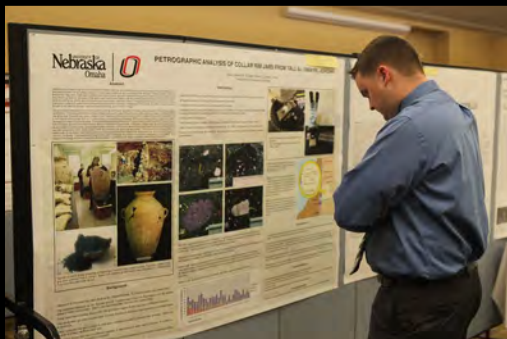


5th Annual Student Research and Creative Activity Fair



UNIVERSITY OF
Nebraska
Omaha



Final Proceedings
March 8, 2013

Dear UNO Community and Friends,

The 5th annual Student Research and Creative Activity Fair was a resounding success and a highlight of the year for the entire campus. Participation in this year's Fair reached an all-time high as 172 talented and motivated undergraduate and graduate students showcased their research and creative activity. Their presentations and displays were inspiring examples of the wealth of knowledge, inspiration, and talent that make up the UNO community. The student participants and their faculty mentors have my sincere thanks for their participation in the Fair. The world awaits their continued contributions to knowledge, community service, and artistic endeavors.

This event would have been impossible without the invaluable contributions of UNO faculty and staff. Our session moderators – Paul Davis, Chris Decker, Angela Eikenberry, Griff Elder, Jeffrey French, Neal Grandgenett, Jeanette Harder, Alan Kolok, Ken Kriz, Harmon Maher, Sara Myers, and Dana Richter-Egger — kept the event running smoothly, and challenged the students with insightful questions. Mary Laura Farnham, Nancy Schlesiger, Mike Mohatt, Beth White, Stacy Newmaster, Catie Miller, and Ana Cathcart of the Office of Research and Creative Activity assisted generously with logistics and encouragement. Special thanks go to Wendi Jensen of ORCA who was the motivational force behind this celebration and the linchpin of its success.

Community support is vital to the mission of any university and is especially important to UNO and its role as a metropolitan university. Our judges volunteered their time and talents and were rewarded by interacting with an amazing group of students. Our thanks go to judges Rhonda Ahrens, Physicians Mutual; Ellie Archer, Women's Fund of Omaha; Adam Case, University of Nebraska Medical Center; Lee Denker, UNO Alumni Association; Charles Fritch, Fritch Eye Care Medical Center; Adam Haeder, AIM Institute; Matt Hammons, University of Nebraska; Kristina Haynie, Project Harmony; Brian Henkel, Papio-Missouri River Natural Resources District; Jef Johnston, Avenue Scholars Foundation; Tim McIvor, Omaha Public Power District; Todd Morris, PayPal; Wendy Patterson, The Salvation Army; Steve Schreiner, UNeMed – University of Nebraska Medical Center; Marty Skomal, Nebraska Arts Council; Bill Snyder, Peru State College; Grant Stanley, CAN (Contemporary Analysis); Paula Turpen, University of Nebraska Medical Center; and Scott Tylski, ConAgra Foods, Inc.

A final thanks to all those colleagues, family, and friends who came to watch and learn at this year's celebration. I'm certain that you were as impressed by this collection of scholarship as was I and that you share my belief that our students are full partners in the present and future of research and creative activity at UNO.



Sincerely,

A handwritten signature in black ink that reads "Scott D. Snyder". The signature is fluid and includes a long horizontal stroke at the end.

Scott D. Snyder
Associate Vice Chancellor

UNIVERSITY OF NEBRASKA AT OMAHA

5TH ANNUAL STUDENT RESEARCH AND CREATIVE ACTIVITY FAIR

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AT A GLANCE:

- 172 projects
- 75 undergraduate students
- 97 graduate students
- Participation from all 6 UNO colleges
- 48 departments represented
- 84 faculty advisors



The Student Research and Creative Activity Fair is administered by the Office of Research and Creative Activity at UNO and was made possible through the generous support of the Office of Sponsored Programs and Research and the Office of Academic and Student Affairs.



SCHEDULE OF EVENTS

7:30 AM - 9:00 AM	Poster Set-up and Install, Check in for Participants	Ballroom and Nebraska Room
9:00 AM - 12:00 PM	Poster Presentations/Exhibits Oral Presentations/Performances	Ballroom and Nebraska Room Council, Dodge, Gallery and Omaha Rooms
12:00 - 1:00 PM	Lunch Provided for All Student Participants, Faculty Advisors, and Judges	Ballroom
1:00 PM - 4:00 PM	Poster Presentations/Exhibits Oral Presentations/Performances	Ballroom and Nebraska Room Council, Dodge, Gallery and Omaha Rooms

FACULTY MODERATORS

Paul Davis, Biology
 Chris Decker, Economics
 Angela Eikenberry, Public Administration
 Griff Elder, Mathematics
 Jeffrey French, Psychology
 Neal Grandgenett, Teacher Education
 Jeanette Harder, Social Work
 Alan Kolok, Biology
 Ken Kriz, Public Administration
 Harmon Maher, Geology/Geography
 Sara Myers, HPER
 Dana Richter-Egger, Chemistry



2013 FAIR JUDGES

Community representatives donated their time and expertise to help evaluate the student presentations. Our gratitude to:

Rhonda Ahrens	Physicians Mutual
Ellie Archer	Women's Fund of Omaha
Adam Case	University of Nebraska Medical Center
Lee Denker	UNO Alumni Association
Charles Fritch	Fritch Eye Care Medical Center
Adam Haeder	AIM Institute
Matt Hammons	University of Nebraska
Kristina Haynie	Project Harmony
Brian Henkel	Papio-Missouri River Natural Resources District
Jef Johnston	Avenue Scholars Foundation
Tim McIvor	Omaha Public Power District
Todd Morris	PayPal
Wendy Patterson	The Salvation Army
Steve Schreiner	UNeMed - University of Nebraska Medical Center
Marty Skomal	Nebraska Arts Council
Bill Snyder	Peru State College
Grant Stanley	CAN (Contemporary Analysis)
Paula Turpen	University of Nebraska Medical Center
Scott Tylski	ConAgra Foods, Inc.





2013 FAIR AWARDEES

UNDERGRADUATE ORAL PRESENTATIONS/PERFORMANCES

Best

CECILIA JENSEN

Dreams or Dots: Reimagining the Coexistence of Text and Music
Major: Music Performance - Strings
Faculty Advisor: Roger Foltz

Outstanding

ANDREW JEZEWSKI

Identification and characterization of a genetic motif that causes life-long infection of a brain liquefying parasite
Major: Biotechnology
Faculty Advisor: Paul Davis

Meritorious

LUCAS HARRISON

Agricultural Runoff in the Elkhorn River: Is Fate Bound to Vegetation?
Major: Biotechnology
Faculty Advisor: Alan Kolok
Co-Authors: Lindsey Knight, Racine Rangel

Meritorious

DANIELLE HOECHNER

Open Minds: Enhancing Preteacher Diversity Experiences
Major: Teach English to Speakers of Other Languages
Faculty Advisor: Sarah Edwards

UNDERGRADUATE POSTERS/EXHIBITS

Best

ANGELA BURGETT

Evaluation of Meso-Scale Topographic Effects on Glaciers in the Western Himalaya of Pakistan
Major: Geology
Faculty Advisor: John Shroder
Co-Authors: John Shroder, Michael Bishop

Outstanding

AMY KILE

Spoken novel word productions across 2-year-olds with varying language skill proficiencies
Major: Pre-Speech Pathology
Faculty Advisor: Shari DeVeney
Co-Authors: Jennifer Morris, Shari DeVeney

Meritorious

LEANNA KEITH

The Themes of Rimsky-Korsakov's Russian Easter Festival Overture
Major: Music Performance - Woodwind
Faculty Advisor: Barry Ford

2013 FAIR AWARDEES

GRADUATE ORAL PRESENTATIONS/PERFORMANCES

- Best** **KATHRYN DEMPSEY**
A computational Model for Identifying Causative Genetic Relationships using Biological Networks and Gateway Nodes
Major: Bioinformatics
Faculty Advisor: Hesham Ali
-
- Outstanding** **JOSHUA LARSON**
Evaluation of the therapeutic value of two drug-like compounds for clearing human infections using the mouse model
Major: Biology
Faculty Advisor: Paul Davis
-
- Outstanding** **AARYN MUSTOE**
Care to share? Exploring the relationship between altruism and oxytocin in marmosets
Major: Psychology
Faculty Advisor: Jeffrey French
-
- Meritorious** **DANIEL LEIB**
Acute Improvements in elderly gait with a structured auditory stimulus
Major: Exercise Science
Faculty Advisor: Sara Myers

GRADUATE POSTERS/EXHIBITS

- Best** **EMILY HANIGAN**
Translating Research to the Community: Can a community-based book club increase physical activity among women long-term?
Major: Health, Physical Education and Recreation
Faculty Advisor: Jennifer Huberty
Co-Authors: A. Weddle, D. Ehlers, Jennifer Huberty
-
- Outstanding** **TRIPARNA DE VREEDE**
Effect of Shared Mental Models on Consensus
Major: Psychology
Faculty Advisor: Roni Reiter-Palmon
-
- Meritorious** **ALEK DIFFENDAFFER**
Patients with peripheral arterial disease exhibit greater toe clearance than healthy controls
Major: Exercise Science
Faculty Advisor: Sara Myers
Co-Author: Troy Rand
-
- Meritorious** **BRENT HASSENSTAB**
Proteolytic Gene Response to Exercise and Temperature
Major: Exercise Science
Faculty Advisor: Dustin Slivka
Co-Authors: Matt Heesch, William Goodenkauf, Landon Zuehlke, Dustin Slivka
-
- Meritorious** **JAY PEDERSEN**
Malware Analysis assisted by Bioinformatics Tools
Major: Bioinformatics
Faculty Advisor: Dhundy (Kiran) Bastola
Co-Authors: Dhundy Bastola, Ken Dick, Robin Gandhi, William Mahoney
-
- Meritorious** **ALLISON LAURITSEN**
Motivating At-Risk High School Students to Achieve: The Relationship Between Race and Hope
Major: Social Work
Faculty advisor: Jeanette Harder

ABSTRACTS

UNDERGRADUATE

LAURA ALLEN

Undergraduate

Systems Analysis of Signal Transduction Networks through R-Based Programming

Major: Biology

Faculty Advisor: Tomas Helikar

Signal transduction is where external signals stimulate several biochemical pathways and result in a cellular response. Anomalies within these pathways can greatly affect a cell's function and can result in disease. Approaching these anomalies from a systems approach means studying the cell as a whole rather than its constituents in isolation. Computer models have been used to study complex biological/biochemical processes, including signal transduction networks because of their ability to be simulated under thousands of environmental conditions, including diseased states, which can result in novel and improved drug targets. My research focuses on how single mutations within a network affect it as a whole. The goal is to identify potential drug targets not previously considered. To accomplish this, I have written an R program that analyzes models simulated under healthy and hundreds of mutagenic conditions, where each component within the model is either permanently activated or inactivated to simulated pathogenic mutations. The power behind this program lays in its ability to rapidly analyze high activity areas of any model, specifically, components that are most influential or most often affected on the model. At this time, the fibroblast cell network has been analyzed under growth, death, motility, and quiescence conditions. Results have indicated that if mutated permanently inactive, most influential nodes typically are embryonic lethal, while most influential and most often affected nodes when mutated active are unique to the model's external conditions. The insights these results provide have the capability of new explorations in more effective drug therapies.

JACOB ANDERSON

Undergraduate

Using tracks to correlate the Nugget Sandstone Formation of Dinosaur National Monument, Utah

Major: Geology

Faculty Advisor: George Engelmann

The Nugget Sandstone Formation, in northeastern Utah has been considered to be Early Jurassic in age. Large-scale cross-bedded eolian dune sands characterize the Nugget. But the lower part of the Nugget consists of sediment that seems fluvial in origin, indicating a drastically different depositional environment than the higher, eolian-dominated sands. Ichnofossil localities with trackways that have been identified as the ichnotaxon *Brachychirotherium* have been found in and around Dinosaur National Monument. *Brachychirotherium* is characterized as a quadrupedal trackway with manus (hand), and pes (foot) tracks in which the pes bears a distinctive toe claw. The aetosaur *Typothorax coccinarum* has been proposed as the trackmaker of the *Brachychirotherium* tracks. *Brachychirotherium* has been considered to indicate a mid to Late Triassic age. If the lower unit of the Nugget Sandstone can be shown to be Late Triassic in age, its relationship to the Glen Canyon Group and the underlying Chinle Group in the Colorado Plateau region to the south can be better resolved.

KRISTI APA

Undergraduate

Structural changes in the nucleus of the solitary tract following chorda tympani nerve cut in young rats

Major: Neuroscience and Psychology

Faculty Advisor: Suzanne Sollars

Taste buds convey sensory information to the brain via the chorda tympani nerve (CT). The CT transmits taste information from the anterior two-thirds of the tongue to the nucleus of the solitary tract (NTS). The NTS is the central first relay station where sensory information about taste is communicated to neurons in the

brain. Previous research conducted to investigate the effects of chorda tympani transections (CTX) revealed plasticity of the sensory system for taste, the gustatory system. CTX surgeries are useful as they enable examination of CT functionality. For example, we can examine whether CT removal impacts cell structure in the NTS. The present experiment focused on identification of how CTX affects development in the brainstem. Twenty female Sprague-Dawley rats were utilized to explore plasticity of neurons within the rostral portion of the NTS. For this study, rats underwent bilateral CTX or a control surgery at 10 days of age. When the rats were adults (minimum of 50 days after surgery), the brains were extracted and placed in a Golgi stain to allow visualization of somas and dendrites. After the tissue was stained, it was frozen and then sectioned on a cryostat at 200 μ m, followed by neuronal tracing using the program Neurolucida (MicroBrightField, Inc.). Neurolucida enables precise tracking of structural changes that may take place as a result of CTX. Currently, work is being done to investigate possible modifications in neural pathways conveying sensory information to the brain and other effects resulting from diminishing sensory input from the CT.

BRYAN ARNOLD

Undergraduate

A novel elastic loading-based exercise program improves both strength and power at the ankle joint

Major: Biology

Faculty Advisor: Mukul Mukherjee

Co-Authors: J.D. Carey, T.J. Rand, S.A. Myers

The ankle joint plays a key role in human movement and is frequently targeted by exercise professionals for strength and power improvements. Recently, elastic bands have been added to many college-level and adult strength training programs to increase athletic strength and power. The goal of this study was to determine whether an elastic loading-based exercise program using elastic bands can improve strength and average power produced by the ankle. The elastic bands used are a large version of a rubber band, about one meter in length, with varying widths which provide different levels of resistance. Ten healthy young subjects participated in this study. Subjects underwent elastic band exercise training instruction with a fitness professional and then completed the elastic band exercise protocol. Pre- and post-exercise training strength testing was performed utilizing the Biodex 3 Isokinetic Dynamometer, testing for ankle strength and power. Scores for both Strength and Average Power improved from Baseline to Post-Protocol testing. Broadening the subjects' age, demographic, and activity range may be beneficial during future research in this area. We concluded that exercise training using an elastic loading-based methodology such as elastic bands show promise for improving ankle strength and power. Further research in this area should involve larger sample sizes, and a variety of age ranges and activity levels. Protocol experimentation should also be considered.

RACHEL BAILEY

Undergraduate

The Use of a Polymer Excipient to Inhibit the Hydrate Transformation of Carbamazepine

Major: Chemistry

Faculty Advisor: Alan Gift

Co-Author: Alan Gift

Solid active pharmaceutical ingredients (APIs) are formed into tablets through a process called wet granulation. This process introduces an aqueous solution that contains a binding agent. However, if the API is an anhydrate crystal, this process may transform it to its hydrate state, which can affect its bioavailability, solubility, and stability. Polymeric excipients have shown to inhibit the transformation of an API to the hydrate form. Different aqueous slurries containing polyvinyl alcohol (PVA) have been examined to understand its inhibitory effects on the anhydrate-to-hydrate crystal transformation of carbamazepine. Each slurry mixture contained 1.0 gram of carbamazepine in 50 mL of an aqueous polymer solution (0.01 mg/mL) and was mixed with an overhead stirrer. Kinetic data was collected with an in-line Raman spectrometer and analyzed with multi-variate software. A variety of polymer solutions of polyvinyl alcohol with different chain lengths and percent hydration values were investigated. The results showed significant increase in transformation time for all of the PVA solutions compared to transformation of carbamazepine in pure water. Many of the PVA solutions showed similar results at inhibiting the carbamazepine transformation, but the PVA solution with the longer chain length and lowest percent hydration showed the least inhibition. More PVA solutions will be examined to determine how these properties affect the of carbamazepine transformation.

ABSTRACTS

AMAYA BANUELOS MARCO

Undergraduate

Madness in African and African-American Feminist novel: A Journey of Reconciliation

Major: English

Faculty Advisor: Pamela J. Smith

To explore madness as a literary topic involves identifying not only the effects of this mental disease in the characters' psyches but also the articulation of a social and gender discourse. Historically, those suffering from madness have been regarded as a threat to the status quo and, therefore, they have been separated from society. The theme of madness has been widely explored by writers and is especially interesting for women's studies as one of its manifestations, hysteria, has helped articulating a discourse of gender, class and race during the turn of the century in Western countries. This research project traces the effects and consequences of madness in female characters in four different African and African-American novels. By providing specific examples from the novels, the goal is to connect them in terms of how the African female experience redefines the term madness, in some cases liberating it from its negative connotations. These novels embark us on a journey from Zimbabwe to North America and the Caribbean that features the transformations of madness across space and time. Tsitsi Dangarembga's *Nervous Conditions* deals with the effects of colonization in the psyche of native women; Zora Neale Hurston's *Their Eyes Were Watching God* brings us to Florida, where an African-American woman is in search of her own voice; Heidi W. Durrow explores in *The Girl Who Fell From the Sky* the struggle of a mulatto girl in a post-racial America and, our route ends with Paule Marshall's *Praisesong for the Widow* in which the Caribbean becomes a place of discovery and reconciliation for the African-American female experience. All of them introduce the theme of madness differently, underlining that madness cannot be pinned down by only one definition. Madness, as seen in these novels, manifests in a myriad of forms.

JUSTIN BARNES

Undergraduate

Physical Activity as a Potential Moderator of Work-School Conflict on Incivility, Caffeine Intake and Sleep Quality

Major: Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer, Eric Faurote

The costs associated with receiving a college education are a tenable burden to many. Since the mid-1990s these costs have risen at a rate well above inflation. As a consequence many college students are turning to paid work to offset these expenses. When students are forced to balance the demands of work and school, work-school conflict often occurs with subsequent negative outcomes. Markel and Frone (1998) defined work-school conflict (WSC) as "the degree to which work interferes with school demands" (p. 278). Students who face this conflict experience elevated stress levels (Roberts, Scherer, Boyer, 2011), which, in turn, have been shown to decrease sleep quality. Other negative consequences of WSC include increased probability of incivility, aggression, and even violence (Cortina, Magley, Williams, Langhout, 2001; Taylor & Kluemper, 2012). Physical activity has a buffering effect on stress and plays an important role in reducing dysfunctional behaviors (Poole, Steptoe, Wawryzyniac, Bostock, Mitchell, Hamer, 2011). Unfortunately, another negative consequence of high WSC is reduced time for physical activity which may increase burnout and detrimentally affect student health. Beyond these negative outcomes WSC has been shown to impair student school performance (McNall & Michel, 2010). It is predicted that those students experiencing high WSC will particularly benefit from physical activity and report lower levels of incivility, less caffeine intake and better sleep quality compared to those with high WSC who engage in lower levels of physical activity. In contrast, it is expected that there will be little difference in incivility, caffeine intake and sleep quality among the students experiencing lower levels of WSC, regardless of level of physical activity. In the proposed study, 120 working college students will respond to an online questionnaire. Multiple regression analy-

sis will be used to examine the relationship between WSC and three outcome variables: incivility, caffeine intake, and sleep quality and to determine whether physical activity moderates the effect of WSC on the outcome variables. Work-school conflict will be measured using six items from the work-school conflict scale developed by Markel and Frone (1998). Physical activity will be measured using seven items from the International Physical Activity Scale (IPAS; Craig, et al., 2003). Ten items from the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kepfer, 1989). Incivility will be assessed using seven items from the Workplace Incivility Scale developed by Cortina, Magley, Williams, & Langhout, 2001). Finally, caffeine intake will be measured using the Caffeine Consumption Questionnaire (CCQ; Shohet & Landrum, 2001), a 10-item measure of caffeine intake.

LINDSAY BROWN

Undergraduate

Influence of density-dependent competition on the feeding behavior of burying beetles *Nicrophorus marginatus*

Major: Environmental Sciences

Faculty Advisor: Claudia Rauter

At high population densities with intense competition for food has a strong impact on feeding behaviors. It has been observed in herbivorous, gregarious insect larvae and social vertebrates that there is a strong selection for increased feeding rates, at the cost of reduced efficiency in energy uptake when a single individual cannot monopolize the food source. The goal of this study was to examine the effect of density-dependent competition on feeding behavior and mass change in adult burying beetles *Nicrophorus marginatus* that feed on carrion. Newly emerged beetles were assigned at random to one of three density treatments: i) 1 male and 1 female, ii) 2 males and 2 females, and iii) 3 males and 3 females. Over 5-weeks, each group of beetles was observed once a week for 1 hour while feeding on an artificial food source. For all density treatments, time spent feeding and mass gain during feeding was highest in week 1 and decreased afterwards continuously. The loss of mass between feedings was largest between week 1 and 2 and decreased over the following weeks. In week 1, time spent feeding and mass gain increased with density, while loss of mass between week 1 and 2 decreased with increasing density. The differences between density treatments diminished with increasing duration of the experiment. These results suggest that beetles show the same behavior as herbivorous, gregarious insect larvae and social vertebrates; only at the beginning of the experiment. The disappearance of the density effect suggests habituation to stressful conditions.

ANGELA BURGETT

Undergraduate

Evaluation of Meso-Scale Topographic Effects on Glaciers in the Western Himalaya of Pakistan

Major: Geology

Faculty Advisor: John Shroder

Co-Authors: John Shroder, Michael Bishop

With the climate changing, the Himalaya is one of the best places to learn more about the activities of glaciers. Specifically, this region has different types of glaciers, and each glacier is responding differently in a similar environment. To further analyze these phenomena, about 30 glaciers were examined in the Nanga Parbat and Karakoram, Himalaya, in Pakistan. Each glacier was mapped using satellite imagery (ASTER, LANDSAT ETM, and SRTM DEM) to determine its current surface configuration and condition. Surging (excessively rapid motion) and non-surging glaciers were featured. Topographic maps and Google Earth were also used to accurately map the glaciers in heavily snow- or debris-covered areas. Surface conditions examined include: area, slope, and curvature measures in a technique called geomorphometry, in which quantitative measures were obtained of the topographic configurations. The surface conditions were then compared to the amount of energy they received from the sun. The surrounding topography can protect a glacier from receiving energy, therefore variability in the surrounding topography means variability in exposure of energy onto the surface. The results will depict spatial variances between the glacier's fluctuations in response to climate change and surrounding topographic differences. These results could result in new classifications by taking into account more variables outside of the glacier's perimeters.

ABSTRACTS

DANIEL CASEY

Undergraduate

Toxicity and Efficacy of KG1 in clearing *Toxoplasma gondii* infection

Major: Biotechnology

Faculty Advisor: Paul Davis

Co-Authors: Paul Davis, Joshua Larson

Toxoplasma gondii is a parasite that is capable of infecting any mammal, including humans. Approximately one third of the world's population is chronically infected, of which, most people are unaware of the parasite's presence. *T. gondii* infection results in two stages, an acute stage known as the tachyzoite and a chronic stage known as the bradyzoite. The immune systems of healthy individuals are able to recognize the tachyzoites and begin to clear them. However, the parasite is able to migrate to brain and muscle tissue where it converts to the bradyzoite stage by forming cysts. These cysts cannot be detected by the immune system, resulting in lifelong infection with a small chance of ever showing symptoms. There are very few drugs that are effective against the acute stage, and there are no known drugs that are able to cure the chronic infection. Efforts are currently underway to discover new drugs that are effective in treating both acute and chronic stages of the parasite. Our lab is currently testing new drugs for their ability to clear *T. gondii*. In this study, compound SJ000018645 (also known as KG1) was analyzed to determine its toxicity against human cells and its ability to kill the *T. gondii*. Initial results show that KG1 is effective against tachyzoites at a concentration that is low enough as to not kill human host cells. Due to the promising results, the next step is to investigate the effectiveness of KG1 against the chronic infection.

LYDIA CHAVEZ

Undergraduate

Music Theory in *Five Easy Steps*

Major: Music Theory and Composition

Faculty Advisor: Barry Ford

All music is written using some form of music theory. Some ideas for pieces come from as small an idea as two notes. I composed a piece for string quartet that came from the idea of two notes, E-flat and D-flat. Using compositional techniques, the piece expanded from two notes, to two chords, and from there to two different pitch centers. This piece, when broken down, will seem no different than Beethoven's Symphony No. 5 movement 4 or a popular song on the radio. It uses the same general form and principles of western music. The *Five Easy Steps* to Music Theory are: 'Is there a motif, an idea?', 'Does that motif repeat? And how?', 'Is there a second motive or idea?', 'How does the second idea relate to the first, if at all?', and 'What do you think this piece is trying to tell you?'. Through those *Five Easy Steps* anyone can understand Music Theory and enjoy music that once seemed abstract but is really structured.

MATTHEW CHRISTENSON

Undergraduate

From Frog to Prince: The Transformation of the Sentinel Organism *Rana pipiens*

Major: Biotechnology

Faculty Advisor: Paul Davis

Co-Authors: Andrew Trease, Lindsey Knight, Alan Kolok, Paul Davis

Due to the agricultural practices within the Midwestern United States, the human water supply is often contaminated with various chemicals that have a significant negative impact on human health, including the herbicide atrazine. Atrazine is the most commonly used herbicide in the world but is a suspected carcinogen and teratogen. In humans, atrazine exposure is associated with tumorigenesis, birth defects, menstrual problems, and low sperm counts. In amphibians, exposure to atrazine retards the ability of tadpoles to fight infections by parasites. In addition, tadpoles that are exposed to atrazine early in development exhibit malformed hearts, kidneys, and gastrointestinal tracts. Moreover, male frogs exposed to

atrazine, at levels below the regulations set by the environmental protection agency, become sterile and in some cases turn into females and hermaphrodites. The central goal of this study is to develop the northern leopard frog *Rana pipiens* into a sentinel organism that can be used to assess atrazine contamination throughout the region. To this end, we first need to characterize biomarkers of atrazine exposure in *R. pipiens*. However, because *R. pipiens* is unsequenced, lacking ample DNA, RNA and protein sequences, we sequenced the RNA from several male and female tissues, including gonad, liver, kidney and brain, and tadpoles undergoing development. Using these data, we have designed primers that will allow us to evaluate the expression of the affected genes at the transcriptional level using reverse transcriptase-quantitative polymerase chain reaction.

GIOVANNI CONSOLINO

Undergraduate

Cultural Values and Cohesiveness: Seeing through the Lived Experience of the Insiders in an Instructional Context

Major: Speech Communication

Faculty Advisor: Chin-Chung Chao

Co-Authors: Chin-Chung Chao

Many studies have found that culture facilitates individuals' integration in a particular social context to develop cohesiveness both at a macro and micro level in an organization. However, few research studies have been investigated to delineate how cultural values can be embedded into a university unit. This study analyzes the departmental culture of an American Midwestern university. Guided by Social Identification and Self-categorization theories to examine members' perception and attachment in an organization the research delves into the cognitive process that leads individuals to recognize themselves as part of the same unit. "The strength of culture can be defined in terms of homogeneity and stability of group membership and the length of shared experiences of the group" (Schein, 1994, p.7). This statement reinforces the pivotal role of culture to identify patterns that exemplify members' assimilation and development in a social setting. Moreover, the use of Schein's Onion Model allows having a comprehensive analysis of the elements that represent the real nature of a subculture. To be specific, this study uses participant observation and in-depth interviews to better understand how cultural values can be embedded into a university unit. The research findings of this study have both enriched the extent literature on organizational communication in general and explored an integrated process developing through the personal accounts in particular.

APRIL CORBET

Undergraduate

Analyzing Sentiments from Street Harassment Stories

Major: Computer Science

Faculty Advisor: Parvathi Chundi

Street harassment is a pervasive problem that typically targets women and LGBTQ community. There are currently no effective methods to deal with the harassers because the acts of harassment happen randomly and are difficult, if not impossible, to prosecute. Hollaback! is an international movement aimed at stopping street harassment, and one of the ways Hollaback! raises awareness and gathers statistics is through supporting a system of blog posts through which Hollaback! servers collect street harassment stories from victims around the globe. In this research, we completed a preliminary study focused on analyzing small samples of Hollaback! stories submitted from major cities such as New York city. The LIWC software we employ is used to measure the positive and negative emotions hidden in each story and correlate it to the socioeconomic status of the location from which the story was submitted, which is validated through pronoun function rates already identified with socioeconomic status [2]. This research creates a localized knowledge of street harassment effects.

SHEILA CORNETT

Undergraduate

Team Dynamics: Understanding the Influence of the "Big Five" Personality Traits on Small Group Reflexivity

Major: Psychology

Faculty Advisor: Roni Reiter-Palmon

Co-Author: Teresa Queen

Teamwork in organizations consists of both individual characteristics and group dynamics. When working in groups, task reflexivity is an important aspect of a group's ability to maximize its potential. Task reflexivity is

ABSTRACTS

defined as “the extent to which team members collectively reflect upon the team’s objectives, strategies and processes as well as their wider organizations and environments, and adapt them accordingly” (West, 1996). The “Big Five” personality traits represent individual attributes, which may predict behaviors and the perception of reflexivity within the group. Previous studies have found conscientiousness to be positively associated with all job criteria; while agreeableness is found to be a valid predictor of job performance in careers where teamwork and cooperation are necessary (Barrick & Mount, 1991). We hypothesize that members with high levels of agreeableness and conscientiousness will be better at recognizing the existence of reflexive behaviors. Conversely, individuals low in these traits will be less likely to perceive team reflexivity. We also anticipate that the traits of emotional stability and intellect will have no significant relationship on perceptions of reflexivity. Our hypotheses were tested using data gathered during a group marketing project (N = 164) for a university course. We anticipate that our results will have practical implications for creating more effective small group structures based on personal attributes and we expect to find directional implications for future research, as our analysis is ongoing.

ERIKA CRAWFORD

Undergraduate

Investigation of 5' NTR Domain II Secondary Structure in Virulent Coxsackievirus B3/28

Major: Biotechnology

Faculty Advisor: William Tapprich

Coxsackievirus B3 (CVB3) is an Enterovirus from the *Picornaviridae* family that contains a positive sense RNA genome. CVB3 is a known pathogenic agent to cause myocarditis and pancreatitis. The genome of CVB3 includes a 748 base 5' untranslated region (5'UTR) organized into six highly structured domains that studies have proven are important to viral efficiency. Comparative sequence analysis shows the nucleotide stretches in the 5' NTR Domain II displays significant variability among enteroviruses. An example of Domain II variability is nucleotide differences found in cardiovirulent CVB3/28 and noncardiovirulent CVB3/GA. These findings, together with studies of chimeric viral genomes, lead to the hypothesis that Domain II could be a virulence determinant. Extensive studies investigating secondary and tertiary interactions occurring in the 5'NTR of CVB3/28 have been conducted to achieve a better understanding of Domain II structure. Results from our laboratory show dramatic structural differences in Domain II of CVB3/28 than that found in CVB3/GA. We have constructed site specific mutations in the CVB3/28 genome within this highly variable region of Domain II to test the detailed relationship between sequence and structure in the 5' NTR. The goal of our investigation through chemical probing techniques is to gain supporting evidence of structural transitions occurring as a result of alterations in the nucleotide sequence of Domain II and its role in CVB3 virulence.

LAUREN DAHLQUIST

Undergraduate

Effects of implementing problem-based learning activities in an undergraduate setting

Major: Biology

Faculty Advisor: Christine Cutucache

Co-Author: Christine Cutucache

A problem-based learning (PBL) activity is a student-focused method of learning that enhances student collaboration and communication to solve a real-life problem. Interestingly, few PBLs have been employed at the undergraduate level, particularly in biology. Therefore, our objective was to discern how PBLs influence knowledgebase, critical thinking skills, student communication, and information retention. We reviewed primary literature from the last decade pertaining to PBL activities in the classroom (n=28). The majority of these articles focused on medical school (n=10), polytechnic schools (n=8), and dental schools (n=4). Only 6 of the 28 articles were written about PBLs at the undergraduate level. Students were assessed in a number of ways, including: self-study, presentation, quiz, examination, survey, peer feedback, assignments, journal writing, or worksheets. In most articles, a facilitator was availa-

ble to closely monitor a small group (n=24). In summary, the most effective method of PBL is a small group led by a sociable tutor where all group members meet and discuss study material. Additionally, we conclude that the incorporation of PBLs in the undergraduate level is a significant benefit to students in the program as well as to their potential in future studies.

AUSTIN DAVIDSON

Undergraduate

Impact of dual-tasking on lower joint dynamics during stair ascension

Major: Biology

Faculty Advisor: Mukul Mukherjee

Co-Authors: Srikant Vallabhajosula, Chi Wei Tan, Mukul Mukherjee, Ka-Chun Siu, Jennifer Yentes, Denise McGrath, Sara Myers

Stair-climbing is a daily activity, often done while performing other tasks such as talking or carrying a laundry basket. The objective of the current study is to evaluate joint dynamics during stair-climbing while dual-tasking to identify changes that take place. We hypothesized that a significant difference in joint moments and powers would occur as a result of dual-tasking during stair ascension. Ten healthy young adults (23.9 ± 2.8 years; 175.98 ± 0.06 cm; 71.3 ± 8.6 kg) performed ten trials for each of four conditions (control, cognitive, motor, and combined). Kinematics and kinetics data were collected as participants ascended a four-step staircase. The first and third steps had built-in force platforms, which allowed us to collect force data from two consecutive ipsilateral steps. A 2x4 (2 steps x 4 conditions) repeated measures ANOVA was applied to compare speed, joint moments and powers of the lower extremities. Bonferroni pairwise comparisons were used to determine significant differences between conditions. For measures that showed significant differences, a repeated measures ANCOVA was performed with speed as the covariate. Condition main effect results indicate that performing a cognitively challenging task has a greater influence than a motor task on how people climb stairs. Step main effect results show that at the first step, participants seem to produce lesser moments at the ankle while producing greater moments at the hip and at knee. Step-Condition interaction results indicate that while ascending the second step, participants increased the power absorbed at the ankle only in the control and motor conditions.

CAROLINE DAY

Undergraduate

Accurately Quantifying Stage Specific Enolase and GAPDH Transcripts in *Toxoplasma gondii*.

Major: Biotechnology

Faculty Advisor: Paul Davis

Toxoplasma gondii is an intracellular parasite with the ability to infect humans and animals, and is closely related to the parasite that causes malaria. The tachyzoite form of the parasite causes infection throughout the body, but after detection by the immune system, *T. gondii* can form long-lived, drug-resistant cysts called bradyzoites in brain and muscle tissue. Present laboratory protocols are not able to produce significant bradyzoite cultures, compromising the ability to evaluate potential drug compounds effective against the bradyzoite stage. We hypothesized that the effectiveness of the growth medium in transforming *Toxoplasma gondii* parasites from the tachyzoite to the bradyzoite stage can be rapidly and precisely determined by using quantitative PCR. Development of unique forward and reverse primers, along with a fluorescent probe for enhanced target analysis, allowed us to detect relative differences in parasite life stage, based on measuring transcription rates of tachyzoite-specific and bradyzoite-specific gene expression. These methods successfully quantified bradyzoite amounts, which can be used in further experiments to aid in drug selection against the bradyzoite stage.

LULU FERDOUS

Undergraduate

Circadian Dysrhythmia and Long Term Flight

Major: Psychology

Faculty Advisor: Jonathan Santo

Circadian Dysrhythmia due to sleep deprivation has been under scrutiny as a chief contributing factor in aviation and aerospace mishaps. Multiple aviation accidents and incidents, increased flight and stay duration for astronauts during space missions, and commercial space flights have placed sleep deprivation study into the foremost of importance. Manned missions require unique consideration due to its flight

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duration, restricted environment, need for drastic physiological adaptation and demand for accuracy in a high risk operation. Despite stringent regulations for crew sleep and rest time, fatigue related incidents are still common and can prove fatal. This raises the question on gauging the quality of sleep rather than the regulated quantity of crew rest time. Due to lack of measuring tools for sleep deprivation, its effect on performance, aeronautical decision making and efficiency are used as indicators of evaluation. The resultant evidences can be witnessed through attention reduction, increased reflex time, lowered motivation and higher levels of risk taking behavior patterns that jeopardize mission and crew safety. This paper discusses circadian dysrhythmia and assesses its effect on long duration manned mission. Some examples used are fatigue studies from aviation accidents, research done on the physiology of astronauts who have piloted manned missions and who are space station residents. Other references include sleep related fatigue studies conducted by the US Military after research on crew members working on overseas flight assignments. The objective of the paper is to add to human factors studies being done on aviation and aerospace science.

NATASHA FIELDS

Undergraduate

The Effects of Stress Reduction Techniques on Stress Reactivity and Cortisol Levels

Major: Neuroscience

Faculty Advisor: Rosemary Strasser

Co-Author: Christine Morrison

The long-term harmful effects of high stress on the body are widely known. High levels of sustained stress over time contribute to a higher risk of heart disease, stroke, lowered immune responses to illness and infection, and is linked to the development of cancer (Khansari, 1990; Segerstrom, 2004). Stress reduction techniques such as yoga therapy, progressive muscle relaxation, and breathing exercises have all been used to reduce overall long-term stress, while also teaching students valuable life-style coping and interaction skills. (Granath et al., 2006; Shorter et al., 2009; West et al., 2004). While extremely valuable, the majority of these studies only look at the stress-reducing effects of these techniques over long periods of time. The current study focuses on one main stress reduction technique, yoga (breathing exercises, postures, and progressive relaxation techniques). The aim is to demonstrate an immediate, lesser, stress response exhibited by those in the yoga condition in as little as thirty minutes, counterbalancing the heightened stress response caused by the induced stress event and potential confounding variables such as caffeine. Regular use of these techniques would lessen the short-term stress response and would likely result in long-term observable decreases in perceived stress and salivary cortisol (a recognized indicator of the physiological stress response), thereby greatly decreasing one's risk of acquiring long-term stress-related disorders. This study will record stress and contributing factors in two ways-- salivary cortisol samples and a series of self-report surveys—measured in control and yoga conditions before, during, and after an induced stress event.

LUWAM GEBRESLASE

Undergraduate

Psychological Capital (PsycCap) and Dark Triad as a Moderator of Unfair Work Situation on the Effect of Organizational Citizenship Behavior (OCB)

Major: Psychology

Faculty Advisor: Lisa Scherer

Co-Author: Lisa Scherer

The purpose of this study is to examine the effect of unfair work situation on Organizational Citizenship Behavior (OCB) when moderated by psycCap and dark triad. Robbins et al. (2012) defines unfairness as an experience of unjust treatment (Robbins, Ford, & Tetrick, 2012). According to Cheung et al. (2011), psycCap is defined as someone's ability to overcome setbacks and includes self-efficacy, hope, optimism and resilience (Cheung, Tang, & Tang, 2011). The dark triad according to Jonason et al. (2010) is "undesirable personality traits" (p. 420) includes, narcissism, psychopathy and Machiavellian-

ism (Jonason & Webster, 2010). Prior research has focused on how employees' behaviors within organizations are affected by emotional intelligence, attitude and job satisfaction (Ashkansay & Daus, 2005; Haung, You & Tsai, 2012). Specifically, this study will examine, if employees high in the positive personality cluster of psycCap will be more likely to engage in OCBs compared to those with low psycCap. Furthermore, it will explore if employees higher in the negative personality cluster of dark triad will be less likely to engage in OCBs compared to those lower in the dark triad. Finally, this study will investigate if those employees exposed to unfair situations will be less likely to engage in OCB. Under unfair work situations, dark triad will interact with psycCap to influence OCBs. Predicted interactions are when dark triad is high, regardless of the level of psycCap, OCBs will be low. Also when dark triad is low, OCBs will be greater under high psycCap compared to low psycCap.

DYLAN GOODMAN

Undergraduate

Variability of Gait is Depend on Direction of Motion

Major: Exercise Science

Faculty Advisor: Shane Wurderman

Human walking displays increased uncertainty in the medial-lateral (ML) direction compared to the antero-posterior (AP) direction. Because of the increased variability, it has been suggested that ML foot placement during walking requires increased upper motor neuron control whereas AP foot placement is a more passive reflex action. To this point all studies have utilized walking in the AP direction, an obvious bias, as this is the primary direction of human locomotion. However, it is not entirely clear if the AP and ML direction have truly been partitioned within the neuromuscular system, or whether foot placement in the plane least reliant upon gravity depends more on active neural control. In this study we tested the amount of variability in foot placement in a lateral stepping gait. We hypothesized subjects would display more variability in the AP plane than the ML plane. Sixteen subjects (age: 23.4 yrs \pm 3.3; height: 179.0 cm \pm 7.4; mass: 83.4 kg \pm 15.7) performed a three minute treadmill trial while heel and toe position were recorded and analyzed. The Coefficient of Variation (CoV) for the AP direction was significantly greater than the ML direction ($F_{1,15}=473.343$, $p<0.001$). The results supported our hypothesis; without gravity in the AP plane, there was significant variability for foot placement. In conclusion, the directions of movement control are not set but rather active control is assumed over the direction that is not benefiting from inertia and gravity.

EMILIANO GRASSI

Undergraduate

Social Competence as a Mediator of the Association between Positive Parent/Child Relationships and Peer Acceptance: An Examination of Early Adolescents from Montreal, Barranquilla, Bogota and Curitiba

Major: Psychology

Faculty Advisor: Jonathan Santo

Co-Authors: Jonathan Santo, J. da Cunha, L.M. Saldarriaga, A.M. Velasquez, Felicia Meyer, L.S. Lopez, G. Carmago, William Bukowski

Rationale: Supportive parenting has been associated with the development of a number of social skills in children, while rigid parenting having been linked to a number of externalizing behaviors, including aggression. Parents play a large role in early peer socialization (i.e. often choosing which friends a child plays with). Two variables, social competence and peer acceptance, have become of great interest to the research community. In the current project, we looked at the inter-relation between early adolescents' social competence and peer acceptance incorporating their relationships with their parents. Method: The sample comprised 1432 fifth and sixth graders from 50 classes from Montreal, Canada; Barranquilla and Bogota, Colombia and Curitiba, Brazil. The Network of Relationships Inventory (Furman & Buhrmester, 1992) was used to measure positive and negative parent/child relationships with eight items (four positive and four negative). The Harter (1982) perceived competence scale was used to measure social competence. Lastly, acceptance was calculated using the number of classroom liking ratings from every participating student in the class. Structural equation modeling was used to analyze the data. Results: Both positive and negative parent/child relationships were modeled on social competence which was itself modeled on peer acceptance. A significant negative association between negative parent/child relationships and acceptance was observed. On the other hand, the effect of positive parent/child relationships on peer acceptance was mediated by social competence. Discussion: The current study demonstrates the importance of parent/child relationships on peer interactions with consideration of social competence. Sex differences will also be discussed.

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THERESA HALLIGAN

Undergraduate

Stratigraphic Analysis of Smectite-Illite within the White River Group

Major: Geology

Faculty Advisor: Robert Shuster

Co-Authors: Robert Shuster, Harmon Maher

This last summer work on fractures and fracture systems within the Miocene (23-5.3 million year old) age White River Group strata was focused on two locations in northwestern Nebraska. These were Monroe Creek (near Harrison, NE) and Toadstool Geologic State Park (near Crawford, NE). These fractures may have formed by chemically driven volume changes as the sediments were buried, an understudied phenomena. Fracture types include clastic dikes, which are sediment filled fractures, and chalcedony veins. Samples were collected, spanning the White River Group and including the very base of the overlying Arikaree Group. Prepared samples were sent out to be analyzed by x-ray diffraction (XRD) for their mineralogy, including the clay minerals, smectite and illite. These two minerals are of particular interest. Swelling clays like smectite can change during geologic burial into nonswelling illite. Change from smectite to illite causes a volume loss and release of water within the rocks, which may produce fractures. The results of the XRD analysis indicate that there were distinct changes in smectite, illite, and mixed smectite-illite content with sample ascent through the White River Group. At Toadstool Geologic State Park mixed smectite-illite vanishes at the very top of the Chadron Formation, a lower unit in the White River Group. The clastic dikes and chalcedony veins are strongly concentrated in the Chadron Formation. Continued research of fractures and fracture systems will aid in understanding how water and other fluids move through sedimentary rocks.

KIEL HANSEN

Undergraduate

The Influence of Task and Impulsivity on Malevolent Creativity

Major: Psychology

Faculty Advisor: Roni Reiter-Palmon

Co-Author: Daniel Harris

Although creativity can be defined in a variety of ways, most people often think of creativity as an act that leads to a positive outcome of some kind. However, there is a darker side to creativity called malevolent creativity. To be malevolently creative is to be intentionally harmful in original ways, and little empirical research has been conducted to study it. The main focus of this study was to examine malevolent creativity and its relationship with different problem-solving tasks (aggressive vs. pro-social) and premeditation (i.e., the degree to which someone acts impulsively and considers the consequences of his or her actions). We hypothesized that people would be more malevolently creative if they (a) responded to an aggressive task and (b) were lower in premeditation. We also hypothesized that these two factors would interact to influence malevolent creativity. Our hypotheses were supported. With the interaction in particular, we found that responding to a pro-social task inhibited the degree to which premeditation influenced malevolent creativity. But when people responded to an aggressive task, premeditation strongly influenced malevolent creativity. These results suggest that people who act impulsively and do not consider the consequences of their actions, as well as people who respond to aggressive problems are more likely to be malevolently creative. Furthermore, we have found support for the notion that the relationship between malevolent creativity and certain traits likely depends on the type of problem that must be resolved.

LUCAS HARRISON

Undergraduate

Agricultural Runoff in the Elkhorn River : Is Fate Bound to Vegetation?

Major: Biotechnology

Faculty Advisor: Alan Kolok

Co-Authors: Lindsey Knight, Racine Rangel

Endocrine disrupting compounds (EDCs) contained in agricultural runoff saturate stream bank sediment

where they remain bioavailable to fathead minnows (*Pimephales promelas*). The large surface area and lipophilic properties of plant cell walls suggest that common waterweed (*Elodea canadensis*) may compete with the fathead minnow as a ligand for the EDCs and as a result affect their bioavailability. To test this, female fathead minnows were exposed to tanks containing contaminated sediment collected from the Elkhorn River at West Point, NE, and varying plant concentrations of Elodea. Following exposure, analysis of hepatic estrogen receptor- α (ER- α) mRNA expression for each group both quantified defeminization and revealed a biphasic relationship between plant concentration and ER- α expression. As plant concentration increased from 0.4 g/L to 8.8 g/L ER- α expression increased. Interestingly, ER- α expression was markedly decreased at the highest plant concentration (24.7 g/L). These results suggest that at lower concentrations plants reduce the bioavailability of EDCs while at very high concentrations they exacerbate the anti-estrogenic effect.

STEVEN HARTMAN

Undergraduate

Annual FAUST Production: Reviving the Castle of Perseverance

Major: Theatre

Faculty Advisor: Amy Lane

The Castle of Perseverance, in my opinion, is the most neglected facility on any of UNO's campuses. Originally designed to be an outdoor amphitheatre/art installation, the Castle's glory days were short lived. It soon became deserted; a ghost town – what I like to call “the ashtray of campus....” That is, until it was revived! By utilizing the Fine Art University Student Theatre's play production slot, along with a generous grant from the university Office of Research and Creative Activity, the idea of producing a theatrical show was not impossible. By utilizing these resources, and allocating a lot of time, I was able to direct and produce a full-length, fully realized production of *The Aliens* by Annie Baker. Producing *The Aliens* was nothing short of humbling. Throughout the process I learned the value of a supportive network and honed skills needed for this collaborative artwork. Additionally, the show itself had a very successful run, and if anything, demonstrated the value of a long forgotten campus relic. If this project inspired only *one* person to consider the Castle of Perseverance as a plausible theatrical venue, then this project was a success.

AMY HESTER

Undergraduate

Structural analysis of the Coxsackievirus B3 genome by in-line probing

Major: Biotechnology

Faculty Advisor: William Tappich

Coxsackievirus B3 (CVB3) is a pathogenic *Enterovirus* of the picornavirus family, with a single-stranded, positive sense RNA genome. Infection can lead to heart disease and pancreatitis. The CVB3 genome consists of 7400 nucleotides with four regions: a 5' untranslated region (5'UTR), an open reading frame, a 3' untranslated region (3'UTR) and a poly-A tail. The CVB3 5'UTR contains 742 bases and seven secondary structure domains. Virulence of CVB3 is found to be associated with the 5'UTR. In order to better understand the virus and its pathogenesis, the 5'UTR has been the focus of our research. Single-stranded RNA is able to fold into a variety of conformations, making it vulnerable to spontaneous cleavage under specific conditions. During an “in-line” conformation, a 2' oxygen, a phosphorous center and an adjacent 5' oxygen fold in a way that makes the phosphodiester bond vulnerable to a nucleophilic attack by the 2' oxygen, resulting in cleavage between the phosphorous and the 5' oxygen. In-line probing experiments have been carried out to determine where the sites of cleavage are located. Radiolabeled RNA subjected to in-line probing is visualized by 10% polyacrylamide gel electrophoresis and phosphorimaging. Because highly structured portions of the molecule are less vulnerable to nucleophilic attack, in-line probing analysis will determine the location of more structured regions. Results from in-line probing will enable us to better understand the three-dimensional structure of the CVB3 genome, as well as its function.

COLLEEN HOCHFELDER

Undergraduate

Survey of rodent *Babesia* infection in the Grand Teton National Park

Major: Biology

Faculty Advisor: Bruce Chase

As human habitation increasingly encroaches on natural habitats, tick-mediated transmission of parasitic infection is an increasing problem for human health. *Babesia* is a tick-borne malarial-like parasite that commonly infects small mammals and is in prevalence in humans and range animals. Genetic analysis of strains

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of *Babesia* parasites endemic in native mammals from different localities can help address whether different ecosystems are isolated with regard to parasite transmission and address how pathogenic strains found in humans are related to those that are endemic in the wild. In order to begin exploring the relationships between parasitemia levels in Wyoming and other regions, surveys were completed in Grand Teton National Park, WY. Five sites with varying ecological factors were surveyed in the park. Small rodents were collected at each site and blood was drawn from these rodents. DNA was then extracted from both whole blood samples and isolated erythrocytes. Currently, portions of the *Babesia microti* genome are being sequenced. These sequences will be utilized as a control for PCR and qPCR assays to determine presence and magnitude of the parasite in rodents of Grand Teton National Park. Completion of genetic analysis of *Babesia* species found in the prairie vole populations in Wyoming holds value in the field of parasitology. Genetic assays have previously been completed in Brazil, as well as Europe and Japan. Developing this assay offers a means to contribute to understanding the complex relationships of *Babesia* populations' diversity.

DANIELLE HOECHNER

Undergraduate

Open Minds: Enhancing Preteacher Diversity Experiences

Major: Teach English to Speakers of Other Languages

Faculty Advisor: Sarah Edwards

"It is easy to teach someone who is like you. But to reach the students who are *not* like you--that is the mark of a true teacher." Versions of this educator's mantra abound within the University of Nebraska-Omaha's (UNO) College of Education (COE). Indeed, with data from the 2010 U.S. Census confirming a dramatic increase in the ratio of minority cultures, the ability to teach diverse populations is now more important than ever. Nevertheless, most of UNO's preservice teachers come from the majority culture and may have had limited experience working with populations that are culturally and linguistically diverse. In recognition of this hurdle, the objective of *Open Minds* was to expand upon the COE's "Culture Walks" (a series of experiences that prepare preservice teachers for their intermediate practicum in the Omaha Public Schools) in two main ways. The researcher first collected data and resources regarding each of three cultural communities of Omaha: the North Omaha African American community, South Omaha Hispanic/Latino community, and Central Omaha Refugee communities. The researcher then organized this data into online presentations, providing both a resource for students and a curricular aid for UNO teachers. The final part of the research involved creating new pre-and post- student surveys to improve data collection and assessment regarding the Culture Walks' effectiveness. As a result, UNO's education undergraduates would better understand culture and its role in education and use student culture as a basis for learning, trademark skills of culturally responsive teachers (CRT) (Ladson-Billings, 2001, p. 98).

CARLEE HOWE

Undergraduate

Metabolic Cost of Postural Control During a Perturbed Gait Task is Related to Gait Variability

Major: Exercise Science

Faculty Advisor: Sara Myers

When subjects walked on a curved treadmill compared to a standard flat treadmill, oxygen consumption (VO₂) increased despite a reduction in vertical displacement of the center of mass (COM). We sought to determine the metabolic cost related to balance and the variability of the COM during walking. Five subjects walked at three speeds on a flat treadmill and a curved treadmill. VO₂ was recorded and used to calculate basal metabolic rate (C1), the metabolic cost associated with maintaining balance (C2) and the metabolic cost associated with walking (C3). Dependent t-tests were used to compare C2 and C3. Correlations between C2, C3, and the variability of COM were done. Displacement, range and the largest Lyapunov exponent of the medial-lateral (ML) and anterior-posterior (AP) direction of the COM were calculated. Differences in these variables were examined using dependent t-tests. Subjects increased

C2 values on the curved treadmill compared to the flat treadmill. They also showed reduced displacement and range with increased Lyapunov exponent of the COM displacement in both AP and ML directions on the curved treadmill. Correlation analysis revealed the Lyapunov exponent in the ML direction to be the most highly correlated with C2, with significant and positive correlations observed at all speeds. Medial-lateral standard deviation of COM displacement also showed a significant negative correlation with C2 at two speeds. This study showed that walking on a curved treadmill causes a more unpredictable gait in the ML direction and this is strongly related to increased metabolic cost.

CECILIA JENSEN

Undergraduate

Dreams or Dots: Reimagining the Coexistence of Text and Music

Major: Music Performance-String

Faculty Advisor: Roger Foltz

Words and music have been inseparable in choral music since the Renaissance, the beginning of western European art music. Traditionally, the chosen text for a work has always directed the composer to create the work in a specific way. Rhythms must be matched to words, natural syllabic accents observed in the placement of the beat, and musical phrases matched to the text's intended effect on the audience. While this "text-painting" can sometimes illuminate a body of text, other times it constricts creativity. In my choral piece, I have striven to create a new way that text and choral music can coexist. A choir sings syllables, not of any words in particular, while a male speaker, standing a little apart from the choir, reads a selection of text from the preface to the first edition of Walt Whitman's great poetic work, "Leaves of Grass." However, the text is neither random nor strictly rhythmic. I devised a system of music notation that directs the speaker to fit certain phrases of the text into specific units of time, thereby both measuring where the text will go and leaving the exact declamation of the text up to the particular cadence of the speaker's speech patterns. Around and behind the speaker, the music sung by the chorus provides abstract depictions of the text. By the end of the piece, both parts working together create a new way for an audience to perceive how text and music can create art.

ANDREW JEZEWSKI

Undergraduate

Identification of a genetic pattern that causes life-long infection for both developed and underdeveloped nations

Major: Biotechnology

Faculty Advisor: Paul Davis

One third of the world is infected with a parasite called *Toxoplasma gondii*. While most parasitic infections mainly effect tropical populations, Toxoplasma is just as prevalent in developed nations. In addition to our understanding that it can cause a significant increase in risky behavior it is also one of the leading causes of fetal malformations. We are finding more reasons every day that support the importance of discovering a way to combat this disease. The key to reaching this goal will be to increase our understanding of the characteristics that define the chronic stage of this infection. Previously, a pattern in this parasite's genetic make-up has been identified that is thought to control its ability to cause a life-long infection. To investigate this, expression levels of luciferase were measured when the regulatory sequence of genes expressed during the chronic stage is allowed to regulate its expression. This expression only occurred during the chronic stage infection. We are now investigating the molecular characteristics of this regulatory motif.

LEANNA KEITH

Undergraduate

The Themes of Rimsky-Korsakov's Russian Easter Festival Overture

Major: Music Performance-Woodwind

Faculty Advisor: Barry Ford

The Russian Easter Festival Overture by Nikolai Rimsky-Korsakov is a highly famous piece for symphony orchestra. The piece is subtitled "Overture on Liturgical Themes". The themes are taken from the *Obikhod*, a collection of chants from the Eastern Orthodox Church. After analysis, the themes can be located and identified. Rimsky-Korsakov used specific themes from the *Obikhod* in a precise pattern in

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order to explicitly describe the story of Easter. The construction of the piece revolves around these themes. The poster will show these themes and the ways in which the themes are used in the Russian Easter Festival Overture.

AMY KILE

Undergraduate

Spoken novel word productions across 2-year-olds with varying language skill proficiencies

Major: Pre-Speech Pathology

Faculty Advisor: Shari DeVeney

Co-Authors: Jennifer Morris, Shari DeVeney

Early language development delays can have long-lasting adverse effects for later social, language, and literacy skill development. Children who by 24 months of age demonstrate expressive language delays through using fewer than 50 words and not producing two-word combinations are identified as late talkers. The central goal of this study was to investigate verbal productions of novel words paired with unfamiliar objects and representational picture symbols. There is limited research regarding the word-learning behaviors of late-talking toddlers. The study utilized a single subject design and analyzed the verbal production characteristics of nine two-year olds (three late talkers with expressive-only language delays, three with expressive and receptive language delays, and three typically developing peers). Participants were between the ages of 24-31 months old. Using an existing data set, we conducted a post-hoc analysis with previously recorded videotaped sessions. We reanalyzed data formerly coded as "spontaneous verbal productions" to identify specific spoken production performance patterns in word learning across participant language skill proficiencies. Specifically, verbal productions were separated into unprompted, prompted, and direct imitation of adult models. We are investigating the differences between typically developing toddlers and their language-delayed peers in targeted spoken word productions. It is predicted that typically developing two-year-olds will likely produce a greater number of unprompted spoken productions than their late-talking peers. Expressive-only participants will likely demonstrate more unprompted spoken productions sooner than their expressive and receptive language delayed peers. The results of this study will help inform clinical practice for speech-language pathologists working in early childhood settings.

NICHOLAS KINKEAD

Undergraduate

Examination of Type III Toxin-Chaperone Interaction by Copurification

Major: Biotechnology

Faculty Advisor: Donald Rowen

Type Three Secretion systems (TTSS) are an important virulence factor for many pathogenic bacteria that can infect humans including *Pseudomonas aeruginosa*. Type three secretion systems consist of a needle-like complex which can transport toxins directly from the bacterial cell cytoplasm to the cytoplasm of a cell of the infected host. The secretion of some toxins requires a chaperone protein to bind to the toxin, but the exact role of the chaperone is not completely understood. Previous results have suggested that the Type III secreted toxin ExoU of *P. aeruginosa* may be unusual in that residues near both the amino and carboxy-terminus are required for chaperone interaction. The C-terminus of ExoU contains a membrane localization domain (MLD), and chaperones have been hypothesized to act to mask MLDs. To confirm the importance of the C-terminal MLD of ExoU on SpcU interaction, I sought to test the ability of ExoU C-terminus truncation mutants to bind to a modified version of SpcU (His-tagged) that can be easily purified. For that experiment, I constructed plasmids that will express His tagged SpcU and either wild type or truncated forms of ExoU in *E. coli* cells. I have conducted trial experiment to optimize the conditions for the purification and to overcome some unexpected problems. Lack of purification of truncated forms of ExoU along with SpcU would support the hypothesis that SpcU binds to the C-terminus and N-terminus of ExoU.

SEAN KIRKER

Undergraduate

Damage Detection on Historic Stone Masonry Using Non-Destructive Testing

Major: Architectural Engineering

Faculty Advisor: Ece Erdogmus

Non-destructive testing has allowed engineers to determine the structural integrity of existing buildings and infrastructure. This has provided the industry with a more economical solution to maintaining historical buildings and reinforcing them as necessary. This research focused on a non-destructive testing method called Impact-Echo, which observes frequencies created by an impact source to determine the condition of the test specimen. Based on a case study at Antiochia ad Cragum in Turkey, the goal of this research focused on developing a methodology to be used to rate and rank the current condition of marble blocks. These blocks were once a part of a 3rd century Ancient Roman Temple which has collapsed. The ultimate goal is the understand the initial causes of the collapse and to design a partial reconstruction. Impact-Echo testing is to be used to determine the structural integrity of the marble blocks to create a safe partial reconstruction in the future while preserving the historical value of the site.

LAURA KNAPP

Undergraduate

Influence of Lead Hyperaccumulators on Surrounding Vegetation

Major: Civil Engineering

Faculty Advisor: Shannon Bartelt-Hunt

Lead, which acts as a neurotoxin, is a persistent soil pollutant present in many urban environments. Recent research suggests that vegetation grown in contaminated soil can bioaccumulate lead and become a pathway for exposure in humans. The relationship between lead concentrations in soil and its accumulation into differing plant biomass is unknown, however, it is known that plants exhibit differential uptake. Therefore, this study focused on metal-hyperaccumulating plants and whether their presence has an influence in the amount of lead present in surrounding vegetation. To conduct this study, contaminated soil was obtained through the EPA. Tomatoes, carrots, and amaranth were planted alongside mustard greens and sunflowers, the hyperaccumulators of interest. Samples of the vegetation and soil were then taken in triplicate and processed with nitric acid to extract the lead and lead concentrations were determined using atomic adsorption spectroscopy. We expected to see a smaller presence of lead in the vegetation grown next to the hyperaccumulators. If hyperaccumulators do have an impact on the lead concentrations in surrounding vegetation, it will provide an additional tool for reducing lead exposure in humans.

WHITNEY KORGAN

Undergraduate

Similar Kinematics Between Flat and Curved Treadmills Confirm That Reduced Body Center of Mass Leads to Increased Energy Expenditure

Major: Neuroscience

Faculty Advisor: Nick Stergiou

Co-Author: Shane Wurdeman

Human gait is an advanced process with many variables affecting efficiency. One controversial aspect is the displacement of the body's center of mass (COM). Initially, the clinicians suggested that by decreasing the body's vertical COM fluctuation, the energy expenditure would decrease also. Previously, we expanded on other research that contradicted this theory. Specifically, we introduced a curved treadmill with an arc shaped walking platform similar to the path of motion of the COM when walking overground, but inverted. Thus, this design counters the arc of the COM, movement of the COM. This made possible achievement of reduced vertical COM movement while maintaining a more natural walking motion, as opposed to subjects' purposefully altering gait. Our previous study did not examine subjects' gait beyond an anecdotal report. Therefore, the purpose of this study was to examine the kinematics of the ankle, knee, and hip between the two treadmill conditions. Our results did not directly confirm our theory, as subjects differed in hip and knee joint range of motion. However, the results do further confirm our first hypothesis. In our initial study, we found that at the slowest speed had the least amount of variation in energy expenditure between the two treadmills but increased with speed. However, in this study the

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slowest speed had the largest difference in range of motion. This suggests that because range of motion and energy expenditure do not show the same pattern, change in energy expenditure was not a secondary effect of treadmill type.

RYAN KORTH

Undergraduate

Fracture analysis of Cretaceous Rocks, Francis Case Lake, South Dakota

Major: Environmental Sciences

Faculty Advisor: Harmon Maher

Co-Authors: Jacob Anderson, Jace Cochran, Theresa Halligan, Anthony Maida, Samuel Nath, Andrew Schwab, Jennifer Stilmock, David Vanosdall, Harmon Maher

This project was carried out by students in a Structural Geology Field Methods class, as a larger ongoing project looking at fracture generation in the Great Plains. The focus is fractures in the Niobrara chalk and Pierre shale at two sites in the area of Francis Case Reservoir, South Dakota. The first site visited was the dam spillway of the reservoir and the second was on the west bank where the highway 44 crosses the reservoir. Orientation data and field observations on joints, veins and faults were collected at both locations. At the bridge 44 site a stratabound and dense network of distinctive veins was the focus of scrutiny. Vein spacing, width and orientation data was measured using both horizontal and vertical traverses. Orientations and observations were also collected from a lower unit, which had more typical joint and vein patterns. Sliding sector circular histograms were constructed for the strike data and then statistically modeled (with up to 4 preferred orientations and a uniform component) for both locations. Comparisons within this study and with other studies, indicates a regionally consistent SE to ESE longitudinal fracture direction exists. Overall the character of the stratabound veins is consistent with deformation, and regional stresses have aligned the veins to their current orientations. Strain measurements indicate a rough estimate of the amount of volume lost in the rock. Because of the complex deformation mechanisms involved, many are still unidentified for this project. These strata show a fracture history worthy of future research.

DEREK LEAS

Undergraduate

Synthesis of novel potential inhibitors of botulinum neurotoxins

Major: Chemistry

Faculty Advisor: James Hagen

Botulinum neurotoxins are the most potent known neurotoxins, and are recognized by the Centers for Disease Control and Prevention as being extremely toxic to humans and their nervous system. The neurotoxin retards the neurotransmitter acetylcholine from entering the synaptic cleft; occurring throughout the whole human body but particularly within the human heart and lungs. Toxin-induced paralysis is the effect of toxin exposure which is often in the form of inhaled aerosols or food contamination; essentially leading to respiratory failure or cardiac arrest. The danger is that the neurotoxin (botulinum neurotoxin) produced by the bacterial species *Clostridium botulinum* can be used as a biological warfare agent. Despite the fact that vaccines exist for these toxins they are available only to military laboratory workers. Furthermore the few vaccines that do exist have no effect on post-contaminated persons. With the ever growing population of our country and botulinum neurotoxin vaccines in short supply, the possibility of a terrorist attack using biological weapons is not something to be chanced leading to the need for new small molecule botulinum neurotoxin inhibitors in the United States bio-defense arsenal. In this study known botulinum neurotoxin inhibitor drug templates were utilized to synthesize potential inhibitors of botulinum neurotoxin that have not been previously considered. Once the novel inhibitors were developed their efficacy was determined thru biological testing by the United States Medical Research Institute of Infectious Diseases. Inhibitors that showed positive inhibition are being considered for further development in order to maximize the drug's potency and activity.

SARAH LEHN

Undergraduate

Effects of *Toxoplasma gondii* growth in host cells that overexpress the gene *CYP17*

Major: Biotechnology

Faculty Advisor: Paul Davis

Toxoplasma gondii (*T. gondii*) is a parasitic protozoa that can infect all mammal including humans. Humans can ingest *Toxoplasma* by eating undercooked meat or by exposure to cat feces. *T. gondii* can cause birth defects, encephalitis, and more recently has been shown to cause behavior alteration in the chronic stage of infection. Recently a cell base screening determined that when the gene *CYP17* was overexpressed, *T. gondii* grew at an increased rate. *CYP17* codes for an enzyme involved in the cholesterol biosynthesis pathway. To determine the mechanism of increased parasite growth, host cells have been created to express an inserted copy of *CYP17*. The created cell lines will be tested against wild-type human cells in three separate experiments. These experiments will test the rate of parasite invasion into host cells, intracellular growth and egress. The outcomes of these experiments will determine at what stage of growth *CYP17* overexpression most affects.

MEGAN LIKEN

Undergraduate

International Trade and Public Opinion

Major: Political Science

Faculty Advisor: Gregory Petrow

Countless scholars and political observers celebrate our increasingly integrated world, a phenomenon referred to as globalization. A major aspect of globalization is the increase of global trade that has followed reduced trade barriers between nations. However, globalization in this respect has also cause real backlashes against it as many have been displaced from their homes and jobs, bringing economic hardships. The fact that some win from globalization and others lose, begs the question-what leads people to support or oppose increased trade? We have addressed this question on the global level. We have analyzed the Gallup World Poll, as well as, the World Values Survey to answer these questions. Our two hypotheses are as follows: First, individuals in nations that benefit more from international trade support such trade more. Second, in these nations, support for international trade leads people to approve more of their leaders. As a result of our analysis, we find among people who oppose free trade, a larger manufacturing base predicts lower regime approval. Among people who support free trade a larger manufacturing base predicts high regime approval.

ALEX MADRAHIMOV

Undergraduate

Targeting signaling cascades for antiviral therapy against Influenza infection

Major: Mathematics

Faculty Advisor: Tomas Helikar

Among emerging infectious diseases, high morbidity and mortality attributed to influenza make it a major threat to human populations worldwide. Immunoprophylactics and antiviral drugs are limited in prevention and treatment, due to selective pressure and increasing resistance among circulating strains, necessitating the need to develop novel therapeutics for the control of an influenza outbreak. However, identification of drug targets has been challenging since the replication of the influenza virus is governed by an intricate network of intracellular regulatory events in addition to an even more complex system of biochemical interactions of the host cell. In this study, we present the first large-scale dynamical model of the molecular mechanism of influenza infection. Each step of the viral life cycle from endocytosis to the budding of progeny virions has been modeled in addition to cellular pathways that are evoked and exploited by the cell obligate parasite. Simulations and analyses of the models dynamics qualitatively reproduced numerous biological phenomena discovered in the laboratory. Finally, the model has been used to compare current and proposed drugs against influenza. Our results indicate that targeting a specific binding interface in the viral proteins is more efficient in reducing replication than existing use of Amantadine/Rimantadine or Zanamivir/Osetamivir. This study provides a better understanding of molecular dynamics of and interactions between viral proteins and host proteins, which is expected to improve vaccine strain selection and novel drug development to prepare us for the next inevitable outbreak.

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ANDILE MAHLANGENI-BYNDON

Undergraduate

Improving the Likelihood of Effective Nutritional Intake among Residents of Long-term Care Facilities

Major: Neuroscience

Faculty Advisor: Priscilla Queen

A concern in some Long-Term Care (LTC) facilities is that the nutritional needs of the residents are not being met and there is a significant risk factor for malnutrition and increased mortality. Many LTC residents do not fully partake in the dining experience due normative (e.g., to a lack of ability to taste and smell their food) and non-normative age changes (e.g., olfactory changes caused by aging, age-related diseases and medications) as well as the environment in which the food is being served (e.g., social factors). The purpose of this study was to identify interventions designed to promote healthy eating among residents in Long-Term Care (LTC) facilities. Specific areas of concern were: eating and normal aging, the social aspect of eating and the environment of the dining experience. Possible interventions are discussed such as consideration of food preferences, flavor enhancers, the number of people the residents eat with, time of day and where they eat. Although food enhancements appear to be the most effective intervention, it is clear that any intervention will include multiple factors.

JACKLYN MILLER

Undergraduate

Puritan Behaviors of High School Students

Major: Political Science

Faculty Advisor: Gregory Petrow

American exceptionalism is a topic that has gained a lot of attention from political scientists- first noted by Alexis de Tocqueville and expanded on by Max Weber (Sanchez-Burks 921). As de Tocqueville and Weber note, this exceptionalism may have risen from America's Puritan-Protestant foundation. Americans are just as traditional in 2000 as they were in 1981 (Uhlmann et al. 18), which indicates that there is a lasting influence of religious traditionalism on American culture. This high level of religiosity despite the economic prosperity felt by the United States seems to be unique to the United States (Uhlmann et al 10). In Puritan culture, these moral principles seeped into the political attitudes of the members of the community, setting no clear boundary between morality and politics. There are many scholars that have evaluated the Puritan's influence on the moral consciousness of Americans, but these influences have yet to be measured in quantitative terms. We expect that with the lasting effects of Puritanical moral principles, there should be a lasting effect on the political attitudes of Americans as well. To test this hypothesis, we developed a Modern Puritan Attitudinal Scale and determined the qualitative behaviors that could be classified as Puritan and linked them to political behaviors.

ANNESHA MITRA

Undergraduate

Depression, Self-Concept Anxiety and Academic Performance Effecting Self-Continuity on Early Adolescents

Major: Psychology

Faculty Advisor: Jonathan Santo

Co-Authors: Jonathan Santo, William Bukowski

Self-continuity reflects the ways in which people reconcile the physical and psychological changes they undergo into a cohesive self-concept. The strategies used by adolescents to explain the stability of perceptions of self-continuity over time have been associated indicators of mental health (Chandler et al., 2003). Studies have shown that depression and self-continuity are negatively related to each other. In the current study, it was hypothesized that self-discontinuity would be associated with increased depressed affect, higher self-concept anxiety and lower academic functioning. Data were collected from 180 (93 male) early adolescents (mean age =10.68, S.D. = .54) in grades five and six from eight classes

in two schools from Montreal, Quebec, Canada. The outcome was self-discontinuity (seven items; ex.: "I'm a completely different person all the time"; $\alpha = .69$). We also measured self-reported depressed affect (ten items, $\alpha = .91$), self-concept anxiety (seven items, $\alpha = .81$) and teacher rated academic functioning. Multiple regression was used to test the associations between depressed affect, self-concept anxiety and academic functioning on self-discontinuity. Analyses revealed that depressed affect ($\beta = .196$) and self-concept anxiety ($\beta = .146$) were positively associated with self-discontinuity. Academic performance however had no effect ($\beta = .081$). The resulting model ($R^2 = 8.6\%$) was a good fit to the data ($F_{(3, 170)} = 6.40, p < .05$). Thus, the current study demonstrated that self-discontinuity was positively associated with depressed affect and self-concept anxiety. Future analyses should examine potential processes explaining these associations. Sex differences will also be discussed.

CHRISTOPHER MOLINI

Undergraduate

TABCAP – A Table-Based Computing Application

Major: Computer Science

Faculty Advisor: Haifeng Guo

Co-Authors: K.R. Guruprasad, Prithviraj Dasgupta

TABCAP is a simple computer application used to process arbitrary data, allowing users to perform complex processing with minimal effort. This is accomplished by using a simple scripting language to establish constraints upon the system, allowing the user to define custom rules for how the program will execute. By making problems defined in terms of abstract constraints and relationships, the application can solve a vast array of problems with very few rules. The results of the computation are presented to the user in tabular form, showing all possible solutions to the user's input. Ultimately, the program enables the user to save time and effort when interpreting data, and is a useful tool for calculations.

CHRISTOPHER MOLINI

Undergraduate

Voronoi Partition-based Distributed Multi-robot Coverage

Major: Information Science

Faculty Advisor: Prithviraj Dasgupta

Robotic coverage of an initially unknown or partially known environment is a problem that is encountered in various applications of robotic systems ranging from unmanned search and rescue, automated demining, extra-terrestrial exploration, and even domestic applications like automated lawn mowing and vacuum cleaning. It involves covering the entire surface area of a region by a group of mobile robots in the minimum possible time while avoiding repeated coverage of the same region by multiple robots. In this research, we propose a technique that divides the region to be covered by the robots into virtual sub-regions or cells using a technique called Voronoi partitioning. A potential problem of using the Voronoi partitioning technique in initially unknown environment is that adjacent Voronoi cells may not be connected because of presence of obstacles. We proposed a solution where the robots reallocate the connected patches in a distributed manner such that each robot is responsible for covering a set of contiguous connected cells. This ensures that the environment can be covered completely without any overlapping coverage. We have demonstrated the operation of our proposed technique on a simulation using e-puck robots and shown that our technique operates successfully.

KIMBERLY MORSS

Undergraduate

Distinguishing between Possible Sources of Lead Poisoning in Children in Omaha, NE

Major: Environmental Sciences

Faculty Advisor: Dana Richter-Egger

Lead poisoning in children of Omaha, NE is an ongoing issue. There are several sources that could potentially contribute to the elevated blood lead levels including; soils contaminated with lead, lead based paint inside and outside the home, dust, toys, candy and water. The goal of this study is to discern the proportion of the contamination for which each source is responsible. Samples from the possible sources as well as a blood sample from the child with an elevated blood lead level were collected to be analyzed through special instrumentation. The method of analysis used in this project uses the distribution of lead and its isotopes in each sample to identify the sources. Identifying the primary sources of

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lead affecting children will provide valuable information in developing methods of preventing lead poisoning in the future.

JOSHUA NELSON

Undergraduate

Security of Programmable Logical Controllers

Major: Computer Science

Faculty Advisor: William Mahoney

Programmable Logic Controllers (PLCs) are the computational building blocks behind industrial networks of various functionalities. The main method of communicating with PLCs is through the Internet Protocol (IP) using a defined protocol, the Common Industrial Protocol (CIP). However, this leads to serious implications when considering the security of PLCs. CIP does not encrypt any information communicated to or from PLCs, allowing network attackers to read, manipulate, and corrupt specific commands simply by sniffing the CIP traffic on the same network as the PLCs and mainframe. My research project was to identify such attacks. The method to analyze the attacks is to thoroughly understand the construct of CIP. Knowing of how commands are used through CIP allows understanding of intentional attacks and the prevention thereof. In order to analyze the attacks further, I can take the role of an attacker sending hazardous commands to PLCs. This lead to immense knowledge behind the Common Industrial Protocol and the communication between the mainframe and the PLCs. Furthermore, this can lead to significant increase in security in industrial networks.

NGUYEN NGUYEN

Undergraduate

Cyclic Voltammograms of Estrogen Quinones

Major: Chemistry

Faculty Advisor: Douglas Stack

Co-Author: Douglas Stack

Estrogen is considered the strongest risk factor for breast and other human cancers. Oxidative metabolism of estrogen (Figure 1) generates o-quinones (Qs) that can damage DNA. The most genotoxic o-quinone is E2-3,4-Q. Cyclic voltammetry (CV) was done on E2-2,3-Q, E2-3,4-Q, and 1-n-butyl- E2-3,4,Q in order to gain insight into their possible role as redox cycling metabolites. The first reduction potential of E2-2,3-Q, E2-3,4-Q, and 1-n-butyl- E2-3,4,Q was measured at -0.275, -0.495, and -0.965 V, respectively versus a silver/silver chloride reference electrode. The second reduction potential of E2-2,3-Q, E2-3,4-Q, and 1-n-butyl-E2-3,4,Q was measured at -0.930, -0.935, and -1.440 V, respectively. All reduction potentials became more positive (more easily reduced) at lower pH. 1-n-butyl- E2-3,4,Q reduction potential was significantly made more positive when converted to its conjugate acid (-0.965V vs. +0.275 V). These results indicate that E2-2,3-Q is more easily reduced than E2-3,4-Q. While E2-3,4-Q has more a reversible CV profile indicating it a more likely candidate for redox cycling.

KELSEY PALM

Undergraduate

Empathetic Responding to those with Celiac Disease as a Function of Trait Empathy and Situational Factors

Major: Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer

This literature review investigates the relationship between trait empathy and empathetic response, along with an examination of situations that elicit higher or lower levels of empathetic response. Research found that while increased levels of trait empathy might lead to more automatic empathetic response (Rameson, Morelli, & Lieberman, 2011), individual differences in empathetic response are large-

ly dependent upon age, gender, emotional appeals, positive or negative situation framing, and degree of information provided (Bagozzi & Moore, 1994; Decety, Echols, & Correll, 2009; Sze, Gyurak, Goodkind, & Levenson, 2012; Taute, Huhmann, & Thakur, 2010). These data were collected predominantly from undergraduate students or others of the same age group, making this research primarily applicable to those between ages 18 and 30. Following this comprehensive review is a proposed research agenda for investigating the interaction of trait empathy and degree of information richness on empathetic response to people with celiac disease, a genetically linked autoimmune disorder (Celiac Sprue Association, 2013), which will utilize a sample of undergraduate students aged 19 and older.

KRISTINA PANZARELLA

Undergraduate

TaqMan Probe Design for Analysis of Stage-specific Genes in *Toxoplasma gondii*

Major: Biology

Faculty Advisor: Paul Davis

Toxoplasma gondii is a spore and cyst forming parasite, granting this species the ability to infect various organisms throughout its life cycle. Transmission can occur in individuals by way of inadvertent ingestion simply by cleaning a cat's litter box, as well as infecting soil and water supplies by improper disposal of feline fecal matter. Infection in humans can also occur by way of ingesting undercooked meat, (namely pork, but others have been reported as well) contaminated by *T. gondii* bradyzoites, cysts that are formed in muscular tissue by the parasite. This is particularly problematic in pregnant women contracting *T. gondii* as it is readily diffused across the placenta thereby infecting the unborn fetus leading to fetal abnormalities and in some cases even death. Although there have been several advances in the fabrication of various antibiotics used to treat the tachyzoite stage in *T. gondii*, only the human immune system has been able to keep the bradyzoite stage in check. In immunosuppressed individuals however, this immunoresponse is less than ample; for example, Toxoplasmosis is one of the leading killers in AIDS patients. The Davis labs' primary target is the bradyzoite stage of the *T. gondii* life cycle. Previous experiments have focused on building an index of genes in *T. gondii* pointedly focused on the comparison of those expressed solely during the tachyzoite phase, and less on the bradyzoite stage. TaqMan probes were developed to aid in this process by targeting the housekeeping gene (all stages), ribosomal protein L33, as well as the bradyzoite stage specific marker lactate dehydrogenase. In this way we are now able to quantitatively monitor the percentage of bradyzoites to tachyzoites in Toxoplasmosis cultures by the level of expression shown in each of the two aforementioned genes.

MARISSA POE

Undergraduate

Changes in the Morphology of Tongue Tissue Resulting from Lingual Nerve Transection

Major: Neuroscience

Faculty Advisor: Suzanne Sollars

The sense of taste is a means through which our nervous system interacts with food and fluid. Taste buds transmit taste information to the brain along the chorda tympani nerve. These taste buds are located in structures called fungiform papillae, which can be found on the anterior surface of the tongue. This papilla structure transmits somatosensory information (hot, cold, etc.) to the brain along the lingual nerve. The lingual and chorda tympani nerves have no known connections or overlap in the papillae or taste buds. It has previously been observed in rats that cutting the chorda tympani nerve early in development causes the fungiform papillae structures to either change in shape or disappear entirely, despite the fact that there is no known relation between this specific nerve and the papilla structure itself. The purpose of this study was to further investigate these two nerves and the papillae and taste buds they innervate. In this study, the lingual nerve was severed in rats of different age groups, and then the tongue tissue from these animals was sectioned on a cryostat to a thickness of 10 μ m. The tissue was then stained and analyzed using a research microscope to determine differing taste bud volumes. These volumes were calculated using the computer program Neurolucida. By observing the changes to the tongue tissue that were caused by severing the lingual nerve, we are able to better understand the relationship between the chorda tympani and lingual nerves and how they interact within the peripheral nervous system.

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JEROME PRUSA

Undergraduate

A Comparison of Genome Structures in Naturally Occurring Virulent and Avirulent Coxsackieviruses

Major: Biotechnology

Faculty Advisor: William Tappich

Coxsackievirus B3 (CVB3) is an enterovirus in the family *Picornaviridae* and relevant to human health, causing diseases including myocarditis, pancreatitis and aseptic meningitis. The viral genome includes a 742 nucleotide 5'Untranslated Region (5'UTR) that serves a critical role in CVB3 infection. Efficient viral replication and viral peptide synthesis require a specific 5'UTR secondary structure that has been extensively studied. Two naturally occurring strains of CVB3 include the virulent CVB3/28 and the avirulent CVB3/GA. Previous studies have used chemical probing to characterize the secondary structure of CVB3/28 and generate an experimentally supported structural model. This current study further examines and compares the CVB3 5'UTR secondary structure in both CVB3/GA and CVB3/28. The primary sequence of both strains have been determined in previous reports, and sequence changes occur at 63 of the 742 positions. Given this variability, the CVB3/GA 5'UTR may include mutations that disrupt or alter the formation of the specific secondary structures required for viral processes. Identification of 5'UTR structural differences between naturally occurring virulent CVB3/28 and avirulent CVB3/GA may provide a better understanding of the structures required for CVB3 5'UTR functionality as well as CVB3 virulence.

RACINE RANGEL

Undergraduate

Phytoremediation: Fish life saver?

Major: Biology

Faculty Advisor: Alan Kolok

Co-Author: Alan Kolok

The primary objective of this research project was to determine if direct competition occurred between an aquatic plant (*Elodea canadensis*), and a fish the fathead minnow (*Pimephales promelas*) for a water-borne chemical, 17 β -trenbolone (17b-Tb). If this were so, phytoremediation (the uptake of chemicals by plants) could remove contaminants within environmental systems in an advantageous and cost effective manner. In the current study, phytoremediation was used to mitigate the concentration of a steroid, 17b-Tb a compound known to cause reductions in the hepatic gene expression of vitellogenin in female fish. 17b-Tb was made available to the fish by means of spiked sediment at a concentration of 0.05 μ g/L. Unlike previous experiments, female fathead minnows in this study did not experience reductions in vitellogenin expression. Time integrating sampling of water determined that the 17b-Tb in the system was converted into trendione, a metabolite that does not appear to be bioavailable to the fish. Phytoremediation may not be necessary for compounds, such as 17b-Tb that quickly degrade into less toxic metabolites.

STEVEN READY

Undergraduate

Abnormal Growth of the Parasite *Toxoplasma Gondii* in Human Cells

Major: Biotechnology

Faculty Advisor: Paul Davis

Toxoplasma gondii is a microscopic parasite that infects all mammals, including humans. The parasite normally inhabits felines but can be transferred to humans from contact with cat feces and eating undercooked meat and unwashed vegetables. Current estimates indicate that 30% of the United States is infected with the parasite. First time infection of *Toxoplasma* in pregnant women is the leading cause of birth defects in the United States, and infection of people with weak immune systems, such as AIDS and transplant patients, often results in death. *Toxoplasma* is also related to the parasite that causes malaria, therefore knowing how the parasite grows may allow for the development of new drugs that can treat not only toxoplasmosis, but malaria as well. When the COPS7B gene activity, which is involved in con-

trolling protein degradation, is increased in human cells infected with *T. gondii*, *Toxoplasma* grows much slower in host cells than it does in cells with normal COPS7B gene levels. We hypothesize that the parasite uses degraded components of host proteins to make its own proteins and when COPS7B levels are high, degradation is impeded. We hope to evaluate this hypothesis by precisely comparing the growth and invasion efficiency of parasites in modified and normal cells, as well as the corresponding protein degradation status.

ANDREW REINKE

Undergraduate

Architectural Engineering Integration Characteristics of Compressed Stabilized Earth Blocks

Major: Architectural Engineering

Faculty Advisor: Ece Erdogmus

Previous studies have been conducted to examine compressive strength and thermal constant characteristics of compressed stabilized earth blocks (CSEB). In order to use CSEB as a sustainable construction material, it is pertinent that the characteristics are clearly understood. In this study of CSEB, the baseline CSEB, without stabilization and reinforcement, and its thermal constants have been considered to understand the effects that the stabilization of earth blocks has on these qualities. In the testing of the thermal constants of this material, the American Society for Testing and Materials (ASTM) standard ASTM C1363 – 05, "Standard Testing Method for Thermal Performance of Building Materials and Envelope Assemblies by Means of a Hot Box Apparatus," was carried out to determine the thermal resistance of the unstabilized and unreinforced baseline CSEB. In addition to the determination of the thermal constants, there has been testing carried out to determine what should be the correct combination of materials would be so that the compressive strength of the construction material would be suitable for use. This aspect is the primary concern with this novel construction material. The investigation into the correct proportions of hydration, stabilization, and indigenous earthen materials is a complicated multivariable analysis. Investigation into this is still ongoing and will continue to dictate the direct of future projects on this subject.

JESSICA RENZ

Undergraduate

Long Range Correlations in the Stride Interval of Stair Climbing

Major: Exercise Science

Faculty Advisor: Nick Stergiou

Walking and stair climbing are tasks performed on a daily basis. The step-to-step timing during comfortable walking exhibits a consistent long-term pattern. The purpose of the current study was to determine if this step-to-step timing retains such a long-term pattern during continuous stair climbing. Ten participants were recruited for the study. Kinematic data was collected using reflective markers placed at the head of the second metatarsal of each foot and tracked with a motion capture system as participants walked on a stairmill device (StairMaster SC916, Fitness Direct, San Diego, CA). The collection began with the subjects choosing their preferred stepping rate on the stairmill. Data was then collected for three minutes at this stepping rate. Subjects were then asked to find their preferred walking rate on the treadmill and data was collected at this rate for five minutes. The mean, standard deviation, and coefficient of variation of the stride time interval, the time between two consecutive steps with the same leg, were then computed for each subject, in each condition. These values indicated that there was a larger amount of variability present during stair climbing than during treadmill walking. We speculate that this may be due to stair climbing being a more strenuous and difficult task than treadmill walking. Detrended fluctuation analysis of the stride interval time series of each subject showed the presence of characteristic long-range correlations during treadmill walking but not during continuous stair climbing.

JOSH RYAN

Undergraduate

Adapting and Directing *The Beautiful and Damned* By F. Scott Fitzgerald

Major: Theatre

Faculty Advisor: Steven Williams

This project involved adapting a century old story by F. Scott Fitzgerald into a stage play. The involvement of outside designers helped to create a specific look and feel to the production, which was staged here in Omaha and underwent a week long run at the Omaha Community Playhouse before going on to

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be performed at the Unicorn Theatre for the Kansas City Fringe Festival in 2012. The project involved the use of on-stage (source) lighting along with the use of an overhead projector to cast color and the feel of various locations onto the playing space. Music was also a major factor in setting the mood for scenes. A combination of songs appropriate to the book's specific time period mixed together alongside modern music gave the atmosphere of the play a unique feel. Costume and properties resided in a non-specific time period in order to balance with the mixture of classical and contemporary influenced by sound and lights. The staging of the production involved a blend of realistic interactions with abstract and expressive movements. Each of the characters in the play were utilized to portray the character themselves, but also functioned as our Narrators in certain parts of the action and were able to jump in and out of the action of the story as needed. This device was used to blur the line between character and storyteller.

HANNA SCHLEU

Undergraduate

Coping Skills as a Moderator of Work-School Conflict on the Effects of Sleep Duration, Mood State, and General Well-Being

Major: Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer

The purpose of this project is to explore the consequences of work-school conflict (WSC) among college students. Specifically, this study, will examine whether coping skills attenuate the negative effects of WSC on sleep duration, mood state, and general well-being. Markel and Frone (1998) proposed the concept of WSC, defining it as "the extent to which work interferes with an adolescent's ability to meet school-related demands and responsibilities" (p.278). Their research indicated that most young adults typically attend school full-time and work part-time. The negative effects of WSC are considerable (Buboltz, Brown, & Sopher, 2001; Womble, 2003). Research by Buboltz, et al., has shown high levels of workload and school demands negatively influence student mood as they are unable to fulfill their obligations in both work and school domains. Furthermore, their study revealed that negative mood has a detrimental effect on sleep duration, which in turn, decreases their overall well-being. Research by Womble (2003) demonstrated that students who worked more hours and took a heavy course load reported a lower GPA at the end of the semester compared to students with fewer demands at school and work. Due to the deleterious effects of WSC on student psychological, physical, and academic outcomes, the study of coping skills is very important. This study seeks to determine the effect of coping skills on students' sleep duration, their tendency to experience positive or negative moods and their general well-being with a specific focus on students experiencing high WSC.

TREVOUR SCHOELLER

Undergraduate

The Effect of Using an I-Pad as a Learning Tool to Improve Reading Fluency

Major: Psychology

Faculty Advisor: Brian McKevitt

This research study, titled "The Effect of Using an I-Pad as a Learning Tool to Improve Reading Fluency" used an I-Pad as a learning intervention for students who were not meeting the standard requirements for their grade level in reading fluency. The purpose of this study was to examine whether the use of an I-Pad as a learning tool increased reading fluency beyond a student's typical improvement rate given regular instruction. Three 3rd grade students, who had fallen behind in reading, but do not meet the standards to qualify for the special education program, were selected by the Title 1 teacher of Underwood Elementary School. Baseline data was first collected, using oral reading fluency curriculum-based measurements; the author began working with the participating students on improving their reading fluency skills through using the I-Pad programs designed to help students read at a better pace. The first student started the intervention on the third day, followed by the second student starting on the 10th

day and 17th day for the third student. Students worked with the I-Pad program for up to 30 minutes a day. This study was conducted over a twelve week period. The researcher found that the students increased the words per minute more than the expected growth in words per minute each week according to AimsWeb. The students also decreased the amount of reading errors for each reading. Further studies with larger sample sizes should be collected to help support these data findings.

BRADY SILLMAN

Undergraduate

Molecular characterization of the *Glechoma hederacea* virescent-like mutant: Discovery of differentially expressed genes

Major: Biology

Faculty Advisor: Mark Schoenbeck

Co-Authors: P. Roxanne Kellar, Mark Schoenbeck

A spontaneously occurring virescent-like mutant has been identified within a local *Glechoma hederacea* population, which is highly sensitive to light levels. The virescent-like genotype of *G. hederacea*, or ground ivy, was discovered occurring as a somatically-arising mutation. Virescence is the phenomenon in which the maturation of chloroplasts, and development of their associated function, is delayed relative to the non-mutant "wildtype". This is distinct from the condition of albinism, the absence of pigmentation and photosynthetic capacity. The *G. hederacea* virescent-like lesion has multiple developmental and physiological consequences, which may be caused by pathogenic agents, though many instances of virescence are known to be caused by mutations in the plant nuclear or plastid genomes. The objective of this study was the identification of genes whose expression is differentially impacted between the two *G. hederacea* genotypes using a range of molecular tools. First, in order to demonstrate that the virescent-like genotype is genuinely a member of the species *G. hederacea*, and not a distinct species of *Glechoma*, we have used inter-simple sequence repeat analysis to show the similarity between the wildtype and mutant genomes. Second, amplification from reverse-transcribed RNA of *G. hederacea* using arbitrary primers yielded distinct amplification patterns that can be used to identify differentially-expressed transcripts between the two genotypes. Third, plasmid sequencing of both genotypes has yielded data for comparative analysis in the search for the genetic basis of the mutant phenotype.

PHILLIP SMITH

Undergraduate

Rite, Recursion, and Rock & Roll: The Compositional Process in *matryoshka*

Major: Music

Faculty Advisor: Melissa Berke

This session will discuss the compositional process for "*matryoshka*", a piece composed for the Omaha Performing Arts' program entitled, "The Rite Returns" (<http://www.theritereturnsomaha.org/>). This festival celebrates centennial anniversary Russian composer Igor Stravinsky's famous piece with music, poetry, and dance. The resulting piece, *matryoshka*, is a synthesis of three things: the influence of Stravinsky, the process of recursion, and the sounds of Rock & Roll. This presentation will discuss the specific musical aspects of these influences, the process of recursion and its translation into sound.

ELIZABETH SPARTZ

Undergraduate

Measuring Anxiety in Mice with Fragile X Syndrome

Major: Neuroscience

Faculty Advisor: Paul Davis

The prevalence of autism in the United States has risen 78% in the last 10 years, and it is estimated that 1 in 88 children in the United States have some form of autism spectrum disorder. The dominant genetic cause of autism is fragile X syndrome which accounts for about 5% of autism diagnoses. Fragile X syndrome is caused by a mutation of the gene *fragile X mental retardation 1* (FMR1) on the X chromosome. Individuals with fragile X syndrome exhibit a continuum of learning disabilities and short-term memory and visual memory impairments. Additional effects include an increased seizure risk and obsessive-type symptoms like those of OCD. In the majority of male and 30% of female cases of fragile X syndrome, ADHD also occurs. Anxiety, largely social anxiety, causes significant dis-

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turbance in daily functioning including difficulty forming peer relations which is the symptom for which we tested. Using mice and mice that have had the fragile X gene knocked out, we were able to measure levels of anxiety with the marble burying test. Each mouse was placed in a cage with 15 marbles, and after 30 minutes the percentage that each marble was buried was recorded. Mice that have higher anxiety bury more marbles. By this measure, one is able to determine differences in anxiety between mice with and without fragile X syndrome. Quantifying anxiety levels in fragile X syndrome mice will be a baseline by which to compare possible treatments first in mice, and then hopefully in humans.

ALYSSA STEFFEN

Undergraduate

Parasite, Pest, and Pathogen Monitoring in Three Newly Established Subspecies of *Apis mellifera*

Major: Biology

Faculty Advisor: Karen Murch-Shafer

The value of honey bee pollination in the United States economy is estimated to be 15 billion dollars per year. The future of our food supply rests on the honey bee, whose pollination efforts account for 1/3 of the food that is produced worldwide. Due to certain threats such as colony collapse disorder, parasitic flies, varroa mite, wax moth, and hive beetle infestations, the *Apis mellifera* species is at risk. This study aims to compare the establishment of three subspecies of *Apis mellifera* (*Apis mellifera lingustica* (the Italian bee), *Apis mellifera carnica* (the Carnolian bee), and Minnesota Hygenic, (a hybrid of *lingustica*)) into the Eastern Nebraska region by quantitatively and qualitatively observing various common stresses placed upon them. We monitored their rigor during hive inspections by analyzing varroa mite counts, honey production, wax volume, and visual observations of brood formation. We found that a prevailing factor, temperature, influenced the growth of all our subspecies in a similar way, despite their different genetic make-ups. Near record warmth during the winter months was only a precursor to a devastating drought and the hottest Nebraska summer on record. These episodes created an ideal niche for certain species, such as the *Achroia grisella*, the lesser wax moth, to multiply and eventually act as a major threat to the colonies.

SHANNON STOFFEL

Undergraduate

A Pilot Study: The aquatic microbial landscape of Heron Haven Nature Center

Major: Chemistry

Faculty Advisor: Christine Cutucache

Co-Authors: Abraham Farhat, LeDawna Strathman

Heron Haven Nature Center is a protected green space in Omaha, NE for wetland flora and fauna. This wildlife refuge area is supplied water from a nearby inlet. This was the first of a series of samplings to be performed, as part of our ongoing objective, to monitor the microbiota populating the area. Water samples were collected from the surface near the inlet, as well as two locations in the main pond: the surface level, and the deepest point (n=3). To determine the microorganisms present, cultures were grown on selective and differential media. The microbial populations within each sample were characterized by means of nutrient agar slants, triple-sugar iron agar slants and biochemical assays. Subsequently, gram stains were performed on isolated populations as well as direct stains for determining morphology. All three samples contained bacteria capable of metabolizing tryptophan. The microorganisms from the inlet stream were able to ferment sucrose and/or lactose, and were both streptococcus and bacillus. The microbes isolated from the bottom of the main pond were able to ferment sucrose and/or lactose and most had the following characteristics: gram-negative bacillus, gram-positive coccus, and gram-negative streptococcus. Finally, the species found on the surface of the main pond were able to ferment glucose, sucrose and/or lactose, and consisted primarily of gram-negative bacillus, gram-positive coccus, and gram-negative streptococcus. This research will provide meaningful insight in the microbial landscape of Heron Haven Nature Center.

TRAVIS TIMM

Undergraduate

Localization of a Type III secretion chaperone SpcU within *Pseudomonas* Bacterial cells

Major: Biotechnology

Faculty Advisor: Donald Rowen

Pseudomonas aeruginosa is an opportunistic bacterial pathogen which is primarily known for causing severe respiratory infection in patients with cystic fibrosis. It is a Gram-negative rod that has several different virulence factors. One virulence factor is the exotoxin ExoU which is secreted into host cells by a specific secretion system referred to as the Type III secretion system (TTSS). Type III secretion is a topic of interest because it is the means by which many bacterial pathogens deliver toxins to cells inside their infected host. Many toxins require a chaperone for secretion by the TTSS, but the role of the toxin is not known. To learn more about the role of Type III chaperones, I have been examining the role of the *P. aeruginosa* chaperone SpcU in the secretion of ExoU. I have constructed a HA-tagged version of SpcU so that we can monitor the localization of SpcU in cells. We have examined whether SpcU is located in the soluble cytoplasmic fraction or is associated with membranes in the bacterial cells by Western immunoblots. From the Western blots done it has been found that a high concentration of SpcU exists in the soluble cytoplasmic fraction of the cells. Through Western blots and Immunoblotting procedures there is evidence of the chaperones existence in the soluble cytoplasmic fraction. Now the lab is trying to find a way to shut down the SpcU chaperone to discontinue the *Pseudomonas* toxin ExoU from being delivered to a host cell.

NHI TRAN

Undergraduate

Botulinum Neurotoxin A Light Chain Inhibitors

Major: Medicinal Chemistry

Faculty Advisor: James Hagen

Botulinum neurotoxins (BoNTs) are microbial products from the spore forming bacteria, *Clostridium botulinum*, that naturally inhabits soil and untreated water worldwide. The BoNTs have been recognized as the most potent, lethal toxins known to humans. BoNTs act as zinc dependent proteases that cleave soluble n-ethylmaleimide-sensitive factor attachment protein receptor proteins that control the release of neuronal vesicles which release acetylcholine into the neuromuscular junction. This inhibition of acetylcholine release can lead to the potentially fatal disease, botulism. Advanced intoxication can lead to flaccid paralysis, respiratory failure, and cardiac arrest. The serotype most commonly associated with human botulism is BoNT/A. BoNTs are single polypeptide chains that are approximately 150 kilodaltons (kDa) each. BoNT/A is cleaved resulting in a 100 kDa heavy chain (HC) and a 50 kDa light chain (LC). In order to counteract the toxins, an inhibitor must have high binding affinity to the BoNT/A LC. The inhibitor must be able to either bind directly to the catalytic zinc of the BoNT/A LC, or block the toxins from accessing the catalytic zinc site. This research has fused together known inhibitor segments to produce mild zinc binding inhibitors. These synthesized inhibitors are to be analyzed for purity by combustion analysis and biological activity to be studied in order to assess whether they can act as vaccines or antibodies in post toxin exposure from potential bioterrorism aerosol attacks of BoNTs or in accidental medicinal overdoses that may occur from medicinal or cosmetic uses of BoNTs.

SHERIDAN TRENT

Undergraduate

Reviewing Resilience as a Possible Moderator of Work-School Conflict on Job Satisfaction, Excessive Daytime Sleepiness, and General Well-Being

Major: Psychology

Faculty Advisor: Lisa Scherer

Co-Author: Lisa Scherer

Work-school conflict (WSC) and its associated negative effects is a prevalent problem among our nation's college student population (Butler, 2007; Steinberg, Fegley, & Dornbusch, 1993). WSC is defined as "the extent to which work interferes with an adolescent's ability to meet school-related demands and responsibilities," (Markel & Frone, 1998, p.278). Daytime sleepiness, job satisfaction, and general well-being are important to study because these factors exert both indirect and direct effects on college stu-

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dents trying to balance a job while attending school. According to the American Council on Education, 70%-80% of undergraduate students elect to work part-time or full time while attending school full-time. General trends in research show negative outcomes associated with working 20 or more hours per week, including increased binge drinking, decreased sleep, and reduced academic performance (Miller, 2008; Gilbert, 2010). Research evidence for the relationship between resilience and academic success is mixed (Elizondo-Omana, 2007; Hartley, 2011), with some studies showing a positive influence and others not showing any appreciable effect. However, one study showed that students scoring high in resilience are less affected by daily 'hassles' and 'struggles' compared to students scoring low in resilience (Lai & Mak, 2009). The specific focus of my proposed oral presentation is to review and integrate the relevant research literature and theory as a basis for proposing resilience as a moderator of WSC on job satisfaction, general well-being, and daytime sleepiness.

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DAVID VANOSDALL

Undergraduate

Microstratigraphy of a Upper Triassic-Lower Jurassic dinosaur quarry

Major: Geology

Faculty Advisor: George Engelmann

The Upper Triassic - Lower Jurassic Nugget Sandstone was deposited within a great sand sea that once covered much of the western US. In 2008, the Saints and Sinners Quarry was discovered near Dinosaur National Monument (DINO) in northeastern Utah. So far, the quarry has produced thousands of theropod dinosaur bones from a bone bed horizon about a meter thick. Outcrop scale relationships of the interdunal sedimentary layers that contain the bone bed and data from quarry maps and studies of the bone occurrences have been used to constrain hypotheses on how this deposit formed. However, smaller scale features of the sediments of the bone bed are not apparent to the naked eye or at levels of magnification possible in the field. Oriented samples were collected from several locations distributed laterally and vertically throughout the quarry and the adjacent interdunal sediments, and the locations of the samples have been mapped. Thin sections have been prepared from the samples for further microscopic analysis. Initial results show that the sediment consists of quartz grains that are subangular to subrounded in shape with generally low sphericity. Most of the sediments appear to be moderately to well sorted with a few samples more poorly sorted. No preferred orientation on the quartz grains exist, but overall bedding orientation might be determined by the cement and iron oxides in the samples. Ongoing analysis of these samples continues in order to identify trends in how the sediment varies within the quarry.

HOLLY WILSON

Undergraduate

Traversing the Interior Land of Chronic Pain

Major: Creative Nonfiction

Faculty Advisor: John Price

Creative Nonfiction is narrative nonfiction, literary journalism. The genre mines truth beyond traditional journalism's limitations, using the descriptive literary tools of fiction such as timing, mood, and setting. This project is an undergraduate work-in-progress of Creative Nonfiction, intended for publication. While pain can warn us of dangerous temperatures or injuries, chronic pain is "ongoing or recurrent pain, lasting

beyond the usual course of acute illness or injury or more than three to six months” (American Chronic Pain Association). A 2011 congressionally mandated report said 100 million American adults are chronic pain sufferers, with medical care and lost productivity costs estimated at \$635 billion annually (“Relieving Pain”). The Decade of Pain Control and Research (2000-2010) ended with unresolved questions not only about the nature of pain, but also the mental and emotional response (Boswell) to assaults upon the human body, from muscles and bones, to nervous and immune systems. There are increasing calls for a paradigm shift, to view this debilitating condition not as a secondary problem, a symptom related to disease or injury, but as a primary diagnosis requiring its own treatment approach (Pain Research Forum). This focus is essential for “physical, psychological, and social well-being” (Clark). As the medical community examines pain and effective strategies, the vast territory of the sufferer’s personal chronic pain journey remains unexplored in a meaningful contextual framework; the missing voice in the pursuit for answers. This multi-disciplinary narrative traverses subjective interpretations of inner landscapes (important components to pain management): emotions, feelings, perceptions, and thoughts.

BRAD WOOSLEY

Undergraduate

Dynamic Robotic Task Allocation using Real Time Path Planning with Field D*

Major: Computer Engineering

Faculty Advisor: Prithviraj Dasgupta

Co-Author: Prithviraj Dasgupta

Multi-robot systems comprise of robot teams which operate collectively to perform the tasks that are assigned to them. One of the major problems encountered by multi-robot systems that operate in initially unknown or partially-known environments is that the conditions in the environment can change dynamically as the robots are performing the tasks. This makes it difficult for the robots to ‘plan’ their tasks ahead of time. However, most state-of-the-art task allocation techniques for multi-robot systems do not incorporate a real-time feedback about the situation of the environment encountered by the robots into their task planning. In this research, we propose to address this deficit by developing a two-layered approach - in the bottom layer, robots update their current perception of the environment, while, in the top-layer, they use the current perception to update their plan of performing tasks. We have demonstrated our technique in a scenario where the robots’ tasks correspond to visiting a set of locations and doing an operation at each location. Such scenarios are encountered in various robotics applications such as detecting potential landmines in an automated humanitarian demining scenario or putting out fires in an automated search and rescue scenario, etc. We have implemented our proposed technique on a Corobot robot within our lab environment and shown that the robot can dynamically detect and avoid obstacles and other mobile robots, and re-plan its path to visit its target locations while incorporating changes to its originally planned paths based on the dynamic and static obstacles it discovers.



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GRADUATE

RYAN ANDERSON

Graduate: Masters

The Principal-Agent Problem and Residential energy Efficiency

Major: Economics

Faculty Advisor: Catherine Co

Despite increased support for residential energy efficiency programs by state and local governments, the adoption of energy-saving technologies continues to lag behind expected values. Economists have identified conflicting incentives between the landlords responsible for purchasing such technologies and the tenants responsible for paying utility bills as a potential contributor to this gap. I apply a logit model to data from the 2009 Residential Energy Consumption Survey to determine the effects of this principal-agent (PA) problem and various incentive programs on a household's decision to invest in two different kinds of energy-saving technologies. I find that the PA problem is particularly pronounced for weatherization improvements, an important finding as these investments have an especially high potential for reducing energy consumption. I also find evidence that existing incentive programs are already somewhat well-tailored to this need, as they perform particularly well in encouraging weatherization improvements as compared to other kinds of energy-saving technologies.

ROSEMARY ARRAH

Graduate: Masters

Teachers' and Principals' perceptions of students with special education needs in Cameroon Secondary Schools

Major: Special Education

Faculty Advisor: Kristine Swain

This study examined teachers' and principals' perceptions of students with special education needs in Cameroon secondary schools. A 26-item survey was completed by 130 teachers and 4 principals from five secondary in Buea subdivision of Cameroon, Africa. The schools were classified as government, denominational or lay private general education schools. In addition to the surveys, 10 participants were selected to participate in an interview. The survey was analyzed using descriptive statistics and t-tests. The results show teachers' and principals' perceptions of students with special education needs were favorable, however specific areas of concern were noted that included insufficient resources for special education, lack of training to work with students with special education needs, additional stress and anxiety when teaching students with special education needs, and preventing the learning of other students. Discussions will focus on future direction for research and creation of awareness of special education needs of students in Cameroon secondary schools.

AARON BROWN

Graduate: Masters

The Decision to Stay or Leave: The role of Spirituality in Attenuating Burnout

Major: Industrial and Organizational Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer, Joseph Allen

Volunteer retention is critical for the success of non-profit organizations, with the specific decision of the volunteer to leave or stay meriting research. Burnout is a common and critical antecedent of the decision to leave (Leiter & Maslach, 2009). The purpose of this study was to determine whether volunteer spirituality attenuated the relationship between burnout and turnover decisions in a sample of non-profit volunteers. As predicted, regression analyses showed that spirituality moderated the relationship between burnout and the decision of intent to leave, with volunteers higher in spirituality indicating significantly lower turnover intentions regardless of level of burnout.

ALEK DIFFENDAFFER

Graduate: Masters

Patients with peripheral arterial disease exhibit greater toe clearance than healthy controls

Major: Exercise Science

Faculty Advisor: Sara Myers

Co-Author: Troy Rand

Minimum toe clearance (MTC) during the swing phase is considered a critical gait event when assessing fall risk. Patients with peripheral arterial disease (PAD) have been shown to experience 73% more falls than healthy controls. It is possible that PAD patients have abnormal toe clearance, contributing to an increased risk of falls. The purpose of this study was to investigate MTC in healthy individuals and PAD patients. We hypothesize that PAD patients would exhibit a reduced MTC due to lower limb impairment. Ten PAD patients and ten healthy controls were studied. Mean MTC and standard deviations were both analyzed. Contrary to our hypothesis, PAD patients had a significantly greater MTC on average. Gait limitations seen in PAD, such as reduced power during stance or shortened stride length may cause PAD patients to compensate and lift their foot higher than a healthy individual. While not significant, the MTC variability was greater in PAD patients. So while PAD patients on average exhibit a greater MTC, certain strides throughout the gait cycle could possibly be lower and put them at risk of tripping. These results could indicate that average MTC in the swing phase may not be a major cause of falling in PAD patients. However further research needs to be performed to make this determination, including examining the variability of MTC over time.

HEATHER DOERING

Graduate: Masters

Environmental Influences on Career Choice Behavior: The Low-Income, First-Generation College Student Perspective

Major: Counseling/Gerontology

Faculty Advisor: Paul Barnes

This study endeavors to examine the barriers and supports that influence the career selection and implementation of low-income, first-generation college students. Using qualitative methodologies, the researcher interviewed eight college sophomores whose experiences are embedded in a need-based learning community. The semi-structured interviews were recorded and transcribed in Fall 2012, with data analysis taking place during Spring 2013. The researcher will present emerging themes and potential implications for counseling practice. The presentation will share results of the study through the perspective of social cognitive career theory (SCCT), an integrative model used in career counseling to conceptualize environmental variables that affect career choice. Career counseling has evolved to become more holistic and sensitive to multicultural differences. Research of contextual influences in the career development of college students has focused on race, ethnicity, and gender, with little recognition of other multicultural factors, such as socioeconomic status (i.e., income, education). Low-income, first-generation college students represent a significant at-risk segment of undergraduate enrollment, yet questions remain about the career development of this population. Increasing our understanding of this population will guide future research and culturally-sensitive counseling interventions, along with furthering the SCCT literature.

MEGAN EDWARDS

Graduate: Masters

Development NGOs in a changing Bolivia: What is their role in civic engagement in Cochabamba?

Major: Public Administration

Faculty Advisor: Angela Eikenberry

The landlocked country of Bolivia, in the South American Andes, has a long history of foreign intervention and NGO activity. Even though unions, neighborhood associations, and indigenous groups have had a strong presence for decades, until the 1990s, when the indigenous rights movement took off and the Law of Popular Participation (LPP) was enacted, most people had limited access or participation in their local and national government (Kohl & Farthing, 2006; Postero, 2007). Many NGOs have seen the law as an opportunity to increase community participation. However, some are also accused of having "undermined political movements that oppose neoliberal policies by focusing their

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target populations on small-scale, local improvements, rather than addressing the structural issues that social movements often confront" (Kohl & Farthing, 2006, p. 137). The opposition to neoliberal policies has grown even stronger in Bolivia since Evo Morales was elected to the presidency in 2005. Since then, the relationship between the state and its citizens has continued to change, as well as that between the state and NGOs. How this is currently affecting the relationships between Bolivian NGOs and the participation of their clients has not been well studied. We attempt to better understand the current role development NGOs play in promoting the civic engagement of Bolivians in their local government in this new political environment through the context of personal interviews with individuals from the public, private and nonprofit sectors, and from a range of specializations such as education, health and the environment.

JODEE FRIEDLY

Graduate: Masters

Applying Historiometry to Terrorist Organizations

Major: Industrial and Organizational Psychology

Faculty Advisor: Gina Ligon

Co-Authors: Dan Harris, Mackenzie Harms, Gina Ligon

Historiometry is a methodological strategy in which historical, qualitative information is translated into quantitative indices. Historiometry can be used to study low base-rate, but important, behaviors. Examples, best practices, limitations, and implications of this technique with regard to terrorist organizational contexts are discussed and reviewed. The application of historiometry to study terrorist groups allows for the examination of groups that are otherwise largely secretive. Historical documentation of rare events such as egregious attacks (e.g., al-Qaeda and 9/11), creative implementation (e.g., Aum and the Tokyo subway gassing), and overall effectiveness of plans (i.e., the attack was completed as planned) afford empirical examinations much different than typical organizational studies. The purpose of this poster is to describe a methodological approach, historiometry (i.e., translating multiple historical records into quantitative indices about terrorist organizational phenomena), explore its advantages and disadvantages, and describe how that methodology can offer an understanding of terrorist organizational behaviors and contexts via extreme behaviors.

KYLE FULLER

Graduate: Masters

MavAssist iPhone Application

Major: Computer Science

Faculty Advisor: Harvey Siy

Mobile application development is an area of computer science that is becoming increasingly popular at an extremely fast rate. Due to the increase in the amount of smart phones on the market, being able to develop for a mobile platform is incredibly important and I feel that it should be a major focus in schools. Because of this belief, I set out to better my own mobile development skills by creating an application that could not only increase my understanding of the field but also help out my university and hopefully others down the line. Not only do I hope to make students' lives easier, but I plan to increase the efficiency and effectiveness of current university resources, which means spending less and doing more with what they have. I believe that much of the current student experience is overcomplicated by unnecessary tasks that could be easily aided or in many case replaced by an intuitive system that is easily accessible through smart phones. The idea is to take all of the data that the university already collects, possibly improve upon it a little, and present it to students in a much smarter way. This is not simply a mobile version of a school website, this is an entirely new way to be a student. With the potential of helping students with everything from finding their way to and throughout buildings, to locating things in a library, and even the ability to find the closest available parking space to their next class at any given time. This is just the start of what it means to be a student in the digital age. My hope is that with my

prototypes potential the university will work with me to implement this into the everyday lives of all students on campus. If done correctly it could change what it means to be a student at a major university. It's only a matter of time before every campus has a tool like this, the only question is whether or not we lead the way and show others what is possible.

MARCIA GHALI BERGEN

Graduate: Masters

Food Deserts as a Social Problem in Omaha

Major: Social Work

Faculty Advisor: Peter Szto

In recent years, the United States Department of Agriculture Economic Research Service has identified food deserts as low-income rural and urban areas that lack access to reasonably priced, nutritious foods due to distance, lack of a car, or insufficient public transportation. There are serious health implications, including obesity, diabetes and malnutrition, associated with food deserts that can greatly reduce quality of life. There are over 23.5 million people living in areas that have been identified as food deserts in the United States. In Douglas and Sarpy counties there are approximately 40,000 people living in food deserts: 11,500 are children under the age of 17 and 4,000 are seniors over the age of 65 (Economic Research Service, 2009). Across the nation food deserts disproportionately affect minorities and those struggling with poverty. Health complications associated with nutrition pose an additional barrier to overcoming poverty. Children experiencing malnutrition during critical stages of development are at risk for long term reductions in physical and mental capacity. In a country as resourced as the United States maintaining the well-being of families and children should be a priority for a society concerned with its own future (Juby and Meyer, 2010). Residents of several Omaha neighborhoods are not able to reliably obtain proper nutrition, because of food deserts. This research project is a secondary analysis, rooted in social welfare theory, exploring the nature of food deserts as a social problem in Omaha, describing the development of food deserts and concluding with policy recommendations.

HEATHER GILES

Graduate: Masters

Predicting Electronic Victimization Among Home School Youth: The Role of Technology use and Skill Level

Major: Psychology

Faculty Advisor: Juan Casas

Many studies have shown that Internet access is available to the majority of youth. Due to increased access to electronic devices and the internet, youth are able to engage in unsupervised electronic interactions (Raskauskas & Stoltz, 2007). As a result, youth are easily able to send hurtful e-mails, make posts to hurt someone emotionally or destroy their reputation. Most studies on electronic victimization have been performed in public or private school settings (Raskauska & Stoltz, 2007). The home school population was chosen for this study because it has been suggested by researchers that electronic victimization is an extension of traditional forms of victimization (e.g. relational, social, physical) that begins at school but then transfers over to electronic mediums (Patchin & Hinduja, 2006). Researchers have also found that high Internet use is significantly associated with being a victim of electronic aggression and an electronic aggressor (Giles, Casas, Bower, & LaVoie, 2012; Ybarra & Mitchell, 2004). Moreover, research has also shown that youth who engage in many different online venues (e.g. chatrooms, e-mail, instant messaging, social networking sites, etc.) are more likely to be electronic victims and electronic aggressors (Patchin & Hinduja, 2006).

The current study examines whether frequency of technology use and technology skill level predicts electronic victimization. The sample consists of 23 homeschooled students (13 females) between the ages of nine and seventeen ($M = 13$) residing in 12 different states.

The present findings show that electronic victimization and aggression are also occurring in the home school population.

ABSTRACTS

WILLIAM GOODENKAUF

Graduate: Masters

High Intensity Anaerobic Training

Major: Exercise Science

Faculty Advisor: Dustin Slivka

Co-Authors: Matt Heesch, Brent Hassenstab

Due to the current popularity of high intensity anaerobic training it is important to understand the possible risks. Rhabdomyolysis is a potentially life threatening syndrome that can result from over exertion. Creatine Kinase is commonly used as a marker of exercise induced muscle damage. The purpose of this study was to determine the magnitude of muscle damage associated with a single high intensity anaerobic training session, and the relationship of this response to initial fitness capacity. Sixteen recreationally trained male participants completed a single high intensity anaerobic training session. Prior to participating in the exercise program the athletes completed an aerobic capacity test, body composition analysis, and a military physical fitness test (1 min push-ups, 1 min sit-ups, 1.5 mile run). The high intensity training in this study used a 1:1 work to rest ratio involving plyometrics and calisthenics. Prior to the session the participants were subject to a 5ml blood draw using venipuncture technique from an antecubital vein. After 48 hours the participants returned for a follow up 5 ml blood draw. Serum from the blood was stored at -80°C until later analysis. CK was assayed using a photometrically based commercially available kit. Despite the high intensity level, it is not anticipated that the CK will reach the upper limits indicating rhabdomyolysis (881-1479 U/L) but will be elevated above resting. Additionally, it is anticipated that there will be an inverse relationship between muscle damage and fitness.

DAVID GROTHEN

Graduate: Masters

Molecular Detection of Pathogens in Environmental Surface Waters of Peru

Major: Biology

Faculty Advisor: Paul Davis

Water is the world's most essential resource for life. While water is essential for life, it also holds the potential to great harm due to the invisible, microscopic pathogens that are able to remain viable in surface and ground water for months. Peru has been at the epicenter for water-borne illnesses on the American continents, including a continent-wide cholera epidemic in the 1990s. These pathogens are particularly detrimental to the youngest generation, pregnant mothers, and the immune-compromised community. Once contracted, these pathogens have the ability to cause growth deficiencies, mental retardation, mental illness, and even death. The people in the slums of Lima, Peru face short and long-term issues in obtaining safe water and recycling wastewater in a manner that is safe for use agriculturally. By taking advantage of novel advances in molecular biology, we are able to detect selected pathogens using PCR on collected and purified water samples. Based on preliminary data we aim to determine what pathogens are present in water supply, the Rimac River, the poorest areas of Lima, and from the Andes Mountain source waters. By using the results of the sampling, we will be able to geographically represent the spread of pathogens throughout the communities' water supply. With further experimentation this could lead to the control of the spread of these pathogens.

EMILY HANIGAN

Graduate: Masters

Translating research to the community: Can a community-based book club increase physical activity among women long-term?

Major: Health, Physical Education and Recreation

Faculty Advisor: Jennifer Huberty

Co-Authors: A. Weddle, D. Ehlers, Jennifer Huberty

The purpose of this study was to describe physical activity (PA), self-worth (SW), and self-efficacy (SE) at one-year follow-up among women who participated in Fit Minded (FM). FM is a community-based

PA book club in which a facilitator targets theoretical constructs and SW during weekly book discussions. Women were asked to complete questionnaires assessing their PA, SW, and SE at baseline, post-program (8 months), and one year after FM (20 months). At one-year follow-up, women were invited to participate in a phone interview. Fifteen of 17 women who participated in FM consented to participate in this study. Twelve women participated in one-year follow-up (mean age = 48 years), with 3 completing questionnaires only, 3 the interview only, and 6 both. PA and SE increased from baseline (PA=1.9 hours per week; SE=40%) to post (PA=4.8 hours; SE=70%) and from baseline to follow-up (PA=3.0 hours; SE=62.3%). SW marginally increased from baseline (2.4) to post (2.5) to follow-up (2.6). All women reported increased awareness and changed perceptions of PA. Women who remained active at follow-up reported prioritizing themselves and PA and using social support to overcome their barriers. Women who struggled to remain active reported not prioritizing PA and needing FM to hold them accountable. Few studies have evaluated the potential of community programs to effect PA behavior change long-term. A community-based book club may be promising for improving women's PA adherence. Consistent with previous research, many women attributed their continued PA to improved SW. Further research with a larger sample is warranted.

MACKENZIE HARMS

Graduate: Masters

Categorizing Violent Extremist Organizations

Major: Industrial-Organizational Psychology

Faculty Advisor: Gina Ligon

Co-Authors: Gina Ligon, Pete Simi, Dan Harris

Violent extremist organizations differ from other ideologically-based groups that do not necessarily meet formal criteria to be considered organizations, and distinguishing between these types of collective arrangements is critical in understanding their strengths and weaknesses. Three arrangements of individuals with varying levels of sophistication were identified: groups, simple organizations, and complex organizations. Each arrangement is discussed in terms of its influence on fundraising, recruiting, and attack execution, with particular emphasis being placed on exemplars from the white supremacist ideology. Despite their shared ideology, white supremacists illustrate marked performance-related differences that are influenced by organizational factors such as leadership, structure, and formalization. Analyzing those differences led to the conclusion that organizations are unique from groups, different structures are best suited for certain strategies, leadership matters a great deal in the context of violent extremist organizations, and organizations are not static.

MACKENZIE HARMS

Graduate: Masters

Team Creativity: An Exploratory Analysis of Creative Problem Solving in Teams

Major: Industrial-Organizational Psychology

Faculty Advisor: Roni Reiter-Palmon

Co-Authors: Brad Hullsiek, Roni Reiter-Palmon, Nicholas Arreola, Ben Wigert, Erika Morral, Danielle Crough

In order to maintain a competitive edge in an ever-evolving market place, organizations rely on teams to solve problems in an effective and creative manner. Problem solving research at the individual level has indicated that a more structured problem solving process facilitates creativity. However, this finding has not been replicated in teams. Building on this research, the effect of process and outcome satisfaction during a team problem solving task is examined. Contrary to creative problem solving at the individual level, teams tended to be more creative in a less structured problem solving task. Specifically, teams who experienced high satisfaction with the team process tended to be more creative when a less structured problem solving process was used than teams who experienced less satisfaction with the team process. Implications of this contradictory finding are discussed and recommendations for future team research are presented.

ELIZABETH HARP

Graduate: Masters

Empathy and Burnout among Volunteers with Varying Degrees of Person-Organization Fit

Major: Industrial-Organizational Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer, Joseph Allen

The purpose of this study was to begin to understand the causes of burnout among volunteers in non-profit organizations. Burnout consists of physical, emotional, and mental exhaustion (Pines & Aronson, 1988). High person-organization (PO) fit, "the compatibility between a person and an organization" (Sekiguchi & Huber, 2011, p. 203), should attenuate volunteer burnout due to sharing values and personality attributes with the organization and fellow volunteers. Empathy was proposed to moderate the relationship between PO fit and burnout. Empathetic individuals might be more likely to volunteer as well as to suffer emotional overload, and therefore burnout, especially when their fit to the organization is poor. Poor PO fit, particularly for highly empathetic individuals, may lead to frustration, a redoubling of efforts, and burnout. We therefore predicted an interaction between level of empathy and PO fit, such that under poor fit, highly empathetic volunteers would experience greater burnout compared to those with lower levels of empathy, whereas level of empathy would not differentially predict burnout under high PO fit. Data gathered from 55 volunteers who work with a national urban renewal organization supported our hypotheses. Volunteer empathy moderated the influence of PO fit on burnout as predicted. The current study contributes to the literature investigating burnout among volunteers by looking specifically at their feelings of fit with the organization and the extent to which their individual empathy influences that relationship. We would also encourage additional scholarship on the identification of factors that maximize volunteer well-being and minimize their stress and burnout.

DANIEL HARRIS

Graduate: Masters

What Business Leaders Can Learn from Terrorists

Major: Industrial-Organizational Psychology

Faculty Advisor: Gina Ligon

Co-Authors: Doug Derrick, Pete Simi, Gina Ligon

The study of leadership has a long and rich history. Business leaders in particular have been the focus of much empirical scrutiny, with an attempt to describe and explain who makes the best leaders, what it means to be a good leader, which leadership styles work best in which situations, and so forth. The subordinates of those oft-studied business leaders are typically guided toward positive behaviors that benefit their organizations or society at large in some way. One method for examining effective or best practice leader behaviors is the examination of outstanding leaders, or those who are able to persuade followers to subsume their personal needs into those of the organization. Leaders of violent extremist organizations (e.g., Osama bin Laden) have been masterful at garnering such commitment from followers. Thus, the intent of the present study is to draw lessons that can be learned from examining how such leaders of terrorist organizations motivate their followers to extraordinary ends. After conducting a qualitative review of the literature on terrorist leaders, we have developed a preliminary model of eight leadership behaviors that terrorists engage in to successfully lead groups of heterogeneous individuals toward challenging goals (and with little to no incentive pay to do so). Example behaviors include sharing their vision consistently, delegating and providing autonomy, and engaging in strong othering. Based on that model, we offer insights that business leaders can apply in their own departments and organizations.

RYAN HASENKAMP

Graduate: Masters

The Relationship Between Ambulatory Activity Patterns and Gait Kinematic Variability

Major: Exercise Science

Faculty Advisor: Sara Myers

Co-Authors: Shane Wurdeman, Sara Myers

The purpose of this study is to investigate the relationship between ambulatory activity as measured through an accelerometer and gait kinematic variability as measured through 3-D motion capture. Analysis of gait variability can provide insights in the motor control of the movement. However, current scientific methods for assessing gait variability are limited to a laboratory. An accelerometer is a tool that may be used to provide similar insight into gait variability. Seven healthy young adults were asked to walk on a treadmill while wearing an

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accelerometer at the hip. Subjects walked at a slow self-selected speed followed by a fast self-selected speed. Continuous joint angle time series were calculated at the ankle, knee, and hip. Raw acceleration was analyzed from the accelerometer. Measures of the temporal structure of variability included the Lyapunov Exponent (LyE) and approximate entropy (ApEn). Pearson's correlations were used to calculate the relationship between gait kinematics and acceleration. There was a significant, positive relationship at the LyE of the hip during the slow condition. There were several moderate but non-significant correlations for LyE at the ankle during slow speed and for ApEn at the knee during slow speed and at the ankle and knee during fast speed. These results provide evidence that there is a relationship between variability of ambulatory activity and gait kinematic variability, however the sample size may be too low to reveal strong correlations. Furthermore, the hip may show the strongest correlation due to the fact that the accelerometer was placed at the hip.

BRENT HASSENSTAB

Graduate: Masters

Proteolytic Gene Response to Exercise and Temperature

Major: Exercise Science

Faculty Advisor: Dustin Slivka

Co-Authors: Matt Heesch, William Goodenkauf, Landon Zuehlke, Dustin Slivka

Aging is characterized by a relative maintenance of myogenic activity and increased proteolytic activity resulting in a loss of muscle mass termed sarcopenia. Little is known about the impact of muscle temperature on the regulation of proteolysis associated with sarcopenia. The purpose of this study is to determine the impact of local muscle heating and cooling on proteolytic gene response following resistance exercise. Recreationally resistance trained male participants will complete 4 sets of 8-12 repetitions of leg extension and leg press at 80% of their 1-repetition maximum for each exercise with two minutes recovery between sets. A ThermaZone Continuous Thermal Therapy System will be used to heat the upper thigh of one leg and cool the upper thigh of the other leg. A muscle biopsy will be taken on one leg (randomized) pre exercise and both legs 4 hours post exercise while femoral blood flow will be measured on both legs pre, post, and 4 hours post exercise. Gene expression analysis will be done on the proteolytic genes of interest Atrogin 1, MuRF1, and FOXO3A. This study will provide critical information for the development of novel temperature optimized exercise strategies that may help combat sarcopenia.

CHARLES HOWELL

Graduate: Masters

Top-Shelf Price for Bottom-Shelf Goods: Transaction Related Price Factors

Major: Economics

Faculty Advisor: Catherine Co

This article specifies and estimates the influence of purchase related transaction costs on the spread in price between new and used durable goods. Its primary contributions are to provide a framework for studying consumer choice in the presence of both new and used markets for durables, and decomposing transaction costs into separate measurable elements. The model also considers the element of newness in the purchase decision. Specifically, I estimate the contribution on price spread of six transaction elements, and a measure of newness, in the market for used store fixtures. Results show that vendors who provide services to reduce transaction costs can command a premium in the marketplace and narrow the spread in price between new and used. The results also show that refurbishing a product, bringing back that new car smell, can increase relative price.

ERIKA JACOBSON

Graduate: Masters

Sedentary Lifestyle in Jefferson County, Nebraska: The Relationship Between Exercise Behaviors and Perceived Physical Health

Major: Social Work

Faculty Advisor: Kerry Beldin

This study examines the relationship between exercise behaviors and perceived physical health status in Jefferson County, Nebraska. The Nebraska Behavioral Risk Factor Surveillance System (BRFSS) was a survey administered to the residents of Jefferson County, Nebraska (n=1146). Respondents were asked to rate their perceived general health status and if they exercised in a setting other than their job in the past 30 days. A chi-squared analysis demonstrated a relationship between respondents' perceived general health status and whether or not if they had been physically active in the past 30 days. The implications of this research suggest further education is needed for the residents of Jefferson County, Nebraska to understand the relationship between general health status and exercise.

CONNIE JONES

Graduate: Masters

Evaluating the Use of Assurance Cases for Digital Forensics

Major: Information Assurance

Faculty Advisor: Robin Ghandi

Assurance cases are a standard modeling technique to show that a claim regarding a system's safety or security is reasonably correct. They have been extended into the field of computer security, specifically to show security of a software program or a computer system. Assurance cases are presented in a pictorial diagram that enables a large amount of evidence to be more readily understandable by stakeholders such as owners and upper management. This adds further value to assurance cases by presenting technical ideas in a way that even those without a technical background can get a grasp of their significance. This research project will look at taking assurance cases and extending them into the field of computer forensics, in particular for use in court cases. At this time there does not exist any such modeling tool to take the evidence from a computer investigation and present it in a credible, convincing argument that could be used to support the claim that someone is guilty (or not) of a computer crime. Assurance cases seem like a useful method to fill that gap.

BRITTANY JUDGE

Graduate: Masters

Positive Behavior Support for Individuals with Severe and Profound Disabilities Postural Transition Detection using a Wireless Sensor Activity Monitoring System

Major: School Psychology

Faculty Advisor: Brian McKevitt

This study explores positive behavior support and its effect on behavioral issues in students with severe and profound disabilities. Because positive behavior support eliminates behavioral problems in normal school populations, it is hypothesized that children with severe behavioral problems, specifically children with severe and profound intellectual disabilities will show a decrease in behavioral problems. In this study, an alternative school population implementing school wide positive behavior support (SWPBS) will be used. It is predicted that these students will show an increase in behavioral performance compared to their behavioral performance before positive behavior support was implemented in their school.

PAMM KILLEEN

Graduate: Masters

"Gettin' Down Wit Da Talkin' Thang," Perception of Communicative Competence When Using Urban Vernacular in a Job Interview

Major: Communication

Faculty Advisor: Chin-Chung Chao

Today's millennials, those individuals born between 1982 and 2002, are competing in distressed job market. Recent research shows employers believe millennials lack competency in communication. Em-

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players' concern is supported by research drawn from a 2009 survey conducted by the Graduate Management Admission Council of corporate recruiters from more than 2000 companies. In this study, 89% of the recruiters ranked communication skills as the number one hiring characteristic. Without competent communication skills, millennials risk unemployment and lack of opportunity for future promotion. Moreover, scholarly research posits that the influences of urbanization, pop culture, text messaging and electronic social networking has adjusted verbal and nonverbal norms. Labeled urban vernacular, this verbal and nonverbal "shorthand" presents a problem for recruiters and employers, as well. The purpose of this thesis is to understand the relationship between using urban language in a job interview and the perceived communicative competence of the applicant. Moreover, this study will investigate the influences age, gender and ethnicity on these perceptions. Using survey data gathered from participants who observe eight different millennial speakers, some of whom use Standard American English (SAE) and others who use urban vernacular, will provide insight into whether cultural norms have become more flexible, making a less formal style of communication acceptable in a recruiting situation.

LINDSEY KNIGHT

Graduate: Masters

A Tale of Two Species: The Fathead Minnow and Northern Leopard Frog as Environmental Sentinels of the Elkhorn River

Major: Biology

Faculty Advisor: Alan Kolok

Co-Authors: Matthew Christenson, Andrew Trease, Paul Davis, Alan Kolok

Environmental sentinel organisms are commonly used to warn of toxic chemicals in the environment that may pose a significant health risk to wildlife. In the Midwest, runoff of pesticides is one source of toxic chemicals to agricultural watersheds that can affect both fish and frogs. The objective of this project was to assess the potential for adverse impacts in one such agricultural watershed, the Elkhorn River, on fathead minnows and northern leopard frogs. Frogs and fish were exposed for seven days to water collected during a pulse of agricultural runoff in the Elkhorn River. Concentrations of pesticides were 1.6 to 281 times greater during the agricultural pulse than during baseflow conditions following the pulse. The impact of pesticide exposure was assessed by measuring the mRNA expression of two estrogen responsive genes, vitellogenin (Vtg) and estrogen receptor- α (ER α), in liver tissues. Quantitative real-time PCR revealed that female fathead minnows exposed to Elkhorn River water were defeminized as indicated by the significant reductions in both Vtg and ER α , whereas female frogs were not. Conversely, exposed male northern leopard frogs were feminized as indicated by an increase in ER α mRNA, whereas male fish were not. The effects observed in the fish and frog sentinels provide warning signs that pesticides present in the Elkhorn River may significantly impair the reproductive health of exposed aquatic wildlife. The contrasting response between the two species suggests that effects observed in wildlife may not be consistent across taxa, highlighting the need for multiple species toxicity testing.

JOSHUA LARSON

Graduate: Masters

Evaluation of the therapeutic value of two drug-like compounds for clearing human infections using the mouse model

Major: Biology

Faculty Advisor: Paul Davis

Toxoplasma gondii is a human parasite that can cause serious health problems, including death, in some individuals. There are currently no FDA approved drugs that are able to completely eliminate toxoplasmosis (*Toxoplasma* infections). Thus, it is important to identify compounds that may be able to serve as anti-*Toxoplasma* drugs. Additionally, many compounds that can eliminate toxoplasmosis are effective in treating malaria, a disease that kills more than one million people each year. Recently, a small group of drug-like compounds were identified as compounds that may be able to clear toxoplasmosis. After their identification, some of these compounds were evaluated in the laboratory for their

ability to kill *T. gondii* outside a host organism. It was demonstrated that some of these compounds can kill *T. gondii* without harming human cells. Two compounds from the described screen were determined to be especially promising drug candidates and were evaluated for their ability to eliminate *Toxoplasma* infection at the organismal level. Since *Toxoplasma* can infect mice as well as humans, mice were chosen as the animal model for evaluating the therapeutic value of these two compounds. The compounds were first demonstrated to be non-toxic to mice. The compounds were then evaluated for their ability to prevent side effects and death in *Toxoplasma* infections in mice. Mouse models have been used to further evaluate safety and efficacy.

ALLISON LAURITSEN

Graduate: Masters

Motivating At-Risk High School Students to Achieve: The Relationship Between Race and Hope

Major: Social Work

Faculty Advisor: Jeanette Harder

Educators within the nation's public school systems are seeing an achievement gap not only between the rich and poor, but also between the white and non-white. The Avenue Scholars program provides students of hope and need in the Omaha area with support throughout high school, college, and into the workforce (Avenue Scholars, 2012). Data was collected on 186 students within the first cohort of the Avenue Scholars program to evaluate attendance and GPA goals as well as demographic factors and hope. In the analysis of the Avenue Scholars dataset, a non-experimental midtest survey research design was used to investigate the hypothesis that there is a relationship between race/ethnicity and the scores on the Gallup Hope, Wellness, and Engagement Survey from 2011 and 2012. This is a statistically significant finding at the .05 level showing that students did score differently on the Hope survey based on their race. This and other findings leave implications for future work in motivating students to achieve academically.

RICHELLE DEMAY

Graduate: Masters

Postural Transition Monitoring using a Wireless Sensor Activity Monitoring System

Major: Computer Science

Faculty Advisor: Jong-Hoon Youn

Mobility health is an important aspect of the overall health status of a person. Many tests exist that determine the mobility health of a subject, but there are several issues associated with these tests. As such, a great deal of work has been done to develop a mobility classification system that not only consolidates these tests, but also does not have any of the associated issues. Even so, many of these systems in development are complicated, and lack the ability to track important mobility related measurements. In particular, many systems in development disregard postural transitions and postural transition time as mobility measures. The goal was to not only remove the human error associated with observational mobility health tests, but to make the system as simple, energy-efficient, and inexpensive as possible. In addition, we wanted this system to be able to detect with accuracy of over 90% six mobility states and postural transition frequency and duration. The goal to keep the system simple and inexpensive was accomplished by using a single wireless waist-mounted triaxial accelerometer. The goal to keep the system energy-efficient was accomplished by processing data on the sensor. This decreased the amount of information to be transmitted to the base station, thereby significantly decreasing energy consumption. The goal to detect six mobility states in addition to postural transition frequency and duration was accomplished by the activity classification algorithm used. The original accuracy goal was surpassed, and the system is able to detect mobility states with up to 98% accuracy.

WILLIAM LENAGH

Graduate: Masters

Multi-Robot Task Allocation: A Stochastic Queuing Approach

Major: Computer Science

Faculty Advisor: Prithviraj Dasgupta

Multi-Robot Task Allocation (MRTA) is an important area of research in autonomous multi-robot systems. The main problem in MRTA is to match a set of robots to a set of tasks so that the tasks can be

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completed by the robots while optimizing a certain metric such as the time required to complete all tasks, distance traveled by the robots and energy expended by the robots. We consider a scenario where the tasks can appear dynamically and the location of tasks are not known *a priori* by the robots. Additionally, for a task to be completed, it needs to be performed by multiple robots. This setting is called the MR-ST-TA (multi-robot, single-task, time-extended assignment) category of MRTA and solving the MRTA problem for this category is a known NP hard problem. We address this problem by proposing a new algorithm that uses a stochastic queue-based model to allocate tasks between robots. We have implemented our algorithm on an accurately simulated model of Corobot robots within the Webots simulator for different numbers of robots and tasks. We investigate a decentralized implementation of our algorithm and compare our results to several other approaches baselined by an offline optimal schedule generated by applications of the Hungarian algorithm.

LOUIS MARTIN

Graduate: Masters

Taste Activity in the Adult Glossopharyngeal Nerve Following Neonatal Chorda Tympani Nerve Injury in Rats

Major: Neuroscience

Faculty Advisor: Suzanne Sollars

Co-Author: Suzanne Sollars

The chorda tympani nerve (CT) transmits taste information from the anterior tongue to the brain. Adult rats receiving chorda tympani transection (CTX), or cutting of the CT, show remarkable structural, functional, and behavioral recovery. However, when the same surgery is performed on neonatal rats (at 5 to 10 days of age), these animals have long-term structural deficits. Interestingly, rats receiving CTX as neonates but not as adults show an abnormal preference for a sour/bitter salt, ammonium chloride (NH_4Cl), as adults. One possible reason for this nerve-induced change in behavior could be that the remaining taste nerves have functional changes following neonatal CTX. To examine this hypothesis, rats received either CTX or a control surgery at 5 days of age. After reaching adulthood, electrical activity from the rats' glossopharyngeal nerve (which carries taste information from the rear 1/3rd of the tongue to the brain) was recorded during application of various concentrations of NH_4Cl , NaCl , and sucrose. There were no differences in nerve response to NH_4Cl or NaCl . However, activity following sucrose administration was significantly higher in the CTX group. While the mechanisms underlying this injury-induced change in responding are not clear, these results could help explain the observed correlation between early chorda tympani damage and a higher consumption of sugary foods in humans. Glossopharyngeal recordings will soon be performed on rats receiving CTX at 10 days of age to determine how age of injury affects nerve activity.

JOHANNES MATSCHKE

Graduate: Masters

The Impact of Performance Payments on Job Satisfaction— Studied Over time

Major: Economics

Faculty Advisor: Catherine Co

By establishing an ordered probit regression model and using data from the British Household Panel Survey, I investigate whether the increasing amount of workplaces related to individual performance payments can be attributed to a positive trend in the impact of performance payments on overall job satisfaction over time from 2001 until 2009. The Agency Theory predicts that implementing performance-related payments should lead to higher risk exposure and an increased effort, i.e. a higher productivity. In return, workers receive a higher wage. My findings cannot confirm a trend, but can confirm the previous literature by finding an insignificant impact of performance payments on job satisfaction, while the Agency Theory would predict a negative relationship as the wage is held constant. My research also provides information about other determinants of overall job satisfaction. According to the data, the most important factor is the worker's age. Job satisfaction decreases until the mid-forties and then increases, confirming the presence of a midlife crisis. Also important is whether one has a job in

the private sector or not. Working for a private firm decreases overall job satisfaction, maybe because of a higher risk exposure of the employees and/or less beneficial business objectives in comparison to public firms or charity organizations. I further find support for the common assumption that women and married couples are more satisfied with work.

SHANE MCFEELY

Graduate: Masters

Communication and Solution Generation in Functionally Diverse Problem-Solving Groups

Major: Industrial-Organizational Psychology

Faculty Advisor: Carey Ryan

Co-Authors: Kelly Grant, Carey Ryan

Functional diversity refers to the variability among group members in task-relevant knowledge, abilities, and experiences. From a cognitive resource perspective, teams diverse in task-relevant experiences are able to draw from a wider range of perspectives, which may improve idea generation (Williams & O'Reilly, 1998). Indeed, functionally diverse (vs. homogeneous) top-management teams have been shown to be more innovative (Bantel & Jackson, 1989). The purpose of the current study was to examine member turn-taking behaviors in problem-solving groups that varied in functional diversity. We expected that more (vs. less) functionally diverse groups would generate more solutions and that turn-taking during solution discussion would mediate that relationship. Business student groups ($n = 32$) were video recorded solving the financial failures of a fictional company. The videos were transcribed and, turn-taking, that is, the number of utterances in each group that occurred during the problem identification and solution generation phases of the discussion, was coded. An utterance was defined as the number of separate times a group member spoke—regardless of length. Group-level regression analyses indicated that members of more (vs. less) functionally diverse groups engaged in more turn-taking (i.e., more utterances) during solution discussion, but not during problem identification. Further, the number of utterances made during the solution discussion mediated the relationship between functional diversity and number of solutions. Additionally, the total number of total utterances partially mediated the same relationship. Thus, more functionally diverse groups may generate more solutions partly because they take more turns speaking during solution generation.

SCOTT MCGRATH

Graduate: Masters

An experiment on evaluating responsiveness of three popular bioinformatics open source programming languages

Major: Bioinformatics

Faculty Advisor: Dhundy (Kiran) Bastola

BioPerl is an open source programming language designed to aid in biological research. Biological data sets have grown exponentially over the past several years. BioPerl's tools allow scientists to manage and effectively analyze these data sets. Previous work here at UNO[1] has documented that BioPerl remains the most popular bioinformatics language. Looking to expand on this, we wished to evaluate the responsiveness of BioPerl to the needs of its community. To accomplish this, we identified major revisions in the source code and then set about data mining the official mailing list. This mailing list serves as the principal interface for communication about BioPerl. A metric could be devised to compare the responsiveness of two languages if we could isolate revision discussion timelines. Our initial results found that BioPerl's mailing lists are too broad in scope to effectively isolate out these conversation threads. We then tested our mining model by evaluating the next two most popular languages: BioJava and BioPython. The major difference between these two languages and BioPerl is that they have a separate developer mailing list. Using the developer mailing list, we were able to identify the lines of communication leading to large source code changes. This led us to conclude that our method could be effective in modeling responsiveness of developers, given a separate developer channel. A developer's channel may be an excellent addition for BioPerl, allowing it to serve as a guide for previous changes, and highlighting what needs attention.

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KRISTIN MICEK

Graduate: Masters

The Relationship Between Teachers' Self-Efficacy with Behavior Management and School-Wide Positive Behavior Supports

Major: Educational Specialist

Faculty Advisor: Brian McKeivitt

Co-Authors: Brian McKeivitt, Jonathan Santo

Research has indicated that self-efficacy is related to many different aspects of student achievement and motivation, and more specific to this study, to teachers and their behavior management strategies. The purpose of this presentation is to share data collected regarding the relationship between classroom teachers' sense of self-efficacy and school-wide positive behavior supports (SWPBS) in an elementary and a secondary school located within the same district.

MOLLY MIERAS

Graduate: Masters

Physiological and Psychological Comparison of Indoor and Outdoor Cycling

Major: Health, Physical Education and Recreation

Faculty Advisor: Dustin Slivka

Co-Authors: Matt Heesch, Brent Hassenstab, Dustin Slivka

Cyclists often feel as if they work harder when training indoors than they do outdoors. It is difficult to determine whether this is due to an actual change in work rate, or different physiological and psychological responses indoors versus outdoors. The purpose of this study was to determine whether an indoor versus outdoor cycling session stimulates different physiological and psychological responses. Twelve recreationally trained male cyclists participated in an initial descriptive testing session, and two experimental trials consisting of one indoor and one outdoor session, in a randomized order. Experimental trials consisted of a 40 kilometer set course in which participants were instructed to give the same perceived effort for both the indoor and outdoor trial. Variables measured include body weight, urine specific gravity, cycling power output, heart rate, core temperature, skin temperature, rating of perceived exertion (RPE), attentional focus, and environmental conditions. Environmental conditions were similar between trials, as only wind speed was higher in the outdoor trial than the indoor ($p=0.020$). Power output was $30.00 \pm 0.05\%$ higher ($p<0.001$), heart rate was $7.60 \pm 0.03\%$ higher ($p<0.001$), and skin temperature was $5.00 \pm 0.01\%$ lower ($p=0.003$) in the outdoor trial than the indoor trial. No significant differences in body weight, urine specific gravity, core temperature, RPE, or attentional focus existed between trials. These data indicate that under similar environmental conditions and perceived exertion, individuals produce more power during outdoor cycling than indoor cycling possibly due to increased heat dissipation capacity.

FRANK MITCHELL

Graduate: Masters

Religion and Reconstruction: Religiosity and Manufacturing Investment and Efficiency during the "Second American Revolution"

Major: Economics

Faculty Advisor: Christopher Decker

The relationship between religion and economic performance remains a controversial topic in the economic literature despite the use of many novel datasets over the last decade. Religion is of interest as a measure of social capital, the value of social connections that affects economic productivity. Religious membership is one of the few sources of data available for an empirical investigation of the relationship between social capital and economic growth and efficiency in 19th century America. Did religious membership in the United States play an important role in its economic development after the Civil War as it became one of the leading industrialized nations? The relationship between religious membership and manufacturing investment growth and efficiency during the Reconstruction period was examined using original religious denomination membership data reconstructed from federal cen-

suses. The main hypothesis was counties with higher rates of religious membership in 1870 would have higher growth in manufacturing investment from 1870-1880 and higher manufacturing efficiency over the period 1870-1900. A variant of Max Weber's (1952) hypothesis was also tested, that counties with higher membership in the pietistic denominations Weber identified would also have higher growth in manufacturing investment and higher manufacturing efficiency.

MADELEINE MOODY

Graduate: Masters

A Relational Aggression Intervention in Early Childhood

Major: School Psychology

Faculty Advisor: Lisa Kelly-Vance

Co-Authors: Lisa Kelly-Vance, Juan Casas

The purpose of this study was to examine the effects of an intervention targeting relational aggression for young children. One significant predictor of behavior problems and social struggles for children is relational aggression, which is used to describe nonphysical aggression used to harm another's social status or reputation or inflict harm on others by manipulating their peer relationships (Crick & Grotpeter, 1995; 1996). The intervention was adapted from Ostrov and colleagues (2009) Early Childhood Friendship Program and implemented over a six week time period to reduce relationally aggressive behaviors and increase prosocial behavior. The first week of the intervention included an educational theatre performance by a local group, RESPECT. The following weeks involved direct instruction using puppets, modeling, role-playing, and time to practice with positive reinforcement. Data was collected using teacher report at the individual and classroom wide levels as well as direct observation.

MELISSA MOUNT

Graduate: Masters

Effects of urbanization on the species richness and abundance of native grassland birds

Major: Biology

Faculty Advisor: L.LaReesa Wolfebarger

Native Grassland bird populations have declined and continue to decline, mostly due to habitat loss as a result of urbanization and agriculture. The quality and productivity of the remaining, highly fragmented patches are threatened by further urbanization. In this study, I determined the effects of urbanization on the species richness and abundance of native grassland birds by surveying grassland fragments representing an urban to rural gradient around Omaha and Lincoln, Nebraska and Council Bluffs, Iowa during the 2011 and 2012 breeding seasons. I used point count and line-transect distance sampling methods to determine the abundance and species richness of native birds. To account for effects of possible differences in management, the density and structure of vegetation were also measured at each site, along with area and edge-to-interior ratio. I determined the degree of surrounding urbanization for each site by using aerial imagery to quantify the land cover of random points in ArcGIS. I hypothesized that the species richness, and abundance of native grassland birds would decrease as urbanization surrounding a site increased.

STEPHANIE MUELLER

Graduate: Masters

Defining and Measuring Employee Organizational Resentment

Major: Industrial-Organizational Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer, Christine Quick

An understudied phenomenon in organizations is employee organizational resentment (EOR), for which we have developed a new scale of measurement. EOR is defined as an employee's state of negative affective brought on by perceived injustice in the workplace and directed towards a co-worker or the organization. We propose that when employees feel high levels of resentment, undesirable outcomes such as counterproductive work behaviors are more likely to occur. Counterproductive work behaviors are intentional, verbal or physical acts towards a person or an organization that could harm the organization's interests (Enns & Rotundo, 2012), and can affect work satisfaction and physical and mental health (Lim, Cortina, & Magley, 2008). We obtained data from employees working in organizations ($N = 114$) and identified several variables used to establish construct validity for the scale. Trait hostility and deviance was found to be positively

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related to EOR, which relate to a negative affect and antisocial acts directed towards other people or an organization. Empathy, the "reactions of one individual to the observed experiences of another" (Davis, 1983, pg.113), resulted in a negative relationship with EOR while extraversion was found to be unrelated to EOR. The new scale included 9 items with responses based on a four-point scale ranging from 1 (*strongly disagree*) to 4 (*strongly agree*) and resulted in a coefficient alpha of .91. An exploratory factor analysis was conducted and resulted in a two-factor scale. Given the findings, the subscales of EOR and its impact on counterproductive work behaviors should be further examined.

NARESH PADALA

Graduate: Masters

Biometric Video Surveillance

Major: Management Information Systems

Faculty Advisor: Douglas Derrick

Biometric surveillance refers to technologies that measure and analyze human physical and/or behavioral characteristics for authentication, identification, or screening purposes. Facial recognition is the use of the unique configuration of a person's facial features to accurately identify them (Frank, 2007). There are many factors that will lead to unsuccessful or successful implementation of the Facial recognition technology. This research project addresses the gaps between potential uses of facial recognition technology and actual implementation results. In this project we have identified the Potential road blocks for implementing the Facial Recognition on biometric surveillance. In this project using the Pittpatt Recognition Software we have tested the system with sample set of images and identified the issues raised while testing and found reasons for it. In this project we gave the recommendations for better utilization of Facial Recognition for Biometric Surveillance. In the Report we summarized with the latest developments in the Face recognition and problems which need to be solved in future.

FARHOD RAHMATOV

Graduate: Masters

Social Network Uses of Newspaper Websites

Major: Mass Communication

Faculty Advisor: Jeremy Lipschultz

In the 21st century the Internet became the broad information exchange network used by people in education, business, government, etc., besides also family members. Moreover, scholars discuss the Internet-based web-sources (e.g., websites, social networks, blogs, forums, microblogging) as a new channel for production, delivering and receiving information and news content. Despite the positive implications of users' participation in news production and distribution processes with the use of the social, blogging and microblogging networks by news organization, trust in new media remains a problem. Meanwhile, this paper is based on a review of the literature examining the cultural shift that includes the use of CMC and the Internet in the production, distribution and consumption of the news. The focus is on news and information, objectivity, authority and the search for truths. This paper found that, with the development of social networks and social media, the news production and consumption processes changed from a one-dimensional, finished offline form to a multidimensional, continuing online form. Overall, the literature review did not find substantial evidence of studies that examine the credibility and trustworthiness of news and information, from professional online newspapers versus independent individuals on social networks. However, this paper found evidence of the expanded uses of mobile technologies as a means of mobilizing the witness, promote, inform and share multimedia content, which in the future could develop a new community of news and information producers and consumers.

TROY RAND

Graduate: Masters

Nonlinear mathematics detect subtle changes in center of pressure measures

Major: Exercise Science

Faculty Advisor: Sara Myers

Falls are one of the most significant health concerns for elderly individuals and 30% of individuals over the age of 65 experience at least one fall per year. It is estimated that falls account for one third of the total cost of medical treatment for all injuries. Because maintaining the center of mass over the base of support is required for balance, it is safe to assume that impaired postural control could lead to falls. In biological signals it is theorized that there exists an optimal amount and structure of variability that is indicative of a healthy system, and there are techniques of nonlinear mathematics that allow us to investigate this healthy variability. The purpose of this research is to measure center of pressure, which is a reflection of center of mass movement, to investigate the structure of variability that is present, and to see how that changes with aging. Ten healthy young subjects and seven healthy older subjects were collected. Ninety-second trials of standing posture were recorded on a force platform while the different sensory systems responsible for balance were challenged. The center of pressure data was analyzed with a variety of linear and nonlinear measures. It was found that when the visual and somatosensory systems were challenged there were significant differences in nonlinear measures of posture. Instead, typical linear measures failed to show a difference. This indicates that the systems responsible for balance may start to decline before standard balance measures show a difference.

AMBER REIS

Graduate: Masters

An Effective Reading Intervention for Elementary Students

Major: School Psychology

Faculty Advisor: Lisa Kelly-Vance

Co-Author: Stephanie Scheer

The purpose of this poster presentation is to describe an empirically supported reading intervention, repeated reading, which can be used to increase reading fluency and comprehension. This poster will describe the intervention and present data to support its use with elementary students. In addition to gaining the knowledge about effective implementation, participants will also learn about motivational components that have been successful with this specific intervention.

ALI REZAEIAN

Graduate: Masters

Sensor Area Coverage Analysis and Experimentation

Major: Computer Science

Faculty Advisor: Azad Azadmanesh

Wireless sensor networks (WSNs) have been employed in numerous military and civilian applications. Some application areas are in battlefield, surveillance, biological detection, and environmental monitoring. A major challenge to such applications is the *sensor area coverage*, which refers to the placement of sensors and their coordination in a mission space (field), so that the application coverage requirements are achieved. Some parameters of coverage quality include the relationship between the mission space points and number of sensor nodes¹, the coverage rate, and the resiliency of field coverage in case of sensor failures. This thesis 1) develops a software package that simulates various coverage algorithms and their enhancements to maintain certain quality of service, and to compare the simulation results against the analytical results of those algorithms; 2) takes advantage of one potential WSN application, e.g. the detection and tracking, to develop a prototype of the object-detection-and-tracking application. The prototype will be able to communicate with the simulation software that visually tracks the object movement.

ABSTRACTS

STEPHANIE SANDS

Graduate: Masters

Measuring Self-Perceived Idea Fluency

Major: Industrial-Organizational Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer, Lee Ferrante

The purpose of this study is to develop and validate a scale for Self-Perceived Idea Fluency (SPIF), defined as one's perceived ability to generate ideas. Currently there are no measures for this construct, so validation of this scale would be of value to researchers and practitioners as a potential indicator of an individual's creative ability without relying on objective measures. Based on previous literature, positive correlations are expected between the proposed scale and Divergent Thinking. Antecedents of Divergent Thinking include Openness to Experience, a personality trait that looks at an individual's tendency to seek out or enjoy novel experiences and situations; and Tolerance for Ambiguity, referring to being comfortable with unclear or vague experiences and situations. Word Fluency is a predicted consequence of SPIF and refers the actual number of ideas generated. Mental Fatigue is expected to have a negative relationship with the proposed scale, and relates to depleted cognitive resources, an antecedent of a Situational Desire for Closure. No previous research has found a significant relationship between Idea Fluency and Internal Locus of Control, the extent to which an individual feels they have control over their outcomes, and so this will be used to evaluate divergent validity. Factor and correlational analyses will be used to assess the dimensionality of the proposed scale items. Regression analyses will be completed to determine which antecedents are the central drivers of idea fluency.

SRIRAM SRINIVASAN

Graduate: Masters

Detecting And Using Base Clusters For Modularity Maximization.

Major: Computer Science

Faculty Advisor: Sanjukta Bhowmick

A network is said to exhibit community structure if the nodes of the network can be easily grouped into set of nodes, such that each group is densely connected internally [1] but sparsely connected with other groups. Most real world networks exhibit community structure and determining communities is an important analysis tool in many application including sociology, epidemiology and biological networks. A popular technique for detecting communities is based on computing the modularity of the network [1]. Modularity computes how well are vertices in a group connected as opposed to being randomly connected. In general, high modularity indicates good partition of network into communities. Maximizing modularity is a NP- hard problem [1]. However, all modularity based algorithm for detecting community structure are affected by the order in which the vertices in the network are processed. Therefore, detecting communities or clusters in real world graph becomes increasingly difficult. Our goal is to find the subnetwork that is invariant across different orderings. We introduce the concept of *base cluster*, that is, a group of vertices that are always partitioned to the same community independent of the perturbations to the input. We develop a preprocessing step that identifies stable base cluster and empirically show that number of base clusters in a network affects the range of modularity values obtained. In particular, base clusters can also help determine strong communities in the network.

ABIGAIL STANGER

Graduate: Masters

Investigation of novel drug therapy of KG4 for *Toxoplasma gondii* infections

Major: Biology

Faculty Advisor: Paul Davis

Toxoplasma gondii is an extremely common parasite of both animals and humans, infecting an estimated up to 40% of the United States human population, but as much as 50% to 80% of the population in much of South America and continental Europe. In a healthy adult, infection with *T. gondii* generally results in minimal or no clinical symptoms due to a robust immune system efficiently suppressing the ac-

tive form of the parasite (the tachyzoite stage). Shortly after infection, however, the parasite forms cysts (the bradyzoite stage) to protect itself from the immune system, which allows for reactivation in the event of immune system depression. *T. gondii* infection has been identified as a leading cause of severe illness amongst immune compromised individuals and pregnant women. Recently, *T. gondii* has also been recognized as a threat to many animal species, including the Southern Sea Otter off the California coast. Given these global and multi-species health concerns, it is critical that we identify effective methods for treatment and control of *T. gondii*. To this end, the goal of this study is to investigate the mechanism of action of the novel drug, KG4, against *Toxoplasma gondii* infection. We will utilize mutagenesis coupled with genomic sequencing techniques to help identify the gene targeted by KG4 to restrict *T. gondii* growth. Such information will be beneficial not only for the clinical use of this drug in treating patients worldwide for *T. gondii* infection, but will also progress our understanding of the parasite for future studies.

SARA TANGDALL

Graduate: Masters

The Influence of Popular Culture on Women's Identities: A Diachronic Discourse Analysis of Vogue Magazine

Major: English

Faculty Advisor: Frank Bramlett

Vogue claims to be a magazine that empowers women through its strong female editors, writers, designers, and models. Vogue's continued relevancy and influence on millions of women has inspired an analysis of Vogue's discourse and a discussion of how this discourse shapes women's identities through an understanding of performativity (Butler). This large-scale discourse analysis examines whether or not ideologies encouraged by Vogue changed over time and how these ideologies influenced identity formation. The discourse features identified in over 84 articles, spanning a time period of over 100 years, include the use of titles, pronouns, and consumer jargon. Through an examination of these features, I discovered Vogue's discourse originally influenced women's identity formation in relation to men. With the rise of the second wave of the feminist movement, this method of identity formation declined as women became more independent, causing a gap in women's identity formation. A consumer driven identity filled this gap, and currently, Vogue's discourse encourages women to build their identities through the idea of a "synthetic sisterhood" (Talbot). Vogue's discourse also promotes a certain level of esthetic perfection. While the discourse in Vogue changed to encourage an understanding of women beyond their esthetic, the importance placed on esthetic perfection never diminished. This is shown through the "problem + solution" (Litosseliti) model found in Vogue and further promotes this synthetic sisterhood. Overall, Vogue's discourse encourages women to implicitly reinforce the patriarchy by participating in this synthetic sisterhood, which is driven by consumerism culture inherently found in capitalism.

VIKAS THOTAKURI

Graduate: Masters

Evaluating the Effectiveness of Network Centrality in the Context of Shakespeare's Plays

Major: Computer Science

Faculty Advisor: Sanjukta Bhowmick

Networks are popular models for representing interactions between entities in systems, such as in sociology, bioinformatics and epidemiology. The entities in the networks are represented as vertices and their pair-wise interactions are represented as edges. Many network metrics such as degree centrality (number of connections of an entity) and betweenness centrality (number of shortest paths passing through the entity) have been developed to rank the entities according to their importance. In this presentation, we study the effectiveness of these metrics in closed-form social interactions—particularly in the context of Shakespeare's dramas. In plays the dialogues amongst characters are very precise to express the gist of their interactions in a short time frame. We are interested in understanding how this sort of interaction differs in a qualitative sense from the interactions seen in social media such as Facebook and Twitter. Our observations show that the popular network metrics are not always successful in correctly identifying the lead characters of the play and in the presentation we discuss some of the new metrics that we have developed to address this issue.

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HEATHER TICE

Graduate: Masters

Development of a Family Affective Commitment Scale

Major: Industrial-Organizational Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer, Rose Green

The three components of organizational commitment are normative (moral obligation to stay with the organization), continuance (based on needs the organization fulfills), and affective commitment (emotional attachment to and internalization of the goals of the organization). Affective commitment has shown to be the most indicative of employee retention, increased organizational citizenship behaviors and other positive work outcomes (He, 2008; Meyer, Stanley, Herscovitch, & Totoplnystsy, 2002). Organizational attitudes such as commitment are not the only forces that influence an employee's behavior; family factors also have an effect. Because organizational affective commitment has such important implications for work outcomes, we expect that attitudes toward the family would also affect work outcomes. As with organizational commitment, it is likely that there are multiple types of family commitment with distinct indicators, yet there is an absence of this type of research. Thus, we propose a new scale measuring family affective commitment (FAC). Paralleling Meyer and Allen's (1991) definition of organizational affective commitment, FAC is defined as the emotional attachment to, internalization of goals and values of, and identification and involvement with the family unit. We developed a scale for FAC and administered it to 123 college students via an online survey system, along with other scales measuring related work attitudes and outcomes. Participants were required to be employed. This study will report the psychometric results including the factor structure and internal consistency reliabilities of FAC, as well as the relationship of FAC with the other constructs.

MATT TUCKER

Graduate: Masters

Survey of Sentiment Analysis

Major: Computer Science

Faculty Advisor: Parvathi Chundi

Blogs and other online social media express opinions of individuals, news organizations, and various groups regarding topics of interest to social media consumers. This paper surveys techniques of sentiment analysis already known in the literature to give an overview of this new and growing field to discern patterns in. This survey aims to clarify and highlight the various techniques used in this new and growing field, and will be used for the master's thesis of the first author.

KRISTIN VANWYNGAARDEN

Graduate: Masters

Phonological profiles of 2-year-olds with expressive-only and expressive and receptive language delay

Major: Speech-Language Pathology

Faculty Advisor: Shari DeVeney

Co-Author: Shari DeVeney

An estimated 10 to 15% of 2-year-old children gain new words more slowly and begin combining words into phrases later than their typically developing peers. This early language delay is associated with negative effects on later reading and social skill development. Although phonological development has been studied in late talking toddlers identified with expressive-only language delay, little is known about the phonological inventories of children identified with expressive and receptive language delays. Previous studies have shown that late talkers have a smaller vocabulary than their typically developing peers, but there is little research distinguishing the difference in phonological development between children identified as expressive-only language delay and children identified as expressive and receptive language delayed. It is important to understand the nuances between the two late talker subgroups for appropriate identification and early intervention services. Therefore, it is important to investigate the differences in the phonetic repertoires of expressive-only language delayed and ex-

pressive and receptive language delayed. In the present study, 15-minute language samples of nine late-talking children, ages 24- to 33-months old, interacting with a parent or caregiver in the child's home were evaluated for their phonetic content. It is hypothesized that children with an expressive-only delay will have larger phonetic inventories and a higher percentage of correct consonant productions than their peers with receptive and expressive delays. This study has clinical implications for speech-language pathologists because it will help provide a clearer understanding of expected clinical differences among late talking toddlers.

DHAWAL VERMA

Graduate: Masters

A Novel Approach for Integration of Association Rule Mining in the Analysis of GWAS for Cancer Networks

Major: Computer Science

Faculty Advisor: Hesham Ali

The advent of high throughput sequencing technologies have facilitated in generating a huge amount of genomic data. As a result, genome wide association studies (GWAS) have been able to identify a large number of strong associations between specific chromosomal loci and both Mendelian diseases and complex human disease. In addition, a wealth of genomic information in the form of publicly available databases is underutilized as a potential resource for uncovering functionally relevant markers underlying complex human traits. The discovery of genetic associations is an important factor in the understanding of human illness to derive disease pathways and a plethora of other information such as the disease-gene associations, the different types of variants associated with the diseases and their correlation with each other. Currently there is no model that can provide the correlation between genetic variants, genes and phenotypes, which serves as a motivation for this research. We propose a graph theoretic approach that models the intricate relationships between the variants, genes and phenotypes, and highlights the common features among the various relationships which can be further explored to extract meaningful features describing the observed behavior of genetic variants for a phenotype. We introduce two types of networks; Phenotype-Variant Network and Phenotype-Gene Network, and use the two networks to explore the shared genetic architecture of complex diseases from the Genetic Association Database. Furthermore, we analyze the networks and explored important sub-networks for the disease class 'Cancer' and used association rule mining on the database to give accuracy scores for the association.

JAMES VNUK

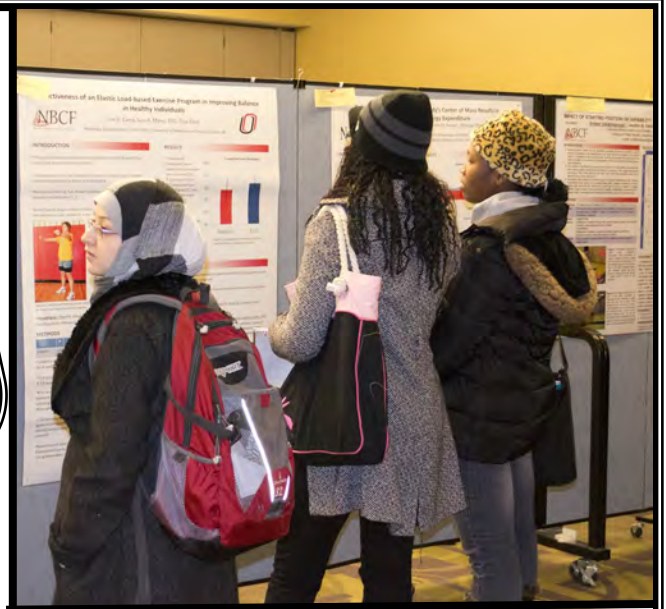
Graduate: Masters

Discourses of Masculinity: The New Man, The New Lad, and *Maxim* Magazine

Major: English

Faculty Advisor: Frank Bramlett

Known for its exploitative handling of women and risqué photographic content, UK-import *Maxim Magazine* is one of the most popular men's "lifestyle" magazines in print today. The men's lifestyle magazine, as a genre, is deeply invested in consumptive, modern identity construction, offering readers guidance in expensive clothing, entertainment devices, video games, books, movies, alcohol, automobiles, sporting goods, and even who to find sexually attractive. Study in sociolinguistics has uncovered that language also plays a pivotal role in the construction of identity, including gender. The incorporation of written articles into *Maxim* to accompany its largely pictorial content, namely interview segments, suggests that *Maxim's* editors do serve a particular *ethos* with consideration to male gender construction, and an interest in perpetuating ideology and discourse surrounding male gender performance, versus other competing arbiters of men's lifestyle such as *GQ* or *Esquire*. The interview space affords readers an opportunity to witness identity performance and gender construction in action, making it an ideal point of analysis to uncover *Maxim's* ideology. Following Judith Butler's theory of gender performativity, and using linguistic methods of discourse analysis, it is the aim of this investigation to show that *Maxim* ratifies popular, hegemonic beliefs surrounding male sexuality, solidarity, and dominance, in contrast to antithetical ideologies for masculine performance, through its choice of interview subjects and interview content. For this analysis, twelve physical issues of *Maxim* dated from January 2011 to December 2011 were collected, representing one year of interview data.



HEATHER WILLIS

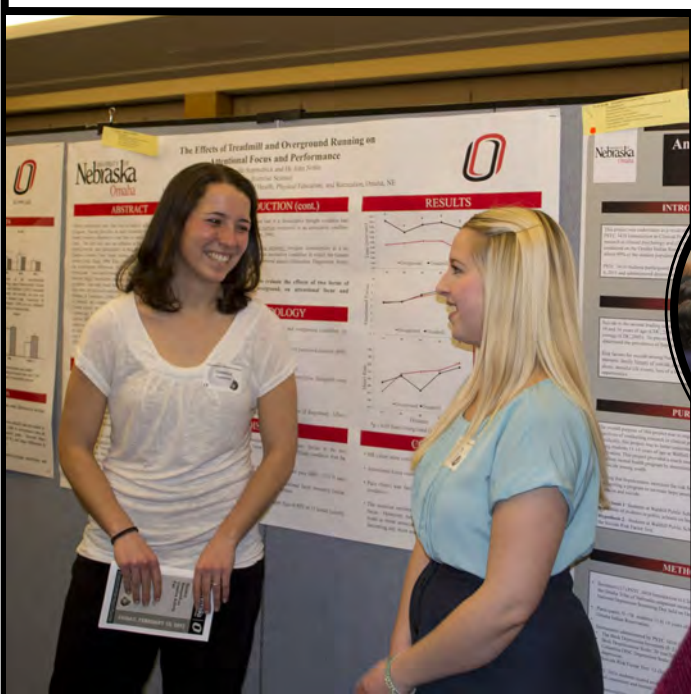
Graduate: Masters

Effects of an Established Wind Farm on Levels of Stress Hormones in Greater Prairie Chickens (*Tympanuchus cupido*) and Sharp-tailed Grouse (*Tympanuchus phasianellus*)

Major: Biology

Faculty Advisor: L. LaReesa Wolfenbarger

Human disturbances such as wind farms potentially stimulate stress responses in wildlife. Levels of stress response hormones in birds can be measured noninvasively by analyzing droppings, and potentially feathers, thereby eliminating capture stress required for taking blood samples. My study will use a radioimmunoassay to measure a stress response hormone in droppings and feathers of Greater Prairie Chickens (*Tympanuchus cupido*) and Sharp-tailed Grouse (*Tympanuchus phasianellus*) at their breeding display grounds. Prior to sample analysis, I will use two methods to physiologically and biologically validate the assay to show that it is an effective method for my study species. My overall objective is to use noninvasive sampling techniques to assess stress levels on a distance gradient from an established wind farm. I hypothesize that, if wind farms induce physiological stress in prairie grouse, then stress hormone levels will decrease as distance from the wind farm increases. The results of my study will provide management and energy development guidelines to protect species of conservation concern.



GRADUATE - DOCTORAL

NICHOLAS ARREOLA

Graduate: Doctoral

The Effect of Problem Construction on Solution Quality and Originality

Major: Psychology

Faculty Advisor: Roni Reiter-Palmon

Co-Author: Roni Reiter-Palmon

Creativity is defined as a product or idea that is both high quality and original. Problem construction refers to a cognitive process of structuring and making sense out of ambiguous, ill-defined problems, and has been shown to positively influence creativity. We examined how the quality and originality of the problem-construction process influenced the quality and originality of solutions to real-world problem scenarios. We found that the quality and originality of the problem-construction process, together, positively influenced the quality and originality of the solutions, but that the specific nature of this relationship varied depending on the problem.

DANIELLE BAILEY

Graduate: Doctoral

Variation in Sex Offender Parole Officer Relationships: Does Victim Age Matter?

Major: Criminology and Criminal Justice

Faculty Advisor: Lisa Sample

Legally, sex offenders are treated as a homogenous group and are often all assigned to intensive parole supervision upon release from prison. Given the heterogeneous nature of the population, however, it is likely that the quality of supervision varies across offenders. This has implications for public safety because it alters the degree of control and the depth of rehabilitation attempts enforced on the sex offender. Previous studies find that the best control of an offender is achieved when a personal, informal relationship is formed between the offender and another prosocial adult. However, in the case of sex offenders, the age of victim may impact the type of relationship parole officers maintain with parolees. This study is a case study examination of the relationships between sex offenders and their parole officers. This study uses qualitative analysis of sex offender parole files to examine if informal relationships exist between offenders and officers and to analyze the variability of those relationships across officers and within officer caseloads. We find that informal relationships do exist, and variation occurs both across officers and within officer caseloads. However, this variation was not related to victim age of the offender but to other offender characteristics or life events.

JASJIT BANWAIT

Graduate: Doctoral

Enriching miRNA-mRNA relationship with miRNA binding site's sequence profiling and its surrounding environment

Major: Information Technology

Faculty Advisor: Dhundy (Kiran) Bastola

Co-Author: Hesham Ali

MicroRNAs are small (approx. 22nt) noncoding RNAs that regulate gene expression by either degrading messenger-RNA (mRNA) that has already been transcribed or by repressing the translation of mRNA. This mechanism of gene regulation by binding of the miRNA to 3-prime-UTR of target mRNAs has been recently discovered and sequence-specific post-transcriptional gene regulation process affects large set of genes involved in number of biological pathways. Mapping of 7nt long miRNA seed sequence to the target gene has been a standard way of predicting miRNA targets. In this study, we have generated a sequence profile-based filter to increase the specificity of human miRNA-mRNA relationship thereby enriching true-positive miRNA target sites in humans based on sequence information. We had integrated the role of binding site's surrounding environment in term of its flanking sequence to further enrich the true miRNA target sites.

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OLIVER BONHAM-CARTER

Graduate: Doctoral

A Meta-genome Sequencing and Assembly Preprocessing Algorithm Inspired by Restriction Site Base Composition

Major: Bioinformatics

Faculty Advisor: Dhundy (Kiran) Bastola

Co-Author: Hesham Ali

In meta-genome sequencing and assembly projects, where there are different types of contigs mixed together in a single pool, the task of assembling its different organisms is a complex and challenging problem. It is therefore desirable to sort the contigs by origins into separate bins from which to work. We propose a framework of using the base compositions of bacterial restriction sites to generate sets of motifs which work to differentiate organismal groups, including the contigs from those groups. We introduce spectrum sets and show how to strategically select them for use in binning contigs from different organisms. We suggest that this framework can save time during a meta-genome sequencing and assembly project. Our method is able to differentiate organisms and to successfully determine the association of the contigs which were derived from an organism. In particular, we show that two genera are fundamentally different by analyzing their motif proportions. Using one of the four total spectrum sets, which encompass all known restriction sites, we show that different sets have different abilities to distinguish sequences. In addition, we show that the selection of a spectrum set which is relevant to one organism, but not the other, greatly improves performance of differentiation, even when the contig size is short (1000bps). Using ten trials of newly selected contigs to confirm our premise, our study provides a proof of concept for a novel and computationally effective method for a preprocessing step in meta-genome sequencing and assembly tasks.

H. DANIEL BUTLER

Graduate: Doctoral

Assessing the Effects of Exposure to Different Prison Environments on Offender Recidivism

Major: Criminology and Criminal Justice

Faculty Advisor: Benjamin Steiner

Co-Authors: Benjamin Steiner, Matthew Makarios, Lawrence Travis

Although researchers have examined the specific deterrent effects of incarceration on offenders' odds of recidivism, little is known about whether these effects differ based on the institution(s) in which offenders were confined. In this study, we use data on a statewide sample of offenders released under post-release supervision in Ohio to examine the impact of exposure to different prison environments on offenders' odds of recidivism. Findings are discussed in terms of their importance for accurately classifying and managing offenders.

JUNG CHIEN

Graduate: Doctoral

Suprathreshold mechanical vestibular stimulation affects postural control during standing

Major: Physical Education

Faculty Advisor: Nick Stergiou

Co-Authors: Mukul Mukherjee, Nick Stergiou

Successful postural control requires integrated information from visual, vestibular and somatosensory systems. While the contributions of visual and somatosensory contributions are easier to study because of the ease of perturbing these systems, this is not the case for the vestibular system. Conventional methods of perturbing the vestibular system are uncomfortable or painful. Therefore, to improve our understanding of the vestibular contributions to standing postural control, we used suprathreshold mechanical vestibular stimulation (sMVS) over the mastoid process. Our objective in this study was to determine the effect of sMVS on the maintenance of static standing posture in a perturbed environ-

ment. Six subjects were tested for their postural control through the Sensory Organization Test (SOT) with and without sMVS on the mastoid processes of both sides. The six SOT conditions were randomly presented to the participants. Postural control was measured by the performance index (PI). The PI is calculated by integrating rectified anterior-posterior (AP) sway signal, and then scaling the result as percentage of maximum AP sway during standing. Higher performance index values represented worse postural control and vice versa. The PI significantly increased ($p = 0.027$) in eye-closed, and unreliable somatosensory inputs condition from 8.56 ± 2.52 (without sMVS) to 13.37 ± 2.39 (with sMVS). The addition of the sMVS worsened the postural control during static standing by about 60%. These results are comparable to the SOT values obtained in subjects with acute vestibulopathy.

BYUNGWOO CHO

Graduate: Doctoral

A Sketch of Sustainable Development: Which Units of US City Budgets Focus on Sustainability?

Major: Public Administration

Faculty Advisor: John Bartle

Sustainability is a frequently cited word by local government leaders but one without meaning absent a context. In spite of the ambiguity, there is a lack of research on the current adoption of sustainability as a budget concept and how the concept is utilized as a performance indicator. Therefore, this research aims to identify the way that Chief Budget Officers, such as mayors or city managers identifies the concept of sustainable development. In addition, this study invests which units of the city government focus on sustainability and have performance indicators for sustainable development. This study employs a content analysis of the latest budget reports of 41 cities, which are receiving the Distinguished Budget Award from GFOA in 2009 (the most complete listing available) among the cities whose population is over 300,000. At first, I analyzed the budget letter of major city governments in the US, and checked how many times the letters mentions sustainability to measure how important they deal with the sustainable development issues in their budget. In addition, I research the performance indicators in their budget and analyze which unit of government focus sustainable development.

SANGIL CHOI

Graduate: Doctoral

On-board Processing of Acceleration Data for Real-time Activity Classification

Major: Information Technology

Faculty Advisor: Jong-hoon Youn

The assessment of a person's ability to consistently perform the fundamental activities of daily living is essential in monitoring the patient's progress and measuring the success of treatment. Therefore, many researchers have been interested in this issue and have proposed various monitoring systems based on accelerometer sensors. However, few systems focus on energy consumption of sensor devices. In this paper, we introduce an energy-efficient physical activity monitoring system using a wearable wireless sensor. The proposed system is capable of monitoring most daily activities of the human body: standing, sitting, walking, lying, running, and so on. To reduce energy consumption and prolong the lifetime of the system, we have focused on minimizing the total energy spent for wireless data exchange by manipulating real-time acceleration data on the sensor platform. Furthermore, one of our key contributions is that all functionalities including data processing, activity classification, wireless communication, and storing classified activities were achieved in a single sensor node without compromising the accuracy of activity classification. Our experimental results show that the accuracy of our classification system is over 95%.

ERIC CUTLER

Graduate: Doctoral

Margin of Stability as a Metric for Balance Impairment in Multiple Sclerosis

Major: Exercise Science

Faculty Advisor: Nick Stergiou

Co-Authors: Shane Wurdeman, Denise McGrath, Sara Myers, Nicholas Stergiou, Jessie Huisinga

Multiple sclerosis (MS) is a chronic disease of the nervous system. This potentially debilitating disorder often results in a general degradation of motor function. In particular, MS patients have been shown to

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exhibit altered balance dynamics while standing. This altered balance is characterized by a large amount of postural sway. Increased postural sway has also been observed in the medial-lateral direction during walking, even in patients with very mild MS. Traditionally, static measurements taken during quiet standing have been utilized to assess balance impairment in MS patients. Unfortunately, many of these approaches fail to account for aspects of balance during dynamic activities such as walking. It is particularly important to investigate balance during walking because this has been shown to correlate with fall risk in MS patients. It would be pertinent to use a metric that accounts for not only the position of the center of mass or center of pressure but also its velocity. One such system that includes center of mass motion is the extrapolated center of mass motion and margin of stability. This model utilizes the well established inverted pendulum analog of gait to characterize dynamic balance. The application of this unique metric could produce valuable new insights into the dynamic balance of gait in MS patients. Thus, the purpose of this study was to investigate the differences in dynamic balance between MS subjects and healthy controls in the medial-lateral direction utilizing the margin of stability.

JACQUELYN DAVIS

Graduate: Doctoral

Chronic Oral Capsaicin Highlights the Relationship Between the Lingual and Chorda Tympani Nerves

Major: Neuroscience

Faculty Advisor: Suzanne Sollars

Capsaicin, the chemical that gives chili peppers their spicy heat, is a neurotoxin which causes damage to the lingual nerve of the tongue. The lingual nerve is responsible for conveying somatosensory information (e.g. temperature, pressure, spiciness) to the brain and is found primarily in structures called fungiform papillae, which are located on the front 2/3 of the tongue. Housed within these papillae are the taste buds, which convey information about taste to the brain by way of the chorda tympani (CT) nerve. Surgically destroying the lingual nerve has been shown to cause age-dependent differences in taste bud volume. This suggests that while the CT and lingual nerves are distinctly different in location and function, some integrated relationship exists between them in supporting taste structures. In an attempt to understand this phenomenon, moderate doses of a capsaicin-containing solution were fed to Sprague-Dawley rats daily, for 40 days. Animals began treatment at young (5 days) or adult (40 days) ages and were sacrificed either two or 50 days after treatments concluded, to allow examination of system plasticity across different developmental stages. Capsaicin-related reductions in taste bud volume were limited to young animals examined 50 days after treatment. Chronic capsaicin exposure thus provides a naturalistic vehicle to study the CT-lingual relationship; since capsaicin is solely a lingual irritant its effect on taste bud volume provides additional evidence of lingual-CT nerve integration. Further exploration will be needed to elucidate both the exact nature of the nerves' relationship and how capsaicin exerts its effects.

KATHRYN DEMPSEY

Graduate: Doctoral

A Computational Model for Identifying Causative Genetic Relationships using Biological Networks and Gateway Nodes

Major: Bioinformatics

Faculty Advisor: Hesham Ali

Recently, High-throughput instruments and associated studies have produced volumes of publicly available metadata that provide a wealth of information that can be used to guide biological research. However, models for identifying actual signals and obtaining useful genetic relationships from such massive data have not been developed at the same rate. This is due in part to high levels of noise in the raw data and the lack of adequate algorithms for analysis. Thus, biological networks have emerged as a popular tool for modeling heterogeneous data because they are capable of representing biological relationships en masse. Moreover, well-established graph theoretic methodology can be applied to network models to increase efficiency and speed of analysis. We highlight how network representation of multiple states of biological data via correlation of gene expression allows us to formally define "Gateway" nodes. Gateway nodes can be loosely described as elements that connect clusters of genes between different

states. We provide evidence that these nodes tend to represent genes that are critical for a shift from one cellular state to another. Further, we provide a proof-of-concept for the existence of these elements by mining gateway genes related to phenotypic shifts in yeast, mice, and humans. We verify these nodes as indicators of cellular activity using literature and knowledgebase derived from in vivo studies. The proposed computational model paves the way to establish novel ways to model and interpret gene expression data along with other biological data for the improvement of target identification in cellular systems.

TRIPARNA DE VREEDE

Graduate: Doctoral

Effect of Shared Mental Models on Consensus

Major: Psychology

Faculty Advisor: Roni Reiter-Palmon

Modern organizations are increasingly relying on teams to solve problems and make decisions. In order to effectively utilize teams, it is important to understand the conditions in which the team can function most efficiently. One of the conditions required to make team work successful is to ensure that there is consensus among the team members about the decisions made. Organizations consider consensus-based decision-making to be important because it has the potential to increase commitment and enable the successful execution of strategies. There are various factors that can have a bearing on consensus decision-making. This study focuses on one such factor that may influence team consensus - shared mental models. Specifically, this study explored if shared mental models had a positive relationship with the consensus decision making in groups. Results show that teams with higher shared mental models reached higher levels of consensus. In addition, it was discovered that perceptions of fairness in the decision-making process was the greatest contributor to difference between groups' shared mental model scores.

AYAN DUTTA

Graduate: Doctoral

Recon_guration Planning of Modular Robot under Uncertainty

Major: Information Technology

Faculty Advisor: Prithviraj Dasgupta

Co-Authors: Prithviraj Dasgupta, Jose Baca, Carl Nelson

In this research we consider the problem of automatically recon_guring or changing the shape of a modular self-recon_gurable robot (MSR) when it cannot continue its motion or task in its current shape. To solve the modular robot recon_guration problem, we propose a novel technique based on a branch of economics called coalition game theory, which is used by people to divide themselves into teams or coalitions. The conventional computer algorithm used for forming coalitions and _nding the best coalitions is very expensive to implement in terms of running time and energy (battery power) and not practical to implement on small-scale, modular robots. We have proposed a new, fast algorithm called searchUCSG that intelligently reduces the number of coalitions it needs to inspect and eventually _nds the best coalitions for the modules of the modular robot. Our proposed technique also incorporates an essential aspect of robotics - uncertainty in operation of the robots movements. We have veri_ed the operation of our algorithm mathematically as well as experimentally using a computer simulated model of a modular robot called ModRED that we are developing as part of the NASA-sponsored ModRED project. Experimental results of our algorithm show that it is able to recon_gure a modular robot while taking signi_cantly lesser time than other state-of-the-art algorithms and is able to form a con_guration that is very close or at worst 80% away from the best possible con_guration of the modules.

BENEDICT FERN

Graduate: Doctoral

School-life conflict and its relationship to student well-being

Major: Psychology

Faculty Advisor: Lisa Scherer

Co-Authors: Lisa Scherer, Lauren Weivoda

The goal of this study is to develop and test a new measure of school-life conflict (SLC) as well as to create a model to better understand the personal characteristics associated with school-life conflict. School-life conflict is the extent to which life demands, such as work and family, interfere with students' ability to

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function at school. We are interested in the extent to which neuroticism and affective organizational commitment influence the experience of school-life conflict, as well as the extent to which school-life conflict and neuroticism influence students' evaluations of their physical and mental health. Specifically, we expect that the relationship between affective organizational commitment (i.e., emotional attachment to the organization) and school-life conflict will be moderated by neuroticism, such that when neuroticism is high, high affective organizational commitment will lead to high school-life conflict, whereas low affective organizational commitment will lead to low school-life conflict. When neuroticism is low, school-life conflict will be low regardless of degree of affective organizational commitment. Moreover, we predict that the relationship between school-life conflict and health will be moderated by neuroticism, such that when neuroticism is high, high school-life conflict will lead to lower health, whereas low school-life conflict will lead to higher health. When neuroticism is low, health will be higher regardless of level of school-life conflict. Implications for methods of reducing SWC and enhancing student coping skills and health will be discussed.

DEBORAH GLEICH-BOPE

Graduate: Doctoral

Urban Immersion Program

Major: Educational Leadership

Faculty Advisor: Connie Schaffer

Co-Author: Cindy Copich

This research investigated the impact of an urban immersion program which partnered urban schools with a state university. The program provided experiences for pre-service teachers by completely immersing them, along with their university instructors, in urban schools in which they worked and learned alongside the teachers and their students. The immersion program assisted in positively reshaping how pre-service teachers perceived urban schools and also increased their confidence in their ability to teach in an urban setting. Results statistically were promising and demonstrated that the program effectively addressed the challenge of recruiting effective teachers to meet the needs of diverse students.

JOSHUA HAWORTH

Graduate: Doctoral

Perception of Motion Complexity is Deficient in Adults with Autism Spectrum Disorder

Major: Health, Physical Education and Recreation

Faculty Advisor: Nick Stergiou

Co-Authors: Wayne Fisher, Srikant Vallabhajosula, Nicholas Stergiou

Preference for biological motion is characteristic of developing children but not for individuals with autism spectrum disorder (ASD). Work in biomechanics has shown that biological motion can be characterized by qualities of the movement variability (entropy). We hypothesize that a deficit in the perception of this variability may be characteristic of ASD, and the functional basis for non-discrimination of biological motion. Five adults without ASD (2 with) stood quietly on a force platform viewing an oscillating point-light, under two conditions. Point-light motion was driven by sinusoidal or chaotic rhythm. Measures of postural sway and gaze were collected during each condition. Sample entropy quantified the temporal structure of variability in each measure. Individuals with ASD exhibited significantly different gaze response to both stimulus conditions, compared to those without ASD. Although this finding is important, our primary hypothesis was that individuals without ASD would differentiate between the conditions whereas those with ASD would not; which is what we observed. Adults without ASD exhibited greater complexity of their gaze behavior towards the complex motion, whereas adults with ASD did not differ in their gaze patterns. This study provides preliminary evidence that the perception of the structure of movement variability differs for adults with ASD when compared with adults without ASD. This finding has potentially important implications relative to the lack of perception and motor response to biological motion reported for individuals with autism in prior research.

MATT HEESCH

Graduate: Doctoral

The Performance Effect of Early Versus Late Carbohydrate Feedings During Prolonged Exercise

Major: Exercise Science

Faculty Advisor: Dustin Slivka

Co-Authors: Molly Mieras, Dustin Slivka

Ingesting carbohydrate during prolonged exercise can increase time to fatigue and improve time trial performance at the end of exercise. The purpose of this study was to determine how the timing of isoenergetic carbohydrate feedings during prolonged cycling affects performance in a subsequent 10 km cycling performance trial. Recreationally trained male cyclists ($n = 8$, age 34.5 ± 8.3 y, mass 80.0 ± 6.3 kg, $16.0 \pm 3.8\%$ body fat, VO_2 peak $4.54 \pm 0.42 \text{ L} \cdot \text{min}^{-1}$) completed four experimental trials consisting of cycling continuously for two hours at 60% of VO_2 peak, followed immediately by a self-paced 10 km performance trial. Participants consumed 250 mL of beverage every 15 minutes during the two hour exercise. The four conditions included no carbohydrate ingestion (PP), early carbohydrate ingestion (CP), late carbohydrate ingestion (PC), or carbohydrate ingestion throughout (CC). A total of 60 g of carbohydrate was given in all trials except PP. Trials were completed in a randomized, counterbalanced order. 10 km performance trial time to completion was faster in trials CC (17.70 ± 0.52 min) and PC (17.60 ± 0.62 min) as compared to trial PP (18.13 ± 0.52 min, $p = 0.028$ and $p = 0.007$, respectively) while trial CP (17.85 ± 0.58 min) was not different from trial PP ($p = 0.178$). Blood variables mirrored performance results. These data indicate that carbohydrate ingestion late during exercise (CC and PC) can improve subsequent 10 km time trial performance while early ingestion (CP) does not.

CHUN-KAI HUANG

Graduate: Doctoral

The Effect of Vibrotactile Stimulation on Long Range Correlation of Stride Interval Time Series Among Different Walking Speeds

Major: Exercise Science

Faculty Advisor: Ka-Chun Siu

Co-Authors: Jung Hung Chien, Srikant Vallabhajosula, Mukul Mukherjee, Nick Stergiou, Ka-Chun Siu

The variability of stride interval (duration between two consecutive heel-contacts of the same leg) is one of indicators to control posture and predict falls during walking. Vibrotactile stimulation (VS) on the plantar foot shows the benefits to reduce postural sway in standing as well as decrease stride interval variability during walking. In addition, stride interval variability is also affected by different speeds. Therefore, the purpose of this study was to investigate the effect of VS and different speeds on changes of stride interval variability. We recruited ten healthy young adults to walk on treadmill with or without VS at five different speeds (preferred walking speed, PWS; 80%, 90%, 110% and 120% PWS). The VS was given by three actuators embedded in the insole with 250Hz and gain of 17.5 db. Gait characteristics were collected by motion capture system. Detrended Fluctuation Analysis was performed on the stride interval time series to determine the strength of long-range correlations over time and provide a measure of the temporal structure of variability (α -value). A two-way ANOVA (conditions; speeds) with repeated measure was used to investigate the effect of VS and speed on the stride interval time series. Post hoc analysis was performed using the Tukey test when a significant main effect was found. We found the smaller α -values at PWS indicating gait variability at PWS exhibits more effective adaptability than those at faster or slower speeds; VS also enhanced this characteristic and made the system more adaptable to environmental stresses. (246/250)

BRAD HULLSIEK

Graduate: Doctoral

The Effects of Ambiguity on Creativity: Comparative vs. Absolute

Major: Industrial-Organizational Psychology

Faculty Advisor: Roni Reiter-Palmon

To gain a competitive advantage, companies rely on creative solutions when solving problems. The most creative solutions are those that are both original and of high quality (Amabile, 1983). Creative solutions stem from ambiguous and ill-defined problems. To expand, a well-defined problem is one in which there is a positively correct and attainable solution to the problem, whereas an ill-defined problem may have numerous solutions because of varying assumptions that conflict with each other (Kitchener, 1983). These challenges are a result of ambiguity or unknown information that differentiates well-defined from ill-defined

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problems. The instructions presented in a problem solving task can help to clarify some of this ambiguity by directing attention to certain aspects of the problem, allowing cues to become less ambiguous and more salient (Dinnel & Glover, 1985). Thus, instructions are essential for facilitating an individual's ability to fulfill multiple objectives and produce creative solutions to an ill-defined problem. Previous research has found that some instructional ambiguity is useful in facilitating creative output (Runco, Illies, & Reiter-Palmon, 2005). Thus, the focus will be on the manipulation of instructional ambiguity (low vs. high) presented in a creative problem solving task. Previous thesis research was unable to establish a statistical difference between low vs. high levels of instructional ambiguity despite contrary indications in open-ended questions. However, current studies revealed that individuals were able to differentiate ambiguity in instructions in multiple dissertation pilot studies. Pilot study results and plans regarding effects on creative output for full dissertation will be discussed.

JANYL JUMADINOVA

Graduate: Doctoral

A Novel Distributed Prediction Market Model and Algorithm for Forecasting Outcomes of Related Events

Major: Information Technology

Faculty Advisor: Prithviraj Dasgupta

Co-Author: Prithviraj Dasgupta

In this research we consider the problem of automatically recon_guring or changing the shape of a modular self-recon_gurable robot (MSR) when it cannot continue its motion or task in its current shape. To solve the modular robot recon_guration problem, we propose a novel technique based on a branch of economics called coalition game theory, which is used by people to divide themselves into teams or coalitions. The conventional computer algorithm used for forming coalitions and _nding the best coalitions is very expensive to implement in terms of running time and energy (battery power) and not practical to implement on small-scale, modular robots. We have proposed a new, fast algorithm called searchUCSG that intelligently reduces the number of coalitions it needs to inspect and eventually _nds the best coalitions for the modules of the modular robot. Our proposed technique also incorporates an essential aspect of robotics- uncertainly in operation of the robots movements. We have veri_ed the operation of our algorithm mathematically as well as experimentally using a computer simulated model of a modular robot called ModRED that we are developing as part of the NASA-sponsored ModRED project. Experimental results of our algorithm show that it is able to recon_gure a modular robot while taking signi_cantly lesser time than other state-of-the-art algorithms and is able to form a con_guration that is very close or at worst 80% away from the best possible con_guration of the modules.

VICTORIA KENNEL

Graduate: Doctoral

Creative Idea Evaluation and Selection: Effects of Process Structure and Individual Differences

Major: Industrial-Organizational Psychology

Faculty Advisor: Roni Reiter-Palmon

Co-Author: Roni Reiter-Palmon

Creativity is the most influential factor in gaining a competitive business advantage in today's economy. Between the processes of brainstorming and actual solution implementation is the critical but overlooked process of evaluating ideas and selecting of solutions to solve problems. We explored how the type of information and structure provided in the evaluation and selection process and participant personality characteristics affected idea evaluation accuracy and the selection of creative solutions to solve a problem. 186 participants read a realistic ill-defined story problem, evaluated the quality and originality of 15 solutions to the problem with a detailed rubric, simple definition, or no information about quality and originality, selected one solution to solve the problem with a structured step-by-step or open selection process, and completed several personality measures. Participants who evaluated solutions with the rubric demonstrated the most solution quality and originality evaluation accuracy. Additionally, those who more accurately evaluated solution quality and originality were more likely to select a truly creative solution to

solve the problem. Furthermore, participants' need for closure and perceptions that they were "too busy for new ideas" hindered while creative self-efficacy bolstered solution quality and originality evaluation accuracy. Finally, participants high in need for closure and perceptions that they were "too busy for new ideas" were more likely to select non-optimal or high-quality only solutions to solve the problem, while participants higher in openness to experience and creative self-efficacy were more likely to select original or truly creative solutions to solve the problem.

DANIEL LIEB

Graduate: Doctoral

Acute Improvements in elderly gait with a structured auditory stimulus

Major: Exercise Science

Faculty Advisor: Sara Myers

Falls among older adults are very common, with one in every three adults over the age of sixty-five experiencing a fall every year. Many factors contribute to falling, including medication, orthopedic injury, neurological dysfunction, and others. One strong indicator that a person may fall which provides a global view of walking health is walking variability. Healthy human walking contains an optimal level of variability that can be measured using nonlinear tools to analyze predictability and how walking evolves over time. Aging can lead to changes in walking variability, tending towards becoming more random and less predictable than optimal. These changes can negatively affect a person's ability to adapt to changes in the environment and increase risk of falling. One way to influence the variability of how someone walks is through listening to a structured auditory stimulus such as music with a specifically designed rhythm. As a pilot study in influencing variability in older adults during normal over-ground walking, custom music files were generated for two older adults based upon Beethoven's classic Für Elise using each subject's own stride times as the basis for the song's tempo. The rhythm was altered by overlaying pink noise on the metronomic tempo, shifting the variability of the rhythm to mimic that found in healthy walking. Though statistical analysis cannot yet be performed on such a small sample size, it appears that walking while listening to this specially designed music holds promise as a method to restore healthy levels of variability in walking.

ROBERT LYTLE

Graduate: Doctoral

Variation in Criminal Justice Policy Making: An Exploratory Study Using Sex Offender

Registration and Community Notification Laws

Major: Criminology and Criminal Justice

Faculty Advisor: Lisa Sample

Variation in Sex Offender Registration and Community Notification (SORCN) policies may suggest differences in public fears of sexual crimes as well as differences in state-level policy-making. This study explored the standardization of SORCN policies across a sample of five Midwestern states. A thematic content analysis showed that states varied in how registrants were defined, what information was selected for public notification, and how sex offender laws are maintained. A typology of revisions emerged, which may inform our understanding about policymaking. Ultimately, existing research provides limited explanations for these results, serving as an impetus for future research on context and process of criminal justice policy change.

HILLARY MCNEEL

Graduate: Doctoral

I'm Just a Juggalo! Will Gangs Go On Without Me?

Major: Criminal Justice

Faculty Advisor: Pete Simi

Co-Author: Gregg Etter

Traditionally, since 1994, Juggalos has been used as a term describing fans of the band, The Insane Clown Posse. While individual Juggalos or Juggalettes might have been involved in criminal activities (drug possession, assaults, vandalisms) the group as a whole was not viewed as a criminal group or a criminal enterprise. This seems to be changing. Four states (Arizona, California, Pennsylvania and Utah) now classify Juggalos as a gang that is involved in criminal activity. The National Gang Intelli-

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gence Center's National Gang Threat Assessment for 2011 lists Juggalos as a type of hybrid gang. This research attempts to look into the Juggalo movement and determine if law enforcement, nationwide, perceives this group as a gang, rock hooligans, or just extreme fans.

AARYN MUSTOE

Graduate: Doctoral

Care to Share? Exploring the relationship between altruism and oxytocin in marmosets

Major: Psychology

Faculty Advisor: Jeffrey French

Both human and nonhuman primates show the capacity to demonstrate other-regarding preferences, i.e., an understanding for the existence, benefit, and welfare of other individuals. However, the motivation or capacity to demonstrate other-regarding preferences, or to behave altruistically, depends on the social, cognitive, and neuroendocrine context. Oxytocin (OT) moderates the salience of social cues and affiliation toward others, but the extent to which OT facilitates altruistic behavior such as other-regarding preferences in nonhuman primates is currently unknown. Thus, the aim of this study was to use a Prosocial Choice Task (PCT) to evaluate whether 6 marmoset donors will altruistically provision food to familiar and unfamiliar partners. Additionally, I explored whether the manipulation of OT would influence the provisioning of food to familiar and unfamiliar partners. I found that marmosets preferentially rewarded unfamiliar partners but not familiar partners, which reveals marmosets' capacity for other-regarding preferences. However, OT did not influence the proportion of altruistic tray pulling in the PCT or homecage grooming and proximity. These results suggest that marmosets are more sensitive to the payoffs of unfamiliar partners over familiar partners, but this effect occurred independent of OT manipulation. These findings highlight the importance of social context in understanding the motivation and demonstration for other-regarding preferences. However, more work is needed to uncover mechanisms and motivations for the marmosets' stronger preference to reward unfamiliar partners more frequently than familiar partners.

CUONG NGUYEN

Graduate: Doctoral

An Exploration of Crowdsourcing Collaboration Processes

Major: Information Technology

Faculty Advisor: Gert-Jan de Vreede

Co-Authors: Onook Oh, Gert-Jan de Vreede, David Kocsis

Crowdsourcing refers to the use of technologies to gather the collective effort and wisdom from an undefined group of online users for organization innovation and problem solving. While the idea holds a lot of potential, its implementation can be thwarted by an ill design and management of the collaboration processes. Therefore, studies on crowdsourcing collaboration processes are important for the advancement of the field. We argue that the study of collaboration processes in crowdsourcing can benefit by referring to the literature on collaboration patterns. We explored and classified support in 135 crowdsourcing websites for six general collaboration patterns (generate, reduce, clarify, organize, evaluate, build consensus) through coding and cluster analyses. Findings showed that generate and evaluate patterns were dominant, while reduce, clarify, organize and build consensus were either rarely implemented or not fully developed. We also found that collaboration did not necessarily happen among online users but also between the online user group (the crowd), the organization's internal expert group, and the technology. These findings reveal implications for future research.

JAY PEDERSEN

Graduate: Doctoral

Malware Analysis assisted by Bioinformatics Tools

Major: Bioinformatics

Faculty Advisor: Dhundy (Kiran) Bastola

Co-Authors: Dhundy (Kiran) Bastola, Ken Dick, Robin Ghandi, William Mahoney

The use of Bioinformatics tools for analyzing digital artifacts is explored in a joint research project between Bioinformatics and Computer Security domains. An algorithm for creating "synthetic DNA" is pre-

sented which allows Bioinformatics tools which process DNA to be used. The sequence comparison tool BLAST is used to examine computer programming assignments for plagiarism, to cluster documents of different content types, and to look for similarities between variants of a particular malware strain.

CNANGSOO SONG

Graduate: Doctoral

Factors Influencing Micro-enterprises' Information Technology Adoption

Major: Public Administration

Faculty Advisor: Kenneth Kriz

Little empirical research has been conducted to examine information technology (IT) interventions for micro-enterprises. IT interventions that lack theoretical and empirical foundations with regard to their design and approach may lead to poorly designed programs and haphazard implementation schemes that do not account for various contextual challenges faced by micro-enterprises, resulting in projects which fail to meet their objectives. Hence, a need to understand critical components of an effective IT intervention for micro-enterprises is compelling. For this, we need to understand significant factors that would influence micro-enterprises' IT adoption. The purpose of the study is to theoretically and empirically investigate significant factors that would be related to micro-enterprises' IT adoption and that may need to be taken into consideration in designing and implementing an IT intervention for micro-enterprises to effectively enable or facilitate micro-enterprises' IT adoption. If effectively adopted, IT may contribute to micro-enterprise development (business growth) through increased business productivity. The growth of micro-enterprises would then contribute to stabilizing or boosting local and national economies through creating jobs. Through a quantitative analysis of potential factors, the research addresses the following research question: *What are the significant factors that would influence micro-enterprises' IT adoption, and how could they be modeled in a way to better explain micro-enterprises' IT adoption?* The research question is answered by identifying potential constructs (or factors) through a literature review and preliminary field research and then by conducting a cross-sectional survey and analyzing collected data through structural equation modeling.

NARGESS TAHMASBI

Graduate: Doctoral

Exploring Network Structure and Information Diffusion Pattern of Twitter- The Jan Lokpal Movement Case

Major: Info Systems and Quantitative Analysis

Faculty Advisor: Deepak Khazanchi

Co-Author: Abhishek Tripathi

Online social media has become an indispensable part of internet users' day to day activities. Online social media such as Twitter, Facebook, etc. empower the common people to share their opinions with others. In recent past, Twitter helped to facilitate spreading of social movements like Egypt revolution (2011), Jan Lokpal movement in India and so on. The Jan Lokpal Bill, is an anti-corruption bill initiated by the social activists of India to appoint an independent body – Jan Lokpal, aims to form effective anti-corruption and grievance redressal system so that effective restraint can be formed against corruption and to provide effective protection to whistleblowers. These social movements stem from the fact that when an incident is getting public attention or a topic is becoming a trend in a social network like twitter, users start to share information from other users and connect to other users and gradually form an information sharing network. The network may expand and reshape overtime. The structure of the network and the pattern it follows is associated with the users' behavior of sharing information and connecting to each other. We analyze the content and structure of Twitter network shaped for spreading news about the Jan Lokpal movement in India. This study helps us to explore the particular structural and contextual characteristics of the information sharing network which facilitates the information diffusion in the Jan Lokpal movement Twitter network.

ABHISHEK TRIPATHI

Graduate: Doctoral

Wisdom of Crowd: a survey and taxonomy of crowdsourced problems

Major: Information Technology

Faculty Advisor: Lotfollah Najjar

Co-Author: Nargess Tahmasbi

The internet enables large scale collaborations between individuals who are geographically separated. Enabling features include email, blogs, knowledge sharing communities, and wikis. This people-centric

technology has large socio-technical impact and allows individuals to participate flexibly in collaborative tasks. This flexibility has allowed tapping the “collective intelligence” of individuals for some tasks. Various new technology and business model has emerged to capitalize the revolution. The relatively new trend by an organization is to utilize the wisdom and labor from the stranger people to solve an open problem with the help of web mediated technology, this new trend is called “Crowdsourcing”. Crowdsourcing is an act of outsource a task to the undefined large number of people in the open form. Crowdsourcing has been used in variety of industries web-based t-shirt company, sells photos and video clips, to solve the R&D challenges etc. Though Crowdsourcing can be used to solve various types of problems from wide variety of organizations, but not much research has been attempted to categorize the various problem domain that can be crowdsource. Of particular in this paper we investigate the type of problems that can be crowdsource. Based on our initial investigation, problem that can be solved by crowdsourcing can be broadly categorize in simple and complex problem which further can be classified in innovative, creative, and specific to environment of the problem.

JULIA WARNKE

Graduate: Doctoral

Scalable Graph Modeling of Next Generation Sequencing Reads

Major: Bioinformatics

Faculty Advisor: Hesham Ali

Co-Author: Hesham Ali

Next generation sequencing has revolutionized nearly all areas of biomedical research. Current sequencing technologies are capable of producing several hundreds of thousands to several millions of short sequence reads in a single run. However, current methods for managing, storing, and processing the produced reads have remained simple and lack the complexity needed to model the produced reads efficiently and assemble them correctly. We present an overlap graph coarsening scheme for modeling reads and their overlap relationships. Our approach differs from previous read analysis methods that use a single graph to model read overlap relationships. Instead, we use a series of graphs with different granularities of information to represent the complex read overlap relationships. We present a new graph coarsening algorithm for clustering a simulated metagenomics dataset. We also use the proposed graph coarsening scheme along with graph traversal algorithms to find a labeling of the overlap graph that allows for the efficient organization of nodes within the graph data structure. We conduct a study to determine the scalability of our algorithm on a large Illumina metagenomics dataset. The obtained results show that our algorithm was able to substantially reduce the overlap graph size and is scalable for large datasets. Our overlap graph theoretic algorithm is able to model next generation sequencing reads at various levels of granularity through the process of graph coarsening. Additionally, our model allows for efficient representation of the read overlap relationships and is scalable for large datasets.

SHANE WURDEMAN

Graduate: Doctoral

Transfemoral amputee prosthesis preference is related to the change in stride-to-stride fluctuations

Major: Exercise Science

Faculty Advisor: Nick Stergiou

Co-Authors: Sara Myers, Adam Jacobsen, Nicholas Stergiou

Currently there are no performance metrics that relate to an amputee's prosthesis preference, a possible result of these measures failing to account for stride-to-stride relationships. The purpose of this study was to determine if changes in stride-to-stride fluctuations during amputee walking with two different prostheses is correlated with preference between the prostheses. Thirteen unilateral, transfemoral amputees walked non-stop on a treadmill for three minutes at a self-selected speed in two different prostheses while motion of the lower limb segments was recorded. After walking, subjects marked their degree of preference on a continuous visual analog scale. The flexion/extension angle of the intact and prosthetic leg's ankle, knee, and hip joint from a three minute interval for each prosthesis was embedded within its reconstructed state space. From this, the largest Lyapunov exponent (LyE) was calculated to measure the temporal organization of the stride-to-stride fluctuations. The change in LyE between prostheses was then correlated with the preference between prostheses. The change in LyE at the prosthetic ankle was found to be strongly correlated with the preference between prostheses ($r=0.629$, $P=0.021$).

In conclusion, the temporal organization of stride-to-stride fluctuations seems to reflect neuromuscular organization of the motor output. The stride-to-stride fluctuations that occur with a prosthesis are altered from the fluctuations that would naturally occur in a non-amputee. Thus, the subjects seem to have an affinity towards a prosthesis that best promotes return to natural stride-to-stride fluctuations. These results are the first to find an objective measure strongly correlated to prosthesis preference.

YAN XIAO

Graduate: Doctoral

The Effect of Public Pension Funding on State Credit Ratings

Major: Public Administration

Faculty Advisor: Kenneth Kriz

The two recessions after 2000, especially the recent Great Recession, has caused state government revenues

to drop and thereby unfunded public pension liabilities to soar. Currently many U.S. states have pensions that are extremely underfunded. Underfunded pension liabilities are an implicit form of debt in state debt portfolio. In 2011, Moody's began a new move for state government credit analysis which incorporates the unfunded pension liabilities into the debt matrices. As such, there is an increasing nationwide concern about credit threat of pension burdens on state bond rating assignment. In the private sector, researchers have concluded that pension funding status affects corporate bond ratings. In the public sector, however, very little research has investigated this link. More important, pension underfunding level reflects the underlying strength of pension management practice which may actually affect state creditworthiness indirectly. To date, no research has explored either the direct or indirect link between pension management practice and state credit ratings. This study will use panel data ordered probit model to investigate the impact of pension management practice and funding status on state credit ratings.

JIE XIONG

Graduate: Doctoral

Cross Country and State Level Analysis of e-Commerce Adoption Between Small Businesses in China and the United States

Major: Information Technology

Faculty Advisor: Sajda Qureshi

Co-Author: Sajda Qureshi

Small businesses represent the majority of all firms in developed countries and emerging countries. As the driving force and the central ingredient behind the economic growth and development of the world including the United States and China, Information and Communications Technologies (ICTs) used for e-commerce have fundamentally shaped a dramatic transformation in both countries. However, the usage of ICT is still a challenge for both developing and developed countries. California and Nebraska, in the USA and two provinces, Zhejiang and Sichuan in China are selected. California and Zhejiang are famous for their information technology industries, and Nebraska and Sichuan are known for their agriculture-based businesses. The research seeks to study the relationships between e-commerce adoption and contextual factors, and examine how these relationships vary across different economic environments. The research questions being investigated are: *What are the factors that affect e-commerce adoption in China and the USA? How do these vary between the two countries? What are the differences between the development of ICT in Nebraska and California? How can emerging area learn from the more developed area in the ICT area?* Drawing upon a comparative case study, conducted to further understand the phenomena, a model is developed using constructs developed from the literature. Data from more than 200 small businesses in both countries are collected by phone, Internet, and face to face interview. Preliminary results suggest that there are key differences in the adoption of ICT for e-commerce in China and the USA and lead to further advances in how small business adoption of ICT's for e-commerce can enable sustainable development to take place in their respective regions.

POST DOCTORAL FELLOWS

JOSE BACA

Graduate: Doctoral

Dynamic Gait Adaptation in fixed configuration for Modular Self-Reconfigurable Robots using Fuzzy Logic Control

Major: Information Technology

Faculty Advisor: Prithviraj Dasgupta

Co-Authors: Prithviraj Dasgupta, Ayan Dutta, Carl Nelson

Modular self-reconfigurable robots (MSRs) are robots that can dynamically adapt their shape and locomotion. They are very useful for maneuvering in tight spaces or when the task being performed by the robots requires them to change their shape autonomously. MSRs are useful in regions that are difficult for humans to maneuver in, such as in extra-terrestrial environments, inside volcanic craters, etc. MSRs are composed of a set of individual modules that can connect in different ways with each other to form different types of robot or shapes. When an MSR cannot continue its desired motion in its current shape, the conventional approach is to reconfigure the MSR by detaching the modules from their current shape and reattaching them to form a new shape or configuration. Reconfiguration, however, is a costly operation in terms of time and energy required by the MSR and might reduce the battery life of the MSR modules, if performed frequently. In this research, we study the problem of how an MSR can continue its motion without reconfiguring its modules, but, instead, by adjusting the way or *gait* with which the modules move. We have proposed a technique from the field of artificial intelligence, called fuzzy logic, for dynamically adapting the gait of MSR modules.

Our proposed technique has several

advantages – it is straight forward to design, easy to implement, and robust in operation. We have demonstrated the operation of our proposed technique through accurate computer simulations on an MSR called ModRED that we are developing.

SOTIRIOS DIAMANTAS

Graduate: Doctoral

Optical Flow based Velocity Estimation for a Mobile Robot

Major: Information Technology

Faculty Advisor: Prithviraj Dasgupta

Co-Author: Prithviraj Dasgupta

In this research, we address an important problem in mobile robotics – how to estimate the speed of a moving robot or vehicle using the technique of optical flow obtained from a series of images of the moving robot captured by a camera. Our method generalizes several restrictions and assumptions that have been used previously to solve the moving target velocity estimation problem – we use an uncalibrated camera, we do not use any reference points on the ground or on the image, and we do not make any assumptions on the height of the moving target from the ground. The only known parameter is the distance of the camera from the ground with the assumption that it is placed parallel to the ground; a case which holds for almost all robotic systems. In our proposed method we exploit the optical flow patterns generated by varying the focal length of the camera in order to pinpoint the principal point on the image plane and calculate the height of the moving target. This height is then used to calculate the speed of the target. We have verified our technique experimentally using a camera and a mobile robot and shown that our method proves to be a parsimonious yet effective irrespective of the distance and the speed of the mobile robot.

ANASTASIA KYVELIDOU

Graduate: Doctoral

Differences of COP variability between full and pre term infants in the sitting position

Major: Health, Physical Education and Recreation

Faculty Advisor: Nick Stergiou

Co-Authors: Regina Harbourne, Nicholas Stergiou

Our goal was to determine whether infants born full term, infants born preterm with developmental delays and infants born preterm and later diagnosed with cerebral palsy differed in their sitting postural control mechanisms. Thirty typical developing (TD) infants born at term, six infants born preterm, which were later diagnosed with cerebral palsy (CP) and five infants born preterm with developmental delays (DD) participated.

ed in this study. Each came to the lab for two sessions. The first session lasted for 45 minutes and was used to perform the Peabody Gross Motor Scale. In the experimental session three trials of sitting were recorded while infants were sitting on an AMTI force platform and postural sway measures were recorded. Amount of variability in the sway movement patterns was analyzed using the range for both the front-to-back and side-to-side and medial/lateral (ML) direction. Structure of variability in the sway movement patterns was analyzed using the largest Lyapunov Exponent (LyE) for both directions. Our analysis showed that TD, DD and CP infants differed in their sitting postural control mechanisms. DD infants had higher amount of variability when compared to TD and CP infants for both AP and ML directions. The structure of variability analysis differed significantly between the three groups. In the AP direction LyE had significantly higher values in TD infants than the DD and CP infants. These outcomes can assist in evaluating therapeutic interventions and in targeting different aspects of postural control for infants with CP or DD.

MU QIAO

Graduate: Doctoral

Visual Flow Affects Walking Kinetics during Split-belt Adaptation

Major: Exercise Science

Faculty Advisor: Mukul Mukherjee

Co-Authors: Mukul Mukherjee, Jung Hung Chien, Nick Stergiou

The effect of visual flow during walking is important because it interacts with the proprioception to maintain stability. The visual-motor perception is even more profound as it may override the contribution from proprioception and shift the control of the central nervous system (CNS) to feed forward. Studies showed that visual flow can affect the walking kinematics. However, its effects on kinetics and the effects of walking adaptations have not been studied. We studied how visual flow and adaptations affect walking kinetics. Specifically, participants walked on a split-belt treadmill with and without visual flow simulating normal walking in a corridor. The speeds of the split belt were 1.5m/s and 0.5m/s, respectively, and the visual flow emulated the slower belt. The effect of the phases during walking adaption was set in 5 conditions (pre-split, early-split, catch, late-split, post-split). Ten healthy young participants (age=25.5±5 years, mean±std, 5 males) attended data collection during which ground reaction forces (GRFs) were recorded. We found that there were significant main effects of both visual flow and adaption phases on the magnitude of the first peak of vertical GRF. For the 2nd peak GRF, only the effect of the adaptation phase was significant. For timing there was significant interactions on the loading duration of the 1st peak of vertical GRF. The results indicate that rather than timing visual flow has an effect on the magnitude of the kinetics during walking. They also indicate that visual-motor perception and coordination seem to control different aspects of walking kinetics.

YAWEN YU

Graduate: Doctoral

Move more, learn better: Contribution of sway variability to achieving sitting milestone in infants with Cerebral Palsy

Major: Exercise Science

Faculty Advisor: Nick Stergiou

Co-Authors: Yawen Yu, Joshua Haworth, Srikant Vallbhajosula, Regina Harbourne, Nicholas Stergiou

Movement experiences foster infants' motor development. After experiencing self-induced optical flow, crawlers learned to attune their posture in response to the visual change of the situated environment. Experiences of self-induced motion are essential to master advanced motor skills. However, children with Cerebral Palsy (CP) have difficulty controlling their body segments, which delays the mastering motor skills (i.e., sitting). In this study, we sought to examine whether movement patterns in early sitting behavior would be associated with the achievement of independent sitting. Twenty-five infants with moderate to severe CP received physical therapy two hours/week for 3 months after enrollment. All infants could prop-sit for 10s when entered the study. Sitting postural sway data was recorded with a force platform within one week of onset of first prop-sitting. Center-of-Pressure data collected from forceplate was analyzed. Children's achievement of sitting posture as sitting stage was coded 3 months after onset of first sitting. Three-months after the first prop-sitting onset, 12 out of 25 infants progressed to independent sitters. Repeated-measure ANOVA showed that RMS and range in the antero-posterior direction, as prop sitting first onset, were significantly higher in children with CP who progressed in sitting stage than those who remained in the prop sitting stage. As beginning sitters, infants with CP couldn't efficiently utilize postural movement to explore the environment. Greater movement experience (higher sway variability) is associated with the progress of independent sitting, suggesting that activities facilitate greater movement during sitting may be beneficial for infant with CP in developing sitting skill.



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