but also shed light on American perceptions of Middle Eastern music and culture at the time. Newspapers and sheet music based on the Exposition reflect the popular opinions among Americans toward Middle-Eastern culture that are not based on these performances. Instead, these opinions drew from popular stereotypes of Middle Eastern figures, specifically the over-sexualized belly dance, the newly introduced “Hootchie-Cootchie.” The dance music associated with the belly dance at the Columbian Exposition was not recorded, but the American opinions surrounding the “Hootchie-Cootchie” were applied to the remainder of Middle-Eastern musics being performed there, such as those on the Gilman recordings. This study will reveal that Americans in 1893 developed deliberate misconceptions about Middle Eastern music and culture based upon mass-produced stereotypes that remained popular American culture for many years after.
Science class can be challenging for students; learning science requires that students be actively engaged in learning. The expectancy-value model (Eccles et al., 1983) identifies student beliefs about the utility value of tasks as an important factor in their engagement and motivation. Using data from the (I-MUScLE) project, this study investigated associations between classroom talk about utility and students’ perception of the utility value of science. Our main research question was: What is the relationship between utility value statements in the classroom and seventh grade students’ perception of the utility of science? Researchers recorded teacher and student interactions in 14 sections of seventh grade science taught by four teachers. Each section was observed on at least 11 different occasions. Interactions were coded for utility value statements. At the end of each lesson, students completed a questionnaire, recording their perceptions of the class, including the usefulness of their learning. HLM was used to analyze the data. The repeated measures of students’ perceived utility value and the quantity of utility statements were included as time varying level-1 variables. Gender, whether a student was Hispanic and their initial ratings of scientific self-competence were included at level-2. Students with higher initial competence tended to rate the science topic as more useful (0.175, p <0.043). For female Hispanics, greater initial competence was associated with increased ratings of usefulness (0.245, p<0.048). There was also a statistically significant relationship between utility statements and student ratings of usefulness (0.041, p<0.007). This relationship accelerated for males with higher initial competence (0.020, p<0.017), but the relationship decreased for females with higher initial competence (0.029, p<0.031). Our results suggest that there is a relationship between the number of utility statements made in a science class and student ratings of the usefulness of what they were learning.
collaboration between the Advanced Photon Source (APS) at Argonne National Laboratory (ANL) and the Advanced Light Source (ALS) at Lawrence Berkeley National Laboratory (LBNL) and our group (NIU) is the first to use it for soft condensed matter coherent X-ray scattering studies and simultaneously optimize and characterize the detector for enhanced performance. The detector uses a custom LBNL-designed CCD, with 480x480 pixels and 96 outputs, giving a nearly column parallel and therefore very fast (200fps) readout. With the help of SVS we have pushed for faster dynamics measurements at the single photon limit and show its promise for coherent X-ray scattering in the flux/photon limited situations.

Kraft, Carol
Development of a Land Ethic in Adolescents Disconnected from Nature
Department of Literacy Education
Research advisor: Professor Mary Beth Henning
Paper presentation

The first Earth Day in 1970 drew attention to environmental problems (Caduto, 1985) that continue to escalate. According to Muir (cited in Goralnik & Nelson, 2011), merely bringing people into the mountains and forests would result in an appreciation and respect for the natural world. Another conservationist, Aldo Leopold (1949), believed that an ethical relation to nature could not exist without love, respect, and admiration for land. Leopold’s view, known as the land ethic, depends upon an understanding of the science of ecology and the relationships between all of the organisms within an ecosystem. Many American adolescents, between 11 and 15 years of age, spend a significant amount of time indoors. Knowledge of global environmental problems is increasing, but direct contact with nature is decreasing (Louv, 2008). Fostering responsibility for the nature is difficult if adolescents are disconnected from nature. The world’s environmental problems (e.g., ozone depletion, fresh water scarcity) are grounded in this disconnection between humans and the natural world (Barry, 2010). American adolescents disconnect from the natural world because they eliminate direct contact with it for the majority of their day (Jickling, 2004). They fail to realize that the natural world can survive without them, but they cannot survive without the natural world. Natural areas can hold special meaning to children and adolescents, and provide significant developmental experiences (Chawla, 2001). Yet little is known about today’s adolescents’ experiences with natural areas. Lack of contact with the outdoors bodes ill for adolescents’ development and perhaps the future of the Earth. Most adolescents feel little or no responsibility to solve a problem that does not directly affect them. How adolescents view and experience the environment will be the focus of this research.

Kron, Clare
Changes in Glutamine Transporter mRNA Expression Levels during Three-Dimensional Growth of Human Hepatocellular Carcinoma (HCC)
Department of Biological Sciences
Research advisor: Professor Barrie Bode
Poster presentation

Human HCC is the fifth most common cancer in the world, with risk factors including both chronic Hepatitis B virus (HBV), and chronic Hepatitis C virus (HCV) infections. Tumor cell proliferation requires rapid synthesis of macromolecules including lipids, proteins, and nucleotides, as well as a carbon source for biosynthetic precursors. Glutamine is the major oxidizable substrate providing for tumor growth; therefore, understanding the method of glutamine uptake is essential in order to both block the uptake of this essential nutrient and to employ its respective transporters for chemotherapeutic drug delivery. Using monolayer cell lines, previous studies had indicated the upregulation of one or more of seven amino acid transporters of glutamine. As tumor growth progresses, microenvironmental changes occur due to the increased
3-dimensional mass that must be supported based on both size and depth of tissue, creating regions of hypoxia, acidity and nutrient limitation. In order to better model tumor growth, three human HCC cell lines (SK Hep, Hep G2, and Huh 7) were grown as 3-dimensional spheroids (avascular tumors), and the mRNA expression of seven glutamine transporters (ASCT2, LAT1, and SNATs 1-5) were examined by Northern blot and qPCR techniques. Compared to monolayer control groups, spheroid growth resulted in generally enhanced or minimal effects on glutamine transporter mRNA levels that were cell line-specific. Notably, SNAT4 was dramatically increased by spheroid growth in HepG2 and Huh7, and SNAT2 was induced in all three HCC cell lines. SNAT2 induction could be attributed to nutrient deprivation, while SNAT4 induction could not be ascribed to any combination of tumor microenvironmental stress. These results demonstrate that distinct HCC cell types differentially induce glutamine transporter expression in response to physiological and molecular cues due to three-dimensional growth.

Kuppa, Lakshmi Pratyusha
Estimation of flow scour around bridge piers using 3-D iterative methodology implemented in a commercial CFD code
Department of Mechanical Engineering
Research advisor: Professor Pradip Manumdar
Poster presentation

Flow scour is the engineering term used to describe the erosion of a sediment bed due to fluid flow. Local scour occurs around objects placed in the path of flow, such as bridge piers. Severe damage or even failure of structures may occur if the amount of scour is too great. Due to the complexity of the fluid/structure interactions and cost of experiments, Computation Fluid Dynamics (CFD) software is often used to predict the shape and depth of a scour hole. This study extends the previous 3-D iterative methodology, with several improvements to the scouring process, implemented in commercial CFD software called STAR-CCM+ to predict the scour hole formation around circular bridge piers. These improvements are inclusion of a variable critical shear stress (VCSS), scouring normal to the sediment bed and a sandslide model. Reynolds Averaged Navier-Stokes (RANS) equations and a Realizable k-ε 2-layer turbulence model are used to resolve the flow field. The methodology uses a single phase implicit unsteady approach to obtain sediment bed shear stress values. Two moving boundary relations are employed, with one based upon an empirical correlation for critical shear stress and the other utilizing the slope of the sediment bed, to iteratively deform the sediment bed. This is accomplished by a user defined routine to move the sediment bed at each time step and a mesh morphing procedure to stretch the existing mesh to maintain cell quality throughout the flow domain. The computational methodology uses Python and Java macro scripts and implemented using Bash script in a LINUX environment. Simulation results are validated by comparison to experimental data found in literature.

Kutryb, Adam
Ancient trade and travel in northwest Pennsylvania: Exotic and local lithic distribution
Department of Anthropology
Research advisor: Professor Mark Mehrer
Paper presentation

This study examines archaeological sites along the Clarion River, southern Allegheny National Forest, northwest Pennsylvania, and to explain the archaeological distribution of local and exotic lithics in the wider area of western Pennsylvania. Its goal is to examine prehistoric trade and travel throughout the region in the context of local geography. This study compares the geographic distributions of locally available lithic materials to those of exotic lithics to determine which areas may have been served by trade and travel
routes. The study analyzes the specific raw material stone types and stone tool types from the study locations and compares these with the source and reduction of the lithic material. Geographic Information Systems (GIS) methods are used to calculate and visually display information, site distribution, and source to site relationships. This analysis seeks to understand how far an object may have traveled, from where prehistoric people were getting their materials, with whom they were possibly trading, and to present archaeological explanations of why people trade and travel. The results indicate that while some exotic objects traveled farther from their source than previously thought, a majority of local chert is found in the sites along the Clarion River and throughout the region and more sites with exotic lithics were located south of the river than north. Site distribution shows that regions south of the Clarion River have more evidence of trade or travel than the forest area north of the river.

Kutumbaka, Kirthi
The RNA esre is not essential for the survival of Escherichia coli
Department of Biological Sciences
Research advisor: Professor R. Meganathan
Paper presentation

Recently it was reported by Chen et al., 2012 that esre (“essential sRNA in E.coli”) is essential for the survival of E. coli. The esre is located within a three gene operon ubiE- yigP- ubiB involved in coenzyme Q (ubiquinone; Q) biosynthesis. The esre is 252 nucleotides long, located at the 3` end of the 606 nucleotide yigP gene. The esre was described as an essential RNA since the authors were unable to obtain mutants unless the esre coding region was present on a complementing plasmid. In contrast to the results of Chen et al., we were able to engineer deletion mutations of yigP as well as esre based on the method by Datsenko and Wanner. Both mutants displayed identical growth phenotypes to that of the ubiB mutant. These mutants were unable to grow aerobically on succinate as the sole source of carbon unless complemented by a plasmid containing yigP or esre in high copy or low copy plasmids. For the growth on succinate, the presence of Q is essential. In order to rule out the possibility of initiation of transcription from vector specific promoters, the genes were cloned into pSMART plasmid which has transcription terminators flanking the gene inserts, thus establishing that the transcription is from cloned promoters. HPLC analysis showed that all three mutants (yigP, esre and ubiB) accumulated the Q biosynthetic intermediate octaprenylphenol. QRT-PCR was performed on the wildtype, mutants and the complemented strains. The esre transcript was absent in the mutant strains, while the transcript was detected in the complemented and the wildtype strains. These results clearly establish that esre is involved in the first monooxygenase step of the aerobic Q biosynthetic pathway in conjunction with that of UbiB.

Madduri, Pransath
Thermo-Fluid Simulation Analysis of High Heat Flux Integrated Chip using Microjet and Micro-channel Liquid flow
Department of Mechanical Engineering
Research advisor: Professor Pradip Majumdar
Poster presentation

Demand for high performance liquid cooling of integrated chip structure is growing due to increased heat generation and heat flux associated with the miniaturized and higher density integrated circuits in chips used in number electrical and electronics devices. A combined integrated micro-jet and forced convection cooling of high heat flux integrated chip is considered in this study. The cooling scheme involves impinging jet convection followed by single or two-phase flow boiling convection through adjacent integrated microchannels. A computational fluid dynamics model will be developed to analyze the fluid flow and heat
transfer characteristics in terms of flow and temperature distributions, pressure drop, and convection heat transfer coefficients using STAR CCM+. A sensitivity parametric study will be conducted to explore the effect of microchannel geometry and size; nozzle size and number; and flow conditions.

**Manzoor, Fawwad**  
Process and Productivity Improvement at SPX Hydraulics Technology  
Department of Industrial & Systems Engineering  
Research advisor: Professor Purushothaman Damodaran  
Paper presentation

This research project was conducted at SPX Hydraulics Technologies at Rockford, IL. The objective of this project is to analyze the existing pump assembly lines and prescribe a line which is efficient and capable of increasing the line throughput to meet demand requirements. The project was organized with two phases. In phase one, data pertinent to the project, such as pump types, bill of materials, number of operations/operators, historical and forecasted demand, etc. were collected. By analyzing the data, the pumps were classified into families and the pumps which contribute close to 80% of the total sales was identified. The operation times for these pumps were later gathered through time studies for further analysis in the second phase. In the second phase, several alternative layouts for building multiple pumps on a single assembly line was developed. These assembly lines were later analyzed using a computer simulation model to choose the most efficient layout. Principles from group technology and mixed model assembly line balancing where used to develop the alternative layouts. Upon gaining confidence with the simulation model, various pumps were built on a pilot line to verify if the simulation results can be replicated in real life. This presentation will concisely illustrate the steps taken to improve the current assembly lines and the future layout which will be implemented to meet the steady growth in demand.

**Martens, Stacey**  
Calvo, Ana M.  
Role of rfeA gene in regulating secondary metabolism in the model fungus Aspergillus nidulans  
Department of Biological Sciences  
Research advisor: Professor Ana M. Calvo  
Poster presentation

Fungal secondary metabolites are compounds that are not directly involved in normal growth, development or reproduction but do serve a significant biological function. Some fungal secondary metabolites are biomedically important while others have detrimental effects, such as mycotoxins. The focus of this study involves the effects of the rfeA putative kinase gene on the production of the mycotoxin Sterigmatocystin (ST) in the model organism Aspergillus nidulans. Previous proteomics results suggested that RfeA might interact with VeA, a global regulatory protein that governs both development and secondary metabolism in numerous fungal species. Thin-Layer Chromatography (TLC) preliminary results show an increase in ST levels in deletion RfeA strains at 25° Celsius in light and dark conditions. These results indicate that RfeA is a negative regulator of ST biosynthesis. Additionally, an unknown metabolite that was not present in the wild-type and complementation-rfeA control strains was observed in the rfeA deletion strain at 37° Celsius under light while the opposite results were observed under dark conditions, indicating that the production of this compound is both rfeA-dependent and light-dependent.

**McElvey, Barbara E.**  
The relationship between educational resources and student achievement in Illinois
This dissertation examined the relationship between educational resources and student achievement in Illinois public schools. Illinois school districts were compared by type, size, and location. This study built on the premise that disparities exist in educational resources because of the state’s reliance on property taxes to fund education. Instructional expenditures per pupil were examined in dollars and by percentage of total budget as well as by total expenditures per pupil. District composite scores on the 2011 Illinois Standards Achievement Test (ISAT) and the Prairie State Achievement Examination (PSAE) were utilized for measures of student achievement. Analysis of variance and Kruskal-Wallis tests revealed significant differences in instructional expenditure per pupil in dollars and total expenditure per pupil among districts when compared by size, type, and location. Significant differences were also found in instructional expenditure per pupil by percentage of total district budget among school districts when compared by type and location. The logistic and multiple regressions identified district and student factors that predicted whether 85% of students in a school district met or exceeded expectations for the composite score on the 2011 ISAT and PSAE. The findings of this study advocate for effective allocation of educational resources because school finance policies in Illinois have continued to benefit some districts while disadvantaging others, affecting economically disadvantaged and racial/minority students the most.

Moran, Rachel
Mate choice copying in two species of darters (Percidae:Etheostoma)
Department of Biological Sciences
Research advisors: Professor Carl von Ende & Professor Bethia King
Poster presentation

Mate choice copying is a form of social learning that is defined as the increased likelihood of an individual choosing a particular mate after observing another individual choosing that mate. Mate choice copying has been demonstrated in a range of taxonomic groups, but within relatively few species within each group, particularly for both sexes. Mate choice copying experiments were performed here using two closely related sympatric species of darters, Etheostoma flabellare and E. zonale. In E. flabellare, males guard a nest site under a rock and care for developing eggs. In E. zonale, eggs are attached to filamentous green algae and neither sex provides parental care. Our results provide the first evidence that mate choice copying occurs in darters. Previously it was hypothesized that copying might be more common in species and sexes that provide parental care, the reasoning being that the costs of choosing poorly may be higher. However, mate choice copying was found in both sexes of E. zonale (no parental care) and in male but not female E. flabellare (male only parental care). Thus the only group that did not mate choice copy was the one whose mate would be providing care, and even E. flabellare females copy the mate choice of other females by some definitions. The relationship, if any, between which sex provides parental care and whether copying occurs remains unclear, and the number of species for which such data are available is limited.

Moya, Jose
The Use of Facebook to Enhance Hispanic Parental Involvement in Schools
Program in Educational Psychology
Research advisor: Professor Lee Shumow
Paper presentation

Schools found struggle to involve Hispanic parents in school life (Tinkler, 2002) Language barrier, different
beliefs about the role of teachers and parents, and, in some cases, mistrust have led many Hispanic parents to perceive schools as intimidating places. This pilot project aimed to break down schools’ walls to allow parents to see inside the classrooms via social networking. A closed groups Facebook account was created to provide a private environment for parents to view educational content and activities in two bilingual kindergarten classes in a predominantly Hispanic school in northern Illinois. A bilingual kindergarten teacher created closed Facebook group as for each of his two kindergarten sections; 14 out of 43 parents joined the Facebook groups. Parents were interviewed 52 days and one hundred fifty-one posts later. Three parents were interviewed in a focus group and eight parents answered questions through Facebook Messenger. Four teachers and the school principal also participated in face-to-face interviews. An e-mail with a short questionnaire was sent to the other 22 school staff members. Seven teachers responded. Analysis of all these data showed a mismatch between parents and teachers perceptions regarding the use of Facebook in the classroom. Whereas parents were enthusiastic about the use of these tools, expressing the wish that every teacher did the same; teachers manifested concern about the possibility that parents might criticize their work. The teachers also declared their worries about the lack of technological knowledge, time, and privacy issues involved. However, when possible solutions to these problems were provided, they still stated that they did not like the idea of implementing Facebook in their classrooms. This pilot project supports more extensive study in order to explore teacher’s skepticism about the use tools that bring more transparency in classrooms, as well as, to measure the impact in the students.

Neil, Matthew
GLI2 mediates CD40L expression in stromal cells
Department of Biological Sciences
Research advisor: Professor Sherine Elsawa
Paper presentation

Recent studies have established a role for the tumor microenvironment (TME) in tumor growth. Our lab has shown that the cytokine CCL5 can increase secretion of IL-6 via GLI2 transcription factor in the TME, highlighting a novel role for GLI2 in modulating cytokines. We hypothesized that GLI2 could regulate cytokines in the TME. Using stromal cells, we screened for cytokines that are differentially expressed in response to GLI2 by quantitative PCR and identified several cytokines that are increased including CCL2, CCL7 and CD40L. Using end-point PCR, we confirmed that overexpression of GLI2 increased CD40L expression in HS-5 and Saka stromal cells. GLI2 knockdown, using RNAi, resulted in a reduction of CD40L expression, suggesting GLI2 is required for CD40L expression. GLI2 protein contains an inhibitory domain near the N-terminus. Transfection of stromal cells with a GLI2 construct that lacks this inhibitory domain (GLI2 ΔN) resulted in increased CD40L expression beyond that of full-length GLI2. CD40L is expressed in a membrane bound and soluble forms. Enzyme-linked immunosorbent assay (ELISA) analysis showed that overexpression of GLI2 ΔN resulted in increased secretion of sCD40L. Bioinformatics analysis of the CD40L promoter identified 3 putative GLI binding sites. Future studies will investigate a direct interaction between GLI2 and CD40L promoter and determine the role of GLI2 in the expression of CD40L protein. CD40L has been shown to increase proliferation of malignant B-cells. Therefore, understanding the mechanism of regulation of CD40L in the TME may provide a novel therapeutic strategy for cancer patients.

Odino, Christine
Latinas self perception of worth based on L2 Proficiency (English) and the correlation to career progression in Corporate America
Department of Literacy Education
Research advisor: Professor James Cohen
Paper presentation
The focus of this paper is to examine the correlation between the self-imposed perception of non-worth or devalued worth for Latinas whom are native Spanish speakers and Second Language English speakers in corporate talent management succession planning. A recent trend has emerged in which identified high performing Latina candidates for advancement are electing not to accept a promotion nor ask to be promoted out of fear of their perceived weakness of their proficiency and comfort with English. As a result of this trend, Latina leadership and representation at higher levels of management are growing at slower rates than other ethnic groups and/or men. The research seeks to explore the fear surrounding the use of the second language and the disservice to both self and company that Latinas are creating by electing to not move their career forward on the basis of one factor: their second language.

Padilla, Marianella
Guo, Jingjing
Zhang, Quan
Evaluation of the relocation of a warehouse facility
Department of Industrial & Systems Engineering
Research advisor: Professor Reinaldo Moraga
Paper presentation

This project evaluated alternatives for the relocation of a warehouse in Caterpillar (Aurora, IL). The warehouse in question is located outside the campus of the company and the new, but smaller, space for the relocation is located in the facility with which the warehouse presents more interactions. An initial analysis to calculate space reductions due to the exit of a product line, the obsolescence of parts and the decrease on the inbound and outbound movements was conducted. Two layout alternatives were presented: one conservative alternative, keeping the standards of the previous location, and a more innovative alternative based on new vehicles, which offer the possibility of space reductions by using narrow aisles. Both alternatives were compared to the baseline scenario of staying in the same location in terms of space, flow, equipment and labor. In addition a simulation of the future campus flow congestion was depicted. The final results included a detailed qualitative and economic evaluation for each alternative. Furthermore, a sensitivity analysis related to the productivity and some relevant costs, was conducted based on the company’s concerns.

Pulvermacher, Robert
Voyles, Elora
Finkelstein, Lisa
Humor Resource Management: Gender, Humor, and Workplace Perceptions
Department of Psychology
Research advisor: Professor Lisa Finkelstein
Poster presentation

Do men enjoy humor with females as the butt of jokes? Do females dislike gender-disparaging jokes regardless of target? This study examined reactions toward gender disparaging jokes. Our research used a fictitious scenario where a new coworker overhears a coworker telling a gender-disparaging joke at a company party. Conditions varied by joke teller and target gender; reactions were measured using perceptions liking, respect, and anticipated interactional justice. Generally, we found preference for male disparaging humor and negative reactions to female disparaging humor. We found that female disparaging jokes were viewed negatively by both genders in terms of what they thought of the teller and their organization, which predicted their choice of humor style they’d implement if faced with that person in the future.
Rasmussen, Matthew
Boveri, Daiv
Wiemer, Katja
Clinton, James
Langley, Matthew

Activation of both Elderly Stereotype and Intent for Action: Do These Factors Influence Distance Perception?

Department of Psychology
Research advisor: Professor Katja Wiemer
Poster presentation

Many factors influence visual perception; level of fatigue, presence of chronic pain, as well as the presence of a weighted encumbrance (Bhalla, & Proffitt, 1999; Proffitt, Stefanucci, Banton, & Epstein, 2003; Witt, Linkenauger, Bakdash, Augustyn, Cook, & Proffitt, 2008). Such findings have given rise to the Effort Hypothesis (Proffitt, 2006), according to which distance, slant, and height perception are influenced by the amount of effort required to reach a target. Recently, these effects have been challenged, showing that effects disappear when demand characteristics are reduced (Durgin et al., 2009). In this study, we tested the effect of a very subtle manipulation, activation of a stereotype of the elderly, which has been shown to reduce walking speed (Bargh, Chen, & Burrows, 1996) and should thus go along with higher perceived effort. Accordingly, the Effort Hypothesis predicts that distance judgments are larger when primed with this stereotype. The 46 participants completed a sentence unscramble task which had 22 groupings of five scrambled words. Participants had to choose four words to construct a sentence. The elderly stereotype condition contained words that were indicative of traits, feelings, and places connected to an elderly stereotype (lonely & Florida), versus a neutral stereotype (happy & California). Participants then judged the distance to a cone that was located at the end (58 feet away) of a long hallway. The analysis revealed a significant difference (p < .05) between the distance estimates for stereotype activation. The geriatric stereotype condition estimated the cone as further (M = 50 ft) than participants who completed the neutral stereotype sentence unscramble task (M = 40 ft). The data from this experiment were consistent with the Effort Hypothesis, showing that even a very subtle manipulation influences distance judgments. A replication and extension investigating the effect of intent on distance perception is currently underway.

Reichle, Robert, Ph.D.
Tremblay, Annie
Coughlin, Caitlin
French-Mestre, Cheryl

Working-memory and nativelikeness in the processing of non-adjacent subject-verb agreement: An ERP study

Department of Foreign Languages & Literature

One major area of investigation in the second language processing literature is the extent to which language learners can process their second language in a native-like way. This study used the event-related potential technique to investigate the electrophysiological brain signatures (ERPs) of language processing among learners of French as a second language. We examined the relationship between participants’ working memory capacity and their ERPs indexed with the processing of verb agreement errors to address the following research question: Do second-language learners exhibit (near-)nativelike processing signatures in the second language for verb agreement violations, and are these processing signatures modulated by the length of the verb agreement dependency? 8 mid-to-high proficiency learners of French as a second language read sentences containing subject-verb agreement violations where the subject and verb were either adjacent to each other (Chaque vendredi, les cuisiniers *finit de travailler très tard ‘Each Friday, the cooks
Repeted-measures ANOVAs revealed significant effects of grammaticality 500-800ms after the presentation of the verb. The effect of grammaticality was stronger in the short-distance condition (i.e., when the subject is close to the verb) than in the long-distance condition (i.e., when the subject is distant from the verb). We also found positive correlations between the cloze test scores and the size of the grammaticality effect in the short-distance condition. These findings suggest the near-nativelike processing of L2 morphosyntax is possible, and that the length of the verb agreement dependency plays a role.

Roberts, Steven  
Chen, Shi-Jie (Gary)  
Lean Process Improvement for Medical/Surgical Unit in a Hospital  
Department of Industrial & Systems Engineering  
Research advisor: Professor Shi-Jie (Gary) Chen  
Paper presentation

This was a one-year lean process improvement project for medical/surgical unit in a local hospital, which focused on understanding four different types of system flows in the unit: patient flow, medication flow, work flow, and information flow. Data collection was done via direct observation (“shadowing”) of system flows as well as direct conversation/interview with the unit staff. These flows were documented by process mapping and value stream mapping to provide the unit staff with a clear visual representation of the entire unit and be able to see the places (with kaizen burst symbols on the map) where wastes were identified and further improvements were needed. The design and implementation of 15 kaizen events including an education/communication kaizen will be discussed.

Rodriguez, Aldo  
Hispanic middle-school students, their mindsets and their school performance: Finding from the I-MUScLE study  
Program in Educational Psychology  
Research advisors: Professor Lee Shumow & Professor Jennifer A. Schmidt  
Poster presentation

This presentation focuses on Hispanic middle school students’ ability beliefs. Theory and research agree that ability beliefs contribute to achievement and performance, and that those students who are explicitly taught how the brain works and how they can improve their learning can develop a growth mindset (belief that ability changes with learning and effort) and a mastery goal orientation, both of which are adaptive for learning (Dweck, 2008). The research question examined in this study is whether participating in a mindset intervention produced a measurable shift in Hispanic students’ initial mindset and their mastery goal orientation compared to the Hispanic students within the control. This study entails secondary analysis of data collected by the I-MUScLE (Incremental mindset utility for science learning and engagement) project which targeted seventh and ninth grade adolescents in their science classes. The Brainology™ program, a tool to teach students about the malleability of the brain, growth mindsets, and learning strategies, was implemented over a six-week period in seven science classrooms (two teachers’ classrooms) while seven other science classes taught by two other teachers served as controls. Preliminary findings indicate that the Hispanic students (n = 101) who participated in the intervention changed significantly more than the Hispanic students in the control group (n=77) in their beliefs about the malleability of intelligence and in their mastery goal orientation immediately following the intervention. At the follow up, however, they had fallen back to where they were before both in malleability beliefs and in mastery goals. There were teacher
effects within the Brainology program. The Hispanic students did better in one of the Brainology teacher’s classrooms than in the other and were less likely to decline over time in her classrooms than in the other teachers classrooms.

Rodriguez, Aldo
Promoting Uruguayan ESL students’ self-regulation through online learning
Program in Educational Psychology
Research advisor: Professor Hidetada Shimizu
Paper presentation

The use and importance given to technology in education around the world has been different in relationship to how these two fields have married and developed. Uruguay appears to be one of the most advanced Latin American countries in this field since it joined the One Laptop Per Child program in 2005. Computers have become an integral part of people’s lives. This new trend raised the awareness of everybody on how to make an effective use of them. An important question is whether educators can piece together education and technology in teaching their lessons. In my particular case, I am a Uruguayan English-as-a-Second-Language instructor, influenced by several methods associated with Content-based instruction. In 2010, I came to the US as a student so I needed to find an alternative to face-to-face teaching to continue teaching my Uruguayan students while I was attending classes here. Technology became the most appealing though challenging way to do it. The challenge was to redefine my teaching experience and the way I had seen education until that moment. The purpose of this presentation is to share how this initial conflict led me to innovation in education, a change in my perception toward education, and new ways to motivate my students to be more self-regulated. In 2012, with 16 students from a Public Uruguayan teacher-trainer institution, and I teaching English Language, Phonetics and Phonology and Methodology online from the US, we combined face-to-face lessons on Skype or Google Hangout with the use of Educational Platforms such as Edmodo, and new software, for them, like IPA Typewriter. Communication with the students was 24/7 and received immediate feedback. This project was evaluated by the students, the authorities, and me in a very positive way and some changes have been introduced for the 2013 implementation.

Rupp, Kathryn
Blaum, Dylan
Higgs, Karyn
Wallace, Patricia
Britt, M. Anne
Effects of Causal Chains on Memory for Expository Texts

Prior research has investigated the effects of causal connectors on readers’ memory for causal explanations within expository texts such as how we interpret pain signals or how stalagmites are formed (Millis, Graesser, & Haberlandt, 1993; Millis, Morgan, & Graesser, 1990). It was found that even short expository texts are challenging and connectors did not significantly increase memory. This lack of effect suggests that students need training to improve their sensitivity to connectors in causal explanations. The current research tests whether a short tutorial will improve students’ memory for explanations of a scientific phenomenon. University students were randomly assigned to either an experimental group (given the tutor before reading the documents) or a control group (given the tutor after completing all measures). The tutorial taught students to carefully attend to language indicating on the key causal elements and how they are related. In addition to instruction, the tutorial also provided practice with feedback. The memory task required participants to read four short expository texts. Each text was a paragraph that described a natural process or mechanism (e.g., supernova, water purification process). After reading all texts, participants were
given the titles and asked to list the causal information from each text. We found that the experimental group had significantly better surprise recall for the explanations than the control group, confirming that the tutorial was effective in helping students represent explanatory texts. We are now expanding the tutorial to help students understand explanations across multiple documents and testing the effectiveness of this expanded tutorial with an essay task rather than a memory task.

Rusnak, Elizabeth
Halas, Courtney
Mounts, Nina
Zebracki, Kathy
Ackman, Jeffrey
Severity of Limb Differences and its Effect on Adolescent Adjustment
Department of Psychology
Research advisor: Professor Nina Mounts
Poster presentation

Existing research studies suggest that adolescents with limb differences and deficiencies are at a greater risk for depression, anxiety, and lower self-esteem. Given the importance of social relationships at this stage in life, adolescents with limb differences likely experience significant social challenges as well. This poster will address several questions. First, what is the relationship between the severity of the limb difference and adolescents’ loneliness and internalizing problems? Second, what is the relationship between the severity of the limb difference and adolescent’ experience with teasing? Third, does teasing from peers mediate the relationship between severity of limb difference and loneliness? Finally, does teasing from peers mediate the relationship between severity of limb difference and internalizing problems? Participants were 39 adolescents (54% female, 46% male) between the ages of 11 and 17 (mean age of 14.21 year) with limb differences and their parents. The majority of the sample was Caucasian with an average yearly family income between $30,000-$40,000. The adolescents were patients at a specialty orthopedic hospital. Results suggest that higher severity of limb difference, as reported by adolescents and parents, was related to higher levels of loneliness as reported by adolescents. Higher severity of limb difference, as reported by adolescents and parents, was related to adolescents reporting higher levels of being teased. Higher levels of teasing from peers mediated the relationship between the severity of the limb difference and loneliness. Teasing from peers also mediated the relationship between the severity of the limb difference and the degree of internalizing problems. The results suggest that the degree of disability in children with orthopedic conditions may be related to the relationship that they have with their peers. The relationship with peers may be related to the higher levels of stress and internal adjustment problems that are experienced by this group of children.

Salaam, Braima
Parental Consulting About Adolescents’ Peers Moderates the Relation Between Social Anxiety and Depression
Department of Psychology
Research advisor: Professor Nina Mounts
Poster presentation

Parental consulting relating to peer relations, social anxiety, peer support and depression was observed among ninety-eight (98) adolescents from predominantly White and intact families, aged between 10-18 (M=15.46years) in arts and science summer camps at a large Midwestern University. Three questions were raised in the study; How are consulting and social anxiety related to depression and peer support? Are
the effects of social anxiety on depression and friend support moderated by consulting? Is the interaction on depression mediated by friend support? A path model using hierarchical regression analysis indicated that higher levels of social anxiety was related to higher depression rates, and higher levels of consulting was related to low levels of depression and higher friend support. Highly anxious adolescents had lower depression levels when parents utilized parental consulting, and adolescents with higher anxiety enjoyed high peer support when consulting was employed to manage peer relations. The mechanism through which adolescent social anxiety and parental consulting interacted to affect the level of depression among adolescents occurred through peer support.

Segundo, Vanessa
Developing Education Centered Communities through Language and Cultural Sensitivity: Latino Parent University
Latino Resource Center
Research advisor: Emily Prieto
Poster presentation

The objective of this investigative project was to examine strategies used to engage non-native English speaking parents that self-identified as Latino and participated in Latino Parent University in District 131 in Illinois. Despite Latino students’ high academic aspirations, they continue to be underrepresented in four year colleges and universities. Research has indicated that outreach programming targeting Latino families that focuses on visibility, cultural sensitivity, and language comprehension increase parental involvement in Latino students’ post secondary aspirations. A close out survey and focus group were conducted at the end of the ten week program, translated from Spanish to English, and interpreted via simple descriptive statistics and content analysis. It was anticipated that participants would benefit from Spanish-only curriculum and instruction and would assist in developing their knowledge regarding school and community resources relating to post secondary opportunities for their student(s). Currently, all data collected is being used as supporting evidence for external funding and grant proposals for various campus offices at Northern Illinois University and serve as recommendations for student recruitment and enrollment policies.

Skills, Kristin
Schwartz, John
Caputo, Annie
Examining factors that Influence Science Anxiety and Coping Behaviors in High School Freshmen
Program in Educational Psychology
Research advisors: Professor Lee Shumow & Jennifer A. Schmidt
Poster presentation

Extant data from the IMUScLE project was used to investigate the relationship between fixed and growth mindset orientation and self-reported science anxiety and coping behaviors in a sample of freshman students in integrated science courses. Previous research indicates that incremental mindset is related to resilience factors that can help students when they experience social or academic adversity and may relate to increased academic achievement over time (Yeager & Dweck, 2012). Studies have indicated that female (Brownlow, Jacobi & Rogers, 2000) and minority students (Gillen-O’Neel, Ruble & Fuligni, 2011) exhibit increased levels of academic anxiety compared to their peers. The current study seeks to investigate the relationship between gender, ethnicity, learning environment, and mindset orientation and measures of science anxiety and coping behaviors. Freshman students (n=174) at a suburban high school completed self-report measures assessing student mindset orientation, science anxiety, and coping behaviors. Results indicated that gender and mindset orientation are significantly related to science anxiety and various coping behaviors. Ethnicity
was not significantly related to science anxiety, but was related to relaxing as a coping behavior. Learning environment was not shown to be significantly related to science anxiety or coping behaviors. Future research and potential applications for programming are discussed.

**Smith, Timothy**  
**Calvo, Ana M.**  
Study of the MtfA Transcription Factor in the Fungal Pathogen Aspergillus fumigatus  
Department of Biological Sciences  
Research advisor: Professor Ana M. Calvo  
Poster presentation

The ubiquitous fungus Aspergillus fumigatus is the leading causative agent of aspergillosis in immunocompromised patients. With new therapies being developed that result in suppressed immune systems and the increase in HIV cases, aspergillosis infections, with an associated high mortality rate, are becoming more frequent. This study involves the functional characterization of A. fumigatus mtfA, a gene encoding a master transcription factor, and assesses its potential as a genetic target to control the detrimental effects of this fungus. In the model fungus Aspergillus nidulans the mtfA ortholog has been shown to play a role in morphogenesis and secondary metabolite production in our laboratory. It is likely that mtfA might control virulent factors necessary for infection in A. fumigatus. In our current study, mtfA deletion, over-expression, and complementation strains were generated in A. fumigatus. Preliminary results have shown that fungal growth is reduced in both deletion and over-expression strains with respect to the control strains, suggesting that wild-type levels of mtfA are required for proper hyphal growth. Tagging mtfA with gfp (encoding a green fluorescent protein) showed nuclear localization of the transcription factor MtfA. Changes in hydrolytic activity have been also associated with pathogenicity. Deletion of mtfA has shown notably reduced levels or protease activity compared to the wild type, while over-expression showed an increase in this enzymatic activity. These results indicate that mtfA is a positive regulator of protease activity in A. fumigatus. In addition, preliminary data has revealed that gliotoxin production was increased when mtfA was over-expressed, indicating a positive role of mtfA in the biosynthesis of the mycotoxin, a known virulent factor.

**Srygler, Robert**  
Association of DRG Proteins with Heat Shock Granules in Heat-Stressed Arabidopsis thaliana  
Department of Biological Sciences  
Research advisor: Professor Joel Stafstrom  
Poster presentation

DRGs are highly conserved GTP-binding proteins (G proteins) that are not well understood. G proteins are usually involved in signal transduction, being activated by GTP. Archaea have one Drg gene, and all studied eukaryotes have at least one representative of the Drg1 and Drg2 orthologous groups. Arabidopsis has 3 Drg genes. DRG proteins interact with DFRPs. In several instances, absence of a DFRP leads to reduced accumulation of its DRG binding partner, and vice versa. This work used Arabidopsis thaliana vegetative tissue to continue the biochemical work previously done with pea root tips. Arabidopsis is a valuable resource, being a fully sequenced organism with many available genetic mutants. DRGs are found in large cytoplasmic granules following heat stress. These are believed to be heat shock granules (HSGs), which contain small heat shock proteins (sHSPs). Previous experiments were modified to study the DRG-associated granules in Arabidopsis. The granules, and associated DRGs and sHSPs, were fractionated by low g-force centrifugation and analyzed in the various mutant lines of knockouts for DRGs and DFRPs following various durations of heat stress and recovery. Heat-induced accumulations of sHSPs and
DRGs were pelletable at low centrifugal force, but were found in the supernatant after a recovery period. The large structures that allow the proteins to co-fractionate in the low g- pellet are believed to be HSGs. The sHSPs were able to be pelleted in the heat-stressed tissues from mutant lines, indicating that HSGs form despite the absence of these genes. The loss of DRG function in the drgl,drg2 mutant is possibly being rescued by the heat stress, which increases the normally low-expressed DRG3 mRNA 1000X that of normal levels. To further understand the function of DRGs, the third Drg gene will need to be knocked out.

Steffens, Brent
Britt, M. Anne
Wiley, Jennifer
Blaum, Dylan T.
Griffin, Thomas D.
Learning in History: Tasks that improve learning from multiple documents
Department of Psychology
Research advisor: Professor Anne Britt
Paper presentation

Learning from history requires students to compare different sources that may have conflicting explanations of events; however, students have difficulty doing so spontaneously (Britt, & Aglinskas, 2002; Rouet et al., 1996; Wineburg, 1991). Tasks must be constructed carefully because they will guide relevancy decisions, which in turn will decided what information will be deeply processed and integrated (Rouet & Britt, 2011). De La Paz and Felton (2010) have used take-a-side prompts to increase engagement in writing in history. One potential drawback to using a take-a-side task is that it could lead to selective learning from the documents (Nickerson 1998). 63 college students and 143 7th graders read nine documents about the Panamanian Revolution of 1903. Students read to either take-a-side on Theodore Roosevelt’s responsibility or to explain-the-perspectives of the different groups. The 7th graders also received a reading activity: identify the motives and actions of different groups involved, to identify important factors that caused the revolution, or to closely read the documents (underline, highlight, and summarize). After completing the essay, students rated their interest, completed a cued recall, and an inference test. Undergraduates prompted to explain-the-perspectives scored higher on the inference test than those prompted to take-a-side (F(2, 63) =3.43, p < .05). In contrast, the 7th graders performed better on the inference test when prompted to take-a-side while closely reading (F(2, 125) =3.82, p < .05). There were no differences in interest and motivation for either group of participants. We are currently analyzing the essay and recall data for coverage of important concepts. We concluded that older students benefit most from a more complex reading and writing task (e.g., explain the perspectives) while younger benefit most from a more focused task (e.g., take a side). Learning from history requires students to compare different sources that may have conflicting explanations of events; however, students have difficulty doing so spontaneously (Britt, & Aglinskas, 2002; Rouet et al., 1996; Wineburg, 1991). Tasks must be constructed carefully because they will guide relevancy decisions, which in turn will decided what information will be deeply processed and integrated (Rouet & Britt, 2011). De La Paz and Felton (2010) have used take-a-side prompts to increase engagement in writing in history. One potential drawback to using a take-a-side task is that it could lead to selective learning from the documents (Nickerson 1998). 63 college students and 143 7th graders read nine documents about the Panamanian Revolution of 1903. Students read to either take-a-side on Theodore Roosevelt’s responsibility or to explain-the-perspectives of the different groups. The 7th graders also received a reading activity: identify the motives and actions of different groups involved, to identify important factors that caused the revolution, or to closely read the documents (underline, highlight, and summarize). After completing the essay, students rated their interest, completed a cued recall, and an inference test. Undergraduates prompted to explain-the-perspectives scored higher on the inference test than those prompted to take-a-side (F(2, 63) =3.43, p < .05). In contrast, the 7th graders performed better on the inference test when prompted to take-a-
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Van Dusen, Erik  
Fluid Compartmentalization in Narrowly Tapered Orogenic Wedges  
Department of Geology & Environmental Geosciences  
Research advisor: Professor Mark Fischer  
Poster presentation

On a regional scale, the internal structure of an orogenic wedge plays a key role in hinterland-to-foreland fluid flow. In addition to widespread matrix flow, fluid movement occurs along bedding planes and through fractures. As large-scale faults form they can channelize or impede fluid flow, potentially compartmentalizing fluids, and altering their distribution within an orogenic wedge. This redistribution may influence the size and location of hydrocarbon accumulations and ore deposits in an orogenic wedge and adjacent foreland basin. Although we have considerable knowledge of fluid systems in orogenic wedges with higher taper angles ($> 8^\circ$), we have little understanding of fluid compartmentalization and fluid system evolution in wedges with thin geometries ($< 4^\circ$) and fewer faults. This project seeks to fill this gap by documenting paleofluid system along a transect through the Jura Mountains of France and Switzerland. I used geochemical and structural analyses of calcite veins to constrain paleofluid origin, migration, and compartmentalization. Calcite veins categorized into bed parallel, strike, and strike oblique orientations were subjected to petrographic, stable isotope, and trace element analyses. Isotopic and trace element analysis of the veins is consistent with an open fluid system with multiple periods of hydraulic conductivity. $\delta^{18}O$ and $\delta^{13}C$ values in vein calcite are shifted away from host rock calcite, and suggest multiple generations of externally derived fluids. Divergences between Fe/Sr ratios between host rock and vein samples along the transect likewise document multiple external fluid sources. Higher Fe/Sr vein values from the foreland region, when compared to values from hinterland veins, suggest different fluid sources for these regions of the Jura. These external fluids entered the system along fractures and faults and had little time to equilibrate with formation fluids contained within the orogenic wedge.

Versal, Sharon  
Natural attenuation of three antibiotics in the Fox River, Kane County, Illinois after discharge from a wastewater treatment plant  
Department of Geology & Environmental Geosciences  
Research advisor: Professor Melissa Lenczewski  
Poster presentation

Pharmaceuticals and Personal Care Products [PPCPs] is a term used to refer to all drugs and consumer chemicals including prescription drugs, over the counter medications, skin preparations (i.e. retinoids, sunscreens, etc.), veterinary medications, and fragrances (musk). PPCPs have recently come to the attention of the scientific community because they have been found in the environment and in trace amounts in drinking water. Few studies have confirmed the breakdown of PPCPs in the environment; if PPCPs are broken down by biodegradation, hydrolysis or photolysis this may be difficult to confirm as they are continuously added to the environment by wastewater treatment plants, surface run-off from confined animal feeding operations, windborne drift from agricultural applications and pet excreta (Daughton, 2001). Of particular concern to human health and aquatic life are antibiotics; the effect of these chemicals on aquatic life and in drinking water at lower than therapeutic doses over extended periods of time is not well known.
In addition, antibiotics found in the environment may contribute to selective antibiotic resistance in bacteria; potentially leading to antibiotic resistant strains of bacteria making bacterial infections more difficult to treat in the future (Kim et al., 2011). Currently, there are no monitoring regulations for PPCPs in the United States (Daughton, 2001). While some removal from human waste is achieved with tertiary treatment at a wastewater treatment plant prior to disposal in receiving waters, there are no specific processes used to remove antibiotics. The purpose of this project is to determine if natural attenuation (volatilization, sorption, biodegradation, photolysis, dispersion & dilution) in the Fox River, Kane County, Illinois reduces the concentrations of Azithromycin, Amoxicillin, and Cephalexin monohydrate, the most prescribed antibiotics in the United States (Center for Health Care Research & Transformation, 2011).

Vodnala, Preeti
Lurio, Larry
Ross, Steve
Development of a Fast Strip Readout X-Ray sensor
Department of Physics
Research advisor: Professor Larry Lurio
Poster presentation

This project aims at designing a fast linear strip x-ray detector optimized for x-ray photon correlation spectroscopy (XPCS) measurements. This detector will provide readout 1000x faster than current strip or area detectors and 256x more solid angle than equivalent point detector systems. Twenty four bunch mode, 153 ns camera readout will be achieved by coupling every pixel to its own lower level discriminator circuit using an application specific integrated circuit (ASIC), and through real-time data compression using circuit board digital logic. The ASIC will be fabricated in AMI Semiconductor’s 0.5μm C5 process. The custom silicon sensor will be fabricated at NIU’s Microelectronics Research and Development facility.

Vobornik, Erin
Application of split-scope to non-Germanic languages
Department of English
Research advisor: Professor Gulsat Aygen
Paper presentation

Split scope occurs when an indefinite and negation take scope independently of each other. Zeijlstra (2011) shows that Dutch, German, and English allow split scope readings because they are Double Negation languages and have negative indefinites (e.g. nothing). Zeijlstra presents an influential new theory, but the scope of the study is focused on languages within the Germanic language family. I apply Zeijlstra’s split scope framework to non-Germanic languages such as: Azerbaijani, Czech, Macedonian Albanian, Persian, Polish, and Turkish. Of the languages tested, Azerbaijani, Czech, and Turkish allow for split scope readings. Using the same split scope examples from (Zeijlstra 2011), I asked for transliterations of the sentences therein from a native speaker of my target language. Iatridou and Sichel (2010) clarify that only deontic models lead to split scope readings, thus I introduced the participants to sentences including both epistemic and deontic modals. In (1), the Azerbaijani data show an aversion to the wide scope readings in which the negation and modal have the most distance between them. I present two findings: split scope is a parametric variation, and modality conditions of the language families lead to split scope. Split scope does in fact occur outside of West-Germanic languages, counter to the hypothesis proposed in (Zeijlstra 2011), but is subject to parameters imposed by modality and the specific treatment of negation in each language family represented.
Wambu, Grace
School Counselors’ Perceptions of Their Academic Preparation and Training Needs: A Kenyan Study
Program in Mental Health Counseling
Research advisor: Professor Teresa Fisher
Poster presentation

The role of the school counselor has remained a contentious issue and a subject of debate among counselor educators and the recipients of school counseling services. This role ambiguity is not unique to school counseling in the United States. School counseling in Kenya is a relatively new profession. To date, the role of the school counselor is unclear and questionable. Although currently most Kenyan schools have a trained school counselor on staff, some schools have a “counselor” with no formal training. Research shows that there is a correlation between the adequacy of training and effective performance of counselor roles. For the school counselors to effectively address the needs of the students, they require to be adequately prepared. This exploratory study sought to examine the perceptions of Kenyans school counselors regarding the adequacy of their academic training relative to their roles performance. A total of 105 practicing school counselors were involved in the study. The study employed a survey design. The purpose of this presentation is to share results of a dissertation study exploring Kenyan school counselors’ perceptions of their academic preparation and training needs. Attendees will also learn about counselor education and training in Africa and draw parallels between the challenges facing school counselors in Kenya and in the United States.

Zack, Carrie
How an American Cultural Model of Shyness May Limit Our Interpretations of and Reactions to Shy Behavior and Contribute to Negative Outcomes for Shy Students
Program in Educational Psychology
Research advisor: Professor Hidetada Shimizu
Paper presentation

In the psychological and education literature, shyness has been linked to a number of negative academic, social, psychological outcomes including lower grades, skipping school, few and low quality friendships, peer rejection (Greco and Morris, 2001; Rubin, Bowker, and Gazelle, 2010), low self-esteem, loneliness, depression and social anxiety disorder and substance abuse (Greco and Morris, 2001; Kagan, 2000). However, some research suggests that shy students in China may not be at increased risk of these negative outcomes and that shyness may even be associated with positive outcomes such as peer acceptance, positive teacher perceptions, and school leadership positions. It has been suggested that different meanings associated with shyness in Chinese culture (in comparison to the Western cultures in which most shyness research has been conducted) can account for some of these differences in outcomes (Chen, 2010; Chen and Rubin, 1999). The current study is a step toward understanding the assumptions underlying the ways in which Americans make sense of and react to shyness (American cultural model of shyness) and how this may be related to negative outcomes for shy students. Data for this study consisted of transcripts from semi-structured interviews with five American graduate students in Educational Psychology, School Psychology, and Clinical Psychology programs. I asked each of them to describe shy students they knew in high school, middle school, and elementary school. Using cultural model theory (D’Andrade, 2005), I analyzed the interview transcripts and found that even though these students were consciously aware of at least two different theories of shyness, they seemed to apply only one of these models in making sense of the behavior of shy students they knew, even when the other model may have fit better with their own observations. These findings and there implications for shy American students will be discussed.
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